SELF-CARE OF ADOLESCENTS WITH TYPE 1 DIABETES MELLITUS (T1DM) ATTENDING RURAL OUTPATIENT MEDICAL CLINICS IN RWANDA

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DECLARATION

I declare that this Dissertation contains my own work except where specifically acknowledged.

MUKAMARARA Immaculee

220017015

Signed ……

Date……

DEDICATION

I dedicate this project to Mary, Mother of God

To NYAMVURA Family

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ABSTRACT

Background: Types 1 Diabetes mellitus in adolescents continue to be a public health concern, and a chronic disease, that requires lifelong insulin therapy. In this perspective, the literature points to the fact that self-care may be of great value for maintaining glycemic control and preventing complications associated with T1DM among adolescents. Considering that there is little knowledge of self-care in the Rwanda context for supporting adolescents with T1DM, it is suggested that this study is of great value for exploring self-care among adolescents for more informed self-care since self-care is determined by knowledge, attitude and practice of an individual.

Methods: A quantitative descriptive cross-sectional design was used to collect, organize, and analyze data. A researcher wants to measure the knowledge, attitude and practice (KAP) of the participants. Therefore, the variables (KAP) were measured on a predefined scale and were analyzed with statistical procedures to determine associations between these variables. Data was analysed by using statistical software SPSS version 25. The analysis involved both descriptive and analytical statistics.

Results: Tables and graphs were used to present results**.** Frequency and percentage were used for summarizing data, while means and standard deviation showed central tendency and dispersion of this summarized data. The knowledge scores > 70% indicated adequate knowledge, while knowledge scores < 70%, indicating insufficient knowledge. Besides, attitudes scores > 70% indicated the positive attitudes scale, while attitudes scores < 70%, indicate negative attitudes. Related to practice also the scores > 70% indicate good practice, scores < 70%, indicate poor practice.

Conclusion:

T1DM is a long-lasting disease which has a noteworthy impact not only on adolescents' lives of but also on their families. Therefore, this study permitted us to identify the level of knowledge, attitude and practice of self-care among adolescents with types1 diabetes mellitus (T1DM). Generally, there was a high level of knowledge found in 29.2% of adolescents, 74.3% have a positive attitude and 20.1% have a good practice, therefore the level of knowledge, attitude and practice on self-care of adolescents with type1 diabetes mellitus need to be enhanced because it is below the expected level.

KEY WORDS:

- Self-care
- Knowledge,
- Attitude
- Practice
- Type 1 Diabetes Mellitus
- Adolescents
- Rwanda

LIST OF SYMBOLS AND ACRONYMS

CMHS: College of Medicine and Health Sciences

DM: Diabetes Mellitus

KAP: Knowledge, Attitudes, and Practices

MoH: Ministry of Health

RDA: Rwanda Diabetes Association

T1DM: Type 1 Diabetes Mellitus

UR: University of Rwanda

WHO: World Health Organization

RSSB: Rwanda Social Security Board

RBC: Rwanda Biomedical Center

Ik: Ikibazo

Md: median

SD: Standard Deviation

CHAP: Chapter

OPD: Outpatient Department

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CHAP 1: INTRODUCTION

I.1. Introduction

Type 1 Diabetes Mellitus(T1DM) is the most common endocrine disorder in childhood whose incidence predominantly occurs during early adolescence(1).T1DM is a chronic illness that most time occurs in children and adolescents. It is characterised by the lack of insulin caused by autoimmune damage of Beta cells of Angels (1). Worldwide the report showed that more than 85% of youth <20 years of age in all diabetes cases (2). Also, the incidence of T1DM is increased at ages 10-14years (2).

The annual incidence of TIDM worldwide in children and adolescents under 15 years old was 98,200 in 2019 and this incidence in the under 20 years age group was 128,900 while the corresponding prevalence was 600,900 and 1,110,100 respectively (3) This incidence was calculated for 45% of countries ranging from 6% in the sub-Saharan African region to 77% in the European region. To sum up (4), it is maintained that patients with T1DM represent 5-10% of all people with diabetes. T1DM induces severe complications, and impaired growth in children and adolescents despite advancements in management (4). T1DM complications are classified into two main categories among others acute and long-term complications (5).

To deal with these complications, self-care has been underscored to be supportive of adolescents with T1DM. (6). Self-care refers to all activities that can be performed by an individual to maintain their health, well-being, and quality of life resulting in disease recovery. In the context of diabetes, self-care is deduced as having adequate knowledge or awareness about diabetes for surviving the complications associated with this invalidating condition. According to the same author, (6), in adolescents with T1DM, self-care enhances patients' autonomy by adhering to diabetes management including regular glucose control, insulin administration, balancing the meal with insulin treatment, and physical exercise (1). To conclude,(7) stated that once self-care is well understood and integrated within the normal daily routines, it may be potent and efficacy in preventing the complications of T1DM in adolescents.

1.2. Background to study

Types 1 Diabetes mellitus in adolescents continue to be a public health concern ,and chronic disease, that requires lifelong insulin therapy (8). In this perspective, the literature points to the fact that self-care may be of great value for maintaining glycemic control and preventing

complications associated with T1DM among adolescents (7). The self-care concept which is widely used interchangeably with self-management denotes twofold dimensions including doing activities taking care of him/ or herself (psychological autonomy) and taking daily decisions (behavioral autonomy) to control blood glucose (9) Self-care is very important to maintain optimal glycemic control and prevent complications including both micro vascular and macro vascular complications, which can negatively affect health, related to the quality of life (9).

The self-care activities should include steady checking of blood sugar (glucose), monitoring and regulatory of carbohydrate intake, adjusting insulin dosage to match the regimen and activity outlines, contributing in moderate-intensity physical activity for more than 150 min per week, and checking urine for ketones where possible (6). Ultimately, (1), argued that self-care should be underpinned by autonomous and responsible attitudes of adolescents as well as their relatives to control T1DM. Concerning the practice of self-care activities, a recent Canadian study by (10) asserted that the practice of regular physical activity is likely to prevent complications associated with T1DM by lowering the risk of mortality by 45%. Despite this evidence, a study conducted in Saudi Arabia, (6) found that adolescents were knowledgeable of T1DM management but failed to adhere to treatment regimens suggesting strong self-management education. In America, (11) observed that adolescents' attitudes towards self-care were poor in that they could not adhere to diabetes regimen by refusing to take insulin in public and respect medical visits as well. Similarly, in China, (9) reported that about 78.9% of participants with T1DM were not able to examine their feet while 33.9% of them did not monitor blood glucose during the time of data collection. In Malawi,(7) it was revealed that the majority of adolescents affected with T1DM were not knowledgeable of self-care practices to such an extent that 58% (42/72) of them experienced difficulty in managing hyperglycemia, 61% (28/46) were unable to perform self-monitoring of blood glucose leading to high admission rate with 44% being admitted 3-4 times and 11% more than 7 times in a year. A Scottish study, (12) pointed out that self-management of T1DM is difficult for adolescents as it requires them to take care of themselves by monitoring blood glucose several times a day (around 4 times a day), calculating insulin dose, regulating food intake, and managing hyperglycemia and hypoglycemia. In this perspective, (13) urged adolescents to integrate T1DM routines into their daily life and identity for self-care empowerment. In Rwanda, studies conducted on diabetes self-care among patients attending a diabetes clinic in Kigali, have focused on types 2 (14), glycemic control (15), but the study explores knowledge, attitudes, and

practices about self-care of adolescents towards T1DM yet to be identified in the Rwandan context. Considering the paucity of research in this area, it is important to investigate T1DM self-care among adolescents.

1.3. Problem statement

T1DM is a worldwide worrying disease that is threatening to children and adolescents. Currently, the International Diabetes Association reports that roughly 1.1 million children and adolescents (<20 years) live with type 1 diabetes around the world(16). Besides, among people with diabetes around the world, T1D accounts for 5-10% of them (17). It is documented that 80% of diabetes deaths occur in low and middle-income countries due to poor glycemic control (18) Failure to achieve glycemic control in children and adolescents exposes them to long term and early complications in multiple organ systems (19).

In Rwanda, (20) maintained that adolescents with T1DM face many challenges, like inadequate knowledge of self-management and lack of confidence in their future resulting in school dropout for fear of being stigmatized by classmates. Also, Kabgayi Hospital Report (2018) displayed that 5 (62.5%) out 8 (100%) adolescents with T1DM were admitted for hyperglycemia in the Emergency Department for being taken care of and 3 (37.5%) of them were readmitted. From the researcher's experience, insulin administration protocol is available, but self-care guidelines were not observed in health facilities which may be an impediment to quality care of adolescents with T1DM. Furthermore, to the researcher's observation, there is no appropriate health education for adolescents with T1DM provided; they follow the health education provided in general at OPD with all patients. Althoughthe Rwandan Government through the Rwanda Ministry of Health has put forward some strategies for improving lifestyles for people living with non-communicable disease (21), these strategies seem to be not specific to the self-care of adolescents with T1DM. Before and after putting forward these strategies, there is no any study done about the self-care of adolescents with type1 diabetes mellitus (T1DM). Means there is no information related to how the adolescents with T1DM perform their self-care in Rwanda context. It is suggested that this study will be of great value for exploring knowledge, attitudes, and practices among adolescents for more informed self-care management.

1.4. Study objectives

The objectives of this study are categorized as general and specific objectives**.**

1.4.1. General objective

The broad objective of this study was to assess the knowledge, attitudes, and practices of self-care of Type 1 Diabetes Mellitus among adolescents attending rural diabetic outpatient medical clinics in Rwanda

1.4.2. Specific Objectives.

- To assess the level of self-care's knowledge of Type 1 Diabetes Mellitus among adolescents attending rural diabetic outpatient medical clinics in Rwanda.
- To explore the attitudes about self-care of adolescents with Type 1 Diabetes Mellitus attending rural diabetic outpatient medical clinics in Rwanda.
- To determine the level of practice about self-care of adolescents with Type 1 Diabetes Mellitus attending rural diabetic outpatient medical clinics in Rwanda.
- To determine associations between knowledge score and socio-demographic data of adolescents with T1DM attending rural diabetic outpatient medical clinics in Rwanda.

1.5. Research questions

- What is the level of knowledge of self-care of Type 1 Diabetes Mellitus among adolescents attending rural diabetic outpatient medical clinics in Rwanda?
- What are attitudes about self-care of adolescents with Type 1 Diabetes Mellitus attending rural diabetic outpatient medical clinics in Rwanda?
- What is the level of practice about self-care of adolescents with Type 1 Diabetes Mellitus attending rural diabetic outpatient medical clinics in Rwanda?
- What are the associations between knowledge score and socio-demographic data of adolescents with T1DM attending rural diabetic outpatient medical clinics in Rwanda?

1.6. Significance of the study

The significance of this study is to be described in line with the nursing administration, nursing practice, nursing education, and nursing research.

Nursing administration: the study findings would inform hospital management as well as the Ministry of Health authorities about current strategies and TIDM self-care guidelines and protocols to streamline the integration of focused self-care management of adolescents with TIDM. There

could also be a possibility to organize continuous training of nurses about self-care of TIDM among adolescents.

Nursing practice: Drawing on the results from this study, TIDM self-care guidelines may be implemented in daily nursing practice which should result in quality service delivery provided to adolescents suffering from T1DM. Adolescents with T1DM and their family members could be empowered in self-care by receiving specific health education which may increase adherence to treatment with a view of preventing complications associated with this disease.

Nursing education: Nursing students may benefit from the findings from this research by updating their knowledge of current trends in self-care of T1DM among adolescents for contributing to quality improvement in diabetes management. Nursing schools' teachers could be informed on T1DM available evidence for supporting adolescents affected with diabetes which could be integrated into nursing curricula.

Nursing research: it is suggested that the findings from this study could form the baseline for future researchers in self-care towards adolescents with T1DM which should result in knowledge refinement, development and sharing in T1DM.

1.7. Definition of the concepts

- **Knowledge**: According to Merriam-Webster (2020), knowledge is the fact or condition of knowing with familiarity gained through experience. Similarly, the Oxford Dictionary (2020) defines the concept of knowledge as a fact, information, and skills acquired through experience or education. In this study, knowledge refers to awareness and understanding of types 1 diabetes mellitus, signs and symptoms, lifestyles (diet, physical exercise, and hygiene), glycemic control, insulin therapy, and complications associated with diabetes.
- **Attitudes**: in the view of the Oxford Dictionary 2018 attitude refers to a way of feeling or acting toward a person, thing, or situation. In this study, attitudes include behaviour or adherence to treatment, feeling or own responsibility to self-care towards T1DM.
- **Practices**: According to Merriam –Webster 2019, the practice is to perform or work repeatedly to become proficient. In this study, the practice involves all activities performed by adolescents with T1DM for caring for themselves including insulin self-administration, carrying out physical exercises, and taking prescribed regimens

- **Self-care**: Oxford Dictionaries 2018 defines self-care as the practice of taking an active role in protecting one's well-being and happiness in a particular condition or period. In context of diabetes, self-care refers to all activities performed by adolescents with diabetes mellitus including self-glucose monitoring, self-administration of insulin, taking balanced diet and physical activities, being able to recognize warning signs of hyperglycemia and hypoglycemia and related management, and maintaining stringent hygiene measures.
- **Type 1 Diabetes Mellitus**: type 1diabetes Mellitus is explained by Merriam-Webster (2018)**,** is a form of diabetes mellitus that usually develops during childhood or adolescence and is characterized by a severe deficiency in insulin secretion resulting from atrophy of the islets of Langerhans and causing hyperglycemia and a marked tendency toward ketoacidosis. In this study, T1DM is a juvenile disease that affects children and adolescents due to a deficiency of insulin production by the pancreas leading to insulin dependency.
- **Adolescents:** Merriam-Webster (2020) defines an adolescent as a person who is no longer a child, but not yet an adult. In this study, an adolescent is any patient diagnosed with T1DM whose age is ranging from 10-19 years old.

1.8. Conclusion

This chapter has introduced the concept of T1DM, the background and the problem statement has been presented. Subsequently, the aim of the study, specific objectives, and research questions were outlined. Finally, the significance of the study and conceptual and operational definitions were provided.

CHAP 2. LITERATURE REVIEW

2.1. Introduction

Diabetes is one of the most overall wellbeing troubles with an expansion in diabetes occurrence in kids and adolescents(1,2) Type 1 diabetes is one of the most difficult non-communicable diseases to treat in children and is a global health issue. Type 2 diabetes mellitus and gestational diabetes mellitus are also included in the classification of diabetes mellitus(22). According to some published research, diabetes self-care is particularly challenging for adolescents;This chapter aimed to outline the theoretical and empirical literature on Knowledge, Attitude, and Practice (KAP) regarding self-care of adolescents with Type 1 Diabetes Mellitus, including unhealthy weight management behaviors and a lack of understanding of how to manipulate insulin to achieve optimal glucose levels(3).

2.2. Search engines

The primary electronic databases, such as the MEDLINE database, were searched as part of the systematic search strategy in this study;the database of PubMed;the database of OVID;and the Index of British NursingThe researcher also included Google Scholar in the search.Additionally, the University of Rwanda materials catalog was examined and, if available, obtained from the university library.The free text search strategy was used to find sources of information on KAP of self-care in adolescents with type 1 diabetes in Rwanda. The keywords were combined.In terms of empirical literature, studies that were published within the last five years (from 2015 to 2020) were included.

2.3. The theoretical literature

2.3.1. Overview on Type 1 Diabetes Mellitus

Evidence from literature shows that at least 600900 children under 15 years are living with T1Diabetes Mellitus, as worldwide estimation, while among individuals under 20 years old the prevalence is almost double(1110100) (23). Type 1 diabetes is a sickness caused by a lack of making of insulin. And this happens when the immune system of body attacks and abolishes cells of beta class which are normal producers of insulin (24).

Insulin is a hormone required to allow the body's cells to use glucose, so without insulin, glucose remains in the bloodstream where it does not produce energy for the functioning of the body (24).

Due to the lack of endogenous insulin production, exogenous insulin must be administered to maintain the body's metabolic function. In addition, diabetics also need glycemic control. Food intake, especially carbohydrate intake, should also be controlled(25) .In this regard, flexible diets are designed to achieve and maintain optimal blood sugar levels. A bolus insulin test is also required(25) .Insulin administration is essential regardless of the treatment regimen chosen.

Diabetes mellitus can cause acute or chronic complications, such as hypoglycemia or microvascular or macrovascular complications that affect many organ systems.However, people whose blood sugar levels are well-controlled experience fewer and fewer serious complications(26). The most common, most severe, and most dangerous type 1 diabetes complication is diabetic ketoacidosis (DKA)(27) .Ketones are produced by the liver when insulin levels are low.If it happens only occasionally, this is normal; however, if it continues, it may be a serious issue.A triad of hyperglycemia, metabolic acidosis, and ketonemia are evident in the patient's blood tests.To improve patient outcomes, prompt diagnosis and appropriate treatment are essential(28) .DKA patients frequently lose water, urinate less, and experience altered consciousness.A high risk of death and the progression into a coma are frequently linked to this condition.Abdominal pain can be severe and common.Ketone levels are high in the urine.DKA has a negative impact on the quality of life of both individuals with type 1 diabetes and their families in the majority of cases. Additionally, it may encourage microvascular complications in diabetics(29) .

Hypoglycemia is a rare and acute diabetic complication, primarily due to many diabetes treatments. Patients with hypoglycemia may become restless, sweaty and weak, exhibit many symptoms of sympathetic autonomic activation, and feel lightheaded and panicked. Altered consciousness can lead to coma, seizures, and even brain damage and death. In diabetics, this may be due to several factors, including: B. Too much insulin, too much exercise, and poor nutrition. A study conducted in the UK found that 90% of patients treated with insulin develop hypoglycemia. (30) Hypoglycemia is most often treated with sugary foods and drinks. The goal of treating hypoglycemia is usually to achieve and maintain good blood sugar levels. For moderate hypoglycemia, treatment is 10 to 15 g of glucose, and carbohydrate should be added following hypoglycemia treatment to prevent recurrence of hypoglycemia.In severe cases, glucagon injection Alternatively, an intravenous infusion of glucose is used for treatment, but usually only if the

person is unconscious(31) .Common chronic complications include microangiopathy resulting in one or more of the following: Abnormal loss of sensation, usually starting in the feet and often later in the fingers and hands. Diabetic muscular atrophy; diabetic retinopathy which can lead to severe vision loss or blindness. Diabetic encephalopathy with increased risk of cognitive impairment and dementia(32) .

Another type of chronic complication is macrovascular disease, where accelerated atherosclerosis can lead to cardiovascular disease that contributes to coronary artery disease causing angina pectoris or myocardial infarction. Peripheral vascular disease contributing to lameness and diabetic foot; and stroke (predominantly of the ischemic type)(33).

The immunity is reduced in a diabetic patient. High blood sugar levels reduce the function of immune cells and increase inflammation contributing to the risk of respiratory infections like pneumonia(34). Note that repeated injections of insulin in or near the same site cause additional subcutaneous fat to accumulate and can appear as a large lump under the skin, “Lip hypertrophy”and hyperplasia. It can be unsightly, mildly painful, and can affect when or how well insulin works (34)

2.3.2. Protocols on Diabetes Management by the Ministry of Health, Rwanda

The Rwandan Ministry of Health's protocols are intended to be a helpful resource for healthcare professionals handling clinical cases in the country.They are based on the services that are provided at various levels of the healthcare system and the resources that are available.They want to standardize service delivery across Rwanda's various socioeconomic levels.Based on facility reports about the clinical features of high-volume and high-risk diabetes treated in healthcare facilities, the clinical aspects of diabetes included in the protocol were chosen(35).

Diabetic ketoacidosis (DKA) is a common clinical problem. It is a severe, acute, and potentially fatal complication of uncontrolled diabetes mellitus that necessitates immediate insulin treatment and intravenous fluids(35). HCO3] >13 mEq/L), as well as blood and urine cultures; CXR; electrocardiogram; and ultrasound of the abdomen.Blood urea (DKA), complete blood count, osmolarity (increase to >290 mOsm/L) Calculate = 2 (Na + K) + urea / 3 + glucose (mg/dl) / 18, anion gap (increase) Calculate = ([Na + K]-[Cl+). The study included blood tests for glucose every hour until the patient was stable and every 6 hours thereafter, urine dipsticks (positive for glucose and ketones), serum electrolytes every 4–6 hours for acute illness, Blood urea (DKA), complete

blood count, osmolarity (increase to >290 mOsm/L) Calculate = 2 (Na + K) + urea / 3 + glucose (mg/dl) / 18, anion gap (increase) Calculate = ([Na + K]-[Cl+.Controlling includes 35 admissions to the high dependency section of an ICU or Medical Ward;Correction of fluid loss with intravenous fluids, such as Ringer's Lactate or Normal Saline: Give 1-3 L in the first hour; 1 L in the second hour; 1 L in the next 2 hours; 1 L every 4 hours, depending on how dehydrated you are;treatment of high blood sugar with insulin:0.1 UI/kg/hr Only short-acting insulin is used to treat hyperglycemia. If an IV line isn't accessible, use the subcutaneous or intramuscular route.

Doses and routes:Initial dose of insulin:Using an electric syringe, continuous IV insulin infusion at a rate of 0.1 U/kg/h.Mix 60 milliliters of isotonic sodium chloride OR with 24 units of regular insulin.Mix 60 units of short-acting insulin with 500 milliliters of normal saline solution if the electric syringe is unavailable.Until the blood glucose level is below 180 mg/dL, infuse at a rate of 15 mL/h (6 U/h);Alter the amount of insulin taken as needed to make sure:The maximum rate at which glucose can be reduced is 100 mg/dL/h.Blood glucose shouldn't fall under 200 mg/dl during the initial 6 hours → In the event that blood glucose stable and pee ketones negative, stop insulin imbuement and begin standard insulin routine;adjustment of electrolyte imbalances, especially hypokalemia;electrolyte disturbance correction, K+ level greater than 6 mEq/L:don't give K+, K+ level is between 4.5 and 6 mEq/L:Give potassium chloride at a dose of 10 mEq/h, with a K+ level of 3-4.5 mEq/L:If the K+ level is greater than 5 mEq/L, potassium infusion should be stopped.

The monitoring of serum potassium must continue even after potassium infusion is stopped to detect recurrence of hypokalemia. In severe hypokalemia: Insulin therapy should not be started until potassium replacement has been started; this is done to prevent hypokalemia-related potentially fatal cardiac arrhythmias; hypoglycemia, which is defined as a syndrome characterized by a reduction in either plasma glucose concentration (100mg/dl), is another clinical aspect of treatment of concurrent infections. Beginning empiric antibiotics on suspicion of infection until culture results are available.If patient is awake and willing to cooperate:Consuming less than 15 grams of glucose as carbohydrates:3 teaspoons of sugar taken orally, 1 glass of juice or soda.And carbohydrates with a long half-life:fruit and breadIf the patient is asleep:If you don't have access to an IV, administer 25 g of dextrose intravenously (one ampoule containing 50 percent dextrose) or 1 mg of glucagon intravenously (can be repeated every 15 to 30 minutes).After 10 to 15 minutes,

measure blood glucose once more.Use 50% dextrose followed by 5% dextrose based on blood glucose titration or 10% dextrose if severe hypoglycemia (40-50 mg/dL) recurs or is associated with sulfonylureas or long-acting insulin.The hyperglycemic regimen should be modified in accordance with the findings of an investigation into the cause.

2.3.3. Diabetes Self-care

The concept of self-care has been defined as an evolutionary process through which patients develop knowledge or awareness as they learn to navigate the complex nature of diabetes in social settings(36). Patients participate in successfully managing their disease through optimal glycemic control and prevention of complications(36). When diagnosing a long-term condition such as diabetes, the goal of self-care is for the patient to understand and manage the condition and know how to take medications to stay healthy(37). In addition, self-care is owned and managed by individuals to help them cope with emotional changes and adherence to treatment, in addition to managing the long-term effects of illness in their own lives(38). Ineffective self-care management can lead to life-threatening microvascular and macrovascular complications and related disorders, which can affect both individuals and society, thus encouraging individuals to take control of their conditions. How you manage it matters(6). Self-care can be achieved by empowering people to understand the causes of disease, its symptoms, and its treatments. In the context of diabetes, the term empowerment means integrating key components of diabetes knowledge, skills, attitudes, and self-awareness rather than simply following conventional methods offered by physicians(39). These key factors help people understand the importance of empowerment in terms of improving their behavior and quality of life(39). Therefore, diabetes self-care education provides the knowledge and skills necessary to help people with diabetes adopt recommended behaviors such as exercise, healthy eating, blood glucose self-monitoring, foot care, and medication administration(39).

2.4. Empirical literature

2.4.1. Knowledge, attitude, and practices

Diabetes management activities range from simple to complex and are one of the key features of self-care. For the most part, patients take care of themselves, but to be successful, they need commitment and knowledge to become self-sufficient in their day-to-day activities. Descriptions of what constitutes diabetes management interventions in the literature vary, but most involve

insulin administration (including adjustments), dietary adjustments, exercise, blood glucose monitoring, urinalysis, and response to hyperglycemia or hypoglycemia(40). Proper self-care helps maintain good glycemic control(41). This means that patients must adhere to a variety of self-care activities recommended by their healthcare provider. This includes observing a range of expected behaviors, especially a healthy lifestyle including exercise, healthy eating, smoking reduction, and weight management(34). These study participant's demonstrated low levels of adherence to most other self-management practices, with a view to easing blood sugar levels and minimizing the likelihood of developing unwanted complications of the disease. , suggesting that they do not understand the importance of these practices. Moreover, the finding that only 15% of participants had good glycemic control suggests that medication alone is not the answer to effective management. There is strong evidence that there is no(42). In this study, conducted in Jimma University Teaching Hospital in southwestern Ethiopia, in his 325 adults with type 2 diabetes, Morrisk's her 8-point medication adherence was used as a tool. As a result, 44.9% of participants had high-level knowledge, 34.9% had moderate knowledge, and 21.1% had low-level knowledge(31)

Because diabetes is a disease that lasts a lifetime and can cause a variety of problems, having good control over one's blood sugar levels could help prevent problems from developing and improve one's quality of life.4 Because the vast majority of day-to-day care in dia Studies(19) revealed low levels of adherence to treatment plans in most other self-care practices, it is believed that appropriate patient knowledge of self-care is the key to achieving therapeutic goals in ambulatory care. This is because patients do not understand the significance of these practices in terms of lowering blood sugar levels and reducing the likelihood of developing complications.In addition, the fact that only 19 of the people who took part in these studies had good glycemic control strongly suggests that medication alone is not sufficient to provide effective management.Additionally, the prose suggests that patients with lower levels of education engage in fewer self-care activities than those with higher levels of education, as patients with lower levels of education may have more difficulty comprehending healthcare providers' treatment recommendations(43)

The KAP of diabetic patients was looked at in the study by Zohair J. Gazzaz(44), and the results showed that the patients had good diabetes knowledge but bad diabetes attitudes and practices.The

knowledge score was 12.42, which was the highest possible score, while the attitude and practice scores were 1.46 and 2.28, respectively, which were the highest possible scores of 5 and 6.

According to the literature, diabetes patients' attitudes and management strategies are negatively impacted by their lack of knowledge.For instance, Sabra et al. conducted a cross-sectional study (45) The findings revealed that nearly half of the 342 diabetic patients enrolled in medical diabetic clinics were unaware of the signs and symptoms of hypoglycemia.Additionally, the results of home-based blood and urine testing were extremely subpar.Additionally, a Saudi Arabian study by Turrky H. Almigbal found that 68.9% of diabetes mellitus patients experienced hypoglycemia as an acute complication due to a lack of knowledge.(46) To enable glycemic self-monitoring and long-term glycemic control, it is essential to raise patients' awareness of health issues through education.

Al Johani(47) also found that patients had poor self-monitoring to control blood sugar and adherence to the recommended diet, as reported by 39.52 percent and 34.63 percent of patients, respectively, in their study.In addition, 68.79 percent of participants reported that they control their T1DM patients through physical activity (PA) and co-confirm the reduction in medication use. Physical activity is typically performed in accordance with the patient's condition.However, due to the frequent risk of hypoglycemia, T1DM patients must pay attention(48) Similarly, Sabra et al.'s study (45) found that 64.8% of people incorrectly believed that diabetes was inherited, 659.9% believed that diabetes was caused by eating too much sugar, and 28.8% believed that oral hypoglycemic agents were more effective than insulin.Notably, all studies indicated a low level of KAPs in patients, emphasizing the necessity of educating diabetics about medication and nutrition. These misconceptions were primarily related to education levels (with higher levels of misconceptions among illiterate participants than literacy) and income levels (with higher levels of misconceptions among participants from lower-income families than among participants from high-income families).Since numerous KAP studies indicate a low level of awareness due to a lack of effective health education, the suggestion is that healthcare professionals should adopt various health education strategies to improve the effectiveness of self-care (43).

2.4.2. The environment of Self-care

Self-care instruction and assistance should be provided to diabetic patients.Actions that provide the patient with behavioural, clinical, educational, or psychosocial assistance in putting into place and maintaining the practices necessary for the patient's ongoing self-care of their illness are what define support(49). However, the availability of e-health technologies has increased to the point where they can supplement or even replace service-based diabetes self-care education and support programs.E-health technologies have made diabetes education, support, and participant communication with providers outside of the clinical setting better.(50) The availability of patient education is negatively impacted by many factors.These incorporate social boundaries, absence of proceeding with schooling programs for diabetes instruction laborers, deficient nursing experience, lacking staffing, the incapable association to work with 'performing nursing obligations to make time for preparing, unnecessary patient connections that limit the time accessible for every patient, lacking showing hours, inadequate time, negative workplaces and mentalities, and the absence of a conversation gathering or clinical heading of showing projects and exercises(51). Additionally, clients in the Easter Ethiopia study had limited collaborative practice due to a lack of organized diabetes care services, which corresponds to barriers cited by health care providers(51).

Diabetes sufferers require the assistance of not only medical professionals but also members of their families and social networks.Health benefits from self-care and social support are undeniable(52). According to the research, self-care benefits are positively correlated with social support.The improvement in diabetes patients' positive self-care practices or shift in the practice of health-protective behaviors was found to be attributed to social support(52).

2.4.3. Identified gap in the literature review.

A literature review has been outlined in this chapter, highlighting and analyzing the relevant literature to this research topic.The results of the literature review revealed that there were nine peer-reviewed studies focused on KAP, whereas there were 14 peer-reviewed studies focused solely on self-care practice. Besides, there were more published peer reviewed qualitative studies (thirteen peer reviewed studies) than peer reviewed quantitative studies knowledge (ten peer reviewed studies). Furthermore, most of these studies were conducted in developed countries. In this study the literature finding showed five studies focused on self-care and three on self-care

practice , two studies focus on KAP, five studies focused on knowledge , two focused on attitude, and five focused on practice In addition we have identified fifteen quantitative studies and sixteen qualitative studies .

The significance of KAP in adult diabetic patients has been the focus of the majority of the research findings.However, there is a dearth of pertinent information regarding diabetes self-care practices among adolescents in particular.Additionally, no research on self-care practices among Rwandan adolescents with DM has been found.In addition, there was a lack of research on KAP's impact on T1DM self-care in Rwanda, making its impact on diabetes self-care in this country unclear.This lack of evidence has made it even more important to conduct research into the extent to which KAP influence self-care among Rwandan adolescents with T1DM.

2.5. Conceptual framework

Orem's nursing theory of self-care deficit will be used in this study(53). The theory of self-care, the self-care deficit, and the theory of nursing systems(54) are George's three main concepts that make up this theory (55). According to(56), dependent care and self-care, two self-care agencies and dependent care agents, three therapeutic self-care demands, four self-care deficits, five nursing care agencies, and six nursing systems, as well as a peripheral concept of basic conditioning factors.

2.5.1. Self-care and dependent care:

For a diabetic adolescent, self-care is all activities performed by himself or herself in order to maintain blood glucose around (57) normal range. Those activities are regular blood glucose control, self-insulin administration, matching time of insulin therapy and mealtime, hygiene measures, physical exercises, and management of acute complications (hypoglycemia and hyperglycemia). Dependent care is the support given by parents, family members or friends to diabetic adolescent to help them to maintain a good life, health and wellbeing (58).

2.5.2. Self-care agency and dependent care agency:

The self-care agency in type 1diabetes mellitus in adolescents is competency and aptitude to manage their diabetes condition in different activities. The adolescent is able to: perform blood glucose, to measure the dose and administer insulin and change different sites of injection. Also, the diabetic adolescent knows how much time to take for physical exercises Dependent care

agency, is the ability of caregivers, like parents, family members, and friends to help the diabetic adolescent in the accomplishment of activities of diabetes self-care (59).

2.5.3. Therapeutic self-care demands:

In the case of diabetic adolescent, therapeutic self-care demand is the total activities or actions taken by adolescents to manage her or their diabetes, according to standards, for the diabetes treatment they have to respect the physician's appointments as recommended, and apply all techniques of self-treatment learned, life self-glucose blood control, self-insulin administration, self-plan of activities (54)**.**

2.5.4. Self-care deficit:

Usually in normal condition the diabetic adolescent assures self-care agency. And when this is not assured the self-care demand increases, then self-deficit occurs; meaning that the adolescent is not able to perform self-care. Parents, family members, friends, and the community are not able to help him or her. In this condition nursing interventions are required, to satisfy the health care demand.

2.5.5. Nursing systems:

According to lack of self -care and lack of dependent self-care, the(56) said that the nursing system is subdivided into three categories of system:

1.Full or total compensatory system When an individual lacks the ability to engage in any form of deliberate/accomplish the action by being unconscious, or not able to maintain auto-run handling, or those who are able to perform actions, but are not able to decide for them. Here it is in case of diabetic adolescent refereed at hospital in KDA condition or in the unconscious state caused by severe hypoglycemia, nursing care will be total. Because the adolescent and parents or other care givers are unable to give any care.

2. Partially compensatory system when the care provider and client have the same engagement in the action of self-care. In the care of diabetes self-care, it is when the adolescent is in a convalescent state and still in the hospital and learns with a nurse how to control blood glucose, how self-insulin injection is done, how to calculate insulin dose, which insulin to choose and which time of injection. Which food to take easily and which food to take with reserve. When and how physical exercises are done. Finally, the adolescent learns how to apply hygiene measures.

3. Education support system, in which the nurse is a guide in different activities in order to prepare the client to develop his or her action of self-care in an adequate manner. Furthermore, the adolescent, guided by a nurse, became independent, in blood glycemic control which is a cornerstone of diabetes, self-insulin administration, which type of insulin, dose, time, and frequency. Be able to identify the different symptoms of hyperglycemia and hypoglycemia. In addition, know how to manage himself or herself when those symptoms occur (6)**.**

2.5.6. Nursing Agency:

According to (56) the nursing agency is the aptitude or power to nurse. Also, nursing agency is a performance/capability that a nurse has to meet a patient's therapeutic self-care demand, within each category of a nursing system that has to be satisfied. To achieve this target a nurse must have effective communication skills, and the ability to create a good relationship with clients and other professionals. In the case of diabetes, a nurse will be able to perform nursing care when an adolescent comes: in KDA condition with the full or total compensatory system, in the partially compensatory system when the adolescent is able to engage with a nurse in activities of self-care.

Also, in the education support system, when the adolescent is independent in different activities of self-care and dependent self-care.

2.5.7. Basic conditioning factors:

The diabetic adolescent has multiple basic conditioning factors:

Age: like other adolescents, the diabetic need to enjoy the freedom, and the life circumstances, but the measures of diabetes self-care is a barrier. They have difficulty to being marginalized by their classmates or friends(60)**.**

Gender: The girls many times efuse to inject insulin on the arm, therefore it is a favorite part of insulin absolution**.** The girl adolescent also often has vaginal thrush without any sexual intercourse, and that is stressful for them(61).

Developmental state: if diabetes is not well managed by self-care agencies and demand self-care agencies, the diabetic adolescent doesn't grow like others of the same age.

The study done in King Abdul-Aziz University Hospital Saudi Arabia,(4) showed that the duration of disease delays the height growth.

This grow insuficience usually cause the body dissatisfaction, as results during the early stages of adolescence .The study conducted by(62) has shown the poorer self-esteem, and anticipations of different issues, like depressive syptoms, less physical activity ,and poorer dietary quality.

According to (63) Many of adolescents lose self-esteem or confidence if they get un favorable or bad comments about their appearance or social looks. Beacause they are very sensitive regarding criticism about this body image.

Socio-cultural orientation: in some regions or countries diabetes is kept secret and this behavior can be the source of DKA, because they are afraid to consult the health facilities at times. During social activities adolescents are afraid to be different from their peers, because they have to take time for blood glucose control, take the food and self-insulin administration. (64)

Health care system factors: Some diabetic adolescents don't have insurance and this condition becomes an obstacle to having access to care. And they can develop acute complications like hyperglycemia or DKA.

Family system factors: When the parents or other family members ignore the disease, at the beginning, they think about poisoning**,** then the patient is not cared for at the time and starts to develop early complications (65).

Resource's availability and adequacy: If the diabetic adolescent doesn't have resources or the parents, the patient can't assure self –care without materials for blood glucose control, access to insulin, appropriate diet, and travel fees for medical appointments. With these diabetes mellitus requirements in adolescents, it is obvious that diabetes is stressful (61).

Orem has developed five assumptions as the following(66,67)

Table 1: Five assumptions developed by Orem

No.	Assumptions
1	Human beings require continuous, deliberate inputs to themselves and their environments to remain alive and function in accordance with natural human endowments.
2	Human agency, the power to act deliberately, is exercised in the form of care for self and others in identifying needs and making needed inputs.
3	Mature human beings experience privations in the form of limitations for action in care for self and others involving making of life –sustaining and function-regulation inputs.
4	Human agency is exercised in discovering, developing, and transmitting ways and means to identify needs and make inputs self and others
5	Groups of human being with structured relationships cluster tasks and allocate responsibilities for providing care to group members who experience privations for making required, deliberate input to self and others

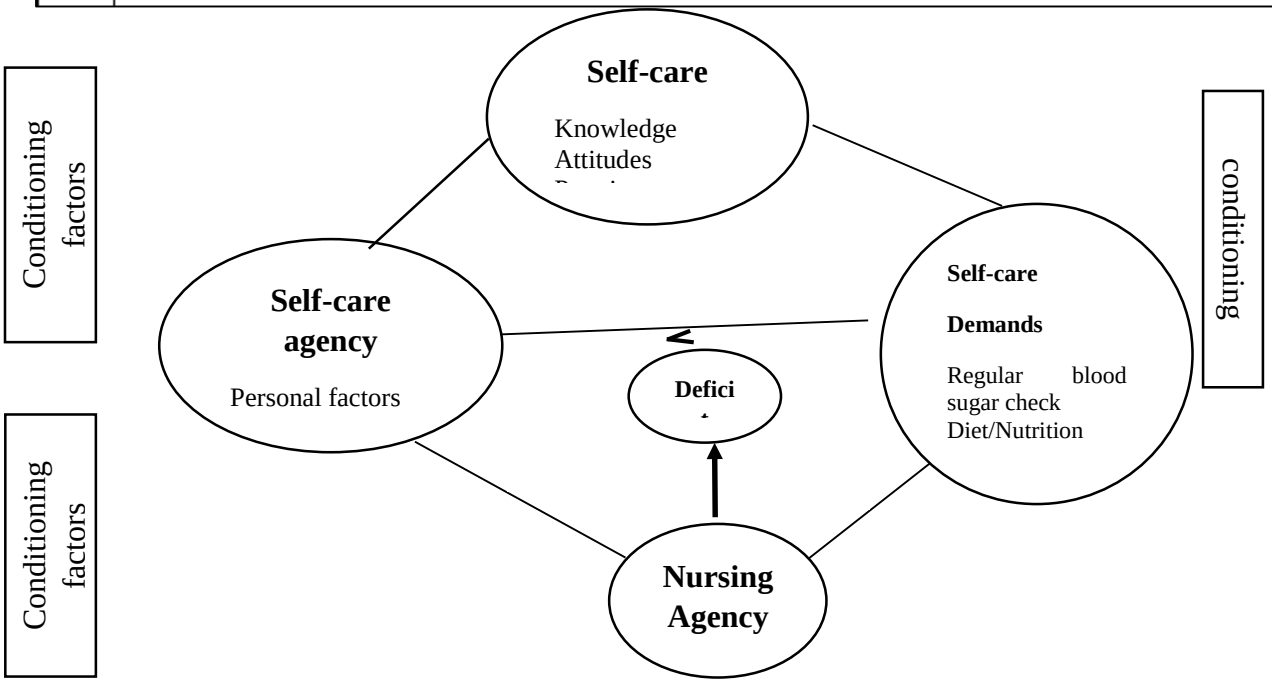

Figure 1: A conceptual framework that synthesizes all the necessary for a research model of diabetes self-care (drawn from Orem's theory of self-care) (68)

2.4 Conclusion

According to the findings of the literature, there were more peer-reviewed studies that focused solely on self-care practice than studies that focused on KAP.In addition, there were more peer-reviewed qualitative studies published than quantitative studies.Additionally, the majority of these studies were carried out in developed nations.In addition, the majority of research results have emphasized the significance of KAP in adult diabetic patients.However, there is a dearth of pertinent information regarding diabetes self-care practices among adolescents in particular.The goal of this study is to help close these gaps in the literature.

CHAP 3: METHODOLOGY

3.1. Introduction

A system of methods utilized in a specific field of study or activity has been defined as a methodology.The specific procedures or techniques used to identify, select, process, and analyze information on a topic constitute the research methodology(68). The approach taken to achieve the study's goals is outlined in this chapter.Data collection instrumentation, data collection procedure, validity, reliability of the instrument, data analysis procedures, ethical considerations, data management, and data dissemination were all described. The setting of the study, the population of the study, the sampling strategy, and the research approach were also mentioned.

3.2. Research design

A study design is a strategy for how the researcher plans to carry out the research (68). Before getting the results, this includes all of the planning, gathering, organizing, and analyzing of data(68). In this review, the scientist utilized a quantitative graphic cross-sectional plan to design, gather, sort out, and break down information in the depiction of diabetes-related KAP of youths with T1DM in Rwanda.These variables (KAP) were not manipulated by the researcher; rather, they were studied as they were at the time of data collection.

To explain a particular phenomenon, quantitative research essentially entails collecting numerical data(69,70).The demographic and KAP data of adolescents with Type 1 diabetes were entered numerically into the questionnaire in this study.Additionally, once the study is finished, the findings can be applied to a larger population for which additional data are required(69). The findings of diabetes-related KAP can be applied to all adolescents with T1DM who visit diabetic outpatient clinics in Rwanda thanks to the proportional sampling of T1DM adolescents in this study.

3.3. Research approach

This study took a quantitative approach to the research.A formal, objective, rigorous, and logical method for generating numerical data to describe events and investigate relationships between variables is known as quantitative research(69). The researcher was able to accurately measure the participants' KAP with this method.As a result, the variables (KAP) were measured using a predetermined scale, and statistical methods were used to examine the relationships between them.

3.4. Setting for the research

The Rwandan government established nationwide NCD clinics focused on more prevalent NCDs like diabetes(71). These clinics and referral hospitals are located in rural districts.Table 2 shows an illustration of each of these clinics.This study was carried out in hospitals in Rwanda in purposefully selected diabetic rural outpatient clinics.The majority of adolescents with diabetes are registered with RBC and District Hospital Referral Hospitals in addition to being members of the RDA (Rwanda Diabetic Association).The participants who had been chosen were asked to meet the researcher at the NCDs Clinics of some health facilities, but only in accordance with the times of their appointments.

3.5. Population

The entire group of people or things for which the researcher wants to generalize their findings is called the "target population."The theoretical population, which is also referred to as the target population, typically possesses a variety of characteristics(72).The adolescents with T1DM in Rwanda's rural hospitals were the focus of this study.

Table 2. Below shows the population.

Table 2: Estimated registered number of diabetic adolescents at RDA/RBC and within different-rural areas of care (10-19years)

No.	Health Facilities	Number of Adolescents with T1DM	No.	Health Facilities	Number of Adolescents with T1DM
01.	CHUB TH	4	21.	KIREHE DH	13
02.	BUSHENGE DH	4	22.	KIZIGURO DH	8
03.	BUTARO DH	3	23.	MIBIRIZI DH	3
04.	BYUMBA DH	11	24.	MUGONERO DH	4
05.	GAHINI DH	3	25.	MUHORORO DH	9
06.	GAKOMA DH	3	26.	MUNINI DH	14
07.	GIHUNDWE DH	5	27.	MURUNDA DH	1
08.	GISENYI DH	10	28.	NEMBA DH	13
09.	GITWE DH	12	29.	NGARAMA DH	4
10.	KABAYA DH	3	30.	NYAGATARE DH	4
11.	KABGAYI DH	22	31.	NYAMATA DH	8
12.	KABUTARE DH	6	32.	NYANZA DH	8
13.	KADUHA DH	2	33.	REMERA RUKOMA DH	12
14.	KIBIRIZI DH	7	34.	RUHANGO PH	6
15.	KIBOGORA DH	8	35.	RUHENGERI PH	11
16.	KIBUNGO RH	9	36.	RULI DH	2
17.	KIBUYE RH	5	37.	ROTONGO DH	2
18.	KIGEME DH	10	38.	RWAMAGANA DH	7
19.	KIRINDA DH	3	39.	RWINKWAVU DH	6
20.	KINIHIRA DH	2	40.	SHYIRA DH	4
	Total	129			139

Due to the Covid pandemic, it was not possible to access all health facilities, the researcher has guided by RDA, choose 20 hospitals which have considerable number of adolescents but only 16 hospitals have accepted the request and allowed researcher to collect data, 3 hospitals did not respond and remaining one responded but the researcher did not facilitate to have access to the respondents.

Table 3: Sites of data collection

HEALTH FACILITIES	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
KABGAYI HOSPITAL	14	9.7	9.7	9.7
GITWE HOSPITAL	12	8.3	8.3	18.1
RUHANGO HOSPITAL	6	4.2	4.2	22.2
KIGEME HOSPITAL	10	6.9	6.9	29.2
MUHORORO HOSPITAL	9	6.2	6.2	35.4
KIBOGORA HOSPITAL	6	4.2	4.2	39.6
KIBUYE HOSPITAL	3	2.1	2.1	41.7
KIBUNGO HOSPITAL	10	6.9	6.9	48.6
KIREHE HOSPITAL	11	7.6	7.6	56.2
BYUMBA HOSPITAL	10	6.9	6.9	63.2
RUTONGO HOSPITAL	2	1.4	1.4	64.6
NYAMATA HOSPITAL	8	5.6	5.6	70.1
NEMBA HOSPITAL	16	11.1	11.1	81.2
RUHENGERI HOSPITAL	10	6.9	6.9	88.2
GISENYI HOSPITAL	9	6.2	6.2	94.4
NYANZA HOSPITAL	8	5.6	5.6	100
TOTAL	**144**	**100**	**100**	

Site Localization

The following districts present the site location of Health Facilities of Rwanda.

PROVINCES	DISTRICT	HOSPITALS
Southern province	Ruhango	1.Ruhango
	Nyanza	2.Nyanza
	Muhanga	3.Kabgayi
	Ruhango	4.Gitwe
	Nyamagabe	5.Kigeme
Northern Province	Gakenye	6.Nemba
	Gicumbi	7.Byumba
	Rulindo	8.Rutongo
	Musanze	9.Ruhengeri
Eastern Province	Ngoma	10.Kibungo
	Bugesera	11.Nyamata
	Kirehe	12.Kirehe
Western Province	Karongi	13.Kibuye
	Nyamasheke	14.Kibogora
	Ngororero	15.Muhororo
	Rubavu	16.Gisenyi

Table 4: Sites localization

3.5.1 Inclusion criteria

- All adolescents with Type 1 Diabetes who attended rural diabetic outpatient medical clinics in Rwanda between the ages of 10 and 19 were included in this study.
- In addition, a consent form for the selected adolescent required the signature of an adult relative.
- They included adolescents who had been diagnosed with T1DM by physicians at least a year prior to the study and who were registered with the RDA and in their health facility. The researcher hoped that by doing so, they would receive instruction on how to manage their diabetes on their own

3.5.2 Exclusion criteria

- The study did not include any adolescents with T1DM who were physically or mentally unable to communicate or interact comfortably.
- Diabetic patients over the age of 19 and diabetic patients under the age of 10
- Children under the age of 1 year who have been diagnosed with diabetes

3.6. Sampling strategy

- The concern of the sampling strategy in this study is to determine the sample size and to describe the sampling methods.

3.6.1. Sample size

The total number of concerned participants was calculated using one of the equations of a known population called Slovin's Formula: $\mathbf{n} = \frac{N}{1+Ne^2}$ with Confidence level of 95% and 5% of alpha error.

n: size of the sample

N: total number of population

e: margin Error (tolerance)

By calculation:

N=268 adolescents with type1 diabetes mellitus attending rural outpatient medical clinics in Rwanda.

e=0.05 , $n = \frac{N}{1+Ne^2} = \frac{268}{1+268(0.05^2)} = 160$ DM patients

This equation of known population called slovin's formula was also used to calculate the sample size in a study conducted among Sudanese individuals with diabetes(73)

3.6.2. Sampling methods

The researcher was used the simple random sampling, that can be defined as the most basic method of sampling. In this method every member has an equal chance of being included, and the same chance of selection.(74)

a. N- Stands for total number of population. The total number of adolescents with T1DM in all rural hospitals are 268

b. **Step1**: Researcher choose to conduct the research in rural area

Step2: There are 40 hospitals in all provinces (Northern has 8 hospitals, Southern has 12 hospitals, Eastern has 10 hospitals, and Western has 12 hospitals). Then, we wrote on the small papers the number from 1 to 8 for Northern Province, 1 to 12 for Southern Province, 1 to 10 for Eastern Province, 1 to 12 for Western Province; among those papers the researcher chose one small paper in each province and read the number labelled on it. Then this number symbolizes the total number of hospitals in which the researcher has to conduct her research (e.g: if the number is 5 for Northern Province it means that the researcher conducted her research in only 5 hospitals in Northern Province).

Step3: The results from **step2** by choosing randomly in each province, we found that they are 4 in Northern Province, 5 in Southern Province, 4 in Western Province and 3 in Eastern Province. So, in total they are 16 hospitals.

Step4: In order to know the name of hospitals in each province, instead of labelling the small paper using the number, they were labelled by their names.

Step5: The hospitals were classified according to each province where they are actually located and researcher chose randomly **4** hospitals(Nemba, Byumba, Rutongo, Ruhengeri) in Northern Province,**5** hospitals (Ruhango, Nyanza, Kabgayi, Gitwe, Kigeme) in Southern

Province, **4** hospitals (Kibuye, Kibogora, Muhororo, Gisenyi) in Western. Province, **3** hospitals (Kibungo, Nyamata, Kirehe) in Eastern Province.

Due to some different circumstances, only 144 have participated in this study, where they attended from the following 16 hospitals: In Southern Province researcher have identified Gitwe District Hospital, Kabgayi District Hospital, Kigeme District Hospital, Nyanza District Hospital and Ruhango Provincial Hospital. In North: Byumba District Hospital, Nemba District Hospital, Ruhengeri Referral Hospital, and Rutongo District Hospital. In the Eastern province researcher have identified Kibungo Referral Hospital, Kirehe District Hospital, and Nyamata District Hospital. In Western Province: Gisenyi District Hospital, Kibogora District Hospital, Kibuye Referral Hospital and Muhororo District Hospital.

3.7. Validity and reliability of research instruments

3.7.1. Data collection instruments

This study utilized a comprehensive KAP questionnaire for adolescents with T1DM.A questionnaire is a printed form that the researcher creates to collect information from a research participant through written or verbal responses(75). Surveys and studies that make use of questionnaires are sometimes referred to as "survey research"(70). The Michigan Diabetes KAP Scale, which the researcher adopted with permission from the Diabetes Research Training Center of Michigan and has been validated, was used in this study(76). After that, the instrument was translated into Kinyarwanda from English.The four sections of the questionnaire were created to collect data:

Section A: consists of twelve questions about age, gender, education, domicile, ubudehe category, household size, employment status, residence, insurance plan, communication and transportation methods, diagnosis date, and health status.

Section B: Knowledge regarding self-care for T1DM, which has thirteen questions

Section C: Attitude regarding self-care for T1DM, which has twenty-two questions

Section D: Information on practice regarding self-care for T1DM, which has sixteen questions.

Table 5: Research variables

KEY DEPENDENT VARIABLES	INDEPENDENT VARIABLES
(a) Self-care (knowledge ,attitude ,and Practice)	**(c)Socio-demographics** Age Gender Wealth index (Ubudehe category) Residence Household size Education employment status Means of transportation. **(d) Health-related characteristics** Year of diagnosis with type I DM Health insurance plan Possession of smartphone to communication health-related activities
(b) Self-care Practices (glycemic control, adherence to medication, diet/nutrition, exercises)	

3.7.2. Validity of instruments

To ensure the content validity of the KAP questionnaire, the questions were based on the literature review related to the topic and a pilot study was performed to ensure that questions are understood by adolescents with T1DM. The researcher intended to conduct a pilot study on randomly selected 10% of the total population (not included in the final analysis) to test the clarity and applicability of the instruments. Based on the result, relevant modifications were made including shortening knowledge questions and attitude questions to make them clear to study participants and to reduce

the time for responding in order to prevent them from the risk of hypoglycaemia. Besides, the data collection instrument was examined for its content validity and relevance by a panel of supervisors from academic staff in SNM, University of Rwanda. Then, the research proposal was presented to the Ethics Committee at CMHS, the University of Rwanda, for scientific approval. Comprehensive KAP questionnaire for adolescents with T1DM was adopted from the Michigan KAP survey.

Table 6: Validity of Data Collection tool

S/N	Research objectives	Conceptual framework	Research instruments
1	To assess the level of knowledge of self-care of Type 1 Diabetes Mellitus among adolescents attending diabetic outpatient medical clinics in Rwanda	Self-care and dependent care Self-care agency and dependent care agent	Item: B- Q1 to13 Descriptive statistics(frequency and percentage) were applied
2	To explore the attitudes about self-care of adolescents with Type 1 Diabetes Mellitus attending diabetic outpatient medical clinics in Rwanda,	Basic conditioning factors	Item: C- Q1 to 22 The researcher used descriptive statistics(frequency and percentage)
3	To determine the level of practice about self-care of adolescents with Type 1 Diabetes Mellitus attending diabetic outpatient medical clinics in Rwanda	Therapeutic self-care demands	Item: D- Q1 to16 The researcher used descriptive statistics(frequency and percentage)
4	To determine associations between knowledge score and	Nursing system and Nursing agency	Item: A- Q1to 11

	socio-demographic data of adolescents with T1DM attending rural diabetic outpatient medical clinics in Rwanda, and registered in RDA, RBC and in their health facilities		The researcher used chi-square test

3.7.3. Reliability instruments

A measure called Cronbach's Alpha coefficient is used to determine a set of scale or test items' internal consistency or reliability(75).The KAP items' internal consistency was measured in this study.By combining items and questions that evaluated these variables, the Cronbach's alpha was used to create KAP scales.Cronbach's alpha greater than 0.90 is considered excellent, 0.80 or higher is considered good, 0.70 or higher is considered acceptable, 0.60 is questioned, 0.50 is considered poor, and less than 0.50 is considered unacceptable(75). This influenced the research team's decision regarding the instrument's reliability, and the acceptable score for our study was 0.70.

3.8. Data collection

A methodical process of gathering and measuring data on variables to achieve the research's goal is known as data collection(70). The following steps were taken to collect data for this study:

The researcher arranged meetings with the staff of the identified rural diabetes outpatient clinics after obtaining permission from the relevant authorities.The researcher provided an explanation of the study's goal during the meetings.This staff helped find participants who were eligible.The researcher identified the participants who met the inclusion criteria and brought them to the private room for an interview.Using an assent and consent form, the study participants gave their permission to the researcher.The forms provided a brief explanation of the purpose of the study, the right to withdraw from the study at any time without compromising care, and some fundamental information regarding the manner in which the study should be carried out.For participants who are unable to read or write, the researcher read the consent form and interpreted its contents.The researcher administered the questionnaire by asking questions face-to-face and

recording responses in a designated space on the questionnaire.The questionnaire took about 45 minutes to complete.

3.9. Data analysis

Information was placed into the PC utilizing factual programming SPSS rendition 25 and cleaned and coded before investigation.Both descriptive and analytical statistics were used in the analysis. Data were summarized using descriptive statistics like frequency and percentage, and means and standard deviation were used to measure the central tendency and dispersion of this summarized data.The Chi-square test was used to examine the relationship between categorical variables in analytical statistics.A significant score was achieved when the confidence intervals of 95% and the 5% threshold were applied.Knowledge scores between 50 and 70 percent indicate moderate knowledge, and scores greater than 70 percent indicate high knowledge.In addition, attitudes scores lower than 50% indicate a low level of attitude, higher than 70% indicate a high level of attitude, and the same holds true for practice level.A score of more than 70% indicates that the practice performed well.Between 50 and 70 percent indicated moderate practice performance, while less than 50 percent indicated poor practice performance.

3.10. Ethical considerations

The dynamic process of determining what is right or wrong is the subject of the ethics subfield of philosophy(77,78). The permission to conduct the study, the right to self-determination and voluntary participation, privacy, informed consent and the information form, protection from harm, confidentiality, and anonymity are all outlined in this section.

3.10.1 Permission to conduct the study

The University of Rwanda's CMHS Institutional Review Board (IRB) granted the study ethical approval. The Michigan Research Center for diabetes provided permission to adopt their validated KAP scales. Also, the permission from the Director Generals of selected hospitals

3.10.2. The right to self-determination and voluntary participation

Respect for human dignity means that participants should be treated as independent individuals who can decide for themselves whether they want to participate in a study or not (77,78). Participants can read the information sheet provided by the researcher and decide whether or not

they want to participate in this study.The participants' decision not to participate in the study was respected by the researcher, and they were not subjected to discrimination.The questionnaires were given to the participants after they had received care so that there wouldn't be any delays in getting services.

3.10.3. Privacy

When a researcher treats all participants equally and fairly and respects their right to privacy, the principle of justice is upheld(77,78). Participants who met the inclusion criteria were chosen without bias toward illiterate or other vulnerable groups in this study.Additionally, the researcher emphasized that participants who refused to participate would not face any compromises or negative consequences.Throughout the course of the study, the questionnaires were kept anonymous to protect the participants' right to privacy.Additionally, the researcher stored all documents in a locked cabinet that could only be accessed by authorized individuals.In order to safeguard the participants' identities, a code number was assigned to each clinic.

3.10.4. Informed consent and information sheets

The researcher obtained informed consent from adolescents with T1DM and informed consent forms from their next of kin (adults) following a comprehensive explanation of the nature of the study.The consent form and assent form both explained the obligation of the study to protect the anonymity and confidentiality of the study participants and the participants' right to choose not to answer any questions or withdraw at any time. Participation in the research was voluntary.

3.10.5. Protection from harm

This study was guided by the principles of beneficence, respect for human dignity, and justice(77). As a result, the researcher was required to ensure that the participants were in good health and that the study was carried out in accordance with the inclusion and exclusion criteria.By providing the informational sheet, explaining the purpose of the research, and avoiding sensitive questions, emotional harm was avoided.In relation to glycemia, the researcher needed to know if the participants had managed their glycemia at the beginning of the study; if not, the researcher assisted the participants in determining their current gycemia prior to the distribution of questions in order to protect them from any harm that might have resulted from hypoglycemia or hyperglycemia.

3.10.6. Anonymity and confidentiality

Anonymity refers to the measures taken to prevent a study participant's responses from being disclosed to anyone outside the research team without the participant's consent(77). Only the researcher and the supervisors of this study have access to the research data.Additionally, the questionnaires were confidentially compiled and numbered, making it impossible to identify a specific participant.Individuals and clinic staff were not linked to participant data analysis.

3.11. Management of the data

The completed questionnaires were stored in a cabinet that was locked, and only the researcher and the supervisor had access to it.On the researcher's computer, password-protected soft copies were kept safe.

3.12. Data dissemination

The potential outcome of the study will be shared among the community diabetes centres upon completion of the master's degree and with future publication plans.

Seminars or workshops will be conducted to the clinic nurses to disseminate the findings.

3.13. Limitations and challenges

3.13.1. Study site limitations

Some Health Facilities did not respond to the addressed requests, for others, even though the request was accepted, the researcher could not be facilitated to access the concerned respondents.

3.13.2. Sample size limitations

Some participants faced difficulties attending their medical appointment during the data collection period resulting in a low sample size.

3.13.3. Generalization limitations

Generalizability limitation was the high cost of resources, time-consuming and long period of waiting for permission to collect data, and a long period of data collection.

3.14. Conclusion

The quantitative descriptive design used in the study has been discussed in detail in this chapter.Research instruments were KAP questionnaires.The population of the study and the sampling have been described.The researcher demonstrated how the questionnaire's validity and dependability were guaranteed.The method by which the collected data was analyzed and ethical

considerations were outlined by the researcher.Additionally, the researcher listed the anticipated limitations of this study.

CHAP 4: RESULTS AND INTERPRETATION

4.1. Introduction

This chapter presents the results of univariate and bivariate analysis. The chapter is subdivided into two sections: section one describes the characteristics of respondents while section two focuses on the association between self-care's knowledge of type1 diabetes mellitus and each of the selected social demographic characteristics.

4.2. Demographic characteristics of respondents

The table 7 presents the information related to socio-demographic characteristics of respondents. The results show that the majority were between age of 16 and 19 years (72.2 %), followed by 20.1 % aged between 13 and 15 years and the remaining 7.6 % were between 10 and 12 years. Regarding the gender of respondents, 54.2 % were female while 45.8% were male.

In this study, we were also interested to know the years of diagnosis of the respondents with type 1 diabetes. As it is shown in the table above, the majority (54.2 %) reported that they were diagnosed for less than five years, followed by the 37.5% of people who were diagnosed between 5 and 10 years, while 8.3 % reported that they were diagnosed for 10 years.

With respect to Ubudehe categories of respondents, the results show that the majority were from category 2 (43.1 %), followed by category 3 (29.2 %), 27.1 % were from category 1 and only one person were from category 4. While only 14 % of respondents were from urban areas, the majority (86 %) were from rural areas.

Results further show that most of the respondents live in their parents' homes (75 %) and 12.5% living in the homes of their relatives. On the other hand, this table shows that both people who lived in their friend's home and those who reported others accounted for 6.3 % of the total.

Regarding the level of education of respondents, the majority have a primary school (47.9 %), followed by 37.5 % who didn’t complete their secondary level, only 6.3 % have completed secondary school and the remaining 8.3 % did not attend any education.

Looking at the level of employment status as reported by participants, the results indicate that the majority were unemployed (43.1 %), and 30.6 % were currently studying. On the other hand, 22.2 % reported that they are part-time workers, and only 2.8 % reported that they were employed.

The researcher was also interested to know the insurance plans of the people who took part in this study. The majority of people (93.1 %) reported using community-based insurance followed by Rwanda Social Security Board (RSSB) (6.9 %)

During the data collection process respondents were also asked to specify modes of their transportation available to them when they went to health-related activities. One fourth of the total respondents reported that they use public bus, followed by 13.7 % who use the Moto taxi. 9.7 And 9 % use Bicycle taxis and rented bicycle respectively. Most of the respondents reported that they use other means, like walking (40.3 %).

It further reported that most of the respondents did not have a smartphone for communication (87.5 %). While only 11.1% have smartphone for health-related purposes.

Table 7: Socio demographics characteristics of respondents (N-144)

	Frequency	**Percent**
Age		
Between 10 and 12years	11	7.6
Between 13 and 15 years	29	20.1
Between 16 and 19 years	104	72.2
Total	144	100
Gender		
Male	66	45.8
Female	78	54.2
Total	144	100
Years of diagnosis with type 1 diabetes		
below 5 years	78	54.2
Between 5 and 10 years	54	37.5
Above 10 years	12	8.3
Total	144	100
Ubudehe categories		
Category1(Very poor people)	39	27.1

Category2(poor people)	62	43.1
Category3**(**resourceful poor people)	42	29.2
Category4(Wealthy people)	1	0.7
Total	144	100
Shelter		
Parent's home	108	75
Relatives' home	18	12.5
Friend's home	9	6.3
Other	9	6.3
Total	144	100
Level of education		
No formal education	12	8.3
Primary school	69	47.9
Secondary school not completed	54	37.5
Secondary school completed	9	6.3
Total	144	100
Current employment status		
Student/in school	44	30.6
Working part-time	32	22.2
Unemployed	62	43
Employed	4	2.8
Disabled	1	0.7
Other	1	0.7
Total	144	100
Insurance plan		
Mituelle de santé	134	93.1
RSSB	10	6.9
Total	144	100
Residence		
Rural	123	86
Urban	20	14

Information not provided	1	1.4
Total	144	100
Communication with smartphone		
Yes	16	11.1
No	128	87.5
Total	144	100
Transport means		
Own bicycle	2	1.4
Rented bicycle	13	9
Bicycle taxi	14	9.7
Rented motorcycle	1	0.7
Moto taxi	20	13.9
Public Bus	36	25
Walking	58	40.3
Total	144	100

Table 8: Measure of internal consistency between items

Items	**Cronbach's alpha**
Items used to measure level of knowledge about self-care of adolescents	**0.829**
Items used to measure level of attitude about self-care of adolescents	**0.680**
Items used to measure level of practice about self-care of adolescents	**0.650**

The table above shows the coefficients of Cronbach's alpha which was used to test the reliability of the data. As shown, all coefficients of Cronbach's alpha are greater than 0.600 Suggesting that the items have a good internal consistency**.**

4.3. Presentation of findings as aligned with the objectives

4.3.1. Level of self-care's knowledge of type1 diabetes mellitus (n=144)

The first objective of this study was to assess the level of self-care's knowledge of Type 1 Diabetes Mellitus among adolescents attending diabetic outpatient medical clinics in Rwanda. According to the results, the majority of respondents were in category of respondents with moderate knowledge (48.6 %), followed by 29.2% in the high category and the remaining 22.2% were in the category of low knowledge.

Table 9: Level of self-care's knowledge of type1 diabetes mellitus (N=144)

Level of self-care's knowledge	Frequency	Percent
Low	32	22.2
Moderate	70	48.6
High	42	29.2
Total	144	100

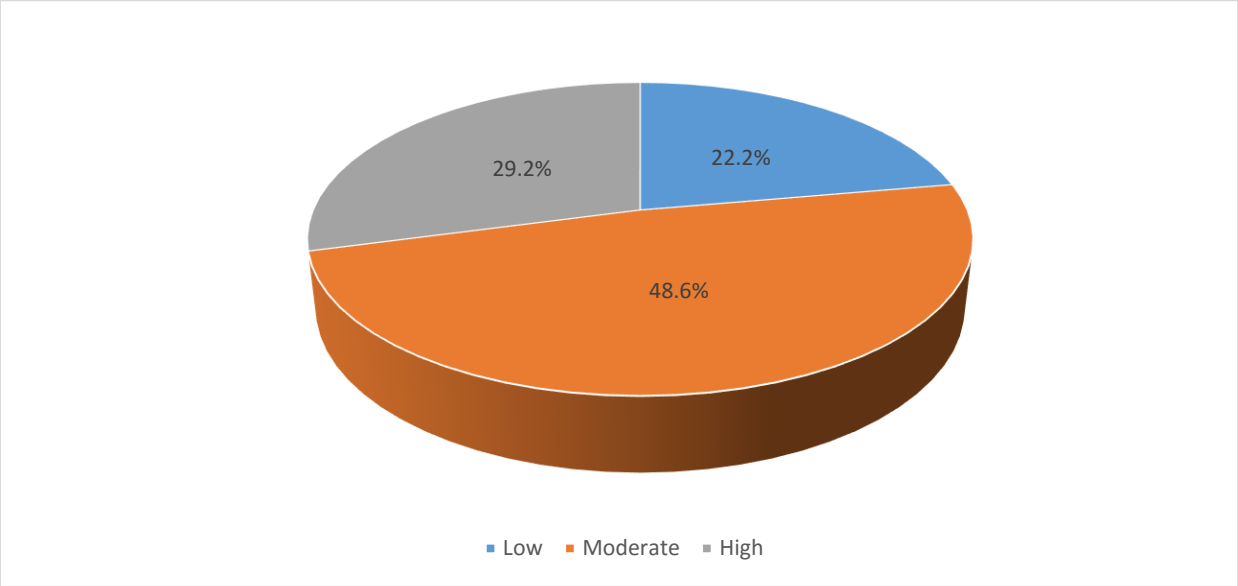

Figure 2: Level of self-care's knowledge (N=144)

4.3.2. Level of self-care's attitude of type 1 diabetes mellitus

The second objective of this study was to assess the level of self-care attitude of type 1 diabetes mellitus among the adolescents attending diabetic rural outpatient medical clinics. The vast majority of respondents have indicated a high level of attitude (74.3 %), while 25.7% have indicated a moderate level.

Table 10: Level of self-care's attitude of type 1 diabetes mellitus

Level of self-care's attitude	Frequency	Percent
Low	0	0
Moderate	37	25.7
High	107	74.3
Total	144	100

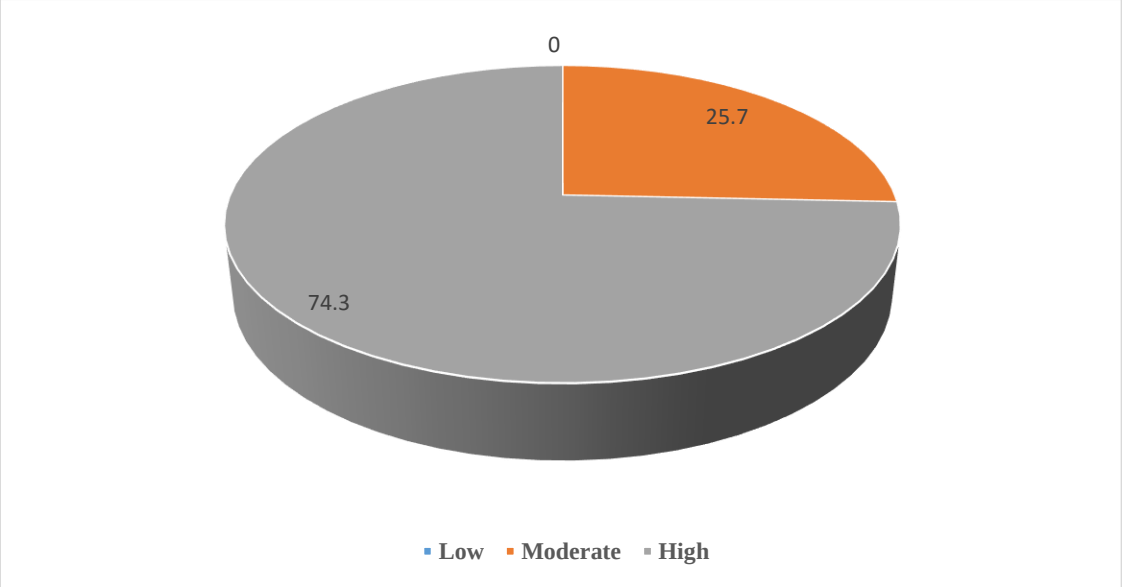

Figure 3: Level of self-care's attitude of type 1 diabetes mellitus (N-144)

4.3.3. Level of self-care's practice among adolescents with type 1 diabetes mellitus (n-144)

The next objective was to explore the level of practice about self-care of adolescents with Type 1 Diabetes Mellitus. As show in figure 4, most of the respondents were in the moderate category (n=81, 56.3 %), only 29 respondents or 20.1 % were in the category of respondents with a high level of practice and the remaining 34 or 23.6% were in the category of low level.

Table 11: Level of self-care's practice among adolescents with type 1 diabetes mellitus diabetes mellitus (N-144)

Levels of self-care's practice	Frequency	Percent
Low	34	23.6
Moderate	81	56.3
High	29	20.1
Total	144	100

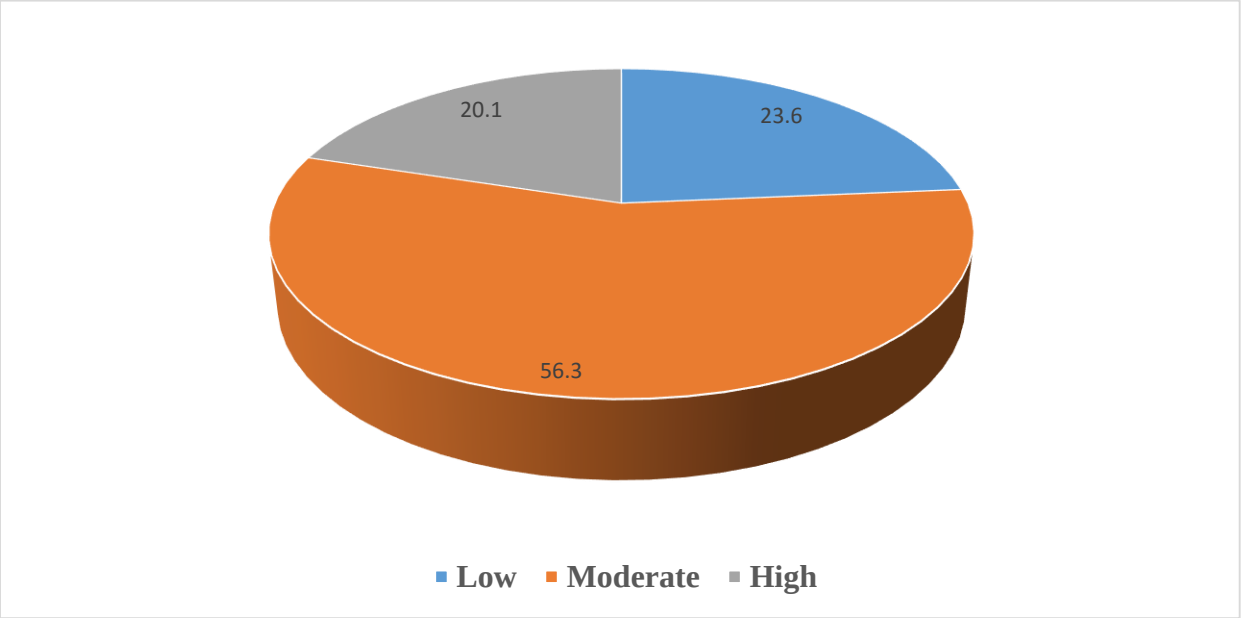

Figure 4: Level of self-care's practice (N-144)

4.4. Bivariate analysis between knowledge and socio-demographic characteristics

This section presents the results of bivariate analysis. As mentioned earlier, in this study the researcher assessed the association between self-care's knowledge of respondents and their socio-demographic characteristics. Thus, the results are shown in the table 12.

In bivariate analysis, the results show that only respondent level of education (p-value=0.023) and employment status (p-value=0.050) were significantly associated with self-care's knowledge. All other socio-demographic factors, including: age, sex, ubudehe category, shelter, and residence of respondents were not statistically associated with knowledge about self-care among adolescents with diabetes with type 1 diabetes mellitus (p-value>0.05).

Table 12: Bivariate analysis between self-care's knowledge and socio-demographics factors

Socio demographic characteristics	**Level self-care's knowledge**						**P-value**
	Low		**Moderate**		**High**		
	Freq	%	Freq	%	Freq	%	
Age							
Between 10 and 12years	3	27.3	5	45.5	3	27.3	**0.701**
Between 13 and 15 years	4	13.8	14	48.3	11	37.9	
Between 16 and 19 years	25	24	51	49	28	26.9	
Gender							
Male	13	19.7	34	51.5	19	28.8	**0.753**
Female	19	24.4	36	46.2	23	29.5	
Year of diagnosis							
From 1 to 4 years	21	26.9	37	47.4	20	25.6	**0.319**
From 5 to 10 years	9	16.7	29	53.7	16	29.6	
From 11 to 19 years	2	16.7	4	33.3	6	50	
Ubudehe category							
Cathegory 1	10	25.6	18	46.2	11	28.2	
Category 2	8	12.9	33	53.2	21	33.9	**0.165**
Category 3	14	33.3	19	45.2	9	21.4	
Category 4	0	0	0	0	1	100	

Category 5	0	0	0	0	0	0	
I don't know	0	0	0	0	0	0	
Shelter							
Parent's home	27	25	52	48.1	29	26.9	
Relatives' home	2	11.1	9	50	7	38.9	**0.723**
Friend's home	2	22.2	5	55.6	2	22.2	
Other	1	11.1	4	44.4	4	44.4	
Level of education							
No formal education	2	16.7	8	66.7	2	16.7	
Primary school	16	23.2	31	44.9	22	31.9	
Secondary school not completed	14	25.9	29	53.7	11	20.4	**0.023**
Secondary school completed	0	0	2	22.2	7	77.8	
University	0	0	0	0	0	0	
Other	0	0	0	0	0	0	
Employment status							
Student/in school	8	18.2	21	47.7	15	34.1	
Working part-time	7	21.9	12	37.5	13	40.6	
Unemployed	16	25.8	36	58.1	10	16.1	**0.05**
Employed	0	0	1	25	3	75	
Disabled	1	100	0	0	0	0	
Other/Please specify:	0	0	0	0	1	100	
Type of Insurance plan							
Mituelle de santé	29	22.7	62	48.4	37	28.9	**0.272**
RSSB	0	0	5	50	5	50	
No insurance	2	50	2	50	0	0	
Residence							
Rural	27	22	61	49.6	35	28.5	**0.32**
Urban	5	25	9	45	6	30	

CHAP 5. DISCUSSION OF THE STUDY FINDINGS

5.1. Introduction

This study determined and described the level of knowledge, attitude and practices towards self-care of adolescents with type1 diabetes mellitus (T1DM) attending rural outpatient medical clinics in Rwanda, prior to the analysis between self-care's knowledge and socio-demographics factors under study. The findings of this study revealed that 42 (29.2%) of respondents have high knowledge about self-care of adolescents with Type1 Diabetes Mellitus attending rural diabetic outpatient medical clinics in Rwanda, 70 (48.6%) have moderate knowledge and 32(22.2 %) have low knowledge. Surprisingly 107 (74.3%) have a high level of attitude, 37 (25.7%) have a moderate level of attitude and no one founded in a low level of attitude concerning self-care of adolescents with type1 diabetes mellitus (T1DM) attending rural outpatient medical clinics in Rwanda.

Most adolescents with type1 diabetes mellitus; 81 (56.3 %) have a moderate level of practice concerning self-care of adolescents with type1 diabetes mellitus, 34 (23.6%) have a low level and only 29 (20.1%) have a high level of practice concerning the self-care of adolescents with type1 diabetes mellitus (T1DM) attending rural outpatient medical clinics in Rwanda. This study determined the analysis of self-care knowledge and socio demographics factors concerning the adolescents with type1 diabetes mellitus (T1DM) attending rural outpatient medical clinics in Rwanda.

The results shows that only respondents level of education (p-value=0.023) and employment status (p-value=0.050) were significantly associated with self-care's knowledge. All other socio-demographic factors, including: age, sex, ubudehe category, shelter, and residence of respondents were not statistically associated with knowledge about self-care among adolescents with diabetes with type 1 diabetes mellitus (p-value>0.05). The discussion section discusses the results of the study according to study objectives and provides discussion on sample size and demographics. The conclusion and recommendations come after the discussion section.

5.2. Discussion of the sample size

144 adolescents with Type 1 Diabetes Mellitus who attended rural diabetic outpatient medical clinics in Rwanda served as the sample for this study.Population and Sample Of the total sample, 14, adolescents from Kabgayi Hospital (9.7%) participated in this study;This study included 12

adolescents (8.3 percent) from Gitwe Hospital;This study included six adolescents from Ruhango Hospital, or 4.2%;This study included 10 adolescents (6.9%) from Kigeme Hospital;This study included 9 adolescents from Muhororo Hospital, or 6.2%;This study included six adolescents from Kibogora Hospital, or 4.2%;This study included three adolescents from Kibuye Hospital, or 2.1%;This study included 10 adolescents (6.9%) from Kibungo Hospital;Kirehe Hospital saw 11 adolescents (7.6%) for this study;This study included 10 adolescents (6.9%) from Byumba Hospital;Rutongo Hospital was the location of this study for two adolescents, or 1.4%;16 adolescents, or 11.1%, participated in this study at Nemba Hospital, while 8 adolescents, or 5.6%, participated in this study at Nyamata Hospital.This study included 10 adolescents (6.9%) from Ruhengeri Hospital;This study was attended by 9 adolescents (6.2 percent) from Gisenyi Hospital and 8 adolescents (5.6 percent) from Nyanza Hospital.

Between October 2021 and February 2022, data were gathered.The sample consists of 78 (54.2%) female adolescents and 66 (45.8%) male adolescents.As respects age, the mean age of the gathering was 15 years (SD=3.03;Md=15).The selected age groups' distributions are uniform and of similar size.However, the prevalence is higher among adolescents between the ages of 16 and 19.There are 104 adolescents between the ages of 16 and 19 (72.2%), followed by 29 (20.1%) adolescents between the ages of 13 and 15, and 11 (7.6%) of adolescents between the ages of 10 and 12.

5.3. Demographics:

Participants in this study ranged in age from 10 to 19 years old, and adolescents with type 1 diabetes (T1DM) average 15 years old.There are 104 adolescents between the ages of 16 and 19 (72.2%), followed by 29 adolescents between the ages of 13 and 15 (20.1%) and 11 adolescents between the ages of 10 and 12.This study showed that the larger part youths with type1 diabetes mellitus are in a scope of 16-19 age, which is unique in relation to the review led in the focal locale of Portugal and uncovered that the larger part are in a scope of 12-14 age group(1).

Most of members were female, as 78(54.2%) are female and 66(45.8%) are male.When it comes to gender equality, this study is very similar to one that was done in the United Arab Emirates(79) and another one that was done in Sudan with Sudanese people(80). According to the year of diagnosis, 78 (54.2%) people with type 1 diabetes mellitus were diagnosed between one and four years ago, 54 (37.5%) people were diagnosed between five and ten years ago, and 12 (8.1%) people

were diagnosed more than ten years ago.The study revealed that adolescents with type 1 diabetes are divided into the following categories based on ubudehe categories—a social stratification program based on household income—with 39 (27.1%) falling into Category 1 (very poor), 62 (43.1%) falling into Category 2 (poor), 42 (29.2%) falling into Category 3 (resourceful poor), and only one (0.7%) falling into Category 4 (wealthy).

The study found that 12 (8.3%) adolescents with type 1 diabetes mellitus did not complete any formal education, 69 (47.5%) were in primary school, 54 (37.5%) were in secondary school, but only 9 (6.3%) adolescents with type 1 diabetes mellitus were able to complete their secondary education.

With regard to their current employment status, 44 (or 30.6%) are still students, 32 (or 22.2%) are employed part-time, 62 (or 43.0%) are unemployed, 1 (or 0.7%) are disabled, and only 4 (or 2.8%) are employed.

5.4. Level of self-care knowledge among adolescents with type 1 diabetes mellitus (T1DM)

This study found that 42 (29.2 percent) adolescents with Type 1 Diabetes Mellitus attending diabetic outpatient medical clinics in Rwanda had a high level of knowledge, 70 (48.6 percent) had a moderate level of knowledge, and 32 (22.2 percent) had a low level of knowledge.In order to assess the adolescents' level of knowledge regarding diet, exercise, glucose control, and foot care, numerous questions were posed to them.The findings indicated that the majority of them gave incorrect responses regarding the diet (healthy eating plan).based on the findings:Adolescents who lack knowledge of diabetes-related physical processes are more likely to feel insecure about their ability and responsibility to control their diet and disease.In spite of the overall findings, at least 122 (84.7%) participants were aware that regular exercise could help lower blood pressure.As a result, this study found that the majority of adolescents with type 1 diabetes lack self-care knowledge—indeed, the majority of them have a moderate or low level of knowledge.A study that was carried out in rural Sullia, Karnataka, is also comparable to this(81). According to the findings of a different study that was carried out in Egypt, 47.7% of the participants had inadequate diabetes knowledge overall(82). Additionally, studies conducted in India indicated a high prevalence of inadequate diabetes education (83). Variations in sociodemographics and assessment parameters could be the cause of this distinction.

5.5. Adolescents with type 1 diabetes mellitus (T1DM)'s self-care mindset

The study's findings regarding diabetes attitude were comparable to those of studies conducted in South India and the United Arab Emirates, which reported a more upbeat outlook on diabetes patients(79). Among the 144 adolescents with type 1 diabetes, 107 (74.3%) have a high attitude, 37 (25.7%) have a moderate attitude, and none have a low attitude toward self-care of T1DM adolescents.

The results showed that, despite the other variables (knowledge and practice), at least the majority of participants have a high level of attitude, even though a significant number of participants have a moderate level in these variables.

However, compared to the studies conducted in Kenya (49.3%) and Debre Tabor Town, Northwest Ethiopia (39.5%) and Adama, Ethiopia (81.9%), where respondents had a positive attitude toward diabetes self-care management, this study found that 75% of respondents had a positive attitude toward diabetes self-care.

The current study found that the majority of respondents were positive, though some had only a limited amount of knowledge.This could be because having good knowledge (of a high level) does not always mean that the patient will have a positive attitude.In fact, the majority of diabetics believe they should be in charge of their own care, but they aren't doing so well and don't go to the doctor very often, so they don't know or get help.Surprisingly, despite the positive overall results, the majority of participants did not consider diabetes to be a severe condition. This was probably because they believed that people with diabetes who do not take insulin to treat it had a mild illness.Because diabetes management necessitates difficult and long-lasting behavioral changes, patients' perceptions of the severity of the disease have significant implications for patient education.Unless patients comprehend and accept the severe nature of the disease, such changes are unlikely to last.When discussing noninsulin-dependent diabetes with adolescents, health care providers will need to strike a balance between providing patients with insulin-dependent diabetes with false assurance and creating unnecessary fear.More than two-thirds of the participants are of the opinion that having diabetes has an impact on nearly every aspect of a diabetic person's life and that keeping blood sugar levels within the normal range helps to prevent complications from diabetes.

5.6. Level of self-care practice among adolescents with type 1 diabetes.

Taking care of oneself practices can work on diabetic control and defer the difficulties.Regular exercise, adhering to the recommended diet, taking prescribed medications, and monitoring blood glucose levels are all examples of self-care practices(84,85) When a patient participates in self-management of the disease through programs of guidance, education, and awareness, the patient and the practitioner benefit both by becoming more receptive to lifestyle changes and drug therapy(86).

According to the findings of this study, out of 144 adolescents with type 1 diabetes, 29 (or 20.1%) have a high level of practice, 81 (or 56.3%) have a moderate level of practice, and 34 (or 23.6%) have a low level of practice.As previously stated, the majority of participants have a moderate or low level of practice, as shown by the results.

According to the questionnaire results, only nine participants checked their blood sugar levels meticulously, indicating that the remaining participants did so irregularly or poorly.As a result, the findings revealed careless methods for checking blood sugar levels.They asked about doing regular exercise to get the best blood sugar levels, and the results show that it only applies to seven people. Additionally, participants were asked if they strictly adhered to the dietary recommendations made by their doctor or diabetes specialist. The results indicate that only 11 participants did so, and 54 participants did not adhere to the dietary recommendations.As a result, the study's overall findings indicate that the participants do not adequately practice self-care.This indicates that patients do not adequately follow the importance of self-care practices for effective diabetes management.Improving medication knowledge and practice strategies by focusing on various age groups (the age groups in our study are:10-12, 13-15, and 16-19) as well as patients with comorbidities may aid in adherence improvement(81,87). Despite the fact that the literature demonstrates a correlation between the patient's belief in medications for disease control and complete adherence to diabetes treatment.It is important to foster great correspondence among medical services suppliers to influence wellbeing convictions and practices of care (88,89).

5.7. Associations between knowledge score and socio-demographic data of adolescents with type 1 diabetes mellitus (T1DM)

The results show that only respondent level of education (p-value=0.023) and employment status (p-value=0.050) were significantly associated with self-care knowledge. This was the case for

adolescents with type 1 diabetes mellitus (T1DM).every other aspect of socio-demographics, such as:Knowledge of self-care among adolescents with diabetes of type 1 diabetes mellitus was not statistically associated with age, sex, ubudehe category, or shelter (residence) of respondents (p-value>0.05).

According to Table 12, this study demonstrates a correlation between knowledge and educational level. This means that adolescents with type 1 diabetes who have a high level of education are more knowledgeable about self-care. This is comparable to the Sudanese individuals study(73). Self-care knowledge was found to be high among 75% of employed participants, 40% of patients with part-time jobs, 34.1 percent of students, and only 16.1% of unemployed participants in this study.Therefore, the findings demonstrated that patients are motivated to avoid any reasons that could cause them to skip their duties due to a lack of knowledge when they have a job or are enrolled in school.

5.8. Study limitations and challenges

This study has some limitations and challenges.

- The study was conducted in 16 health facilities in rural area of Rwanda, so the findings could not be generalized to all health facilities of Rwanda.
- Lack of previous research studies on this research study
- Limited access to some health facilities for data collection leads to missing the data that could have helped the researcher in this study
- Time constraints, because of Covid pandemic limited the researcher to have full control of the research schedule.
- Limited resources

CHAP 6: CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter is subdivided into two sections: section one includes the conclusion which summarizes the findings of this study according to the aligned objectives, and section two is recommendations which give the suggestion or proposal as to the best course of action.

6.2. Conclusion

Teens and their families face significant challenges as a result of T1DM, a chronic condition.Teens with Type 1 Diabetes Mellitus (T1DM) were found to have varying levels of self-care knowledge, attitude, and practice in this study. In general, 29.2% of adolescents have a high level of knowledge, 74.3% have a positive attitude, and 20.1% have a good practice. As a result, the level of self-care knowledge, attitude, and practice of adolescents with type 1 diabetes mellitus is below the expected level. In fact, in Rwanda every health facility has NCDs service that has a responsibility of taking care of adolescents with T1DM regularly, also RDA perfoms the visit to youth every trimester. But due to the adolescent period, they prefer to have independence and increase their interaction with peers than parents and care providers. Also, the adolescents tend to be an idealist and possess a strong sence of fairness therefore tend to have poor practice and also tends to neglect what they have learned from NCDs and RDA. The patient's skills should be strengthened by nursing intervention strategies, and best practice models for diabetes treatment measures should be introduced following established guidelines.Patients should be educated and guided on how to take care of themselves through interventions that take into account personal, family, and sociocultural factors.

6.3. Recommendations

The results of this study inform the researcher to present recommendations in order to enhance the knowledge, attitude and practice about self-care of adolescents with type1 diabetes mellitus (T1DM) attending rural outpatient medical clinics in Rwanda towards type1 diabetes mellitus(T1DM); thus, the researcher has recommendations to the nursing practice, parents, education authority, and administration as well as future researchers.

Recommendations to Adolescents with type1 diabetes mellitus

- Diabetes patients should seek medical attention early to avoid later complications.Patients with diabetes should also learn as much as they can about the disease from their doctors and other healthcare professionals.
- An adolescent with T1DM also have the right and responsibility to live healthy like others, therefore they have to adhere to self-care of T1DM.

Recommendations to parents and other relatives

- Parents, and other relatives have responsibility to be knowledgeable about self-care of T1DM in order to be able to support, help, remind and give encouragement to follow the established guidelines (self-care) to their considerable children (adolescents with T1DM). And to do not marginalize them.

Recommendations to nursing care providers

- Nursing care providers specifically who are working in NCDs services to enhance health education at the service level, organize community outreach at school levels and household levels to help maintain and strengthen the knowledge acquired at health facilities regarding type1 diabetes mellitus (T1DM) and monitor the attitude and practice towards self-care of an adolescent with T1DM.

Recommendations to the administration.

- The Ministry of Health in collaboration with the Ministry of education plans and implement the training for teachers about guideline of T1DM self-care.

Recommendations to other researchers

- The researchers should do other studies in other health facilities from other regions of Rwanda since this study was conducted from 16 health facilities among 40 health facilities located in rural area of Rwanda.
- The researchers should do a further inquiry to know other factors contributing to knowledge, attitude and practice towards self-care of adolescents with type1 diabetes mellitus (T1DM).
- Qualitative studies to know the challenges in practice and attitude would help us to know in depth information from the adolescents suffering with type1 diabetes.

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THE FORM FOR SUBMISSION OF THE DISSERTATION

UR-COLLEGE OF MEDICINE AND HEALTH SCIENCES
P.O.BOX 3286 KIGALI

DECLARATION AND AUTHORITY TO SUBMIT THE DISSERTATION

Surname and First Name of the Student: **MUKAMARARA Immaculée**

Reg. Number: 220017015

Title of the project: « **SELF-CARE OF ADOLESCENTS WITH TYPE 1 DIABETES MELLITUS (T1DM) ATTENDING RURAL OUTPATIENT MEDICAL CLINICS IN RWANDA** ».

a. *Declaration by the Student*

I do hereby declare that this ***dissertation*** submitted in partial fulfilment of the requirements for the degree of **MASTERS OF SCIENCE** in **NURSING**, at the University of Rwanda/College of Medicine and Health Sciences, is my original work and has not previously been submitted elsewhere. Also, I do declare that a complete list of references is provided indicating all the sources of information quoted or cited.

Date and Signature of the Student: The 25th April, 2022

b. *Authority to Submit the dissertation*

Surname and First Name of the Supervisor ……Rajeswaran Lakshmi …….

In my capacity as a Supervisor, I do hereby authorize the student to submit his/her **dissertation**.

Date and Signature of the Supervisor/Co-Supervisor

……25.04.22

…….

PERMISSION FROM MICHIGAN RESEARCH CENTER.

Malec, Mary <mmalec@med.umich.edu>

À: Immaculée MUKAMARARA

Cc: Cain, Sarah

Lun. 5 Oct. 2020 à 12:56

Hello Immaculée Mukamarara,

Thank you for contacting the Michigan Diabetes Research Center. Please feel free to use our Revised Michigan Diabetes Knowledge Scale and Michigan Diabetes Attitude Scale for your study. We only ask that you cite our center as follows: "The project described was supported by Grant Number P30DK092926 (MCDTR) from the National Institute of Diabetes and Digestive and Kidney Diseases".

The link to our survey instruments can be found at http://diabetesresearch.med.umich.edu/Tools_SurveyInstruments.php

Thank you –

Mary A Malec

Director of Administration

Michigan Diabetes Research Center (MDRC)

Michigan Center for Diabetes Translational Research (MCDTR)

Normal business hours (M-Th 6-4)

UNIVERSITY of RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES
DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 9th /6/2021

Ref: CMHS/IRB/**201**/2021

Immaculée Mukamarara
School of Nursing and Midwifery, CMHS, UR

Dear Immaculée Mukamarara

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Self-Care of Adolescents with Type 1 Diabetes Mellitus (T1DM) Attending Outpatient Medical Clinics in Rwanda".***

Having reviewed your application and been satisfied with your protocol, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Dr Stefan JANSEN
Ag Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:

- Principal, College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

APPENDICE 1

LETTER OF INFORMATION

Research Title: self-care (Knowledge, attitudes, and practices) of T1DM among adolescents attending diabetic outpatient medical clinics in Rwanda

I am Immaculee Mukamarara, a master's student working under the supervision of Dr. Lakshmi Rajeswaran, PhD, in the School of Nursing and Midwifery at the University of Rwanda. We are conducting a study to examine the Knowledge, Attitudes, and Practices about self-care of T1DM among adolescents attending diabetic outpatient medical clinics in Rwanda. We would like to invite you to participate in the study given your extensive experience as an adolescent with T1DM. If you agree to participate, either you will be invited to complete a questionnaire on your own, or we will read the questionnaire to you, and the answers you provide will be recorded on the questionnaire. The questions you will be asked are based on your self-care (Knowledge, Attitudes, and Practices) about T1DM as adolescents with T1DM. This study is important because it seeks to gain insight into how the health of adolescents with T1DM can be improved.

If you are agree to participate in this study, the questionnaire should take approximately 45 minutes to finish. All information collected for the study will be kept confidential. This will be kept in a secured cabinet and password-protected laptop and will be destroyed seven years after the study is completed. Participants' personal information will not be used in any data analysis to protect individual participant's confidentiality. The identified/anonymized data will be accessible by the researcher and her supervisor. However, specifically, the data may be made available to other researchers in Rwanda upon publication so that they may be able to inspect and/or analyze the data as well. No personal information that can identify you will be associated with the data set that will be shared.

You must be less 20 years older to participate in this research. Thus, your Legal Guardian will have to sign the Consent Form. There are no known risks or harm associated with this study. However, your participation is completely voluntary, and you may refuse to participate, choose not to answer any questions or withdraw from the study at any time. There is no consequence of withdrawing or not answering any questions. There are no financial benefits for participating in this study.

A summary of results (tables indicting the number of respondents who fall in the various major response categories) that will not contain any identifying information will be given to the school of Nursing and Midwifery, the University of Rwanda, after then will be disseminated to communities where the study was conducted. You can also contact Dr. Lakshmi Rajeswaran, Ph.D., 0781 833 371, and Immaculée Mukamarara, 0788 505 115, if you are interested in getting feedback on results.

Should you need more information, clarification of issues, or verification of information, you can contact the primary researcher (Mrs. Immaculée Mukamarara) or her supervisor (Dr. Lakshmi Rajeswaran, PhD) using the contact information provided to you.

If you have any questions about the conduct of this study or your rights as a research participant you may contact the Office of Research Ethics, the Chairperson of the CMHS IRB and or the Deputy Chairperson at the University of Rwanda using the contact information provided to you. If you agree to participate, go to **Assent Form** (adolescent) **or Consent form** (Legal Guardian)

Appendix 2

ADOLESCENTS WITH T1DM ASSENT FORM

Research Title: Self-care of T1DM among adolescents attending diabetic outpatient medical clinics in Rwanda

I have read the Letter of Information, the nature of the study was explained to me, and all questions have been answered to my satisfaction, and I agree to participate.

Are you 18 years old or less? ☐ Yes ☐ No

Do you agree that we can write down on the questionnaire the responses you provide?

☐ Yes ☐ No

Participant Name _____Participant Signature_____ Date_____

"My signature means that I have explained the study to the participant named above. I have answered all the questions."

Researcher's Name _____ Researcher's Signature _____ Date _____

Thank you for agreeing to participate in this study.

Consent Form for Legal Guardian of adolescents with T1DM

Research Title: Self-care of T1DM among adolescents attending diabetic outpatient medical clinics in Rwanda

I, ……., the Legal Guardian of an adolescent with T1DM whose name is ……., after reading the Letter of Information, and receiving the explanation regarding the nature of the study, as well as all questions have been answered to my satisfaction, I agree the adolescent named above to participate in this study.

Are you over 18 years old and Legal Guardian of adolescent named above?

☐ Yes ☐ No

Legal Guardian Name _____ Legal Guardian Signature_____ Date_____

"My signature means that I have explained the study to the Legal Guardian named above. I have answered all the questions."

Researcher's Name _____ Researcher's Signature _____ Date _____

Appendix 3

DATA COLLECTION INSTRUMENTS

ID _____

Today's Date _____

(A) Socio-demographics

Please answer each of the following questions by filling in the blanks with the correct answers or by choosing the single best answer.

Q1. Age: …… years old

10 to 12 years ☐

13-15 years ☐

16-18 years ☐

Q2: ☐ Male ☐ Female

Q3. Year of diagnosis with type

(Please enter the year/month) …. /….

Q4. Ubudehe category? (Check one box)

☐ 1 category

☐ 2 category

☐ 3 category

☐ 4 category

5 don`t know

Q5. Where do you live most of the year? (Check one box)

☐ 1 Parents` home

☐ 2 Home of a relative

☐ 3 Friend`s home

4 Other _____

Q6. What is your level of education? (Tick the appropriate one)

☐ 1 no formal education

☐ 2 primary school

☐ 3 secondary school not completed

☐ 4 secondary school completed

☐ 5 university

6 others ……

Q7. What is your current employment status?

a. student/in school ☐

b. Working part-time ☐

c. Unemployed ☐

d. Employed ☐

e. Disabled, ☐

f. Other/Please specify: _____

Q8. Insurance plan (check all that apply)

- ☐ 1 Community based insurance
- ☐ 2 RSSB
- ☐ 3 No insurance
- ☐ 4 Other …….

Q9. Residence

☐ Rural

☐ Urban

Q10. Do you have a smartphone to communication for your health-related activities?

☐ Yes

☐ No

Q11. Which means of transportation do you use for your health-related activities?

☐ Own bicycle

☐ Rented bicycle

☐ Bicycle taxi

☐ Own moto

☐ Rented moto

☐ Moto taxi

☐ Bus

☐ Other/specify …….

(B) Knowledge questionnaire regarding self-care of T1DM (adopted from Michigan DM knowledge scale) (Self-care).

Please read each statement and then indicate whether you think it is true or false by placing a checkmark in the box below the TRUE or FALSE. If you do not know the answer, please put a checkmark in the box below the DON'T KNOW. (Self-care demands)

	TRUE	**FALSE**	**DON'T KNOW**
1. The diabetics diet is a healthy diet for most people	☐	☐	☐
2. A pound of chicken has more carbohydrate in it than a pound of potatoes.	☐	☐	☐
3. Orange juice has more fat in it than low-fat milk.	☐	☐	☐
4. A can of diet soft drink can be used for treating low blood glucose levels.	☐	☐	☐
5. Using tournesoil oil in cooking can help lower the cholesterol in your blood	☐	☐	☐
6. Exercising regularly can help reduce high blood pressure	☐	☐	☐
7. For a person in good control, exercising does not affect blood sugar levels.	☐	☐	☐
8. Wearing shoes a size bigger than usual helps prevent foot ulcers.	☐	☐	☐
9. Eating foods lower in fat decreases your risk for heart disease	☐	☐	☐
10. Numbness and tingling may be symptoms of nerve disease	☐	☐	☐

11. High blood glucose levels may be caused by too much insulin.	☐	☐	☐
12. If you take your morning insulin but skip breakfast your blood glucose level will usually increase	☐	☐	☐
13. Having regular check-ups with your doctor can help spot the early signs of diabetes complications	☐	☐	☐

C. Attitude questionnaire regarding self-care of T1DM (adopted from Michigan DM attitude scale) (Self-care demands)

Each numbered below statement finishes the sentence "In general, I believe that..." Mark the answer that you believe is true most of the time or is true for most people. Place a checkmark in the box below the word or phrase that is closest to your opinion about each statement.

1= strongly disagree

2= disagree

3= neutral

4= agree

5= strongly agree

In general, I believe that:	**Strongly Agree 5**	**Agree 4**	**Neutral** 3	**Disagree 2**	**Strongly Disagree 1**
1. People who do not need insulin to treat their type 1 diabetes have mild illness.	☐	☐	☐	☐	☐

2. It is very helpful to try to have good blood sugar control as the complications of T1D will occur anyway and anytime.	☐	☐	☐	☐	☐
3. T1DM affects almost every part of a diabetic person's life.	☐	☐	☐	☐	☐
4 .Keeping the blood sugar close to normal can help to prevent the complications of T1DM.	☐	☐	☐	☐	☐
5. Health care professionals should help T1DM patients make informed choices about their care plans.	☐	☐	☐	☐	☐
6 .People whose T1DM is treated by insulin have also to worry about getting long-term complications.	☐	☐	☐	☐	☐
7. Almost everyone with T1DM should do whatever it takes to keep their blood sugar close to normal.	☐	☐	☐	☐	☐
8. The emotional effects of T1DM are high.	☐	☐	☐	☐	☐
9. Blood sugar testing is not needed for people with T1DM.	☐	☐	☐	☐	☐
10. T1DM is life-threatening diseases because the person never get a break from it	☐	☐	☐	☐	☐

11. The person with T1DM is the most important member of the diabetes care team.	☐	☐	☐	☐	☐
12 .T1DM diabetes is a very serious disease.	☐	☐	☐	☐	☐
13 .Having T1DM changes a person's outlook on life.	☐	☐	☐	☐	☐
14. People with T1DM diabetes are likely to reap many benefits by properly monitoring their blood sugar	☐	☐	☐	☐	☐
15 .T1DM is as serious as T2DM	☐	☐	☐	☐	☐
16. Properly monitoring of blood sugar is hard work	☐	☐	☐	☐	☐
17. Tight control of blood sugar makes sense for people with T1DM.	☐	☐	☐	☐	☐
18.It is frustrating for people with T1DM to take care of their disease.	☐	☐	☐	☐	☐
19. People with T1DM have a right to decide how hard they will work to control their blood sugar.	☐	☐	☐	☐	☐
20 .People who take insulin should be concerned about their blood sugar.	☐	☐	☐	☐	☐
21. ...People with T1DM have the right not to take good care of their diabetes.	☐	☐	☐	☐	☐
22. ...Support from family and friends is important in dealing with T1DM.	☐	☐	☐	☐	☐

(D).Practice questionnaire regarding self-care of T1DM (adopted from Michigan DM practices scale) (self-care agency)

The following statements describe self-care activities related to your T1DM. Thinking about your self-care over the last 8 weeks, please specify the extent to which each statement applies to you.	Applies to me very much 3	Applies to me to a considerable degree 2	Applies to me to some degree 1	Does not apply to me\ 0
1. I check my blood sugar levels with care and attention.	☐	☐	☐	☐
2. The food I choose to eat makes it easy to achieve optimal blood sugar levels.	☐	☐	☐	☐
3. I keep all doctors' appointments recommended for my diabetes treatment.	☐	☐	☐	☐
4. I take my diabetes medication (e. g. insulin) as prescribed.	☐	☐	☐	☐
5. Occasionally I eat lots of sweets rich in carbohydrates.	☐	☐	☐	☐
6. I record my blood sugar levels regularly (or analyse the value chart with my blood glucose meter)	☐	☐	☐	☐
7. I tend to avoid diabetes-related doctors' appointments.	☐	☐	☐	☐

8. I do regular physical activity to achieve optimal blood sugar levels.	☐	☐	☐	☐
9. I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	☐	☐	☐	☐
10. I do not check my blood sugar levels frequently enough as would be required for achieving good blood glucose control.	☐	☐	☐	☐
11. I avoid physical activity, although it would improve my diabetes.	☐	☐	☐	☐
12. I tend to forget to take my diabetes medication (e. g. insulin).	☐	☐	☐	☐
13. Sometimes I have real 'food binges' (not triggered by hypoglycaemia).	☐	☐	☐	☐
14. Regarding my diabetes care, I should see my medical practitioner(s) more often.	☐	☐	☐	☐
15. I tend to skip planned physical activity.	☐	☐	☐	☐
16. My diabetes self-care is poor.	☐	☐	☐	☐

THANK YOU FOR YOUR HELP!

Appendix 4

Ibibazo mu Kinyarwanda

IBARUWA YO GUTANGA AMAKURU

Umutwe w'imbanziriza mushinga y'ubushakashatsi:

"Kwiyitaho kw'ingaragu n'abangavu bafite uburwayi bwa diyabete yo mu bwoko bwa mbere bivuriza mu bitaro byo mu Rwanda "

Nitwa Mukamarara Immaculée,ndi umunyeshuri,niga mu cyiciro cya gatatu mu ishuri ry'abaforomo (kazi), n'ababyaza riri muri Kaminuza y'u Rwanda.Ubushakashatsi twatangiye buzareba ubumenyi, imyifatire n'ibikorwa mu kwiyitaho kw'ingimbi n'abangavu bafite uburwayi bwa diyabete yo mu bwoko bwa mbere bivuriza mu bitaro binyuranye byo mu Rwanda, nkaba mfashwa na Dogiteri Lakshmi Rajeswaran. Turifuza kugutumirira kugira uruhare muri ubu bushakashatsi, ukurikije ubunararibonye ufite ku ndwara ya diyabete yo mu bwoko bwa mbere.

Niba wemeye kwitabira ubu bushakashatsi, ushobora kuzuza ibibazo wenyine cyangwa, tukabigusomera, kandi ibisubizo mutanga bizandikwa ku bibazo. Ibibazo uzabazwa bishingiye ku bumenyi, imyifatire n'ibikorwa byawe birebana n'uko kwiyitaho kw'ingimbi n'abangavu bafite uburwayi bwa diyabete yo mu rwego rwa mbere.Ubu bushskashatsi ni ngombwa, kuko burashaka kumenya neza uburyo ubuzima bw'ingimbi n'abangavu bafite uburwayi bwa diyabete yo mubwoko bwa mbere bushobora kunozwa.Niba wemeye kwitabira ubu bushakashatsi, ushobora gusubiza ibi bibazo nko mu minota 45 ukaba urangije. Amakuru yose yakusanyijwe kuri ubu bushakashatsi azabikwa mu ibanga. Ibi bizabikwa muri mudasobwa igendanwa kandi irinzwe. Kandi ibi bizata agaciro hashize imyaka irindwi ubu bushakashatsi burangiye.

Amakuru yihariye y'abitabiriye ubushakashatsi ntazakoreshwa mu gusesengura amakuru ayo ari yo yose kugira ngo arinde ibanga ry'umuntu ku giti cye. Amakuru yamenyekanye n' atamenyekanye azagerwaho n'umushakashatsi n'umuyobozi we. Ariko, by'umwihariko, amakuru amaze gutangazwa azashobora kubonwa n'abandi bashakashatsi bo mu Rwanda kugirango

bayagenzura cyangwa kandi bayasesengure. Nta makuru yihariye ashobora kukumenyekanisha azahuzwa n'andi yemejwe kugirango abandi bashobore kuyakoresha.

Kugirango witabire ubu bushakashatsi, ugomba kuba uri munsi y'imyaka 20. Bityo rero umwishingizi wawe agomba ku rupapuro rwemeza ko abyemeye. Nta ngaruka cyagwa mbogamizi zijyanye n'ubu bushakashatsi. Kugira uruhare muri ubu bushakashatsi ni ku bushake bwawe, ushobora kwanga, guhitamo kudasubiza ikibazo icyo ari cyo cyose. Nta ngaruka bizakugiraho, kandi nta n'inyungu y'amafaranga yo kwitabira ubu bushakashatsi. Incamake y'ibyavuye mu bushakashatsi (imbonerahamwe yerekana umubare w'ababajijwe n'ibyiciro by'ibisubizo) bitazaba bikubiyemo amakuru ayo ari yo yose azahabwa ishuri ry'abaforomo n'ababyaza, Kaminuza y'u Rwanda, nyuma y'aho rizatangarizwa aho ubushakashatsi bwakorewe.

Ukeneye ibisobanuro ku byavuye mu bushakashatsi cyangwa amakuru yisumbuye ku bisubizo cyangwa kugenzura amakuru, wahamagara umushashatsi Mukamarara Immaculée kuri 0788505115, cyangwa cyangwa umuyobozi we Dr. Lakshimi Rajeswaran kuri 0781833371

Niba ufite ikibazo kijyanye n'uko ubushakashatsi buzakorwa, cyangwa uburenganzira bwawe nk'umuntu witabiriye ubushakashatsi, ushobora guhamagara mu biro bishinzwe imyifatire n'ubushakashatsi cyangwa umuyobozi w'ishami ry'ubuganga n'andi mashami y'ubuvuzi cyangwa se umuyobozi wungirije muri Kaminuza y'u Rwanda, kuri no y'itumanaho wahawe. Niba wemeye kwitabira, urareba urupapuro rwemewe ku ngimbi n'abangavu cyangwa urw'umwishingizi.

Appendix 5

IFISHI IGENEWE INGIMBI N'ABANGAVU BAFITE UBURWAYI BWA DIYABETE YO MU BWOKO BWA MBERE

Umutwe w'ubushakashatsi:" Ukwiyitaho kwingimbi nabangavu barwaye diyabete yo mu bwoko bwa mbere bitabira amavuriro yo mu Rwanda yita kundwara ya diyabete".

Nasomye Ibaruwa yamakuru, imiterere yubushakashatsi yaransobanuriwe, kandi ibibazo byose nabajije nabisubijwe, nkaba nemeye kugira uruhare mu bushakashatsi.

Ufite imyaka 18 cyangwa irenga? Yego ☐ Oya ☐

Uremera ko dushobora kwandika kubibazo ibisubizo utanga? Yego ☐ Oya ☐

Izina ry'abitabira _____ Umukono w'abitabira_____ Itariki_____

"Umukono wanjye bivuze ko nasobanuriye abitabiriye ubushakashatsi bavuzwe haruguru. Nasubije ibibazo byose."

Izina ry'umushakashatsi _____ Umukono w'umushakashatsi _____ Itariki _____

Urakoze kuba wemeye kugira uruhare muri ubu bushakashatsi.

IFISHI Y'UMWISHINGIZI W'INGIMBI N'ABANGAVU BARWAYE DIYABETE YO MU BWOKO BWA MBERE WEMEWE N'AMATEGEKO.

Umutwe w'ubushakashatsi: "Ukwiyitaho kwingimbi nabangavu barwaye diyabete yo mu bwoko bwa mbere bitabira amavuriro yo mu Rwanda yita kundwara ya diyabete".

Njye, …… .., Umwishingizi wemewe n'amategeko w'umwangavu cg ingimbi urwaye Diyabete yo mu bwoko bwa mbere witwa …… .., nyuma yo gusoma Ibaruwa yamakuru, no kwakira ibisobanuro bijyanye nimiterere yubushakashatsi, kandi ibibazo byose nabajije nabisubijwe nemera ko ingimbi yavuzwe haruguru izitabira ubu bushakashatsi.

Urengeje imyaka 18 kandi uri umwishingizi wemewe n'amategeko wingimbi cyangwa umwangavu wavuzwe haruguru?

Yego ☐ Oya ☐

Izina ry'Umurinzi wemewe n'amategeko _____ Umukono w'Umurinzi wemewe n'amategeko _____ Itariki_____

"Umukono wanjye bivuze ko nasobanuriye ubushakashatsi umurinzi wemewe n'amategeko wavuzwe haruguru. Nasubije ibibazo byose."

Izina ry'umushakashatsi _____ Umukono w'umushakashatsi _____ Itariki _____

Urakoze kwemera kugira uruhare muri ubu bushakashatsi.

Appendix 6

UBUSHAKASHATSI/IBIBAZO

Nimero y`ubazwa: ……..

Itariki y'uyu munsi: ...../...../.....

(A) **Irangamimerere**

Ndagusabye subiza buri kimwe mu bibazo bikurikira wuzuza ahabugenewe ibisubizo by'ukuri cyangwa uhitamo igisubizo kimwe kiri cyo kurursha ibindi.

Ik 1. Ufite imyaka ingahe? ☐

Ik 2: Igitsina

Gabo ☐ Gore ☐

Ik 3. **Ni ryari wamenye ko urwaye diyabete**

(andika ukwezi/umwaka) …. /….

Ik 4**. Icyiciro cy` Ubudehe**,

Icya 1 ☐ Icya 2 ☐

Icya 3 ☐ Icya 4 ☐

Icya 5 ☐ Nta cyo nzi ☐

Ik 5. Ni hehe uba cyane mu mwaka? (Hitamo akazu kamwe).

a. Ubana n`ababyeyi ☐

b. Ubana n`umuvandimwe ☐

c. Ubana n`inshuti y'umuryango ☐

d. Uba ahandi, sobanura ……..

Ik 6. Ni ikihe cyiciro cy'amashuri wize? (hitamo kimwe gikwiye)

a. Ntabwo nize ☐

b. Amashuri abanza ☐

c. Amashuri yisumbuye ntabwo nayarangije ☐

d. Amashuri yisumbiye narayarangije ☐

e.Kaminuza ☐

f. Ayandi, sobanura …….....

Ik 7. Ni iki ukora ubu?

a. Umunyeshuri/uri ku ishuri ☐

b. Simfite akazi gahoraho ☐

c. Ntakazi mfite kampemba ☐

d. Akazi k'umushahara ☐

e.Mfite ubumuga ☐

e. Ibindi, ndagusabye sobanura: ……..

Ik8. Gahunda y'ubwishingizi (uzuza aho ubona hose ko ari ngombwa)

a. Ubwisungane mu kwivuza ☐

b. RSSB ☐

c. Ntabwishingizi ☐

d.Ubundi, sobanura:……..

Ik9. Aho utuye

Mu cyaro ☐

Mu mugi ☐

Ik.10. Ufite simatifoni igufasha kumenyekanisha ibikorwa byawe birebana no kwivuza?

Yego ☐

Oya ☐

Ik.11. Ni ubuhe buryo bwo kugenda ukoresha mu bikorwa byawe bijyanye no kwivuza?

Igare ryanjye ☐

Igare nakodesheje ☐

Igare ritwara

abagenzi ☐

Moto yanjye ☐

Moto nakodesheje ☐

Moto itwara abagenzi ☐

Bisi ☐

Ibindi/ sobanura …….

(B) Ibibazo k`ubumenyi bujyanye no kwiyitaho k'umuntu ufite diyabete yo mu bwoko bwa mbere (byakuwe mu gipimo cy`ubumenyi k' ukwiyitaho k'umuntu ufite diyabeye yo mu bwoko bwa mbere cyo muri Michigan) (Kwiyitaho).

Ndagusabye soma buri nteruro noneho werekane niba utekereza ko ari ukuri cyangwa atari ukuri, ushyira akamenyetso mu kazu munsi ya NIBYO cyangwa SIBYO. Niba utazi igisubizo, shyira akamenyetso mu kazu kari munsi ya NTABYONZI. (Icyo kwiyitaho bisaba).

	NIBYO	SIBYO	NTABYO NZI
1. Indyo y'umuntu urwaye diyabete ni indyo itanga ubuzima ku bantu benshi	☐	☐	☐
2 Ikiro cy'inkoko kifitemo isukari nyinshi kuruta ikiro cy'ibirayi.	☐	☐	☐
3 Umutobe w'icunga wifitemo ibinure byinshi kuruta amata afite binure bike.	☐	☐	☐
4 Agakombe k`ikinyobwa kidasembuye kagufasha kuvura isukari iri ku gipimo cyo hasi mu maraso.	☐	☐	☐
5 Gukoresha amavuta y'igihwagari muguteka byafasha mu kugabanya kolesiteroli mu maraso yawe.	☐	☐	☐
6 Gukora imyitozo buri gihe bishobora gufasha kugabanya umuvuduko mwinshi w'amaraso.	☐	☐	☐
7. Ku muntu wigenzura neza, gukora imyitozo ntacyo bihindura ku kigero cy'isukari mu maraso.	☐	☐	☐
8 Kwambara inkweto nini ho gato kuruta uko byari bisanzwe bifasha gukumira ibisebe by'ibirenge.	☐	☐	☐

9. Kurya ibiryo bifite ibinure bike bigabanya ibyago byo kurwara indwara y'umutima .	☐	☐	☐
10. Kugira ibinya no kumva utuntu tukujombagura mu mubiri bishobora kuba ibimenyetso by'indwara y' imwakura	☐	☐	☐
11. Ikigero cy'isukari nyinshi mu maraso gishobora guterwa na ensiline nyinshi cyane.	☐	☐	☐
12. Niba ufashe ensiline yawe ya mugitondo ariko ntufate ifunguro rya mu gitondo, ikigero cy'isukari yawe mu maraso kizazamuka buri gihe.	☐	☐	☐
13. Kwisuzumisha buri gihe kwa muganga wawe bishobora gufasha kumenya ibimenyetso biza kare by'ingaruka za diyabete.	☐	☐	☐

C. Ibibazo birebana n'imyumvireijyanye no kwiyitaho k'umuntu ufite diyabete yo mu bwoko bwa mbere kirebana (byakuwe mu igipimo cy`imyumvire ijyanye no kwiyitaho cyo muri Michigan) (Icyo kwiyitaho bisaba).

Buri numero iri munsi y'amagambo arangiza interuro "Muri rusange, ndizera ko ..." Shyira igisubizo wizera ko ari ukuri hafi buri gihe cyangwa ari ukuri ku bantu benshi. Shyira akamenyetso ka ∨ mu kazu kari munsi y'ijambo cyangwa interuro yegereye igitekerezo cyawe kijyanye na buri nteruro.

1= Sinemeranya na byo na busa

2= Sinemeranya na byo

3= Ndifashe

4= Ndemeranya na byo

5= Ndemeranya na byo cyane

Muri rusange ,ndemera ko	**Ndemeranya na byo cyane 5**	**Ndemeranya na byo 4**	**Ndifashe 3**	**Sinemeranya na byo 2**	Sinemeranya nabyo na busa 1
1.... Abantu badakeneye ensiline yo kuvura diyabete yabo yo mu bwoko bwa 1 bafite indwara yoroheje.	☐	☐	☐	☐	☐
2.... Birafasha cyane kugerageza kugenzura isukari mu maraso na cyane ko ingaruka za diyabete yo mu bwoko bwa mbere zishobora kuza mu buryo ubu n'ubu n'igihe iki n'ik	☐	☐	☐	☐	☐

3. Diayabete yo mu bwoko bwa mbere itera ingorane hafi kuri buri gice cy'ubuzima bw'umuntu urwaye diyabete.	☐	☐	☐	☐	☐
4 . Gukora ku buryo isukari yegera iri nzima bishobora gufasha gukumira ingaruka za diyabete yo mu bwoko bwa mbere.	☐	☐	☐	☐	☐
5. Abakozi b'umwuga bo kwa muganga bagomba gufasha abarwayi ba diyabete yo mu bwoko bwa mbere guhitamo amakuru yizewe arebana na gahunda zabo zo kwivuza.	☐	☐	☐	☐	☐
6. Abantu bafite diayabete y'ubwoko bwa mbere bavurwa na ensiline bagomba na none guhangayikishwa no kuba bagira ingaruka zigihe kirekire.	☐	☐	☐	☐	☐
7. Abantu hafi ya bose bafite diyabete yo mu bwoko bwa mbere bagomba gukora buri kimwe cyose gishoboka kugirango isukari yabo mu maraso igume yegereye inzima.	☐	☐	☐	☐	☐
8. Ingaruka zijyane n' amarangamutima zitewe na diyabete yo mu bwoko bwa mbere ziri ku gipimo cyo hejuru.	☐	☐	☐	☐	☐
9. Gupima isukari mu maraso ntibikenewe ku bantu bafite diyabete yo bwoko bwa mbere.	☐	☐	☐	☐	☐
10. Diayabete y'ubwoko bwa mbere ni indwara ihungabanya ubuzima bitewe	☐	☐	☐	☐	☐

n'uko itigera na rimwe iha umuntu agahenge.					
11. Umuntu urwaye diyabete yo mu bwoko bwa mbere ni umunyamuryango w'ingenzi cyane mu bagize itsinda ry'ubuvuzi bwa diyabete.	☐	☐	☐	☐	☐
12. Diyabete yo mu bwoko bwa mbere n'indwara ikomeye cyane.	☐	☐	☐	☐	☐
13. Kugira impinduka za diyabete yo mu bwoko bwa mbere bihindura uko umuntu abona ibintu mu buzima.	☐	☐	☐	☐	☐
14. Abantu barwaye diyabete yo mu bwoko bwa mbere bafite inyungu nyinshi mugukurikirana uko bikwiye isukari yabo mu maraso	☐	☐	☐	☐	☐
15. Diabete yo mu bwoko bwa mbere irakomeye nk'iyo mu bwoko bwa kabiri.	☐	☐	☐	☐	☐
16. Gukurikirana uko bikwiye isukari mu maraso ni umurimo ukomeye.	☐	☐	☐	☐	☐
17. Kugenzura isukari mu maraso neza cyane bifite ishingiro ku bantu barwaye diyabete yo mu bwoko bwa mbere.	☐	☐	☐	☐	☐
18. Bitera ipfunwe ku bantu barwaye diyabete yo mu bwoko bwa mbere kwita ku ndwara yabo.	☐	☐	☐	☐	☐
19. Abantu barwaye diyabete yo mu bwoko bwa mbere bafite uburenganzira bwo gufata icyemezo k'uburyo bakora cyane	☐	☐	☐	☐	☐

kugirango bagenzure isukari yabo mu maraso.					
20. Abantu bafata ensiline bagomba kumva ko isukari yabo mu maraso ibareba.	☐	☐	☐	☐	☐
21. Abantu barwaye diyabete yo mu bwoko bwa mbere bafite uburenganzira bwo kutita neza kuri diyabete yabo.	☐	☐	☐	☐	☐
22. Inkunga y'umuryango n'inshuti ni ingenzi m'uguhangana na diyabete yo mu bwoko bwa mbere.	☐	☐	☐	☐	☐

(D). Ibibazo birebana n' ibikorwa mu kwiyitaho k' umuntu ufite diyabete yo mu bwoko bwa mbere (byavanye mu gipimo cy' ibikorwa bya diyabete byakorewe muri Michigan) (Ubushobozi bwo kwiyitaho).

Interuro zikurikira zisobanura ibikorwa byo kwiyitaho kubirebana na diyabete yo mu bwoko bwa mbere. Tekereza uko wiyitayeho mu byumweru 8 bishize, ndakwinginze erekana urugero rw' ukuntu ibiri mu nteruro zikurikira byakuyakubayeho.	**Bimbaho cyane** **3**	**Bimbaho biringaniye** **2**	**Bimbaho gake** 1	**Ntabimbaho** **0**
1. Nsuzuma ikigero cy isukari iri mu maraso mbyitayeho kandi mbyitondeye.	☐	☐	☐	☐
2. Ibiryo mpitamo kurya bituma ngira urugero rwiza rw' isukari mu maraso.	☐	☐	☐	☐
3. Nubahiriza gahunda zose zategetswe na muganga (rendez-vous) mu bijyanye n' imivurire y' uburwayi bwanjye bwa diyabete.	☐	☐	☐	☐
4. Mfata imiti yanjye ya diyabete (urugero. ensiline) nk'uko byanditswe na muganga.	☐	☐	☐	☐
5. Rimwe na rimwe ndya ibiryo byinshi bikungahaye ku binyasukari.	☐	☐	☐	☐
6. Nandika ikigero k' isukari mu maraso buri gihe (cyangwa ngasesengura	☐	☐	☐	☐

ibipimo byanjye nkoresheje akamashini gapima isukari mu maraso).				
7. Nsa nukunda kwibagirwa ibijyanye n' agahunda za muganga zirebana na diyabete.	☐	☐	☐	☐
8. Nkora imyitozo ngororamubiri ya buri gihe kugira ngo ngire urugero rwiza rw' isukari mu maraso.	☐	☐	☐	☐
9. Nkurikiza uko biteganijwe amabwiriza ajyanye n' indyo yategetswe na muganga cyangwa inzobere mu bijyanye na diyabeti.	☐	☐	☐	☐
10. Ntabwo njya ngenzura urugero rw' isukari mu maraso kenshi bihagije nk'uko byakabaye bikorwa kugira ngo ngenzure neza isukari mu maraso.	☐	☐	☐	☐
11. Nirinda gukora imirimo isaba ingufu, n'ubwo yafasha mukunyorohereza diyabete.	☐	☐	☐	☐
12. Nsa nukunda kwibagirwa gufata imiti yanjye ya diyabete (urugero, ensiline).	☐	☐	☐	☐
13. Rimwe na rimwe mfata "ibiryo byinshi" (bidatewe no kugira isukari nke mu maraso).	☐	☐	☐	☐

14. Kubijyanye no kwita kuri diyabete yanjye, nshobora kureba muganga wanjye/ abaganga kenshi na kenshi.	☐	☐	☐	☐
15. Nsa nukunda kwirengagiza imirimo y' ingufu iteganyijwe.	☐	☐	☐	☐
16. Uburyo niyitaho mu bijyanye na diyabeti yanjye ntibihagije.	☐	☐	☐	☐

Urakoze kumpa ubufasha!

Appendix 8: Work Plan

No. Activity	SEP		OCT		NOV		DEC		JAN		FEB		MAR		APL		Days
1 Proposal writing	X	X															30
	X	X															
2 Approval of Research Protocols			X	X													30
			X	X													
3 Field visits, the permission of data collection					X												7
4 Pilot study					X	X											14
5 Field research activities (Data collection)						X	X	X									21
6 Design databases; enter and cleaning data and data analysis							X	X	X	X							30
7 Draft report writing									X	X							30
											X	X					
8 First draft report with a PowerPoint presentation on key findings (workshops/conferences)											X	X					14
9 final report writing (consideration comments received)													X	X			30
													X	X			
10 defence															X		7
11 Editing of final report and submission															X	X	14
12 Dissemination of report																X	7
yujghTotal number of days																	224