HIGH BLOOD PRESSURE AMONG CHILDREN AND ADOLESCENTS WITH DIABETES MELLITUS TYPE 1 AT THREE UGANDAN REGIONAL REFERRAL HOSPITALS: PREVALENCE, ASSOCIATED FACTORS AND GLYCEMIC CONTROL

CHARLES MWENDWA

MUTISYA 2021-04-03568

A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF MEDICINE IN PAEDIATRICS AND CHILD HEALTH OF KAMPALA INTERNATIONAL UNIVERSITY

MARCH 2024

Declaration

I **Charles Mwendwa Mutisya** declare that this research titled "***High Blood Pressure among Children and Adolescents with Diabetes Mellitus Type 1 at three Ugandan Regional Referral Hospitals: Prevalence, Associated Factors and Glycemic Control"*** is my own work and has never been submitted before to any other university or institution of higher learning for any academic award. Where the work of other people has been included, it has been duly cited and acknowledged.

.....

Charles Mwendwa Mutisya

Date.....11-03-2024.....

Approval

I hereby certify that I have read this research Thesis titled "***High Blood Pressure among Children and Adolescents with Diabetes Mellitus Type 1 at three Ugandan Regional Referral Hospitals: Prevalence, Associated Factors and Glycemic Control"*** which has been prepared under my supervision.

Signature……

Date…11-03-2024……..

Professor Martin Nduwimana

MBChB (University of Burundi, 1983)

MMED Paediatrics and Child Health (Free University of Brussels 1990)

Associate Professor of Paediatrics, Kampala International University.

Signature……

Date…11-03-2024……..

Prof. Ndeezi Grace

MBChB (MUK, Uganda, 1987)

MMED Paediatrics and Child Health(MUK, Uganda, 1993)

PhD (Bergen Norway/MUK, Uganda, 2011)

Acknowledgement

This research has been a product of support coming from different sources and i wish to acknowledge them all. I am grateful to my supervisors for their individual and collective advice, guidance, patience, and encouragement throughout the research period.

My sincere gratitude goes also to all the lecturers in the department for their work in developing this research. Special mention to my departmental colleagues for all the support and encouragement that they gave me. I also acknowledge the contribution of the research participants who made this study possible, not forgetting the administrators and staff of the study centre for being very supportive.

Dedication

I dedicate this dissertation to my family, siblings, colleagues and friends. I will always remain indebted to you.

Table of Contents

Declaration ii

Approval iii

Acknowledgement iv

Dedication v

List of figures x

List of Tables xi

List of abbreviations and acronyms xii

Operational Definition xiii

Definitions of key terms xiv

Abstract xv

Chapter 1: Introduction 1

1.1 Background 1

1.1.1 Historical perspective 1

1.1.2 Theoretical background 2

1.1.3 Conceptual background 2

1.1.4 Contextual Background 5

1.2 Problem statement 6

1.3 Objectives of the study 6

1.3.1 General objective 6

1.3.2 Specific objectives 6

1.3.3 Research questions 7

1.4 Justification 7

1.5 Significance 7

1.6 Scope 8

1.6.1 Time scope 8

1.6.2 Content scope 8

1.6.3 Geographical scope 8

1.7 Conceptual frame work 9

Chapter 2 Literature review 11

2.0 introduction 11

2.1 Prevalence of hypertension in diabetes mellitus type 1 11
2.2. Glycemic control by glycated haemoglobin. 12
2.3 Associated factors for hypertension among diabetic participants 13
2.4 Integration of literature 15
Chapter 3 16
3.1 Methodology 16
3.2 Study design 16
3.4 Study population 17
3.4.1 Target population 17
3.4.2 Eligible population. 17
3.4.3 Study participants 17
3.4.4 Sample size for prevalence 17
3.4.5 Sample size for associated factors 18
3.6 Sampling technique 19
3.7 Study procedure 20
3.8 Research instruments 21
3.8.1 Questionnaires 21
3.8.2 Research equipments 21
3.8.3 Anthropometric tools 21
3.9 Blood pressure measurement 22
3.10 Glycemic control by HbA1c measurement 22
3.11 Reliability and validity 23
3.12 Data management plan 24
3.14 Ethical considerations. 24
3.14.1 Research Approval 24
3.14.2 Informed consent 24
3.14.3 Community engagement plan 25
3.15 Dissemination of results 26
Chapter 4: Results 27
4.1 Introduction: 27
4.2 Study participants 27

4.3 Socio-demographics....28
4.4 Medical factors....30
4.5 Diet and behavior factors....32
4.6 Prevalence of elevated blood pressure and hypertension among diabetic patients....33
4.7 Glycemic control....35
4.8 Factors associated with elevated blood pressure and hypertension among study participants....35
4.8.1 Bivariate analysis of socio-demographic factors and high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH....35
4.8.2 Bivariate level analysis of medical factors and high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at at JRRH, LRRH and MRRH....37
4.8.3 Bivariate analysis of diet and behavior factors and high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH.....39
4.9 Multivariate level analysis of associated factors....39
Chapter 5: Discussion, conclusions and recommendations....41
5.1 Introduction:....41
5.2: Prevalence of elevated blood pressure and hypertension among DM type 1 participants....41
5.3 Level of glycemic control among DM type 1 participants....42
5.4 Factors associated with hypertension among the DM type 1 participants....42
5.5 Limitations....43
5.6 Strength of the study....44
5.7 Conclusions....44
5.8 Recommendations....44
References....45
Appendices....55
Appendix I: Work plan....55
Appendix II: Budget of the Study....56
Appendix III: Map of Uganda Showing study districts....57
Appendix IV: Table comparing different variables among the study sites....58
Appendix V: English informed consent....59
Appendix VII: Assent form ENGLISH....65
Appendix VIII: English Questionnaire....70

Appendix IX: Lugisu Informed consent 72
Appendix X: Lugisu Assent Form 79
Appendix XI: Lugisu Questionnaire 85
Appendix XII: Lusoga Assent Form 88
Appendix XIII: Lango Assent consent 94
Appendix XIV: Lango Informed consent 100
Appendix XV: Lango Questionnaire 113
Appendix XVI: Lusoga Informed consent 115
Appendix XVII: Lusoga Questionnaire (Ekyolusoga) 128
Appendix XVIII: Mbale Regional Referral Hospital Approval letter 131
Appendix XIX: Lira Regional Referral Hospital Approval letter 133
Appendix XX: Jinja Regional Referral Hospital Approval letter 134
APPENDIX XXI: REC Approval 135

List of figures

Figure 1.Conceptual framework 9
Figure 2: Conceptual frame work 9
Figure 4: A pie-chart showing distribution of elevated blood pressure and hypertension among children and adolescents 6months to 18 years with DM type 1 at JRRH, LRRH and MRRH 33
Figure 5: A column Chart showing frequency of high blood pressure among the selected study sites of DM type 1 particpants aged 6 months to 18 years of age.....34
Figure 6: A pie-chart showing the level of glycemic control among children and adolescents 6months to 18 years with DM type 1 attednig JRRH, LRRH and MRRH 35

List of Tables

Table 1: Krejcie and Morgan table 18
Table 2: A table showing targeted participant enrolment per each research site. 19
Table 3: A table showing social-demographic characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH. 29
Table 4: A table showing medical history and clinical characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH. 31
Table 5: A table showing dietary and behavior characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at at JRRH, LRRH and MRRH..... 32
Table 6: A table showing stages of high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH (N=61). 34
Table 7: Bivariate analysis of socio-demographic factors of children and adolescents aged 6 months to 18 years with DM type 1 at at JRRH, LRRH and MRRH 36
Table 8: A table showing bivariant analysis of medical history and clinical characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH 38
Table 9: A table showing bivariant analysis of diet and behavior factors of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH 39
Table 10: A table showing multivariant logistic regression of factors associated with high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH 40

List of abbreviations and acronyms

BCE	Before Current Era
BP	Blood Pressure
DM	Diabetes Mellitus
HbA1c	Glycated haemoglobin
HTN	Hypertension
IDF	International Diabetes Federation
JRRH	Jinja Regional Referral Hospital
LRRH	Lira Regional Referral Hospital
MRRH	Mbaale Regional Referral Hospital
NCDs	Non-Communicable Diseases
RAAS	Renin angiotensin aldosterone system
USA	United States of America
WHO	World Health Organization

Operational Definition

Adolescent- the phase of human life between 10-18 years (Singh et al., 2019).

Definitions of key terms

Prevalence: Number of disease cases that are present in a particular population at a given time. In this study, it will refer to the number of cases of high blood pressure among children and adolescents with diabetes mellitus type 1.

Factors: Any attribute, characteristic or exposure of a child or adolesecnt that increase the chance of having high blood pressure in children and adolescents with diabetes mellitus type 1. In this study, they will include socio-demographic, medical factors, diet and behavioral factors.

Elevated blood pressure is an average blood pressure equal to or above 90th percentile but less than 95th percentile for age, sex and high or blood pressure 120/<80-129/<80 mm Hg for adolescents (Flynn, Kaelber, Baker-Smith, Blowey, Carroll, Daniels, Dionne, et al., 2017).

Hypertension is defined as an average blood pressure above or equal to 95th percentiles for sex, age and height or ≥130/80 mm Hg for adolescents (Flynn, Kaelber, Baker-Smith, Blowey, Carroll, Daniels, Dionne, et al., 2017).

High blood pressure: This is defined as a combination of elevated blood pressure and hypertension.

Processed foods: Foods that have undergone some processing and have nutrients and fibre removed. Other ingredients like sugars, sweeteners, are often added. Examples include white bread, and cakes. They are known to be a source of sugar (Albuquerque et al., 2022).

Sweetened drinks: Are drinks with added sweeteners, like sucrose, high-fructose or fruit juice concentrates (Ruanpeng et al., 2017).

Physical exercise: Any bodily movement produced by skeletal muscles that requires use of energy it is observed with an average of 60 minutes of moderate-to-vigorous daily
physical activity (Bull et al., 2020).

Abstract

Background: The coexistence of diabetes and hypertension (HTN) worsens clinical outcomes of diabetic children with respect to both microvascular and macrovascular disease. It increases mortality risk by 7.2 times with a higher risk of death in developing countries. Therefore, a comprehensive care of Diabetes must be adhered to including hypertension screening.

Objectives: To determine the prevalence and factors associated with high blood pressure and describe the level of glycemic control among children and adolescents with diabetes mellitus in selected hospitals in east, and northern Uganda.

Methods: This was a multi-center health facility-based cross-sectional descriptive and analytical study. It was conducted among 150 children and adolescents aged 6 months to 18 years with diabetes mellitus type 1 attending Jinja Regional Referral Hospital (JRRH), Mbale Regional Referral Hospital (MRRH) and Lira Regional Referral hospital (LRRH). Interviewer administered questionnaires were used to obtain data and data collected was then analyzed in line with study objectives using STATA version 18.The prevalence of high blood pressure and glycemic control was determined as percentages whereas factors associated with high blood pressure were analyzed at both bivariable and multivariable logistic regression. Significance of association was set at P-value <0.05 at 95% confidence interval.

Results: Of the 150 participants 115 (76.5%) were above 12 years of age, the median age was 15 (IQR 13-17). There were more females [81/150 (54%)] than males. The majority were attending school [130/150 (86.7%)] with a few in boarding school [26/130 (20%)]. Sixty-one patients (40.7%) had high blood pressure and 53 (86.9%) of these had poor gylcaemic control. Among patients without high blood pressure 62/89 (69.7%) had poor gycaemic control.

Factors associated with high blood pressure among DM type 1 participants include having diabetes for more than 4 years, ((4-8 years (aOR 2.233) and over 8 years (aOR 4.545)) and poor glycemic control (HBA1C <7%) (aOR 2.905) with a P-value <0.05.

Conclusion: There was a high prevalence of high blood pressure and poor glycemic control (HbA1c >7%) level among the study participants. Factors associated with high blood pressure included duration of disease since diagnosis of more than 4 years and poor glycemic control.

Chapter 1: Introduction

1.1 Background

1.1.1 Historical perspective

Awareness of Hypertension patterns dates way back to 2600 BCE and was recognized as hard pulse disease. In 1550BCE it was linked to heart and brain afflictions as recorded by the Egyptian physicians on the Eber papyrus. Following the development of manometer in 1733, Nicolai Korotkoff described the sounds auscultated with stethoscope while sphygmomanometer cuff is deflated so as to define systolic and diastolic blood pressure measurement (Harold, 2017).

Essential hypertension and malignant hypertension didn't come to light until 1910 -1914 with diagnosis of hypertension and its impact of being untreated devastated the life of President Franklin Roosevelt until his death in 1945 (Harold, 2017). This sparked off numerous studies in regards to hypertension including Framingham studies which showed that hypertension and hyperlipidemia were greatly associated with many cardiovascular morbidities like stroke, heart failure and heart attack, predisposition to premature deaths among others. The risk was more with higher blood pressure. Additionally, pharmacological discoveries in management of hypertension were initiated starting with hydrochlorothiazide, hydralazine and reserpine in 1967 with single drug therapy with no focus, no target blood pressure to development of stepwise incremental therapy with intention of obtaining target BP. In 1997, the DASH study established the role of diet and reduced salt in-take in the control of blood pressure all of which are still key strategies in management of hypertension (Saklayen & Deshpande, 2016). Development of hypertension guidelines by the National Joint commission was instituted in USA releasing the 1st edition in 1977 with the current being 8th edition published in 2017 (Harold, 2017).

On the other hand, the word diabetes was first coined in the 2nd century by Aretaeus of Cappadocia describing a wasting disease from excessive urination consistent with a clinical picture of DM type 1 (Dyson, 2021). Thomas Willis added the word Mellitus in the 17th century relating to the sweet taste of urine (Dyson, 2021). It was until 1948, that Howard Root made the observation that hyperglycemia was linked to blood vessel disease like hypertension (Harold, 2017). This primed a better understanding of diabetes and its relationship to cardiovascular diseases

1.1.2 Theoretical background

The theory of planned behavior was the basis for this study. This model is key in health promotion and diseases prevention strategies programme development and implementation.

Theory of planned behavior as described by Fishbein and Ajzen in 1975 describes health behavior as a result of logically reasoned decision to engage in or not to engage in a particular behavior. This usually hinges on the information available for the individual upon which to decide on the behavior coupled with the intention to change. Furthermore, this decision is influenced by the ease to perform the action and the significant views of the others and the conviction that the behavior is within his or her control. For one to change must have good attitude and have the control over the behavior. (Fichten et al., 2014; Sanne et al., 2018)

Use of this model promots behavior change. Individuals with diabetes need to understand the burden of hypertension amongst those with diabetes and its impact on the quality of life and how to improve their lifestyle. When they appreciate the importance of physical exercise, compliance to dietary recommendations and proper glycemic control in prevention of elevated blood pressure and other linked complications. This will then redirect the individual patients into proper health behavior. Additionally, upon knowing there are complications they seek proper medical attention with the assistance of medical doctors to enhance a healthful living and prevent morbidity.

1.1.3 Conceptual background

High blood pressure is defined as a combination of elevated blood pressure and hypertension. Whereas elevated blood pressure is average blood pressure equal or above 90th percentile but less than 95th percentile for age, sex and hight or blood pressure 120-129/<80mm Hg for adolescents, hypertension is defined as average blood pressure above or equal to 95 percentiles for sex, age and height or ≥130/80mm Hg for adolescents (Flynn, Kaelber, Baker-Smith, Blowey, Carroll, Daniels, Dionne, et al., 2017a).

On another hand diabetes mellitus refers to group of conditions characterized by chronic high blood glucose levels. The common disorder is either insufficient insulin production from the pancreas as seen with type 1 DM or resistance to the effects of insulin as commonly seen in type 2 DM. (ISPAD, 2010). This study however will focus on DM type 1.

Hyperglycemia and increased free fatty acids associated with DM type 1 lead to oxidative stress by increasing production of endothelin-1 and angiotensin II which in turn lead to elevated blood pressure (Homhuan et al., 2021). Additionally maladaptive insulinemia leads to alterations in the vascular function with vascular stiffness, hypertrophy, fibrosis and ultimately remodeling (Sowers, 2013). Through the ventromedial hypothalamus mechanism there is an increased sympathetic output in the presence of hyperinsulinemia. Adipokine produced among the obese people from their adipose tissue also increases sympathetic activation increasing the afferent traffic from the efferent activity to the kidney (Sowers et al., 2011). All these factors in concert play a central role in the development of hypertension. Thus approximately 50% of diabetes mellitus patients have co-existence of HTN and there's a four-fold increase in cardiovascular disease in individuals with co-occurrence of HTN and DM (Lastra et al., 2014; Sowers et al., 2011).

There is therefore a higher prevalence of hypertension in diabetes mellitus estimated at about 40% globally (Shen et al., 2019) . There has been an association of hypertension in diabetes patients with factors like diabetes type, duration of diabetes, sex, age, nutritional status and glycemic control increasing the risk.(Boer et al., 2017). This co-existence of hypertension in diabetes complicates treatment strategies and worsens the risk of both macro and microvascular complications of diabetes with a large percentage of DM patients expressing poorly controlled hypertension (Tsimihodimos,, Clicerio, James, & Ferrannini, 2018).

Proper glycemic control is defined by the random blood sugar of less than 11.1mmol/l or a glycated haemoglobin of <7% reflecting glucose control over period of 3 months (Limbert et al., 2022).
poor glycemic control is associated with high level of dyslipidemia and is association with early development of atherosclerosis .Atherosclerosis is associated with cardiac and vascular abnormalities which are associated with hypertension development (Stankute et al., 2019).

Proper glucose control, early detection of hypertension and institution of treatment is the basis for preventing progress and damage of DM and hypertension in children and adolescents. It is recommended therefore to have routine blood ressure (BP) monitoring and screening among diabetes patients (American Diabetes Association, 2019; Zeitler et al., 2018).

Pathophysiology of hypertension in diabetes

Hyperglycemia and increased free fatty acids associated with DM type 1 due to insulin deficiency leads

to oxidative stress by increasing production of endothelin-1 and angiotensin II which in turn lead to elevated blood pressure (Homhuan et al., 2021). Additionally maladaptive insulinemia leads to alterations in the vascular function with vascular stiffness, and remodeling (Sowers, 2013). Adipokine produced in the obese people increases sympathetic activation (Sowers et al., 2011) and protein glycation in diabetes also serves as precursor to vascular stiffness leading to reduction in arterial distensibility (Sunkara & Ahsan, 2017). Finally diabetes has also been associated with volume expansion as a consequence of insulin and chronic hyperglycemia in the proximal tubules resulting into sodium retention (Sunkara & Ahsan, 2017).

All these factors in concert play a central role in the development of hypertension. Thus approximately 50% of diabetes mellitus patients have co-existence of hypertension.There is a four-fold increase in cardiovascular disease in individuals with co-occurrence of HTN and DM (Lastra et al., 2014; Sowers et al., 2011).

Diagnosis of high blood pressure

Diagnosis of blood pressure is done by auscultatory method and done during at least 3 separate visits and if it elevated then an ambulatory blood pressure monitor is recommended in children to be able to rule out white coat hypertension. Core to the blood pressure measurement is a fitting and appropriate blood pressure cuff (cuff bladder length encircling at least 80% of the arm and width -to- arm circumference of 45-55%). It's taken when the patient is in the relaxed state using the right hand after about 5 minutes of rest and it's the average recorded after taking BP 2-3 times with 2 minutes in between the readings. (American Diabetes Association, 2017; Boer et al., 2017; Donaghue et al., 2018; Flynn, Kaelber, Baker-Smith, Blowey, Carroll, Daniels, Dionne, et al., 2017b).

Treatment

Children with elevated blood pressure are managed initially with dietary modification, exercise and weight loss interventions for about 3-6 months after which pharmacological management can be instituted if no improvement. ACE inhibitors or angiotensin receptor blockers should be considered as first line pharmacological management for high blood pressure (American Diabetes Association, 2017).

Monitoring and screening

It is recommended that blood pressure should be measured minimally once a year starting from 3 years (Donaghue et al., 2018). However children with obesity, renal disease, aortic arch obstruction or coaction and diabetes should have their blood pressure measured at every hospital visit (Flynn, Kaelber, Baker-

Smith, Blowey, Carroll, Daniels, Dionne, et al., 2017b).

1.1.4 Contextual Background

Globally there was a total of over 422 million people suffering from diabetes mellitus by 2014 with observed rise in the burden in the low- and middle-income countries. (WHO, 2020). According to the SEARCH for Diabetes in youths, it's estimated that DM prevalence is about 2.22 cases/1,000 young people with type 1 diabetes contributing 1.93/1,000 and type 2 DM having a prevalence of 0.24/1,000 (Pettitt et al., 2014).

International diabetes federation (2020) estimates 1.1 million children and adolescents globally are affected by DM type 1 (Grabia et al., 2021) and DM type 2 accounts for 8-45% of all new cases of diabetes (Temneanu et al., 2016). In Lithuania, DM type 1 was associated with a 29.8% prevalence of hypertension among children and adolescents and 24% had at least one microvascular complication (Stankute, Dobrovolskiene, Danyte, Razanskaite-virbickiene, et al., 2019).

Cioana and colleagues in their metanalysis found that 25% of the children and adolescents with diabetes had hypertension (Cioana et al., 2021a). Findings from South African National Health and Nutrition Examination Survey (SANHANES-1) found a prevalence of 58.5% (Mutyambizi et al., 2017). A study in Morocco reported a prevalence of 70.4%, 9.7% in Nigeria and 54.2% in a Benin study (Berraho et al., 2012; Ogunleye et al., 2012; Unadike et al., 2011). Additionally, it's estimated that the disease burden of HTN and DM will double by 2025 and 2035 respectively with Dm increasing by 166.9% between 2013 and 2035 (Chang et al., 2019; Guariguata et al., 2014).

A prospective study in Rwanda under the International Diabetes Federation's Life for a Child (LFAC) program found a 31.8% prevalence of hypertension among children and adolescents with type 1 DM and there was an observed increment at both one year and 2 year follow up with a prevalence of 44.9% and 40.3 % respectively. This was attributable to the poor glycemic control (Marshall et al., 2015)\

In Uganda, International Diabetes Federation (IDF) estimated that 2300 children and adolescents were affected by DM type 1 in 2019 (IDF Diabetic Atlas, 2019). There is an estimated national DM prevalence of 1.4% among the adult population with 2.7% in urban and 1.0% in rural areas. There is also a 24.3 % prevalence of hypertension among the diabetic population (Bahendeka et al., 2016). Studies in southwestern Uganda reported a hospital prevalence of 2.5% and community prevalence of

16.1 % with a 45% prevalence of hypertension in Diabetes in the hospital-based study (Chiwanga et al., 2016; Dickson, 2016). However, all these are studies done in adults with very limited studies in Uganda as a whole on the co-existence of hypertension among diabetes children and adolescents.

1.2 Problem statement

The coexistence of diabetes and HTN worsens clinical outcomes of diabetic children with respect to both microvascular and macrovascular disease (Khangura DS, Waqar Salam M, Brietzke SA, 2018). HTN with diabetes increases mortality risk by 7.2 times with a higher risk of death in developing countries (Vargas-Uricoechea & Cáceres-Acosta, 2018). Diabetes management should therefore be comprised of a multifaceted approach that targets routine blood pressure screening and glycemic control.

Two previous studies in Uganda reported a high prevalence of hypertension among diabetes patients of 61.9% (Muddu et al., 2018) and 82.5% and (Saasita et al., 2021) in Mulago national referal hospital and Southwestern Uganda respectively. However, these studies did not include children and adolescents with diabetes mellitus and focused on Diabetes type 2. A cross-sectional study assessing the prevalence and factors associated with dysglycemia among girls in selected boarding secondary schools in Wakiso District, Uganda reported that dysglycemia was associated with HTN (Nakiriba et al., 2018). However, they only studied girls and did not stratify diabetes. There is gap of knowledge on the prevalence and factors associated with high blood pressure among children and adolescents with diabetes mellitus type 1 hence the study.

1.3 Objectives of the study

1.3.1 General objective

The general objective was to determine the prevalence and factors associated with high blood pressure and level of glycemic control among children and adolescents with diabetes mellitus in selected hospitals in east, and northern Uganda.

1.3.2 Specific objectives

i. To determine the prevalence of high blood pressure among children and adolescents with diabetes mellitus type 1 in Jinja, Lira and Mbale Regional Referral Hospitals.
ii. To determine the level of glycemic control among children and adolescents with diabetes mellitus type 1 in Jinja, Lira and Mbale Regional Referral Hospitals.

iii. To describe the factors associated with high blood pressure among children and adolescents with diabetes mellitus type 1 in Jinja, Lira and Mbale Regional Referral Hospitals.

1.3.3 Research questions

i. What is the prevalence of high blood pressure among children and adolescents with diabetes mellitus type 1 in Jinja, Lira and Mbale Regional Referral Hospitals?
ii. What is the level of glycemic control among children and adolescents with diabetes mellitus type 1 in Jinja, Lira and Mbale Regional Referral Hospitals?
iii. What are the factors associated with high blood pressure among children and adolescents with diabetes mellitus type 1 type 1 in Jinja, Lira and Mbale Regional Referral Hospitals?

1.4 Justification

Diabetes and hypertension are on the rise among children and adolescents and it rests on the pandemic of obesity. Diabetes, Hypertension, or a combination of both, cause 80% of end-stage renal disease globally (IDF diabetes atlas, 2019). In type 2 diabetes, HTN often precedes chronic kidney diseases (CKD) and contributes to the progression of nephropathy, whereas in type 1 diabetes, HTN is more often a consequence of CKD (World Health Organization, 2019).

In the US a third of the newly diagnosed diabetic adolescents, 32% are hypertensive (Xu & Verre, 2018) with 24% having at least a microvascular complication at diagnosis. In a metanalysis by Cioana and colleagues (2021) found a 25% hypertension in diabetes children and youth.

Screening and early diagnosis is the mainstream for prevention of disease progression and damage caused by DM/HTN co-occurrence. It is on this basis that the research sought to determine the prevalence of high blood pressure, level of glycemic control and factors associated among DM type 1 patients in Jinja Regional Referral Hospital (JRRH), Lira Regional Referral Hospital (LRRH) and Mbale Regional Referral Hospital (MRRH)

1.5 Significance

To science: the study contributes to the epidemiological data on the prevalence of high blood pressure among diabetic type 1 children and adolescents, factors associated and the level of glycemic control.

To the community: Findings of this study will increase awareness of the caregivers and children/Adolescents with diabetes mellitus type 1 on the risk of developing high blood pressure and it also enabled those with undiagnosed hypertension to know their status.

To the clinician: findings of this study will raise awareness on the DM patients who are highly at risk of developing high blood pressure and other complications which arise from hypertension among diabetes. This will aid in earlier screening of those at-risk groups in the diabetic patients and also help clinicians carry out focused follow up among the diabetic patients like BP screening and weight monitoring.

To the stakeholders: the findings of this study serve as a basis for program implementations, policy formulation and also serve as basis for advocating for campaigns and interventions for prevention

1.6 Scope

1.6.1 Time scope

The study was carried out from October – Deember 2023.

1.6.2 Content scope

The study established the proportion and factors associated (social -demographic, medical, diet and behavior factors) with high blood pressure and level of glycemic control among diabetic children and adolescents attending care form JRRH, LRRH and MRRH.

1.6.3 Geographical scope

The study was carried out at Jinja regional referral hospital, Mbale regional referral hospital in Eastern Uganda and Lira regional referral hospital located in Northern Uganda.

1.7 Conceptual frame work

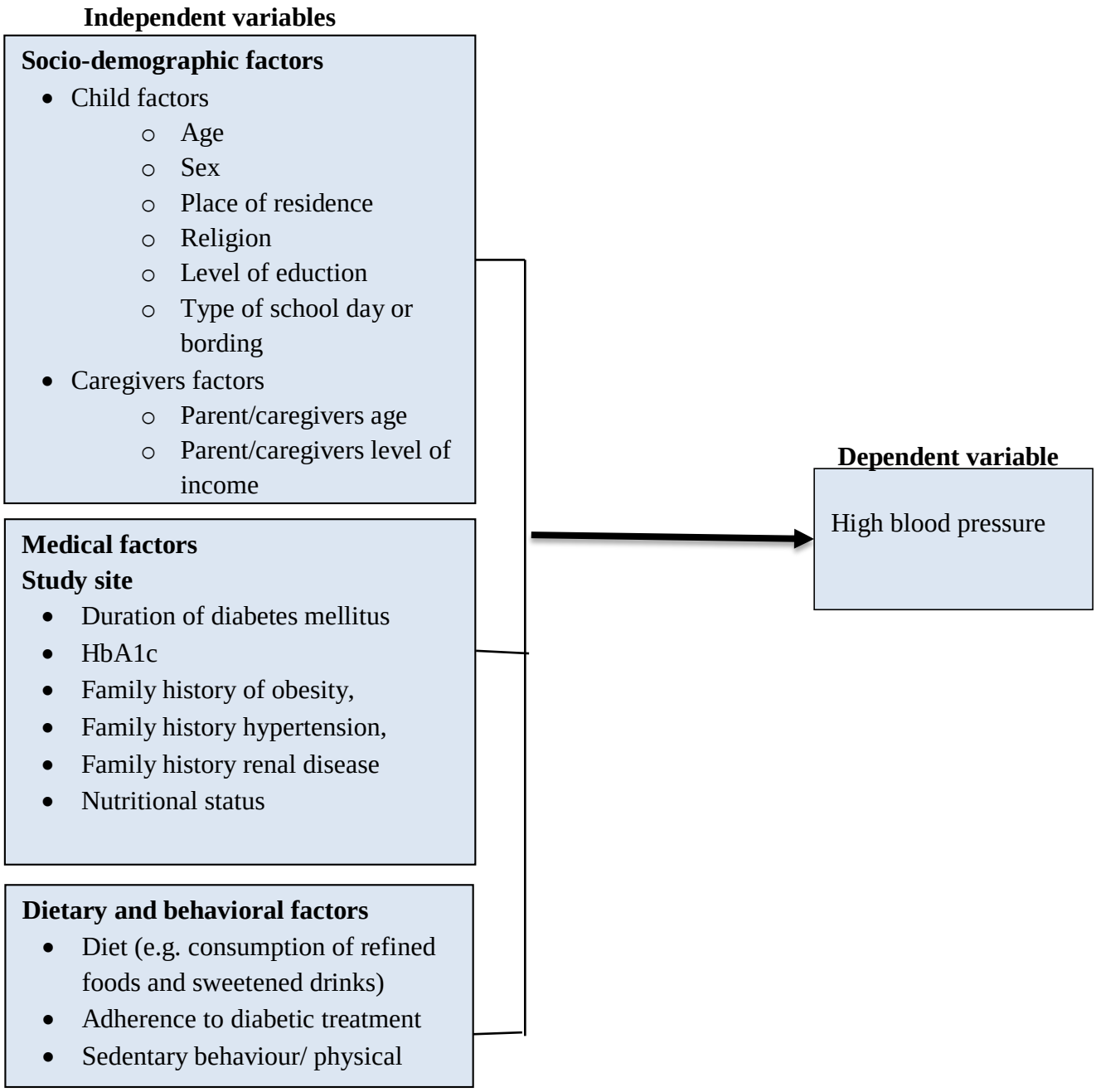


Figure 2: Conceptual frame work

Explanation of the conceptual framework

In absence of intervening variables, the independent variables interact to bring about high blood pressure among diabetic children and adolescent. Demographic factors like age and being female increases the risk of high blood pressure among diabetic population (American Diabetes Association,

2017). Additionally, medical factors like diabetes type, poor glycemic control, duration of the disease, and behavior factors like improper diabetic diet, not enough physical activity and not attending to diabetic health education showed an increased risk for hypertension amongst diabetic children (Cioana et al., 2021; Colberg et al., 2016; Holmager et al., 2021; S. Lynch et al., 2018).

Chapter 2 Literature review

2.0 introduction

Diabetes mellitus refers to a group of conditions characterized by chronic high blood glucose levels. Common disorder is either insufficient insulin production from the pancreas as seen with type 1 DM or resistance to the effects of insulin as commonly seen in type 2 DM (ISPAD, 2010). It is estimated that ¾ of all DM type 1 cases are diagnosed below 18 years of age (American Diabetes Association, 2017).

Globally there is a total of over 422 million people suffering from diabetes mellitus by 2014 with observed rise of the burden in the low- and middle-income countries (WHO, 2020). According to the SEARCH for Diabetes in youths, it's estimated that DM prevalence is about 2.22 cases/1,000 young people with type 1 diabetes contributing 1.93/1,000 and type 2 DM having a prevalence of 0.24/1,000. (Pettitt et al., 2014).

International diabetes federation (2020), estimates 1.1 million children and adolescents globally are affected by DM type 1 (Grabia et al., 2021) and DM type 2 accounts for 8-45% of all new cases of diabetes reported (Temneanu et al., 2016). In the US it's estimated that DM type 2 accounts for 1 out of 3 newly diagnosed diabetes adolescents.

In Uganda, the national diabetes prevalence stands at 1.4% with 2.7% in urban areas while 1.0% found in rural areas (Bahendeka et al., 2016). However, it's an agreed consensus that many diabetic individuals are unaware of their status. IDF estimates that 2300 children and adolescents affected by DM type 1 in 2019 (IDF Diabetic Atlas, 2019). Unfortunately, there is a 69% expected increase in DM type 2 in low income country to which Uganda subscribes by the year 2030 (Shaw et al., 2010).

2.1 Prevalence of hypertension in diabetes mellitus type 1

High blood pressure is defined as a combination of elevated blood pressure and hypertension. Where elevated blood pressure is average blood pressure equal or above 90th percentile but less than 95th percentile for age, sex and height or blood pressure 120-129/<80mmhg for adolescents and Hypertension defined as average blood pressure above or equal to 95 percentiles for sex, age and height and ≥130/80mmHg for adolescents (Flynn, Kaelber, Baker-Smith, Blowey, Carroll, Daniels, Dionne, et al., 2017a).

There is an uprising burden of hypertension in diabetic population among children and adolescents.

(Cioana et al., 2021). The SEARCH for diabetes in youth today found a prevalence of 5.9% in DM type 1 youths.(Rodriguez et al., 2010).

A longitudinal study in Bangladesh established a 20.5% burden of elevated blood pressure at baseline of the study rising to 31.7% at the end of a 4 year follow up with a significant association between diabetes duration and elevated blood pressure (Jones, Khanolkar, Gevers, Stephenson, & Amin, 2019). Additionally, in Lithuania, DM type 1 prevalence among hypertensive children and adolescents was at 29.8% (Stankute, Dobrovolskiene, Danyte, Razanskaite-virbickiene, et al., 2019).

A prospective study in Rwanda under the International Diabetes Federation's Life for a Child (LFAC) program found a 31.8% prevalence of hypertension among children and adolescents with type 1 DM and there was an observed increment at both one year and 2 year follow up with a prevalence of 44.9% and 40.3 % respectively (Marshall et al., 2015).

In Uganda, the general prevalence of hypertension among diabetes population is 24.3 % (Bahendeka et al., 2016). Studies in southwestern Uganda reported a hospital prevalence of 2.5% and community prevalence of 16.1 % with a 45% prevalence of hypertension in diabetes in the hospital-based study (Chiwanga et al., 2016; Dickson, 2016). However, all these are studies done in adults with paucity of data in children's populations with diabetes.

2.2. Glycemic control by glycated haemoglobin.

The hemoglobin A1c test is used to evaluate a person's level of glucose control. It shows an average of the blood sugar level over the past 90 days. Hemoglobin becomes glycated from the bloodstream. The amount of glucose that is present in the blood will attach to the hemoglobin protein, and increased glucose levels (Susilawati et al., 2023).

The ISPAD Clinical Practice Consensus Guidelines 2022 defines glycemic control as glycated hemoglobin A1c less than 7%. (Limbert et al., 2022). The target is to prevent the negative effect of hyperglycemia among the sufferers like development of microvascular complications (De Oliveira et al., 2016).

Many African countries report a high burden of poor glycemic control among DM type 1 children and adolescents with Southern Ethiopia (83.6%)(Shibeshi et al., 2022), Tanzania (97.3%)(McLarty et al., 2021), South Eastern Nigeria (78.9%)(Ogugua et al., 2021) and Kenya (72%)(Ngwiri et al., 2015) .

The factors contributing to poor glycemic control are several and include poor compliance to insulin, poor blood glucose monitoring and dietary habits (Kyokunzire & Matovu, 2018; Ngwiri et al., 2015; Ogugua et al., 2021)

Parental involvement in the care and treatment improves glycemic control by 13 times (Ogugua et al., 2021). Adolescents with DM type 1 have high rates of non-adherence to care by 93% and only 21% reach the glycemic control target of <7%(Ibrahim et al., 2022).

2.3 Associated factors for hypertension among diabetic participants

2.3.1 Demographics

According to American diabetes association (2017), 14-45% of the patients with DM type 1 have at least two cardiovascular complications including hypertension and this risk increases with age and there's a higher burden in girls than boys. This agrees with Abdelbagi and colleagues (2021) which showed that older patients had higher risks of having hypertension in diabetic children compared to controls without DM with the incidence of HTN increasing progressively with age from 5% at 10 years to 70% at 40 years (Sunkara & Ahsan, 2017). Additionally, in the TODAY clinical trial, males were found to have 87% greater risk for hypertension compared to females (Lastra et al., 2014; Lj. Lynch et al., 2013) and a 2.96 increased risk in a study in northern Sudan (Abdelbagi et al., 2021).

A Study in Northwest Ethiopia found that residing in urban areas was associated with 2.8 increased risk for hypertension among diabetic patients compared to those residing in rural areas (Akalu & Belsti, 2020).

2.3.2 Medical factors

DM type 1 duration has a strong association with overweight and obesity with BMI increasing by 0.6kg/m 2 (95%CI 0.6 to 0.7) for every additional year of Diabetes (Jones, Khanolkar, Gevers, Stephenson, & Amin, 2019) with an incidence of hypertension of approximately 30% (Sunkara & Ahsan, 2017).

Obesity and overweight are key drivers of hypertension in diabetes with an estimated 6% increase in risk of hypertension per unit ($1Kg/M^2$) increase in body mass index (BMI) (Lj. Lynch et al., 2013) . Additionally, Akalu & Belsti, (2020) in their study in ethiopia found that BMI ≥25 kg/m2 was associated with 3.2 time's higher risk for hypertension among diabetes patients. This is explained by

the development of vascular stiffness and endothelial dysfunction associated with obesity which is a precursor for the development of hypertension (Mariye et al., 2019). However a study done in Sri Lanka by Faroos and Kisokanth (2013) found no influence of overweight and obesity on hypertension in DM patients.

Duration of diabetes mellitus is another medical factor associated with occurrence of HTN aong DM patients. In a multicenter study among youths and adolescents with diabetes mellitus, Lynch et.al (2013) showed, that increase in duration of DM augments the incidence of hypertension (11.6% at admission Vs 33.8% at 3.9 years of follow up). There is an 8.52 times increased risk of hypertension with long time (> 6 years) since DM diagnosis compared to short time (less than 1 year) and this could be attributed to autonomous imbalance and blood vessel stiffening that increases over time leading to hypertension (Mariye et al., 2019).

High levels of glycated hemoglobin which reflect poor glycemic control and hyperglycemia are associated with adverse effects on vascular wall function resulting in onset of hypertension (Akram, Abdullah, & Ibrahim, 2022). There is an established strong correlation between high level of HbA1c and hypertension with each 1% increase in HbA1c among DM type 1 patients was associated with an increase of 1.73mmhg in diastolic blood pressure (de Oliveira, et al., 2016).

Furthermore HbA1c was associated with 1.06 hazard ratio for complications among DM patients including hypertension (Dart et al., 2014). This is because hyperglycemia increases sympathetic activity, activation of RAAS, increasing cardiac output and vascular resistance of the peripheries thus occurrence of hypertension (Cioana et al., 2021b).

A study in Batticaloa observed an association with family history of hypertension (p-value 0.003) with development of hypertension among Diabetic patients compared to those without family history of hypertension (Faroos & Kisokanth, 2013).

2.3.3 Behavior factors

Diets in Southern Sahara Africa have predominantly been based on the whole gains foods, legumes , green leafy vegetables and fruits which have a low glucose index and thus cardiometabolic index compare to the western diet dominated by processed foods , meat , fats and sugary drinks (Afshin et al., 2019). However there's an observed transition of food in the region with tendency to high glycemic index diet as observed in a study in southwestern Uganda where High-Glycemic Index food was the

most consumed food group with median servings of 14 servings per week (Holmager et al., 2021).

A study by Mariye and colleagues (2019) in Ethiopia,not attending to diabetes education sessions, diet, exercise and self-monitoring as factors increasing odds of hypertension development in diabetes populations by 2.61,9.70,5.47 and 6.62 respectively.

Regarding physical exercises, it's recommended that children and adolescents have moderate physical exercise at least 60minutes a day (Grabia et al., 2021). This is because Physical activity is a pillar in the non-pharmacological control and management of hypertension and diabetes mellitus both type 1 and type 2. It plays a key role in improving blood glucose control, increase insulin sensitivity, reduce cardiovascular risk factors, weight loss and diabetes related complications (Colberg et al., 2016).

Physical activity and exercises are recommended for diabetic populations. Physical activity includes all movements that increase energy consumption and planned structured physical activity. Aerobic exercises are the commonest in children and youths which include walking, cycling, jogging, and swimming among others (American Diabetes Association, 2016).

Sedentary lifestyle involves low energy expenditure like television watching, video games playing, desk work among others have a significant positive influence on the development of cardiometabolic syndrome (Dempsey et al., 2014). Higher amounts of sedentary lifestyle is highly linked to increased morbidity and mortality as it is associated with poor glycemic control and high insulin resistance coupled with increased weight gain (Colberg et al., 2016).

2.4 Integration of literature

Diabetes mellitus is a growing public health concern on the rise among children and adolescents and this is greatly attributable to the pandemic of obesity and overweight among children and adolescents. Hypertension is a common co-occurrence with DM resulting commonly from hyperinsulinemia and hyperglycemia, with hypertension increasing the risk for cardiometabolic complications. However, there's paucity of data on coexistence of hypertension in DM type 1.With proper monitoring, glycemic control and blood pressure control coupled with proper adherence to both diet and physical activity recommendations there can be delay in progression of disease and morbidities.

Chapter 3

3.1 Methodology

3.2 Study design

This was a health facility-based cross-sectional descriptive and analytical study determining the prevalence and factors associated with high blood pressure among children and adolescents with diabetes mellitus in JRRH, LRRH and MRRH.

3.3 Study sites.

This study was conducted in Jinja, Lira and Mbale Regional Referral hospitals.

JRRH is a government hospital and also serves as a teaching hospital for Kampala International University for both undergraduates and postgraduate medical students, serves the district of Bugiri, Iganga, Jinja, kaliro, Luuka, Mayunge, Namayingo, kayunga and parts of Buikwe. It's a 500-bed capacity and was established in the in 1930s. It is located about 82 km east of Kampala. It has a diabetic clinic headed by a clinical officer. It is run on thursdays and has a total of 122 patients of whom 52 are below 18years. The services offered in this clinic include health education, clinical reviews, carrying out some investigations like random blood sugar and HbA1c testing and provision of medicines to the patients.Other hospital staff involved in running the clinic are peer co-ordinators

LRRH is a government owned specialized hospital serving the northern region covering the districts of Amolatar, Apac, Dokholo, Lira, Kole and Oyam. It also serves as teaching hospital for Kampala International University students both undergraduate and postgraduate medical students. It's a 400-bed capacity hospital which was established in 1920 (www.health.go.ug). It's located approximately 342 km north of Kampala the country's capital. It has a diabetic clinic headed by a clinical officer and is run on Thursdays with a total of 197 patients of whom 84 are below 18years. The services offered in this clinic include health education, clinical reviews and carring out some investigations like random blood sugar and HbA1c testing. Other hospital staff involved in running the clinic are one assistant nursing officer and a peer co-ordinator.

MRRF also a government owned hospital serving the eastern Uganda covering the districts of Budaka, Bukwa, Mbale, Pallisa, Sironko, Bulambuli, Bududa and Tororo. It's a 415-bed facility which was established in 1924, it is located approximately 227 km east of Kampala. It has a diabetic clinic headed by an assistant nursing officer and is run on Tuesdays with a total of number of 180 patients of whom

56 are below 18years. The services offered in this clinic include health education, clinical reviews, carrying out some investigations like random blood sugar and HbA1c testing and giving out diabetic medicines. They also conduct home visits at least twice a year for patients within mbale district. Other hospital staff involved in running the clinic are one assistant nursing officer and two peer co-ordinator.

These hospitals were chosen because they have well organised diabetic clinics. Doctors including physicians are called in these clinics for patients with complications and sometimes help in patients follow up during normal clinic days. Patients from other neighbouring hospitals are referred to these hospitals by nurses, doctors or clinical officers. Diagnosis of diabetes in these children and adolescents is done by a team of clinicians, nurses and doctors stationed at the different health facilities and confirmed at the referral hospitals for those that have been referred.

3.4 Study population

3.4.1 Target population

Children and adolescents aged 6 months to 18 years with diagnosis of diabetes mellitus type 1 and caregiver pair.

3.4.2 Eligible population.

All children and adolescents with diabetes mellitus type 1 and caregiver pair attending diabetic clinics at MRRH. JRRH and LRRH.

3.4.3 Study participants

All eligible patients fulfilling the inclusion criteria and who consented/assented to participate in the study

3.4.4 Sample size for prevalence

The sample size was estimated considering Krejcie and Morgan tables (1970) for estimating sample size considering an assumed population proportioni of 0.50, a degree of accuracy of 0.05. There is documented diabetic children in the study sites of 192 patients. From the Morgan table, the appropriate sample size for proper representation is 127 participants.

Table 1: Krejcie and Morgan table

Krejcie and Morgan table									
N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	850	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	25	140	103	340	181	1000	278	4500	354
35	32	150	108	360	156	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	333	1000000	384
Note: N is Population Size S is Sample Size									

3.4.5 Sample size for associated factors

Using Open Epi calculator, the sample size was calculated for two proportions considering obesity which increase the odds of hypertension among diabetic patients by 2.6 times compared to those with normal weight (Anjajo et al., 2023). This took into consideration a 95% confidence interval, power of

the study of 80%. Considering Kelsey's formula, a sample size of 144 participants was obtained for the associated factors.

Therefore, a larger sample size of 144 was used as the minimal sample size to which 6 participants (5%) were added to cater for withdrawals.

3.5 Selection criteria

3.5.1 Inclusion criteria

1. All children and adolescents aged 6months to 18 years with diabetes mellitus type 1 and caregiver pair attending JRRH, MRRH and LRRH during the duration of the study.
2. Caregivers who consented in addition to assent for the children aged 8 years and above.

3.5.2 Exclusion criteria

1. Children with history of known congenital heart disease and renal disease prior to DM diagnosis
2. History of hypertension prior to diagnosis of diabetes

3.6 Sampling technique

JRRH, LRRH AND MRRH were selected purposeful because they have well organized clinics for management of DM patients.

The particpants were selected randomly as shown in table 2 below.

Table 2: A table showing targeted participant enrolment per each research site.

Hospital	**Registered DM type 1 clients**	**Targeted number to be enrolled**
MRRH	56	42
JRRH	52	39
LRRH	84	63
Total	192	144

The study participants were enrolled consecutively after obtaining consent from the caretakers and assent from participants aged 8 years and above until a desired sample size was obtained. To avoid double enrolment a unique identifier was put on the patient files.

3.7 Study procedure

After arrival at the selected health facility, the study participants followed the procedure below:

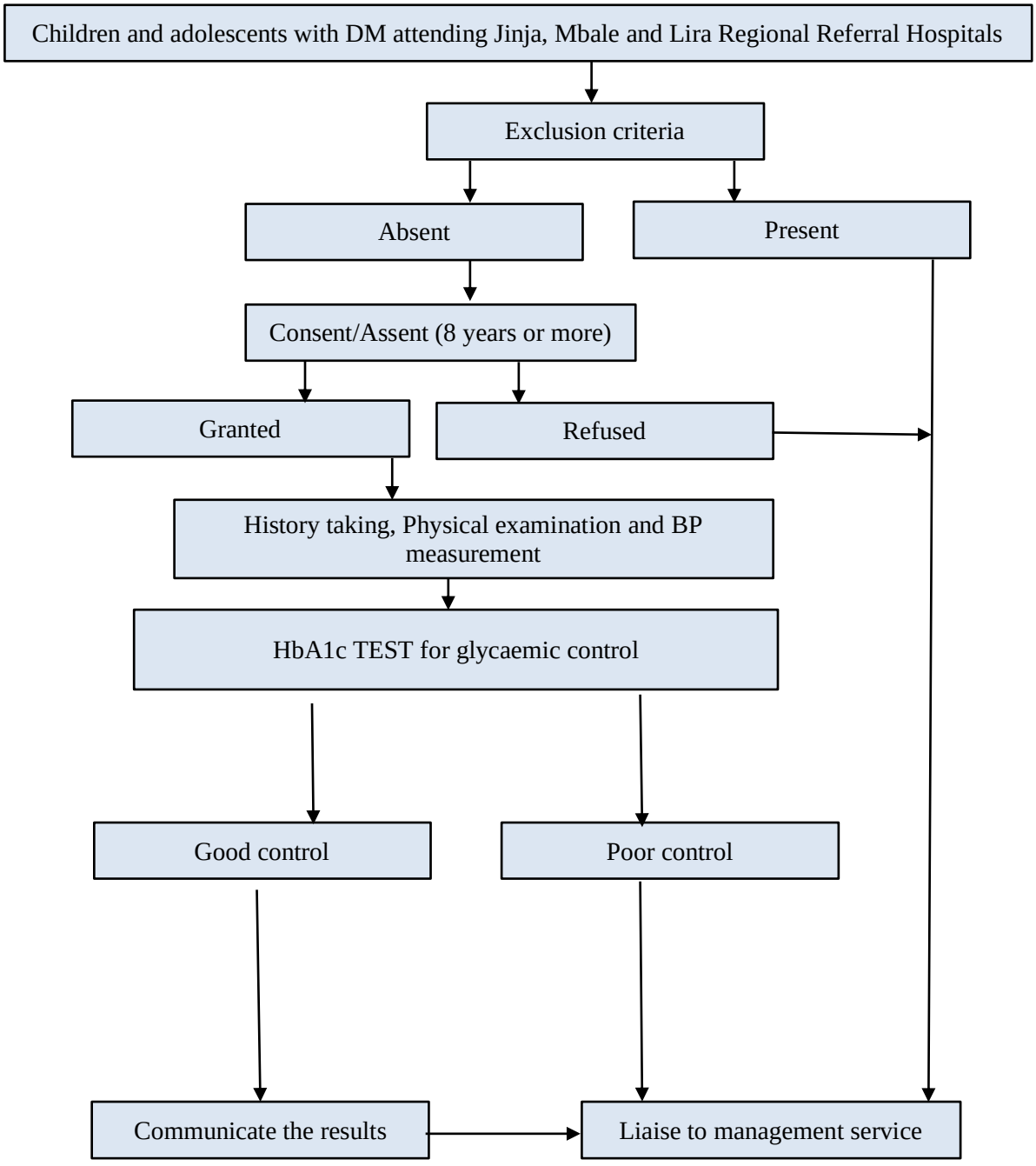


Figure 1: study participant flow chart

Upon arrival at the facility on a clinic day, participants were briefed about the study, and for those

meeting the criteria, informed consent and assent (8years or more) was obtained after thorough explanation of the study procedure. They signed the forms in 2 copies one to be retained by the study participant and another by the researcher. Those unable to sign a thumb print was used. For children aged 8 years and above, assent was also obtained on top of the consent from their guardians. Those who were 18 years provided their own consent to partipate in the study. Standard operationg procedures for Covid-19 were adhered to such as social distancing, proper use of face masks and hand washing or use of sanitizers before and after every particiant.

The researcher only had close contact with the participant when taking blood pressure, weight, height and HbA1c of the participants.

3.8 Research instruments

3.8.1 Questionnaires

A close ended questionnaire was employed to obtain data on the demographic, medical dietary and behaviour factors of the study participants. The questionnaire consisited of 4 sections A, B, C and D. Section A contained the social demograophic characteristics of the child and mother such as age, gender and occupation. Section B contained the medical data such as the duration of dibates mellitus, HbA1c and family history of medical illnesses. Section C contained behavioral and diet factors such as number of excercises and intake of sweetened drinks. Section D contained the blood pressure measurements and categoris of hypertension.

3.8.2 Research equipments

3.8.3 Anthropometric tools

These focused on taking weight and height of the participants. A well calibrated upright wooden board with a movable head piece was used in both standing for those above 2 years and recumbent position for those less than 2 years or less than 87 centimetres. The value was obtained to the nearest 0.1centimeter. For the weight measurement, a Secca (model 874U) digital weighing scale was used to the nearest 0.1kgs. Those children unable to stand, caregivers were weighed first and then weighed both with the child and the difference obtained to ascertain the child's weight. Weight for height was assessed for children below 5 years and body mass index (BMI) for children and adolescents 5 years and above. This was interpreted as follows: over weight (weight for height greater than 2 standard deviation) and obesity (weight for height greater than 3 standard deviation) for children below 5 years

and BMI greater than 1 standard deviation and BMI greater than 2 standard deviations for overweight and obesity respectively using the WHO child growth standards. While underweight was weight/legth or weight/height < 2 standard deviation or a BMI < 2 Standard deviation using WHO child growth standard charts

3.9 Blood pressure measurement

Blood pressure (BP) was measured using the auscultatory method by the help of an aneroid sphygmomanometer brand name Yuwell, ISO 9001:2015 certified and a stethoscope. This was done using an age-appropriate cuff covering ≥ 40% width and a length of at least 80% of the arm. The cuff was placed tight enough but allowing one finger room betweem the cuff and the skin and the artery mark placed anteriorly and 2 centimeters above the antecubital fossa. It was done after about 30 minutes of patient resting and in a quiet place with the the mid upper arm point maintained at the heart level and the patient seated upright. Participants were allowed to stand for 5 minutes before measuring the BP to rule out orthostatic hypotension. BP was taken from both arms then 3 times from the arm with the hinghest BP with the arm resting on a table and then the average of the last two measurements was used as the blood pressure with 1 minute in between the measurements (Álvarez et al., 2022).

High blood pressure was diagnosed if the pressure was above or equal to the 90th percentile for age, sex and height for children below 13 years and BP above 120/80 mmHg (Flynn, Kaelber, Baker-Smith, Blowey, Carroll, Daniels, Ferranti, et al., 2017).

3.10 Glycemic control by HbA1c measurement

HbA1c was measured using bioherms A1C EZ 2.0 analyzer. The bioherms A1C EZ 2.0 is a portable HbA1c analyzer certified by the national glycohemoglobin standardization program

PROCEDURE

Participant's fingertip was cleaned using an alcohol swab and then dried thoroughly. A code chip was then inserted into the bioherms analyzer. The analyzer was switched on and a test strip was inserted into the analyzer in the test strip slot. The fingertip was then pricked using a lancet, a sampler was used to obtain the sample by touching the blood to the samplers thread giving time for the the entire thread to become red. Three drops of buffer A were added to the analyzer at the buffer port after the voice prompt. After ten seconds blood sample was added at the sample port within five seconds. The sampler was then removed after three beaps. Analyzer automatically started a 130 seconds count after which two drops of buffer B were added into the buffer port. The analyzer then automatically started another

count of 130 seconds after which the results were displayed, read and recorded. A repeat of this procedure was done for each round of testing.

3.11 Reliability and validity

The questionnaires were pretested from Mbale and Jinja Regional Referral Hospital clinic in order to establish clarity of the questions, reliability and validity. A total of 15 participants were sampled in the pretest and these were excluded from the actual study.

Reliability:

A Cronbach alpha was calculated giving a value of 0.84. since it was above 0.7 it was considered reliable for the study.

Validity

For content validity the following formula was considered after assessing the questions by my supervisors as relevant

$$\text{CVI} = \frac{items\ rated\ as\ relevant}{total\ number\ of\ itemsin\ the\ questionaire}$$

The CVI obtained was 0.92 and greater than 0.7 thus considered valid for the study.

Laboratory test

The researcher and research asssitants underwent hands on training on the use of the HbA1c auto analayzer for over 1 weeks in order to develop expertise in operating the machinie. The training was overseen by a laboaratory technologists who ran the control tests at LRRH for every 20 tests.

Weighing scale.

Every clinic day before starting to take measurements, an item of a known weight was used for weighing scale standardization.

Blood pressure Machine

For every participant blood pressure was measured by auscultatory method and using a fitting cuff. The BP measurement was taken thrice and recording the average of the last two as the true blood pressure with 1 minutes interval in between the measurements and blood pressure was measured 30 minutes after patient was in a resting position.

Quality control

The weighing scale was standardized on a daily basis with a known weight and the same BP machine type and brand was used in all sites and the HbA1c machine was also subjected to quality control after every 10th patient using the quality control solution. The questionnaires were filled by the principal investigator or the trained research assistant and were checked for completeness at the end of the participant interview.

3.12 Data management plan

Data from completed questionnaires was sorted and entered into Microsoft excel software and exported to STATA version 22 and analyzed according to objectives.

Objective 1 and 2; for the prevalence of high blood pressure and glycemic control was analyzed using univariable analysis and presented as a percentage in a pie-chart.

Objective 3: for the factors associated with high blood pressure in diabetic children and adolescents, the variables were analyzed at both bivariable and multivariable logistic regression. Significance level at bivariable analysis was set at 95% C.I and any variable having a P-value of less than 0.2 was subjected to multivariable logistic regression to establish association between the variables and high blood pressure in diabetic children and adolescents. The results are presented in tables with crude odds ratio at bivariable and adjusted odds ratio for the multivariable level analysis with their corresponding p-values and confidence interval at 95%.

3.14 Ethical considerations.

The following were considered to render the study ethical

3.14.1 Research Approval

The study approval and clearance for the conduction of research was sought from Bishop Stuart University research and ethics committee with reference number BSU-REC-2023-184 and latter registered by the Uganda National Council of Science and Technology to receive permit to conduct the research

3.14.2 Informed consent

An informed consent from the individual particpants was sought from the legal caregivers of the participants and assent from the individual participants 8 years and above. Before obtaining the consent

and assent, the participants were fully explained to the purpose and goals of the research being undertaken

3.14.3 Community engagement plan

The community engagement plan for the study on high blood pressure among children with Diabetes mellitus at Jinja, Lira and Mbale Referral Hospitals: Prevalence, associated factors and glycemic control involved, identifying the target community, which is diabetic children in the three Regional Referral Hospitals. The second step was to identify key stakeholders such as hospital management and the clinician incharge of the diabetic clinics who can help engage with the target community. Communication strategies were developed including frequent phone calls to effectively deliver key messages with the clinicians. Incentives such as transport reimbursement were offered to encourage participation.Finally, feedback was provided to the community on the study's results. By implementing these strategies, participation in the study was increased, and the community understood the importance of the research

3.14.4 COVID-19 Standard Operating Procedures

Precaution and guidelines of the ministry of health were followed while conducting the study. The researcher ensured that all the study participates have thoroughly washed their hands with soap and water. The study team provided sanitizers to be used during the study period. Social distancing was maintained and all study participants instructed to wear face masks. During individual face-to-face interviews, both the study participants and the research assistants wore face masks and maintained a social distance. Closeness with individual particpants was during anthropometric measurements and blood pressure measurement.

3.14.5 Privacy and confidentiality

Anonymity of the participants was maintained as the questionnaires did not bare the participant’s names. The data is kept well with access granted only to the principal investigator.

3.14.6 Re-imbursement/compensation

Study participants were given 5000 Uganda Shillings as time and transport money

3.14.7 Respect of individual persons

Participants were free to opt out of the study at any level without any repercussions on their medical care

3.14.8 Benefits and risks

This study was of minimal risks and there were no financial beneficits for participating in this study where participation was purely voluntary. However, participants were communicated their blood pressure status and HbA1c as this was communicated to the hospital management team

3.15 Dissemination of results

Completed copies of the research work were submitted to the participating hospitals, KIU postgraduate directory and KIU library. Publications in peer review journals and conferences have been planned for.

Chapter 4: Results

4.1 Introduction:

This chapter presents the result of 150 diabetes type 1 children and adolescents assessed for high blood pressure and glycaemic control levels. During data collection, additional 6 children were added to the study increasing the number from 144 to 150

4.2 Study participants

A total of 150 type 1 diabetes participants were enrolled in the study from Lira Regional Referral Hospital, Jinja Regional Referral Hospital and Mbale Regional Referral Hospital from October to December 2023. The study profile is shown below.

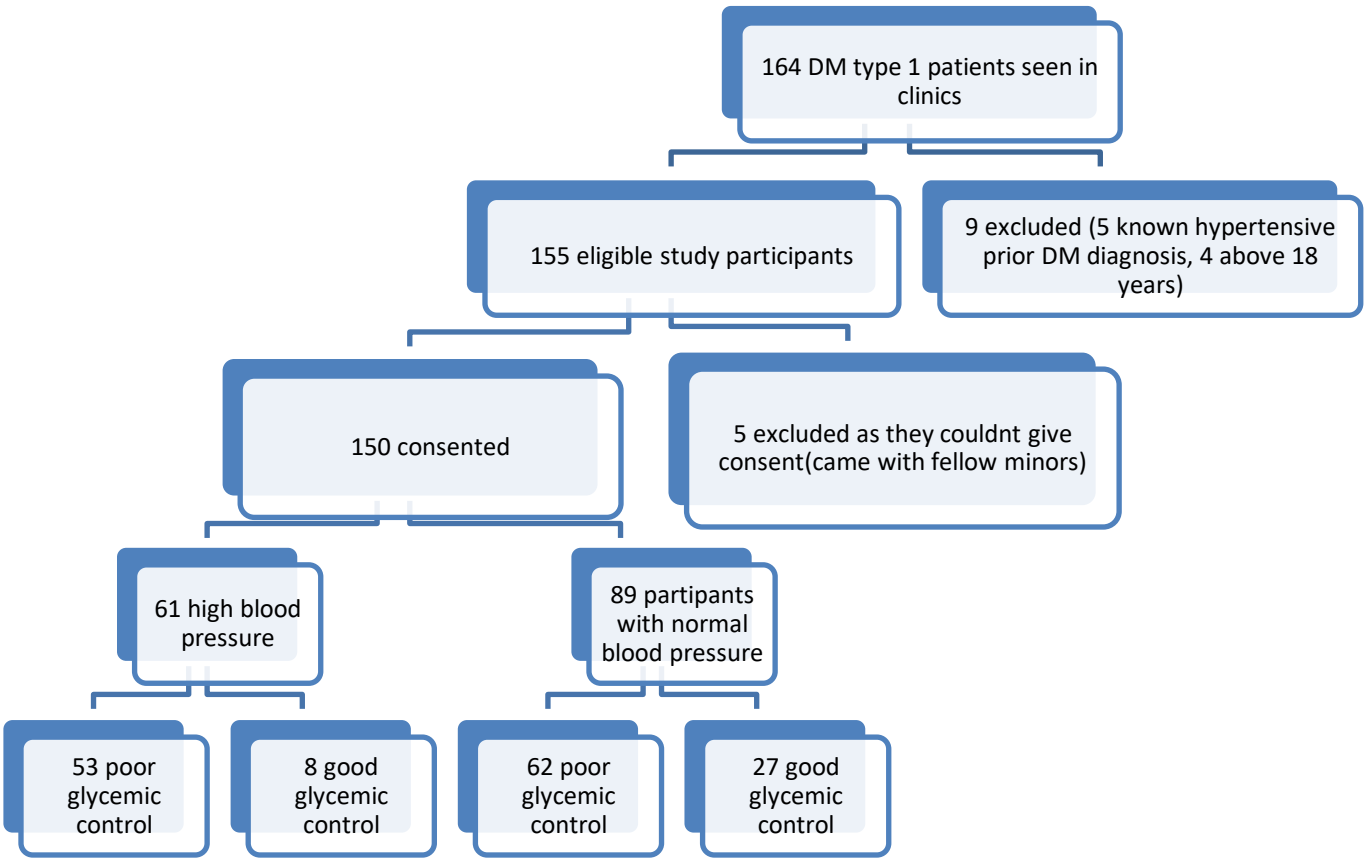


Figure 2: participant profile

4.3 Socio-demographics

The median age of the study participants was 15 (13-17) years with 17 years as the modal age with females 81(54%) as the majority. Over two-thirds of the participants had primary level education as the highest attained level, 103(68.7%) with 40% of the caretakers earning between 500,000-1000000 Ugandan shillings and aged 31-50 years (72.0%). This is as shown in table 3

Table 3: A table showing social-demographic characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH.

Hospital	Total	No.enrolled
JRRH	52	41
LRRH	84	65
MRRH	56	44
Total		150
	Frequency	Percentage
Age		
≤5 years	2	1.3
6- 12 years	33	22
13-18 years	115	76.7
Sex		
Male	69	46
Female	81	54
School type		
Day	104	69.3
Boarding	26	17.3
N/A	20	13.4
Education level		
At most Primary	103	68.7
Secondary	44	29.3
Tertiary	3	2.0
Residence		
Rural	110	73.3
Urban	40	26.7
Occupation		
Students/Pupil	130	86.7
Peasant	11	7.3
Others	9	6.0
Religion		
Protestant	76	50.7
Catholic	35	23.3
Muslim	24	16
Pentecostal	15	10
Caretaker Age (years)		
≤30	3	2.0
31-50	108	72.0
51-70	39	26
Caretaker income		
No assured income	42	28.0
<200,000	15	10.0
200,000-500,000	8	5.3
500,000-1,000,000	60	40.0
>1000,000	25	16.7

4.4 Medical factors

Majority of study participants had diabetes type 1 for less than 4 years 96 (64%) with a median duration of 3(1-4) years with a mean random glucose level of 11.23±0.50mmol/l which is elevated above normal. Forty-three of the participants (28.7%) and 20(13.3%) of the study participants were underweight and overweight respectively with 64 (42.7%), 40(26.7%) and 59(39.3%) with family history of diabetes, obesity and hypertension respectively.This is as shown in table 4

Table 4: A table showing medical history and clinical characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH.

	Frequency	Percentage
Administering treatment		
Self	137	91.3
Caretaker	13	8.7
Family History of Diabetes Mellitus		
No	86	57.3
Yes	64	42.7
History of complications		
No	31	20.7
Yes	119	79.3
Type of DM Complications		
None	31	20.7
Diabetic ketoacidosis	19	12.7
Hyperglycemia	26	17.3
Hypoglycemia	69	46.0
Others	5	3.3
History of Admission		
No	45	30.0
Yes	105	70.0
Family history of Obesity		
No	110	73.3
Yes	40	26.7
Family history of Hypertension		
No	91	60.7
Yes	59	39.3
Family history of Renal disease		
No	146	97.3
Yes	4	2.7
Nutritional status		
Normal	87	58
Underweight	43	28.7
Overweight	20	13.3
Random blood sugar		
Normal	95	63.3
High	55	36.7
Disease Duration (years)		
<4	96	64
4-8	45	30
9-12	9	6

4.5 Diet and behavior factors

Ninety-three particpants (62.0%) consumed refined foods while 73(48.7%) consumed sweetened drinks and only 93(62.0%) had regular exercises. This is as shown in the table 5 below

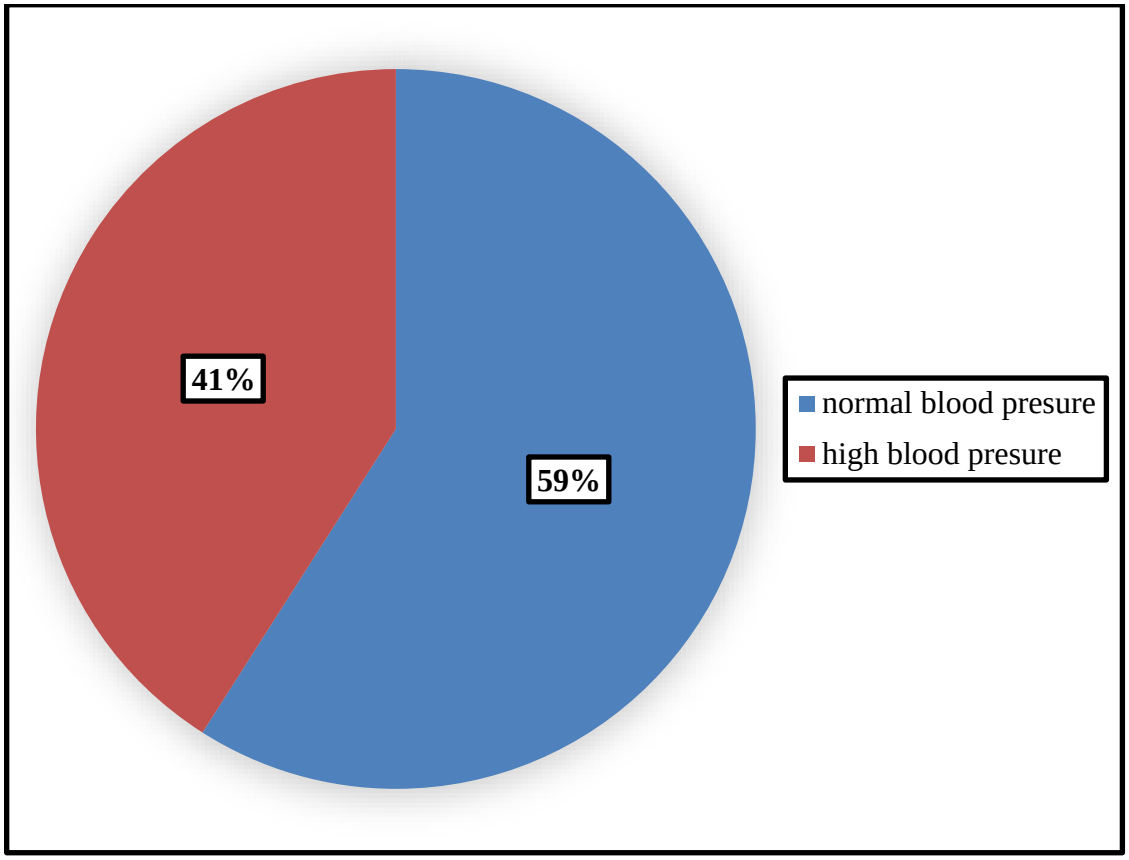
Table 5: A table showing dietary and behavior characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at at JRRH, LRRH and MRRH.

	Frequency	Percentage
Refined food consumption		
No	57	38.0
Yes	93	62.0
Sweetened drink consumption		
No	77	51.3
Yes	73	48.7
Physical exercises		
No	57	38.0
Yes	93	62.0
Adherent to ati-diabetic care		
No	13	8.7
Yes	137	91.3

4.6 Prevalence of elevated blood pressure and hypertension among diabetic patients

There was a 41% (61) burden of hypertension and elevated blood pressure among the study participants. This is as shown in figure **Error! Not a valid bookmark self-reference.**.

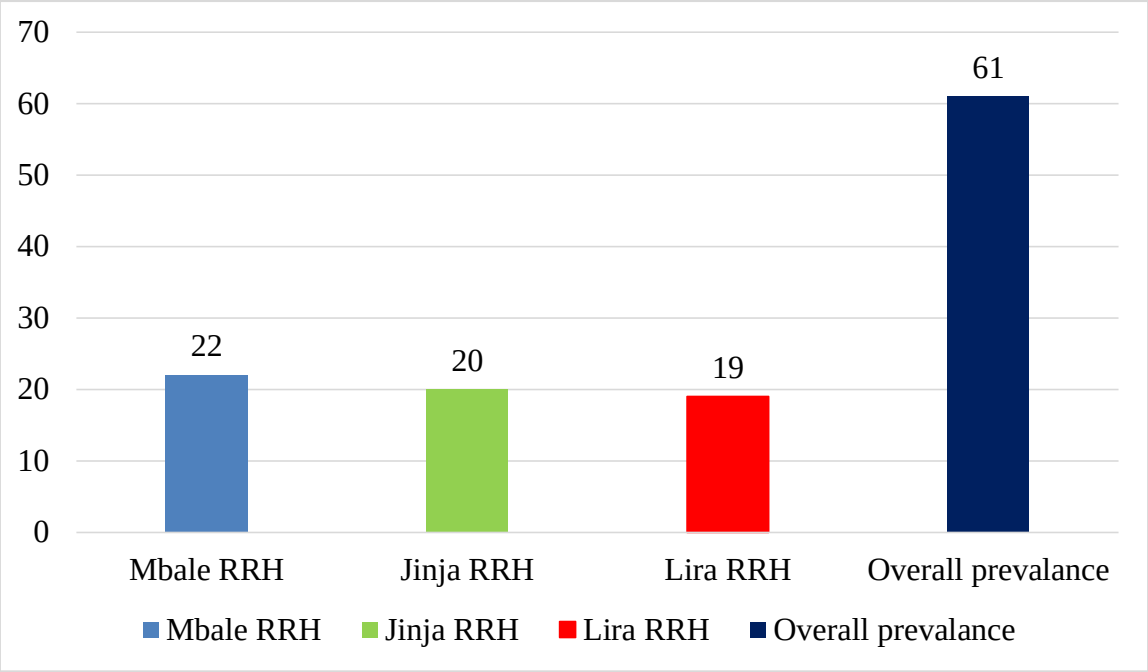
Figure 3: A pie-chart showing distribution of elevated blood pressure and hypertension among children and adolescents 6months to 18 years with DM type 1 at JRRH, LRRH and MRRH



Among the particpants with high blood pressure, 22(36.1%) were from Mbale RRH, followed by Jinja RRH, 20(32.8%) and Lira RRH contributing 19(31.1%) of the observed high blood pressure among the study particpants. This is as shown in

Figure 4 below

Figure 4: A column Chart showing frequency of high blood pressure among the selected study sites of DM type 1 particpants aged 6 months to 18 years of age.



Of the 61 patients, 32 (52.5%) had elevated blood pressure whereas the rest had hypertension. Hypertenison stage 1 contributed 32.8%(20) among the participants, this is as shown in table 6 below

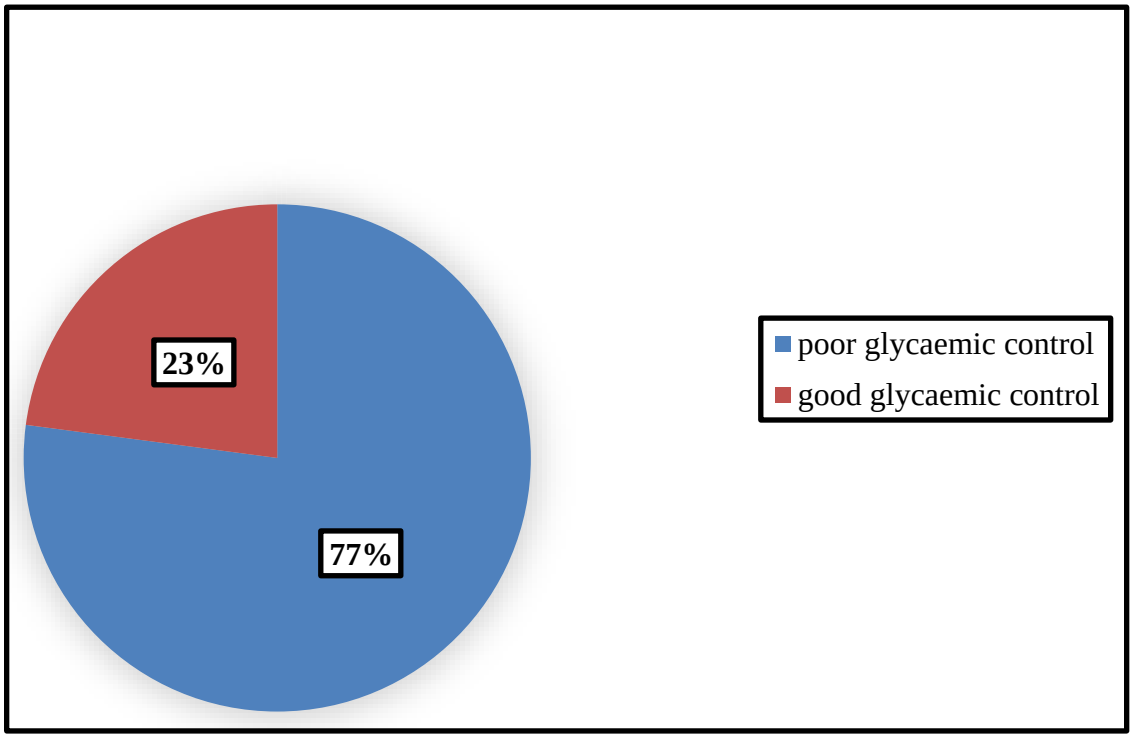
Table 6: A table showing stages of high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH (N=61).

	Frequency	Percentage (%)
Elevated blood pressure	32	52.5
Hypertension stage 1	20	32.8
Hypertension stage 2	9	14.7

4.7 Glycemic control

Only 35(23.3%) of the study participants had good glycemic control. The mean HbA1c was 10.47±0.27%. This is shown in figure 6 below

Figure 5: A pie-chart showing the level of glycemic control among children and adolescents 6months to 18 years with DM type 1 attednig JRRH, LRRH and MRRH



4.8 Factors associated with elevated blood pressure and hypertension among study participants

4.8.1 Bivariate analysis of socio-demographic factors and high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH

Socio-demographic factors such as age, gender, type of school and the caretakers, occupation were not associated with high blood pressure.This is as shown in table 7 below.

Table 7: Bivariate analysis of socio-demographic factors of children and adolescents aged 6 months to 18 years with DM type 1 at at JRRH, LRRH and MRRH

	High blood pressure		**COR (C.I)**	**P-value**
	No (%)	**Yes (%)**		
Age				
≤5 years	1(50)	1(50)	1.447(0.088-23.712)	0.796
6- 12 years	20(60.6)	13(39.4)	0.940(0.426-2.074)	0.879
13-18 years	68(59.1)	47(40.9)		
Sex				
Male	39(56.5)	30(43.5)		
Female	50(61.7)	31(38.3)	0.806(0.419-1.550)	0.518
School type				
Day	63(60.6)	41(39.4)	0.976(0.367-2.594)	0.961
Boarding	14(53.8)	12(46.2)	1.286(0.395-4.188)	0.677
N/A	12(60)	8(40)		
Education level				
At most Primary	63(61.2)	40(38.8)	1.270(0.111-14.466)	0.847
Secondary	24(54.5)	20(45.5)	1.667(0.141-19.758)	0.686
Tertiary	2(66.7)	1(33.3)		
Residence				
Rural	64(58.2)	46(41.8)		
Urban	25(62.5)	15(37.5)	0.835(0.397-1.756)	0.634
Occupation				
Students/Pupil	76(58.5)	54(41.5)	1.421(0.340-5.933)	0.630
Peasant	7(63.6)	4(36.4)	1.143(0.179-7.283)	0.888
Others	6(66.7)	3(33.3)		
Religion				
Protestant	52(68.4)	24(31.6)	0.923(0.284-2.996)	0.894
Catholic	16(45.7)	19(54.3)	2.375(0.672-8.397)	0.179
Muslim	11(45.8)	13(54.2)	2.364(0.619-9.032)	0.209
Pentecostal	10(66.7)	5(33.3)		
Caretaker Age (years)				
≤30	2(66.7)	1(33.3)	0.475(0.040-5.679)	0.556
31-50	68(63)	40(37)	0.559(0.267-1.171)	0.123
51-70	19(48.7)	20(51.3)		
Caretaker income				
No assured income	26(61.9)	16(38.1)	0.923(0.335-2.544)	0.877
<200,000	11(73.3)	4(26.7)	0.545(0.135-2.204)	0.395
200,000-500,000	4(50)	4(50)	1.50(0.303-7.432)	0.619
500,000-1,000,000	33(55)	27(45)	1.227(0.476-3.167)	0.672
>1000,000	15(60)	10(40)		

4.8.2 Bivariate level analysis of medical factors and high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at at JRRH, LRRH and MRRH

Among the medical factors of the study participants, family history of hypertension, duration of disease of 4-8 and 9-12 years and poor glycemic control increased the odds for high blood pressure by 2.002(95% C.I 1.025-3.912 P0.042), 2.562(95%C.I 1.233-5.321 P 0.012), 5.977(95% C.I 1.478-24.171 P 0.012) and 2.885(95% C.I 1.209-6.886 P 0.014) respectively. They had a P-value less than 0.2 thus significant at bivariant level analysis and were carried for multivariate stage. This is as shown in table 8 below.

Table 8: A table showing bivariant analysis of medical history and clinical characteristics of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH

	High blood pressure			
	No (%)	**Yes (%)**	**COR (C.I)**	**P-value**
	Frequency	**percentage**		
Administering treatment				
Self	84(61.3)	53(38.7)	0.394(0.123-1.269)	0.119
Caretaker	5(38.5)	8(61.5)		
Family History of Diabetes Mellitus				
No	53(61.6)	33(38.4)		
Yes	36(56.2)	28(43.8)	1.249(0.647-2.412)	0.507
History of complications				
No	21(67.7)	10(32.3)		
Yes	68(57.1)	51(42.9)	1.575(0.683-3.634)	0.285
Type of DM Complications				
None	21(67.7)	10(32.3)		
Diabetic ketoacidosis	12(63.2)	7(36.8)	1.225(0.370-4.060)	0.740
Hyperglycemia	14(53.8)	12(46.2)	1.800(0.613-5.289)	0.285
Hypoglycemia	41(59.4)	28(40.6)	1.434(0.587-3.504)	0.429
Others	1(20.0)	4(80)	8.4(0.828-85.227)	0.072
History of Admission				
No	25(55.6)	20(44.4)	0.801(0.395-1.623)	0.537
Yes	64(61)	41(39)		
Family history of Obesity				
No	63(57.3)	47(42.7)		
Yes	26(65)	14(35)	0.722(0.340-1.530)	0.394
Family history of Hypertension				
No	60(65.9)	31(34.1)		
Yes	29(49.2)	30(50.8)	2.002(1.025-3.912)	0.042
Family history of Renal disease				
No	86(58.9)	60(41.1)	0.478(0.049-4.704)	0.518
Yes	3(75)	1(25)		
Nutritional status				
Normal	55(63.2)	32(36.8)		
Underweight	23(53.5)	20(46.5)	1.495(0.712-3.135)	0.288
Overweight	11(55)	9(45)	1.406(0.526-3.757)	0.497
Random blood sugar				
Normal	55(57.9)	40(42.1)	0.849(0.430-1.676)	0.637
High	34(61.8)	21(38.2)		
Disease Duration (years)				
<4	65(69.1)	29(30.9)		
4-8	21(46.7)	24(53.3)	2.562(1.233-5.321)	0.012
9-12	3(27.3)	8(72.7)	5.977(1.478-24.171)	0.012

Glycemic control				
Good	27(77.1)	8(22.9)		
Poor	62(53.9)	53(46.1)	2.885(1.209-6.886)	0.014

4.8.3 Bivariate analysis of diet and behavior factors and high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH.

There were no significant factors at bivariate level among the diet and behavior factors as all had P-value greater than 0.2. This is as shown in table 9 below.

Table 9: A table showing bivariant analysis of diet and behavior factors of children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH

	High blood pressure			
	No (%)	Yes (%)	COR (C.I)	P-value
Refined food consumption				
No	33(57.9)	24(42.1)		
Yes	56(60.2)	37(39.8)	0.908(0.465-1.775)	0.779
Sweetened drink consumption				
No	46(59.7)	31(40.3)		
Yes	43(58.9)	30(41.1)	1.035(0.539-1.987)	0.917
Physical exercises				
No	35(61.4)	22(38.6)		
Yes	54(58.1)	39(41.9)	1.149(0.586-2.254)	0.686
Adherent to atidiabetic care				
No	5(38.5)	8(61.5)	2.536(0.788-8.163)	0.119
Yes	84(61.3)	53(38.7)		

4.9 Multivariate level analysis of associated factors

Having diabetes for more than 4 years increased the odds for developing hypertension among the study participants with those 4-8 years having 2.233 (95% C.I 1.049-4.750 P0.037) increased odds and those over 8 years were 4.545 (95% C.I 1.075-19.221 P 0.040) times more likely to develop hypertension compared to those with less than 4 years of diabetes mellitus type 1. Additionally, poor glycemic control over 3-month period (HbA1c) increased the likelihood of developing hypertension by 2.905 (95% C.I 1.149-7.342) times compared to those with good glycemic control. It was statistically significant with a P-value of 0.024. This is as shown in table 10 below.

Table 10: A table showing multivariant logistic regression of factors associated with high blood pressure among children and adolescents aged 6 months to 18 years with DM type 1 at JRRH, LRRH and MRRH

	aOR	**95% C.I of aOR**	**P- value**
Disease Duration (years)			
<4			
4-8	2.233	1.049-4.750	0.037
9-12	4.545	1.075-19.221	0.040
Glycemic control			
Good			
Poor	2.905	(1.149-7.342)	0.024
Family history of hypertension			
No			
Yes	2.008	0.969-4.159)	0.061

Chapter 5: Discussion, conclusions and recommendations

5.1 Introduction:

The main objective of the study was to determine the prevalence and factors associated with high blood pressure and level of glycemic control among children and adolescents with diabetes mellitus in selected hospitals in east and northern Uganda.

5.2: Prevalence of elevated blood pressure and hypertension among DM type 1 participants

There was a high burden of elevated blood pressure and hypertension among the DM type 1 participants in the study areas (41%). This could be attributed to hyperglycemia and increased free fatty acids associated with DM type 1 which lead to oxidative stress by increasing production of endothelin-1 and angiotensin II which in turn lead to elevated blood pressure (Homhuan et al., 2021). Additionally, it could be as a result of maladaptive insulinemia leading to alterations in the vascular function with vascular stiffness, hypertrophy, fibrosis and ultimately remodeling (Sowers, 2013). This effect on the microvasculature is central to the development of high blood pressure among the sufferers of diabetes mellitus.

The prevalence is higher than the 36.1%, 19.4% observed in Lithuania and Australia respectively among DM type 1 patients less than 18 years of age (James et al., 2023; Stankute et al., 2019). The difference could be attributed to the difference in inclusion criteria where current study involved children with DM duration less than 6 months since diagnosis yet during initiation of treatment there's still weight fluctuations and metabolic instabilities among the sufferers which could contribute to the observed high prevalence (Couper et al., 2014; Stankute et al., 2019). James and colleagues enrolled only adolescents 16-25 years while current study enrolled children and adolescents and additionally the current study also considered high blood pressure rather than hypertension alone as in the observed studies. The study findings concur with the report that a larger proportion of DM type 1 patients have hypertension co-existence and this is worrisome given the 4-fold increase in cardiovascular disease it carries (Lastra et al., 2014; Sowers et al., 2011). This makes vigilant screening and prompt initiation of treatment for high blood pressure a key intervention strategy among DM type 1 suffers (American Diabetes Association, 2019; Zeitler et al., 2018).

5.3 Level of glycemic control among DM type 1 participants

There was a very poor level of glycemic control among the study participants with 77.1% having HbA1c above 7%. This could be attributed to poor treatment compliance among the participants as majority were adolescents aged 13-18 years 76.4%, 61.8% on refined foods in their diet and 61.8% were not having routine exercises. This agrees with other studies that poor compliance to insulin, blood glucose monitoring and dietary recommendations hampers proper glycemic control (Kyokunzire & Matovu, 2018; Ngwiri et al., 2015; Ogugua et al., 2021). Furthermore, caretakers were only involved in the care/ drug administration in 8.7% of the participants yet caretaker involvement increases the odds of good glycemic control by 13 times compared to those not involved (Ogugua et al., 2021) and bearing 12 years and older increases the risk for poor glycemic control (De Oliveira et al., 2016).

The study findings concur with other studies about poor glycemic control among DM type 1 children and adolescents, Southern Ethiopia (83.6%)(Shibeshi et al., 2022), Tanzania (97.3%)(McLarty et al., 2021), South Eastern Nigeria (78.9%)(Ogugua et al., 2021) and Kenya (72%)(Ngwiri et al., 2015) However the prevalence was higher compared to that observed in Northwest Ethiopia (39.3%) (Kidie et al., 2022). The difference is because the current study enrolled children from 6months to 18 years while the former enrolled those from 3 years and above and the study was a retrospective study.

5.4 Factors associated with hypertension among the DM type 1 participants

Having diabetes for more than 4 years increased the odds for developing hypertension among the study participants with those 4-8 years having 2.207 increased odds and those over 8 years were 4.823 times more likely to develop hypertension compared to those with less than 4 years of diabetes mellitus type 1. This is because of the vascular damage attributable to longer period of exposure to high inflammatory cytokines seen during hyperglycemia than those with shorter duration of diabetes which leads to autonomous imbalance and blood vessel stiffening resulting into hypertension (Homhuan et al., 2021; Mariye et al., 2019). This agrees with a longitudinal study in Bangladesh where after 4 years of follow up of DM type 1 patients, the burden of elevated blood pressure increased from 20.5% to 31.7% (Jones, Khanolkar, Gevers, Stephenson, & Amin, 2019). In Rwanda it increased from 31.8% at baseline to 44.9% and 40.3% at 1 and 2 years follow up periods (Marshall et al., 2015).

Mariye and colleagues in their study in Tigray Ethiopia found an 8.52 times increased risk for hypertension with long time (> 6 years) since DM diagnosis compare with short time (less than 1 year) (Mariye et al., 2019). While in southern Ethiopia, the hypertension risk was 7 times higher when the

duration of DM is longer than 5 years since diagnosis [AOR = 7.47, 95% CI (2.02, 27.57), P = 0.003] (Anjajo et al., 2023).

Additionally, the longer the duration of the disease the higher the burden of masked hypertension among patients with type 1 diabetes (Homhuan et al., 2021). This could explain the burden of undiagnosed hypertension among DM type 1 patients observed in this study since 52.5% of those with high blood pressure had disease duration of more than 4 years. This calls into effect strongly the ISPAD recommendation of blood pressure screening of all diabetic patients at every visit following diagnosis of DM type 1 as early diagnosis and intervention is the only remedy to worsening of microvascular damages (Limbert et al., 2022).

Poor glycemic control over a 3-month period increased the likelihood of developing hypertension by 3.192(1.236-8.240) (1.149-7.342) times compared to those with good glycemic control. This is because high glycated hemoglobin reflects poor glucose control with variable glycemia levels yet hyperglycemia increases sympathetic activity, activates the renin-angiotensin system and altering the vascular wall function over time leading to increased vascular resistance in the peripheral vessels thus development of high blood pressure (Akram, Abdullah, & Ibrahim, 2022) (Cioana et al., 2021b). Additionally, poor glycemic control is associated with high level of dyslipidemia which is associated with the early development of cardiac and vascular abnormalities through the process of atherosclerosis thus hypertension development (Stankute et al., 2019).

De Oliveira and colleagues in 2016 reported a 1.73mmhg increase in diastolic blood pressure among DM type 1 patients for every 1% increment in HbA1c. This increment is detrimental as it can augment the risk of stroke by 14-17 %, and coronary artery disease by 6-9 % (De Oliveira et al., 2016). Additionally, HbA1c is associated with 1.06 hazard ratio for complications among DM patients including hypertension (Dart et al., 2014).

5.5 Limitations

The study enrolled children who had just been diagnosed who still have autonomic instabilities and weight fluctuations which could have affected the results.

The study wasn't able to rule out kidney diseases among study participants as this could have affected results, however we relied on history to rule it out.

The study did not diagnose or classify the diabetes however the researcher relied on hospital diagnoses as they were on routine care.

5.6 Strength of the study

Glycated hemoglobin was done for every patient and used for the determination of glycemic control

To the author knowledge, this is among the few studies that have described hypertension among type 1 diabetes mellitus patients in children and adolescents in the region.

This was a multicenter study thus gives a good reflection of status of type 1 diabetic patients across the Eastern and Northern Uganda.

5.7 Conclusions

There was a high prevalence of elevated blood pressure and hypertension among DM type 1 participants with 4 out of 10 children affected.

There was a high level of poor glycemic control (HbA1c <7%) among the DM type 1 study participants with ¾ patients being poorly controlled.

The factors associated with high blood pressure among the DM type 1 participants was duration of disease since diagnosis of more than 4 years and poor glycemic control.

5.8 Recommendations

There's a strong need to enforce the routine blood pressure screening among DM type 1 patients on every routine visit in order to have early diagnosis and intervention of elevation in blood pressure. There's need for counselling of the young adults on the compliance to the treatment guidelines so as to ensure proper compliance to treatment thus enabling proper glycemic control which in turn will prevent development of complications like high blood pressure.

References

Abdelbagi, O., Musa, I. R., Musa, S. M., Altigani, S. A., & Adam, I. (2021). Prevalence and associated factors of hypertension among adults with diabetes mellitus in northern Sudan : a cross - sectional study. *BMC Cardiovascular Disorders*, 1–7. https://doi.org/10.1186/s12872-021-01983-x

Abdissa, D., & Kene, K. (2020). Prevalence and Determinants of Hypertension among Diabetic Patients in Jimma University. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, *13*, 2317–2325.

Afkarian, M. (2016). Diabetic kidney disease in children and adolescents. *Pediatr Nephrol*, *30*(1), 65–74. https://doi.org/10.1007/s00467-014-2796-5.Diabetic.

Afshin, A., Sur, P., Fay, K., Cornaby, L., Ferrara, G., & Salama, J. (2019). Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the global burden of disease study 2017. *Lancet*, *393*(10184), 1958–72.

Akalu, Y., & Belsti, Y. (2020). Hypertension and Its Associated Factors Among Type 2 Diabetes Mellitus Patients at Debre Tabor General Hospital, Northwest Ethiopia. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 13, 1621–1631.

Akram, N. N., Abdullah, W. H., & Ibrahim, B. A. (2022). Factors Contribute to Elevated Blood Pressure Values in Children with Type 1 Diabetes: A Review. *Medical Journal of Babylon*, 19(2), 126-128.

Albuquerque, G., Pavesi, A., Bragotto, A., & Costa, H. S. (2022). Processed Food: *Nutrition, Safety, and Public Health.*

Álvarez, J., Aguilar, F., & Lurbe, E. (2022). Blood pressure measurement in children and adolescents: Key element in the evaluation of arterial hypertension. *Anales de Pediatria*, *96*(6), 536.e1–e536.e7. https://doi.org/10.1016/j.anpedi.2022.04.015

American Diabetes Association. (2016). Prevention or delay of type 2 diabetes. Sec. 4. In Standards of Medical Care in Diabetes. *Diabetes Care*, *39*(Suppl.1), S36–S38.

American Diabetes Association. (2017). Children and adolescents. Sec. 12. In Standards of Medical Care in Diabetesd-2017. *Diabetes Care*, *40*(January), 105–113. https://doi.org/10.2337/dc17-S015

American Diabetes Association. (2018). 10. Microvascular Complications and Foot Care: Standards of Medical Care in Diabetes. *Diabetes Care*, *41*, S105–S118.

American Diabetes Association. (2019). Children and adolescents: Standards of Medical Care in Diabetes-2019. *Diabetes Care*, *42*(S1), 148–164. 10.2337/dc19-S013

Bahendeka, S., Wesonga, R., Mutungi, G., Muwonge, J., Neema, S., & Guwatudde, D. (2016). Prevalence and correlates of diabetes mellitus in Uganda : a population-based national survey. *Tropical Medicine and International Health*, *21*(3), 405–416. https://doi.org/10.1111/tmi.126

Berraho, M., Y., E. A., A., B., K. El Rhazi, M., & Chikri, and C. N. (2012). Hypertension and type 2 diabetes: a cross-sectional study in Morocco (EPIDIAM Study). *The Pan African Medical Journal*, *11*, 52.

Boditech Med Incorporated. (2016). *ichroma™ HbA1c*. *15*, 2016.

Boer, I. H. de, Bangalore, S., Benetos, A., Davis, A. M., Michos, E. D., Muntner, P., Rossing, P., Zoungas, S., & Bakris, G. (2017). Diabetes and Hypertension: A Position Statement by the American Diabetes Association. *Diabetes Care*, *40*(September), 2–3. https://doi.org/10.2337/dci17-0026

Bull, F. C., Al-, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., Dempsey, P. C., Dipietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., … Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. 1451–1462. https://doi.org/10.1136/bjsports-2020-102955

Chang, H., Hawley, N. L., Kalyesubula, R., Siddharthan, T., Checkley, W., Knauf, F., & Rabin, T. L. (2019). Challenges to hypertension and diabetes management in rural Uganda: a qualitative study with patients, village health team members, and health care professionals. *International Journal for Equity in Health*, *18*(38), 1–14.

Chiwanga, F. S., Njelekela, M. A., Diamond, M. B., Guwatudde, D., Nankya-mutyoba, J., Kalyesubula, R., Adebamowo, C., Ajayi, I., Reid, T. G., Volmink, J., Laurence, C., Adami, H., Holmes, M. D., Dalal, S., Chiwanga, F. S., Njelekela, M. A., Diamond, M. B., Guwatudde, D.,

Nankya-mutyoba, J., … Ajayi, I. (2016). Urban and rural prevalence of diabetes and pre-diabetes and risk factors associated with diabetes in Tanzania and Uganda Urban and rural prevalence of diabetes and pre-diabetes. *Global Health Action*, *9*(1). https://doi.org/10.3402/gha.v9.31440

Cioana, M., Deng, J., Hou, M., Nadarajah, A., Qiu, Y., Song, S., Chen, J., & Rivas, A. (2021a). Prevalence of Hypertension and Albuminuria in Pediatric Type 2 Diabetes A Systematic Review and Meta-analysis. *JAMA*, *4*(4), 1–27. https://doi.org/10.1001/jamanetworkopen.2021.6069

Cioana, M., Deng, J., Hou, M., Nadarajah, A., Qiu, Y., Song, S., Chen, J., & Rivas, A. (2021b). *Prevalence of Hypertension and Albuminuria in Pediatric Type 2 Diabetes A Systematic Review and Meta-analysis. 4*(4). https://doi.org/10.1001/jamanetworkopen.2021.6069

Colberg, S. R., Sigal, R. J., Yardley, J. E., Riddell, M. C., Dunstan, D. W., Dempsey, P. C., Horton, E. S., Castorino, K., & Tate, D. F. (2016). Physical Activity / Exercise and Diabetes: A Position Statement of the American Diabetes Association. *Diabetes Care*, *39*(November), 2065–2079. https://doi.org/10.2337/dc16-1728

Dart, A. B., Martens, P. J., Rigatto, C., Brownell, M. D., Dean, H. J., & Sellers, E. A. (2014). Earlier Onset of Complications in Youth With Type 2 Diabetes. *Diabetes Care*, *37*(February), 436–443. https://doi.org/10.2337/dc13-0954

Dart, A., Sellers, E., Martens, P., Rigatto, C., Brownell, M., & Dean, H. (2012). High burden of kidney disease in youth-onset type 2 diabetes. *Diabetes Care*, *35*(6), 1265–1271.

de Oliveira, S., Nascimento, D. d., Tibana, R. A., de Oliveira, S. L., Neto, I. d., Falleiros, R. K., Prestes, J. (2016). Elevated glycated hemoglobin levels impair blood pressure in children and adolescents with type 1 diabetes mellitus. *Diabetol Metab Syndr*, *8*(4), 1-6.

de Oliveira, S., Nascimento, D. d., Tibana, R. A., de Oliveira, S. L., Neto, I. d., Falleiros, R. K., . . . Prestes, J. (2016). Elevated glycated hemoglobin levels impair blood pressure in children and adolescents with type 1 diabetes mellitus. *Diabetol Metab Syndr*, *8*(4), 1-6.

Dempsey, P., Owen, N., Biddle, S., & Dunstan, D. (2014). Managing sedentary behavior to reduce the risk of diabetes and cardiovascular disease. *Curr Diab Rep*, *14*(522).

Dickson, K. (2016). Prevalence of diabetes and its associated risk factors in south-western Uganda. *African Journal of Diabetes Medicine, 24*(1), 15–17.

Donaghue, K. C., Craig, M. E., Chew, R. P. W. E. Y., Wong, T. Y., Eduardo, L., Zabeen, B., & Salem, M. A. (2018). ISPAD CLINICAL PRACTICE CONSENSUS GUIDELINES ISPAD Clinical Practice Consensus Guidelines 2018: Microvascular and macrovascular complications in children and adolescents. *Peadiatric Diabetes, 19*(October), 262–274. https://doi.org/10.1111/pedi.12742

Dyson, P. (2021). Type 1 Diabetes: Dietary modification over 100 years since Insulin. *Practical Diabetes,* 40-44.

Ekoru, K., Doumatey, A., Bentley, A. R., Chen, G., Zhou, J., Shriner, D., Fasanmade, O., Okafor, G., Eghan, B., Agyenim-boateng, K., Adeleye, J., Balogun, W., Amoah, A., Acheampong, J., Johnson, T., Oli, J., Adebamowo, C., Collins, F., Dunston, G., … Rotimi, C. (2019). EClinicalMedicine Type 2 diabetes complications and comorbidity in Sub-Saharan Africans. *EClinicalMedicine, 16,* 30–41. https://doi.org/10.1016/j.eclinm.2019.09.001

Faroos, M. K. M., & Kisokanth, G. (2013). Prevalence of Hypertension among Diabetic Patients Attending Diabetic Clinic at Teaching Hospital, Batticaloa. Proceedings of the Third International Symposium. SEUSL: 6-7 July 2013, Oluvil, Sri Lanka, 1, 90–96.

Fichten, C. S., Nguyen, M. N., Amsel, R., Jorgensen, S., Budd, J., Jorgensen, M., Asuncion, J., & Barile, M. (2014). How Well Does the Theory of Planned Behavior Predict Graduation Among College and University Students with Disabilities? *Social Psychology of Education, 17*, 657– 685.

Flynn, J. T., Kaelber, D. C., Baker-Smith, C. M., Blowey, D., Carroll, A. E., Daniels, S. R., Dionne, J. M., Falkner, B. E., & Flinn, S. K. (2017). Clinical practice guideline for the management of high blood pressure in children and adolescents. *Pediatrics, 140*(3), e20171904. https://doi.org/10.1542/peds.2017-1904

Flynn, J. T., Kaelber, D. C., Baker-Smith, C. M., Blowey, D., Carroll, A. E., Daniels, S. R., Ferranti, S. D. d., Dionne, J. M., Falkner, B., Flinn, S. K., & Gidding, S. S. (2017). Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents. *Pediatrics. 140*(3).

Grabia, M., Markiewicz-Zukowska, R., & Socha, K. (2021). Prevalence of Metabolic Syndrome in Children and Adolescents with Type 1 Diabetes Mellitus and Possibilities of Prevention and Treatment: A Systematic Review. *Nutrients, 13*(1782), 1–15.

Guariguata, L, Whiting, D., Hambleton, I., Beagley, J., Linnenkamp, U., & Shaw, J. (2014). Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes Res Clin Pract, 103*(2), 137–149.

Guariguata, Leonor, & Jeyaseelan, S. (2019). Children and non-communicable disease: Global Burden Report 2019. *NCD Child, 46*.

Harold, J. G. (2017). Historical perspective of hypetension. *American Academy of Cardiology*, 1–4.

Harold, J. G. (2017, August 21st*). Harold on History: A Historical perspective on Diabetes and Cardiovascular Disease*. Retrieved from www.acc.org: https://www.acc.org/latest-in-cardiology/articles/2017/08/16/10/42/harold-on-history-an-historical-perspective-on-diabetes-and- cardiovascular-disease

Holmager, T. L. F., Meyrowitsch, D. W., Bahendeka, S., & Nielsen, J. (2021). Food intake and cardiometabolic risk factors in rural Uganda. *Archives of Public Health, 79*(24), 1–9.

IDF diabetes atlas. (2019). *IDF diabetes atlas.*

ISPAD. (2010). Diabetes in children and adolescents DIAGNOSING DIABETES IN CHILDREN: *basic training manual for healthcare professionals in developing countries* (1st ed.). International Society for Pediatric and Adolescent Diabetes (ISPAD).

Jones, S., Khanolkar, A. R., Gevers, E., Stephenson, T., & Amin, R. (2019). Cardiovascular risk factors from diagnosis in children with type 1 diabetes mellitus: A longitudinal study. *BMJ Open Diab Res Care*, 7, 1-9. doi: 10.1136/bmjdrc-2018-000625

Khangura DS, Waqar Salam M, Brietzke SA. (2018). Hypertension in Diabetes. [Updated 2018 Feb 14]. In: Feingold KR, Anawalt B, Boyce A, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available. 279027.

Kiconco, R., Rugera, S. P., & Kiwanuka, G. N. (2019). Microalbuminuria and Traditional Serum

Biomarkers of Nephropathy among Diabetic Patients at Mbarara Regional Referral Hospital in South Western Uganda. *Journal of Diabetes Research,* 2019, `1-8.

Kim, J., Montagnani, M., & Kwaug, K. (2006). Reciprocal relationship between insulin resitance and endothelial dysfunction. *Circulation,* 113, 1888–1904.

Lastra, G., Syed, S., Kurukulasuriya, L. R., Manrique, C., & Sowers, J. R. (2014). Type 2 diabetes mellitus and hypertension: *An update. Endocrinol Metab Clin North Am., 43*(1), 103–122. https://doi.org/10.1016/j.ecl.2013.09.005.Type

Lynch, Lj., Elghormli, L., Fisher, L., Gidding, S. S., Laffel, L., Libman, I., Pyle, L., Tamborlane, W. V., Tollefsen, S., Weinstock, R. S., & Zeitler, P. (2013). Rapid Rise in Hypertension and The TODAY clinical trial. *Diabetes Care, 36,* 1735–1740. https://doi.org/10.2337/dc12-2420.

Lynch, S., Pfeiffer, C. M., Georgieff, M. K., Brittenham, G., Fairweather-tait, S., Hurrell, R. F., Mcardle, H. J., & Raiten, D. J. (2018). Biomarkers of Nutrition for Development (BOND) Iron Review. *The Journal of Nutrition, 148,* 1001S–1067S. https://doi.org/10.1093/jn/nxx036

Mariye, T., Girmay, A., Tasew, H., Teklay, G., Ayele, E., Gerensea, H., & Mokonnen, H. (2019). Determinants of hypertension among diabetic patients in Public Hospitals of the Central Zone, Tigray, Ethiopia 2018: unmatched case- control study. *Pan African Medical Journal, 33*(100), 1–12. https://doi.org/10.11604/pamj.2019.33.100.17094

Marshall, S. L., Edidin, D., Arena, V. C., Becker, D. J., Ch, M. B. B., Bunker, C. H., Gishoma, C., Gishoma, F., Ronald, E., Kaberuka, V., Ogle, G., & Sibomana, L. (2015). Glucose control in Rwandan youth with Type 1 diabetes following estalishment of systemic HbA1c based care and education. *Diabetes Res Clin Pract, 107*(1), 113–122. https://doi.org/10.1016/j.diabres.2014.09.045.GLUCOSE

Martin, M., Edrisa, M., Samuel, K., Frank, M., & Kiiza, M. C. (2018). Obesity and Weight-Loss Medication Microalbuminuria among Newly Diagnosed Diabetic Patients at Mulago National Referral Hospital in Uganda: A Cross Sectional Study. *Journal of Obesity and Weight-Loss Medication, 4*(021), 1–8. https://doi.org/10.23937/2572-4010.1510021

Muddu, M., Mutebi, E., Ssinabulya, I., Kizito, S., & Mondo, C. K. (2018). Hypertension among

newly diagnosed diabetic patients at Mulago national referral hospital in Uganda a cross sectional study. *Cardiovascular Journal of Africa, 29*(4), 218–224. https://doi.org/10.5830/CVJA-2018-015

Mutyambizi, C., Chola, L., Groot, W., Pavlova, M., Labadarios, D., & Hongoro, C. (2017). The extent and determinants of diabetes and cardiovascular disease comorbidity in South Africa results from the South African National Health and Nutrition Examination Survey (SANHANES-1). *BMC Public Health, 17,* 1–11. https://doi.org/10.1186/s12889-017-4792-8

Mwenda, V., Mwangi, M., Nyanjau, L., Gichu, M., Kyobutungi, C., & Kibachio. J. (2018). Dietary risk factors for non-communicable diseases in Kenya: findings of the STEPS survey, 2015. *BMC Public Health, 18*(S3), 97–104.

Nakiriba, R., Mayega, R. W., Piloya, T., Nabukeera-Barungi, N., & Idro, R. (2018). Prevalence and factors associated with dysglycemia among girls in selected boarding secondary schools in Wakiso District, Uganda. *Adolescent Health, Medicine and Therapeutics, Volume 9,* 167–176. https://doi.org/10.2147/ahmt.s178746

NIH. (2005). *Theory at a Glance: A Guide For Health Promotion Practice* (K. R. Barbara & G. Karen (eds.); 2nd ed.). Division of Cancer Control and Population Sciences, National Cancer Institute. Spring.

Oburu, O. G. (2009). *MAKERERE U NIVERSITY GLYCAEMIC CONTROL AND PREVALENCE OF MICROALBUMINURIA AMONG CHILDREN WITH TYPE 1 DIABETES MELLITUS ATTENDING M ULAGO HOSPITAL* (Issue May). Makerere University.

Ogunleye, O. O., O., O. S., Akinyemi, J. O., & Ogbera, A. O. (2012). Clustering of hypertension, diabetes mellitus and dyslipidemia in a Nigerian population: a cross sectional study. *African Journal of Medicine & Medical Sciences, 14,* 191– 195.

Osman, H. A. M., Elsadek, N., & Abdullah, M. A. (2013). Original Article Type 2 diabetes in Sudanese children and adolescents. *SUDANESE JOURNAL OF PAEDIATRICS, 13*(2), 17–23.

Panagiotopoulos, C., Hadjiyannakis, S., & Henderson, M. (2018). Diabetes Canada Clinical Practice Guidelines Expert Committee. Type 2 diabetes in children and adolescents. *Can J Diabetes,*

42(S1), 247–254. 10.1016/j.jcjd.2017.10.037

Pavkov, M., Bennett, P., Knowler, W., Krakoff, J., Sievers, M., & Nelson, R. (2006). Effect of youth-onset type 2 diabetes mellitus on incidence of end-stage renal disease and mortality in young and middle-aged Pima Indians. *JAMA, 296*(4), 421–426.

Pettitt, D. J., Talton, J., Dabelea, D., Divers, J., Imperatore, G., Lawrence, J. m., D.Liese, A., Linder, B., Mayer-Davis, E. J., Pihoker, C., H.Saydah, S., Standiford, D. A., & F.Hamman, R. (2014). SEARCH for Diabetes in Youth Study Group. Prevalence of diabetes mellitus in U.S. youth in 2009: the SEARCH for diabetes in youth study. *Diabetes Care, 37*(2), 402–408.

Reid, A. E., & Aiken, L. S. (2012). Integration of Five Health Behaviour Models: Common Strengths and Unique Contributions to Understanding Condom Use. *Psychol Health, 26*(11), 1–20. https://doi.org/10.1080/08870446.2011.572259.Integration

Reinehr, T. (2013). Type 2 diabetes mellitus in children and adolescents. *World J Diabetes, 4*(6), 270–281. 10. 4239/wjd.v4.i6.270

Rodriguez, B. L., Dabelea, D., Liese, A. D., Fujimoto, W., Waitzfelder, B., Liu, L., Bell, R., Talton, J., Snively, B. M., Kershnar, A., & Urbina, E. (2010). Prevalance and correlates of elevated blood pressure in Youth with diabetes mellitus: the SEARCH or diabetes in youth study. *J Pediatr, 157*(2), 245–251.

Saklayen, M. G., & Deshpande, N. V. (2016). Timeline of History of Hypertension Treatment. *Frontiers in Cardiovascular Medicine, 3*(February). https://doi.org/10.3389/fcvm.2016.00003

Sanne, P. N. C., Wiese, M., Africa, S., & Wiese, M. (2018). The theory of planned behaviour and user engagement applied to Facebook advertising. *South African Journal of Information Management, 20*(1), 1–10. https://doi.org/%0A10.4102/sajim.v20i1.915

Seeman, T., Pohl, M., Palyzova, D., & John, U. (2012). Microalbuminuria in children with primary and white- coat hypertension. *Pediatric Nephrology, 27,* 461–467. https://doi.org/10.1007/s00467-011-2019-2

Shaw, J., Sicree, R., & Zimmet, P. (2010). Global estimates of the prevalence of diabetes for 2010

and 2030. *Diabetes Res Clin Pract, 87*(1), 4–14.

Shen, Y., Dai, Y., Wang, X. Q., Zhang, R. Y., Lu, L., Ding, F. H., & Shen, W. F. (2019). Searching for optimal blood pressure targets in type 2 diabetic patients with coronary artery disease. *Cardiovascular Diabetology, 18*(160), 1–13. https://doi.org/10.1186/s12933-019-0959-1

Sowers, J. (2013). Diabetes mellitus and vascular disease. *Hypertension, 61*(5), 943–7.

Sowers, J., Whaley-Connell, A., & Hayden, M. (2011). The role of overweight and obesity in the cardiorenal syndrome. Cardiorenal Med, 1, 5–12.

Stankute, I., Dobrovolskiene, R., Danyte, E., Razanskaite-virbickiene, D., Jasinskiene, E., Mockeviciene, G., Marciulionyte, D., Schwitzgebel, V. M., & Verkauskiene, R. (2019). Factors Affecting Cardiovascular Risk in Children, Adolescents, and Young Adults with Type 1 Diabetes. *Journal of Diabetes Research, 2019,* 1–10. https://doi.org/10.1155/2019/9134280

Sunkara, N., & Ahsan, C. H. (2017). Hypertension in diabetes and the risk of cardiovascular disease. *Cardiovasc Endocrinol, 6,* 33–38. https://doi.org/10.1097/XCE.0000000000000114

Susilawati, E., Levita, J., Susilawati, Y., & Sumiwi, S. A. (2023). Review of the case reports on

Temneanu, O., Trandafir, L., & Purcarea, M. (2016). Type 2 diabetes mellitus in children and adolescents: a relatively new clinical problem within pediatric practice. *Journal of Medicine and Life, 9*(3), 235–239.

Tropical Medicine and International Health, 21(3), 405–416. https://doi.org/10.1111/tmi.12663

Tsimihodimos, V., Clicerio, G.-V., James, M. B., & Ferrannini, E. (2018). Hypertension and Diabetes 6/10/42/harold-on-history-an-historical-perspective-on-diabetes-and-cardiovascular-disease

Tsimihodimos, V., Clicerio, G.-V., James, M. B., & Ferrannini, E. (2018). Hypertension and Diabetes Mellitus: Coprediction and Time Trajectories. *Hypertension, 71,* 422-428. doi:10.1161/HYPERTENSIONAHA.117.10546

Unadike, B. C., Eregie, A., & Ohwovoriole, A. E. (2011). Prevalence of hypertension amongst

persons with diabetes mellitus in Benin City, Nigeria. *Nigerian Journal of Clinical Practice, 14,* 300–302.

Uwaezuoke, S. N., & Ayuk, A. C. (2020). Diabetic Kidney Disease in Childhood and Adolescence: Conventional and Novel Renoprotective Strategies. *EMJ Nephrol, 8*(1), 68–77.

Varda, N. M. (2013). Microalbuminuria in pediatric patients with hypertension. *Health, 5*(4), 40–46.

Vargas-Uricoechea, H., & Cáceres-Acosta, M. F. (2018). Control of blood pressure and cardiovascular outcomes in type 2 diabetes. *Open Medicine, 13*(1), 304–323. https://doi.org/10.1515/med-2018-0048

World Health Organization. (2019). Classification of diabetes mellitus. *In Clinics in Laboratory Medicine* (Vol. 21, Issue 1). https://doi.org/10.5005/jp/books/12855_84

Xu, H., & Verre, M. C. (2018). Type 2 Diabetes Mellitus in Children. *Am Fam Physician, 98*(9), 590–594.

Zabeen, B., Nahar, J., Islam, N., Azad, K., & Donaghue, K. (2018). Risk factors associated with microalbuminuria in children and adolescents with diabetes in Bangladesh. *Indian J Endocrinol Metab., 22*(1), 85–88.

Zeitler, P., S, A., & Fu, J. (2018). ISPAD clinical practice consensus guidelines 2018: type 2 diabetes mellitus in youth. *Pediatr Diabetes, 19*(S27), 28–46.

Appendices

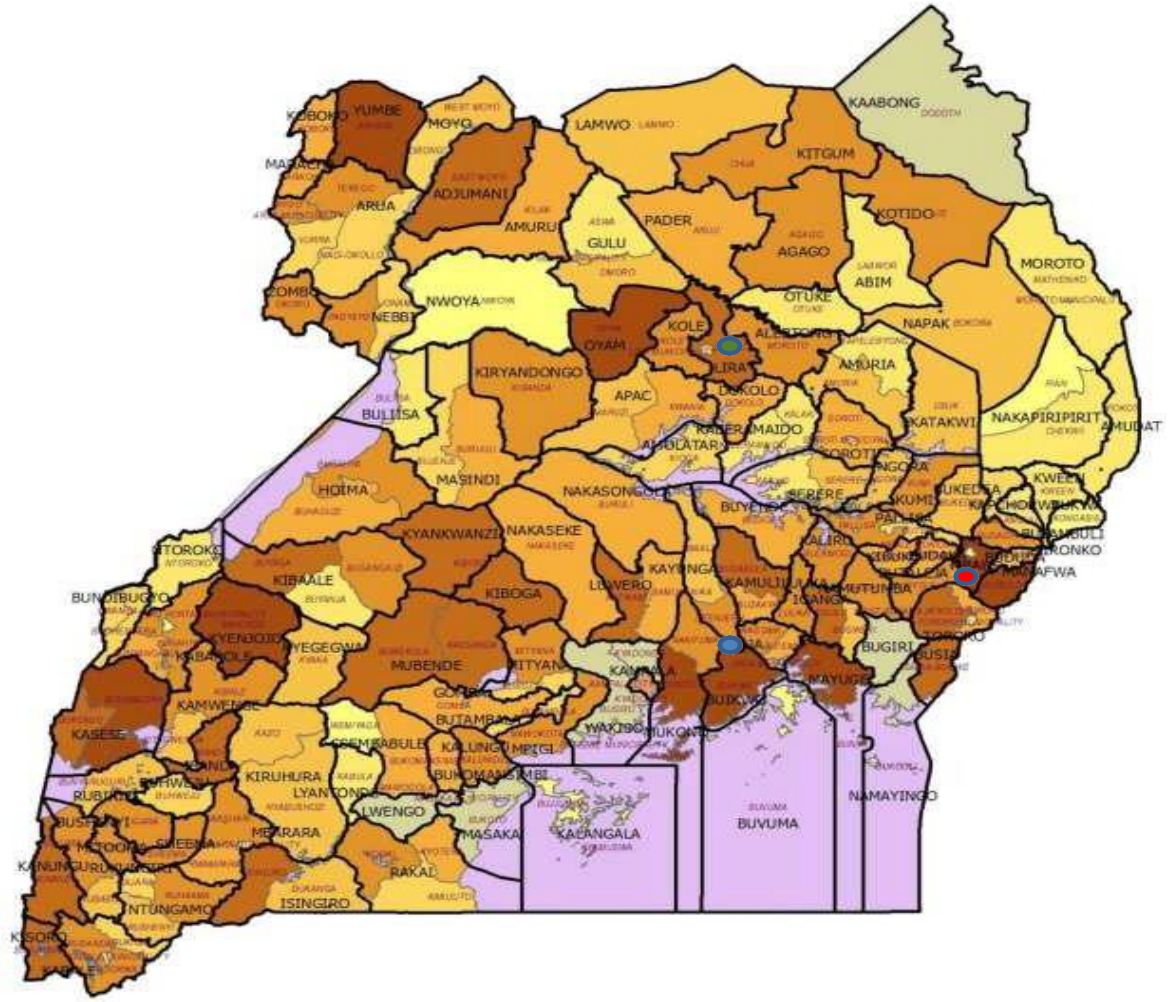
Appendix I: Work plan

Time lines / Activity	Feb-Jun 2023	Jul-Aug 2023	Sep-Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024	Responsible
Proposal writing and presentation to department and Faculty REC	■							Principle investigator (PI), Supervisors and research coordinator
Review by IREC		■						IREC
Data collection			■					PI
Data Analysis				■				PI
Report writing					■			PI and Supervisor
Defense						■		PI, supervisor and research coordinator
Publication							■	PI, supervisor

Appendix II: Budget of the Study

ITEM	QUANTITY	UNIT COST	AMOUNT (UGX)	COMMENT
Transport			680,000	
HbA1c	150	10,000	1,500,000	
Pens	10	500	5,000	
Biostatician	1	500,000	500,000	To support in analysis
Computer	1	1,300,000	1,300,000	
Airtime		50,000	50,000	
Printing	150x12	100	180,000	First print for supervisor review
Binding	4	1500	6,000	
Publication	1	800,000	800,000	
Study assistants	3	250,000	750,000	One per study centre
Internet		200,000	200,000	
Gloves	5	20,000	100,000	
Miscellaneous	10%		750,100	
Total			**6,821,000**	

Appendix III: Map of Uganda Showing study districts



KEY

1. Jinja district
2. Lira district
3. Mbaale district

Appendix IV: Table comparing different variables among the study sites.

Table showing the comparison of variables according to study site

Variable	Jimja RRH (%)	Mbale RRH (%)	Lira RRH (%)
History of DM			
No	16(39.0)	25(56.8)	45(69.2)
Yes	25(61)	19(43.2)	20(30.8)
History of obesity			
No	26(63.4)	33(75.0)	51(78.5)
Yes	15(36.6)	11(25.0)	14(21.5)
history of hypertension			
No	19(46.3)	28(63.6)	44(67.7)
Yes	22(53.7)	16(36.4)	21(32.3)
Nutrition Status			
normal	13(31.7)	28(63.6)	46(70.8)
underweight	26(63.4)	4(9.1)	13(20.0)
overweight	2(4.9)	12(27.3)	6(9.2)
Refined foods Consumption			
no	1(2.4)	10(22.7)	46(70.8)
Yes	40(97.6)	34(77.3)	19(29.2)
Sweetened Drinks intake			
No	8(19.5)	16(36.4)	53(81.5)
Yes	33(80.5)	28(63.6)	12(18.5)

Appendix V: English informed consent

BISHOP STUART UNIVERSITY
RESEARCH ETHICS COMMITTEE
P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468 E-mail: rec@bsu.ac.ug

INFORMED CONSENT FORM

This document outlines the research study and expectations for potential participants. It should be written in lay man terms and typed on BSU-REC letterhead.

Instructions

1. The wording of this document should be directed to the potential participant not BSU-REC.
2. If a technical term must be used, then define it the first time it is used and any acronyms or abbreviations used should be spelled out the first time they are used.
3. All the sections of this document must be completed without any editing or deletions.
4. Please use a typing font that is easily distinguishable from the questions of this form. Preferably the font size should be 12.

Study title :

Elevated blood pressure and hypertension among children with Diabetes mellitus at three Ugandan regional referral hospitals: prevalence, associated factors and Glycemic control

Principle investigator

Dr Charles Mwendwa Mutisya

Introduction

What you should know about this study:

1. You are being asked to join a research study.

Leave blank for REC office only: **BSU-REC Stamp:** BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA RESEARCH ETHICS COMMITTEE 28 SEP 2023	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-154

36

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

2. This consent form explains the research study and your part in the study.
3. Please read it carefully and take as much time as you need
4. You are a volunteer. You can choose not to take part and if you join, you may quit at any time. There will be no penalty if you decide to quit the study.
5. **Brief background to the study**

Co-occurrence of diabetes and hypertension has been linked to worse clinical outcomes in terms of both microvascular and macrovascular disease. (Khangura et al., 2018). Diabetes and HTA raise mortality risk by 7.2 times, with developing nations having a greater death rate. (Vargas-Uricoechea & Cáceres-Acosta, 2018). Therefore, a comprehensive strategy focusing on frequent blood pressure monitoring and glucose control should be used to manage diabetes.

Previous study in Uganda reported a high prevalence of Hypertension and described factors associated with hypertension among patients with diabetes mellitus (Muddu et al., 2018). However, children and teenagers with diabetes mellitus were not included in that study this
Leaves a knowledge gap about the prevalence and risk factors for high blood pressure in children and adolescents with type 1 diabetes and this study will be aiming to close this gap

Leave blank for REC office only: **BSU-REC Stamp:** 28 SEP 2023	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-184

BISHOP STUART UNIVERSITY RESEARCH ETHICS COMMITTEE

MBER:

Purpose of the research project

To establish Elevated blood pressure and hypertension among children with Diabetes mellitus at three ugandan regional referral hospitals: prevalence, associated factors and Glycemic control . Estimated number of the participants are 136 and the duration are three months.

Why you are being asked to participate?

Because patients in my study with diabetes are at risk of hypertension because of constant elevated high blood glucose

Procedures

Following this interview hight weight and blood pressure of your child will be taken . In addition, blood sample of your child will be collected and taken to the laboratory for investigations.

Risks or discomforts

There will be no predicted risks to you and your baby other than little pain and discomfort during collection of blood sample

Benefits

This study will fill the gap of knowledge on Elevated blood pressure and hypertension among children with Diabetes mellitus at three ugandan regional referral hospitals: prevalence, associated factors and Glycemic control . All laboratory investigations will be free of charge and their findings will contribute to improve the patient's care And the researcher pays the fees for investigations

Leave blank for REC office only: **BSU-REC Stamp:** BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA RESEARCH ETHICS COMMITTEE 28 SEP 2023	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-154

MBER:

Incentives or rewards for participating
There will be no personal profit for taking part in this study

Protecting data confidentiality
To ensure confidentiality, the questioner will be taken out in the doctor's office in ward or OPD, where no one else will listen to it.

Protecting subject privacy during data collection
Only special recognition numbers will be operated for every contributor rather than of names. The consummated questionnaires including the data that you give will be retained below lock and key and gained only by the researcher.

Right to refuse or withdraw
Taking part of this study is elective. You are free to leave from the study at any time you want, and reject to response any questions that you do not want

What happens if you leave the study?
Your choice to or not to take part in this study is entirely voluntary. You are free to leave from the study at any time if you select to and to reject to respond any questions that you may not want to. You will not be prejudiced in any way for making such a choice and it will not in any way influence the management of your child.

BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA 26 SEP 2023 RESEARCH ETHICS COMMITTEE

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-184

MBER:

Who do I ask/call if I have questions or a problem?

Include contact for the researcher, and Chairperson, BSU-REC.

Dr. Godfrey Zaari
Rukundo Chairman, BSU-
REC
P.O. Box 09
Mbarara Tel:
0772663671

Leave blank for REC office only: **BSU-REC Stamp:** BISHOP STUART UNIVERSITY P.O.BOX 09. MBARARA RESEARCH ETHICS COMMITTEE 28 SEP 2023	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-154

MBER:

What does your signature or thumbprint on this consent form mean?

Your signature on this form means

- You have been informed about this study's purpose, procedures, possible benefits and risks
- You have been given the chance to ask questions before you sign
- You have voluntarily agreed to be in this study

Name of adult participant	Signature of participant or Legally authorized representative	Date
_Name of person obtaining consent	Signature	Date
Print Name of witness	Signature or thumbprint or mark	Date

Leave blank for REC office only: **BSU-REC Stamp:** BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA RESEARCH ETHICS COMMITTEE 28 SEP 2023	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-184

MBER:

Appendix VII: Assent form ENGLISH

BISHOP STUART UNIVERSITY

RESEARCH ETHICS COMMITTEE

P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468 E-mail: rec@bsu.ac.ug

ASSENT FORM

This document outlines the research study and expectations for potential participants. It should be written in lay man terms and typed on BSU-REC letterhead.

Instructions

1. The wording of this document should be directed to the potential participant not BSU-REC.
2. If a technical term must be used, then define it the first time it is used and any acronyms or abbreviations used should be spelled out the first time they are used.
3. All the sections of this document must be completed without any editing or deletions.
4. Please use a typing font that is easily distinguishable from the questions of this form. Preferably the font size should be 12.

Study title:

Elevated blood pressure and hypertension among children and adolescents with Diabetes mellitus at three Ugandan regional referral hospitals: prevalence, associated factors and Glycemic control

Principle investigator

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Dr Charles Mwendwa Mutisya

Introduction

What you should know about this study:

1. You are being asked to join a research study.
2. This assent form explains the research study and your part in the study.
3. Please read it carefully and take as much time as you need
4. You are a volunteer. You can choose not to take part and if you join, you may quit at any time. There will be no penalty if you decide to quit the study.

Brief background to the study

Co-occurrence of diabetes and hypertension has been linked to worse clinical outcomes in terms of both microvascular and macrovascular disease. (Khangura DS, Waqar Salam M, Brietzke SA, 2018). Diabetes and HTA raise mortality risk by 7.2 times, with developing nations having a greater death rate. (Vargas-Uricoechea & Cáceres-Acosta, 2018). Therefore, a comprehensive strategy focusing on frequent blood pressure monitoring and glucose control should be used to manage diabetes.

Previous study in Uganda reported a high prevalence of Hypertension and described factors associated with hypertension among patients with diabetes mellitus (Muddu et al., 2018). However, children and teenagers with diabetes mellitus were not included in that study this
Leaves a knowledge gap about the prevalence and risk factors for high blood pressure in children and adolescents with type 1 diabetes and this study will be aiming to close this gap

Purpose of the research project

To establish Elevated blood pressure and hypertension among children and adolescents with Diabetes Mellitus at three Ugandan Regional Referral Hospitals: Prevalence, associated factors and Glycemic control. Estimated number of the participants are 136 and the duration are three months.

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Why you are being asked to participate?

Because patients in my study with diabetes are at risk of hypertension because of constant elevated high blood glucose

Procedures

Following this interview height weight and blood pressure of your child will be taken. In addition, blood sample of your child will be collected and taken for HbA1c.

Risks or discomforts

There will be no predicted risks to you and your baby other than little pain and discomfort during collection of blood sample

Benefits

This study will fill the gap of knowledge on Elevated blood pressure and hypertension among children with Diabetes mellitus at three Ugandan regional referral hospitals: prevalence, associated factors and Glycemic control. All laboratory investigations will be free of charge and their findings will contribute to improve the patient's care and the researcher pays the fees for investigations

Incentives or rewards for participating

There will be no personal profit for taking part in this study

Protecting data confidentiality

To ensure confidentiality, the questioner will be taken out in the doctor's office in ward or OPD, where no one else will listen to it.

Protecting subject privacy during data collection

Only special recognition numbers will be operated for every contributor rather than of names. The consummated questionnaires including the data that you give will be retained below lock and key and gained only by the researcher.

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Right to refuse or withdraw

Taking part of this study is elective. You are free to leave from the study at any time you want, And reject to response any questions that you do not want

What happens if you leave the study?

Your choice to or not to take part in this study is entirely voluntary. You are free to leave from the study at any time if you select to and to reject to respond any questions that you may not want to. You will not be prejudiced in any way for making such a choice and it will not in any way influence the management of your child.

Who do I ask/call if I have questions or a problem?

Include contact for the researcher, and Chairperson, BSU-REC.

Dr. Godfrey Zaari
Rukundo Chairman, BSU-
REC
P.O. Box 09
Mbarara Tel:
0772663671

Principle
Investigator

Dr charles
mwendwa mutisya
TEL. 0706751033

Email: hilaac2018@gmail.com

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Statement of Consent

I have been informed about this study's purpose, procedures, possible benefits and risks

I have been given the chance to ask questions before you sign

I have voluntarily agreed to be in this study

Name of Parent Signature of parent Date

_____ _____ _____

Print name of young participant Signature of young participant Date

Researcher's Signature

I have fully explained the research study described by this form. I have answered the participant and/or parent/guardians questions and will answer any future questions to the best of my ability. I will tell the family and/or the person taking part in this research of any changes in the procedures or in the possible harms/possible benefits of the study that may affect their health or their willingness to stay in the study.

_____ _____ _____

Name of researcher Signature Date

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Appendix VIII: English Questionnaire

SECTION A: SOCIODEMOGRAPHIC DATA (ENGLISH QUESTIONNAIRE)

1. Age of the child (in months):……..Date of birth ……..
2. What is the sex of your child?
   Male ☐ Female ☐
3. What is the type of school Type of school
   Day scholar ☐ boarding school ☐ N/A ☐
4. Age of the caregiver
   ……
5. Residence: Rural ☐ Urban ☐
6. Caregivers monthly income: No assured income ☐ <200,00 ☐ 200,00-500,000 ☐
   500,000-1M ☐ >1M ☐
7. What is your religion?
   Catholic ☐ Protestant ☐ Pentecostal ☐ SDA ☐ Others:.....
8. What is your level of education?
   No formal education ☐ Primary ☐ Secondary ☐ Tertiary ☐
9. What is your occupation?
   ……

SECTION B: MEDICAL DATA

10. How long have you had diabetes ?..... years
11. Most recent RBS……..
12. HBA1c……
13. Current antidiabetic treatment: Insulin ☐ Oral hypoglycemic ☐ Both ☐
14. Who administers medication? Self ☐ Caretaker ☐
15. Have you ever been in any diabetic program? Yes ☐ No ☐
16. Does the child take the antidiabetics as recommended always? Yes ☐ No ☐

BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE

42

17.Family history of DM Yes ☐ No☐

18.Have you experienced any complications of diabetes Yes ☐No☐

19.If yes in 15, above, which complication?.....

20.Have you ever been admitted due to a complication of diabetes? Yes ☐ No☐

21.Family history of Obesity: Yes ☐ No☐

22.Family history of hypertension: Yes ☐ No☐

23.Family history of renal disease Yes ☐ No☐

24.Weight....., height/length..... MUAC.....

25.Weight for height/length Z category.....

26.BMI.....

27.BMI Category .....

28.Nutritional status Overweight☐ Obese☐ Normal☐ Underweight☐

SECTION C: DIET AND BEHAVIOR FACTORS

29.Do you eat refined foods Yes ☐No☐

30.Do you drink Sweetened drinks Yes ☐ No☐

31.Do you do physical excises every day? Yes ☐ No☐

32.Are you currently taking any steroid medication like dexamethasone, prednisolone or hydrocortisone? Yes ☐ No☐

33.Have you ever been diagnosed with any genetic disorder? Yes ☐ No☐

SECTION D: BLOOD PRESSURE

34.SBP1..... SBP2..... SBP3..... Average SBP.....

35.DBP1.....DBP2.....DBP3..... Average DBP.....

36.Blood pressure category

Normotensive☐ Elevated BP☐ Hypertensive☐



Appendix IX: Lugisu Informed consent

BISHOP STUART UNIVERSITY

RESEARCH ETHICS COMMITTEE

P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468 E-mail: rec@bsu.ac.ug

LUPURUPUSI LWE KHUFUKILISANA NI'UMULWALE KHUMUKAANGA OBA TAAWE

Lupurupusi luno lurumbula lukhalala lwe byekhuwetselesaho Ni byesi khusubila khukhwama mubeminilemo babanyalisa. Lwakhila khuronewa mululimi lwabushele ate tsinyukuta tsakhila khurubukhilila.

Byekhulondelela

1. Burone bwe lupurupusi luno bwakhila khutsya isi Ibo babeminilemo babanyalisa, Ili isi BSU-REC tawe.
2. Nga shilomo shikhategelelekha mangu tawe sharambisiwile kulundu kumukiboole, nyowa ushinyonyole no, ninabyo byoronele mubwimbi byakhila khunyonyolewa machiboole.
3. Bisitsya byosi mu lupurupusi luno byakhila khumaliwa nga mbawo shoshusilemo oba warusamo ta.
4. Nakhwikotselele, rambisa tsinyukuta tsinyalisibwa khusomewa bulayi.

KUMURWE KWEKHUSOMAKHO:

Khukwiyongela khwapresha uwe kamafuki Ni mumisuwa mumakangilo kataru ke angaki mw nambo Uganda: injeli isi bibonekhesamo, bubonelo byomanyilakho Ni injeli iye khubushendesakho mu mafuki.

Umuwetselesi

Dr Charles Mwendwa Mutisya

Khukhwanjula kumurwe

Shesi wakhila khumanya mukhuwetselesa khuno:

1. Wasabiwile khukhwigata khu musomo kwekhuwetselesakho.
2. Lupurupusi luno lunyonyola khuwetselesa khwo Ni kumulimo kwokholele.
3. Nakhwikotselele soma nikhukhwimenyelesa ate uyile imbuka yowo impala.
4. Wewe uli umuyeti. Unyala wakhalawo khutakhwiminilamo ta ate nga wingilemo unyala wakhalawo khulekha imbuka yoosi. Mbawo umundu unakhukhalila kumusango nga walekhele ta

She khubamanyisakho mu musomo kuno mubwimbi.

Khubonekhesewa khwelufu lwasukali ni presha kumulundu mutwela sharerere tsimbela tsitsiyembelesa khukhwamilamo nga tsifu tsekamafuki. Lufu lwa sukali ni presha tsongesa khufwa chimuilundu 7.2, mumanambo kaka khutsowatsowana khufwa khukali. (Vargas-Uricoechea & Cáceres-Acosta, 2018). Nashiryo khukwofasa khukali khwakhila khuba nabi mukhulolelela presha iye kamafuki Ni byendya khushendesakho lufu lwasukali.

Khuwetselesewa khukhwabelewo myi nambo Uganda khwokesa khurubukhilila khwe lufu lwa presha amala khwanyonyola, ni byesi ubonelaho mubalwale bali ni lufu lwa sukali (Muddu et al., 2018). Lwankubade babana babali ni kimiko 19 khukhwila asi biminila mu khuwetselesawa khuno ta. Ari shino shilekhawo lipongo lyekhumanya khubonekhesewa ni khukhwiyembelesa khwesi lufu lwa presha mubana ni bafubukha bashili, babali ni lufu lwa sukali, ari khuwetselesewa khuno khuliwo khukhwikala lipongo lino.

Shitsilililwa she khuwetselesa.

Khumanya khulufu presha lulwiyongele nabi mubana bali ni lufu lwasukali mumakangilo kataru ke angaki mwi nambo Uganda, injeli yesi yirubuhilisiwa mubandu, byesi ubonelakho ni injeli iyekhushendesa sukali yuno mumafuki. Inamba iye batsa khwiminilamo ili 136 mumbuka iye kimwesi kitaru.

Khulwashina usabiwile khukhwiminilamo?

Lwekhuba mukhu wetselesewa khwase, babandu bsbali ni lufu lwa sukali bali khubunkenke bwekhuba ni lufu lwa presha, lwasukali umukali mu mafuki.

Bwekhulondelela.

Khulondelela khuwetselesewa khuno, buleyi, busiro ni presha iye kamafuki ko'mwana binaronewa bitsye byofasiwe.

Bunkenke oba khukhwiwulila bubi.

Inabawo bunkenke byosi bunakhwolakho oba khumwana wowo taa akhali bulumi bukyekhe bwesi unyala wiwulila nga khuli khukhurusakho kamafuki kekhupima.

Byekhufunamo.

Khuwetselesa khuno khunitsusa lipongo lye khumanya khu presha uwe'ankaki mumafuki ke babaana babali ni lifu lwasukali mumakangilo kataru ke angaki mwi nambo Uganda: Injeli isi bubonekhesewamo, byesi ubonelakho ni injeli iye khubushendesakho mu mafuki.

Byekhuwetselesaho byosi byabusa ate bibyamamo biyeta umulwale khumanya byebulamu bwewe ate nu'likhuwetselesa asasula khawumule khe khuwetselesa.

Kumukabo kwekhukhwiminilamo.
Mbawo bye khufunamo Inga umundu mukhuwetselesa khuno ta.

Khulinda bibyama.
Mukhulinda bibyama, lupurupusi luno kane lurusiwe mu yafesi iyo'musawu luyiliwe isi umundu ukundi akhanyala walusoma ta oba wawulilisa byesi mulikhukanikha ta.

Khulinda bibyama byo'yo isi ulikhureba.
Byosi byesi kane yesi khurebele akhuwe nanalindiwa khuta khumanyiwa ni babandu babandi ta.

Lukusa lwekhuloba khukhwiminilamo.
Khukhwiminila mumusomo kuno wamwene niye ukhalawo ate imbuka yosi isi ukanila khururamo mbawo buwangafu ta, yade nga birebo bilala nga wiwulila ukana Khukhwilamo tawe, nasho ikhukhuminilisa tawe.

Shishikholekha nga walekhele khukhwiminila mu khuwetselesewakhuno?
Khuli khulawo khwowo khukhwiminila mumusomo oba ta, ari mbawo unakhukhalila kumusango nga walekhele ta, oba walobele umwana wowo khuwetselesewakho.

Nanu isi inyala nareba oba napila khasiimu nga indikho nishirebo oba buwangafu bwosi?

Wakhila khugatamo Inamba ya nashitsyolongo umukhulu uwa BSU-REC.

Dr. Godfrey Zaari
Rukundo Nashitsyolongo
uwa BSU-REC
P.O. Box 09
Mbarara Tel:
0772663671

Shina shesi shangumu khu lupurupusi luno shimanyisa?

Shangumusho khurupurupusi luno shimanyisa:

- Bakhumanyisile shitsilililwa she kumusomo, injeli yesi batsa khushikholamo, bibyamamo, ni bulumi bunyala bwamilamo.

- Wawebwele ikhabi iye khureba birebo nga ushili khurakho shangumu khu lupurupusi luno ta.
- Wafukilisile khukhwiminila mukhuwetselesa khuno mubutongole.

_ _ _ _

Appendix X: Lugisu Assent Form

BISHOP STUART UNIVERSITY
RESEARCH ETHICS COMMITTEE
P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468
E-mail: rec@bsu.ac.ug

LUPURUPUSI LWE KHUFUKILISANA NI'UMULWALE KHUMUKAANGA OBA TAAWE

Lupurupusi luno lurumbula lukhalala lwe byekhuwetselesaho ni byesi khusubila khukhwama mubeminilemo babanyalisa. Lwakhila khuronewa mululimi lwabushele ate tsinyukuta tsakhila khurubukhilila.

Byekhulondelela

Burone bwe lupurupusi luno bwakhila khutsya isi ibo babeminilemo babanyalisa, ili isi BSU-REC tawe..

Nga shilomo shikhategelelekha mangu tawe sharambisiwile kulundu kumukiboole, nyowa ushinyonyole no, ninabyo byoronele mubwimbi byakhila khunyonyolewa machiboole.

Bisitsya byosi mu lupurupusi luno byakhila khumaliwa nga mbawo shoshusilemo oba warusamo ta.

Nakhwikotselele, rambisa tsinyukuta tsinyalisibwa khusomewa bulayi.

KUMURWE KWEKHUSOMAKHO:

Khukwiyongela khwapresha uwe kamafuki ni mumisuwa mumakangilo kataru ke angaki mw nambo Uganda: injeli isi bibonekhesamo, bubonelo byomanyilakho ni injeli iye khubushendesakho mu mafuki.

Umuwetselesi

Dr Charles Mwendwa Mutisya

Leave blank for REC office only: BSU-REC Stamp:	REC OFFICE USE ONLY: APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Khukhwanjula kumurwe

Shesi wakhila khumanya mukhuwetselesa khuno:

Wasabiwile khukhwigata khu musomo kwekhuwetselesakho.

Lupurupusi luno lunyonyola khuwetselesa khwo ni kumulimo kwokholele.

Nakhwikotselele soma nikhukhwimenyelesa ate uyile imbuka yowo impala.

Wewe uli umuyeti. Unyala wakhalawo khutakhwiminilamo ta ate nga wingilemo unyala wakhalawo khulekha imbuka yoosi. Mbawo umundu unakhukhalila kumusango nga walekhele ta.

She khubamanyisakho mu musomo kuno mubwimbi.

Khubonekhesewa khwelufu Iwasukali ni presha kumulundu mutwela sharerere tsimbela tsitsiyembelesa khukhwamilamo nga tsifu tsekamafuki. Lufu lwa sukali ni presha tsongesa khufwa chimuilundu 7.2, mumanambo kaka khutsowatsowana khufwa khukali. (Vargas-Uricoechea & Caceres-Acosta, 2018). Nashiryo khukwofasa khukali khwakhila khuba nabi mukhulolelela presha iye kamafuki ni byendya khushendesakho lufu lwasukali. Khuwetselesewa khukhwabelewo myi nambo Uganda khwokesa khurubukhilila khwe lufu lwa presha amala khwanyonyola, ni byesi ubonelaho mubalwale bali ni lufu lwa sukali (Muddu et al., 2018). Lwankubade babana babali ni kimiko 19 khukhwila asi biminila mu khuwetselesawa khuno ta. Ari shino shilekhawo lipongo lyekhumanya khubonekhesewa ni khukhwiyembelesa khwesi lufu lwa presha mubana ni bafubukha bashili, babali ni lufu lwa sukali, ari khuwetselesewa khuno khuliwo khukhwikala lipongo lino.

Litsilililwa she khuwetselesa.

Khumanya khulufu presha lulwiyongele nabi mubana bali ni lufu lwasukali mumakangilo kataru ke angaki mwi nambo Uganda, injeli yesi yirubuhilisiwa mubandu, byesi ubonelakho ni injeli iyekhushendesa sukali yuno mumafuki. Inamba iye batsa khwiminilamo ili 136 mumbuka iye kimwesi kitaru.

Leave blank for REC office only: BSU-REC Stamp:	REC OFFICE USE ONLY: APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Khulwashina usabiwile khukhwiminilamo?

Lwekhuba mukhu wetselesewa khwase, babandu bsbali ni lufu lwa sukali bali khubunkenke bwekhuba ni lufu lwa presha, lwasukali umukali mu mafuki.

Bwekhulondelela.

Khulondelela khuwetselesewa khuno, buleyi, busiro ni presha iye kamafuki ko'mwana binaronewa bitsye byofasiwe.

Bunkenke oba khukhwiwulila bubi.

Inabawo bunkenke byosi bunakhwolakho oba khumwana wowo taa akhali bulumi bukyekhe bwesi unyala wiwulila nga khuli khukhurusakho kamafuki kekhupima.

Byekhufunamo.

Khuwetselesa khuno khunitsusa lipongo lye khumanya khu presha uwe'ankaki mumafuki ke babaana babali ni lifu lwasukali mumakangilo kataru ke angaki mwi nambo Uganda: Injeli isi bubonekhesewamo, byesi ubonelakho ni injeli iye khubushendesakho mu mafuki. Byekhuwetselesaho byosi byabusa ate bibyamamo biyeta umulwale khumanya byebulamu bwewe ate nu'likhuwetselesa asasula khawumule khe khuwetselesa.

Kumukabo kwekhukhwiminilamo.

Mbawo bye khufunamo Inga umundu mukhuwetselesa khuno ta.

Khulinda bibyama.

Mukhulinda bibyama, lupurupusi luno kane lurusiwe mu yafesi iyo'musawu luyiliwe isi umundu ukundi akhanyala walusoma ta oba wawulilisa byesi mulikhukanikha ta.

Khulinda bibyama byo'yo isi ulikhureba.

Byosi byesi kane yesi khurebele akhuwe nanalindiwa khuta khumanyiwa ni babandu babandi ta.

Leave blank for REC office only: BSU-REC Stamp:	REC OFFICE USE ONLY: APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Lukusa lwekhuloba khukhwiminilamo.

Khukhwiminila mumusomo kuno wamwene niye ukhalawo ate imbuka yosi isi ukanila khururamo mbawo buwangafu ta, yade nga birebo bilala nga wiwulila ukana Khukhwilamo tawe, nasho ikhukhuminilisa tawe.

Shishikholekha nga walekhele khukhwiminila mu khuwetselesewakhuno?

Khuli khulawo khwowo khukhwiminila mumusomo oba ta, ari mbawo unakhukhalila kumusango nga walekhele ta, oba walobele umwana wowo khuwetselesewakho.

Nanu isi inyala nareba oba napila khasiimu nga indikho nishirebo oba buwangafu bwosi?

Wakhila khugatamo Inamba ya nashitsyolongo umukhulu uwa BSU-REC.

Dr. Godfrey Zaari Rukundo Nashitsyolongo uwa BSU- REC

P.O. Box 09 Mbarara Tel: 0772663671

Shina shesi shangumu khu lupurupusi luno shimanyisa?

Shangumusho khurupurupusi luno shimanyisa:

Bakhumanyisile shitsilililwa she kumusomo,injeli yesi batsa khushikholamo, bibyamamo, ni bulumi bunyala bwamilamo.

Wawebwele ikhabi iye khureba birebo nga ushili khurakho shangumu khu lupurupusi luno ta.

Wafukilisile khukhwiminila mukhuwetselesa khuno mubutongole.

Leave blank for REC office only: BSU-REC Stamp:	REC OFFICE USE ONLY: APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Lisina lyo mukhulu uwiminilemo Shangumu shayo uwinilemo oba

Tsinakhu yesi bisigile khushikhilila Lisina

_____ _____

lyo'mundu ukhurakho shangumu Tsinakhu tse khufuki lisana

_____ _____ _____

Lisina lyo'mujulizi Kumukhono oba shangumu Tsinakhu

Leave blank for REC office only: BSU-REC Stamp:	REC OFFICE USE ONLY: APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Appendix XI: Lugisu Questionnaire

SHISITSYA A : BIBIBAWAMBAKHO

1. Bukhulubwo'mwana(mumwesi):.....Tsinakhutse asalikhilaho.....
2. Umwana uwengana namwe uwesinde ?
   Uwesindee Uwengana
3. Lisomelo lyeshikha shina isi asomela ?
   Lyekhulota ingo lyekhukona iwene Nga sasoma ta
4. Kimiko kyoyo ulabilila umwana
   .....
5. Bumenyelo: Mushalo ☐ Mushirimba ☐
6. Silingi tsesi ulabilila umwana afuna mumweesi: mbawo tsesi asubila taa☐ <200,000☐
   200,000-500,000☐500,000-1M☐ >1M☐
7. Uli uwe idini shina ?
   Umukatuliki ☐ Umuprotestant☐ Umulokole Umuseventh day Ichindi busa:.....
8. Busomi bwowo bubufurayo nibwo buli ?
   Wakhutsyakho isomeelo taa ☐ Primary ☐ Secondary☐
   Wakholakho ikoosi yoosi
9. Uramba mulimo shina ?
   .....

SHISITSYA B: BYEBULAMU BIBIKHUWAMBAKHO

10. Wamalile imbuka shina nga uli nilufu lwasukali luno ?..... kimiko
11. Most recent RBS.....
12. Bujanjabi bwesi abe ulikho: Insulin☐ Oral hypoglycemic☐ Kositsyana☐



51

13. Nanu ukhuwa bujanjabi? Wamwene☐ Ukhulabilila☐

14. Wabatsakakho mundengekharengekha iye lufu lwasukali ? Eeh ☐ Tawe☐

15. Umwana amila kamasuswa ke lufu lwasukali nga bilakililo byomusawu biloma ? Eeh ☐ Tawe ☐

16. Iliwo uwabatsakakho ni lufu lwa sukali mubalebe ? Eeh ☐ Tawe ☐

17. Wayiwulilatsakakho bulumi bwe lufu lwa sukali? Eeh ☐ Tawe ☐

18. Nga eeh (mu 17), angaki wo, bulumi shina bwesi wiwulila ?.....

19. Wafunatsakakho bujanjabi mwikangilo khulwe bulumi bwesi wiwulila bwo ? Eeh ☐ Tawe ☐

20. Iliwo uwabatsakakho ni lufu lwa khuneraka busa mubalebe : Eeh ☐ Tawe ☐

21. Iliwo uwabatsakakho ni lufu lw…a presha iye angaki mumisuwa: Eeh ☐ Tawe ☐

22. Iliwo uwabatsakakho ni lufu lwe tsimbiko mubalebe Eeh ☐ Tawe ☐

23. Busiro……, buleyi…… MUAC…..

24. Busiro byomundu uli ni buleyi bwo …….

25. Shipimo she kiminawa kyemwibili ……..

26. Shikha she shipimo she kiminawa kyemwibili……

27. Intsimikha mu byekhulya Busiro bukali☐ Bunefu bukali☐ Nibwobubwenebwo☐ Busiro bukyekhe☐

SHISITSYA C: **INDYA NI NTSIBIRISA**

28. Bilyo bisye byosi ubilya Eeh ☐ Tawe ☐

29. Unwa byekhunwa bitokote Eeh ☐Tawe ☐

30. Kamakumba ke kumubili kwowo ukakololamo buli lunakhu ? Eeh ☐ Tawe ☐

31. Isi khulomela ano iliwo kamasuswa kakayengukhila mu minawa, nga prednisolone oba hydrocortisone? Eeh ☐ Tawe ☐

32. Bakhupimatsakakho bakhutwiyamo lufu lwosi lwe mumafuki ? Eeh ☐Tawe ☐

SHISITSYA D: **PRESHA IYE KAMAFUKI**



33. SBP1…….. SBP2…….. SBP3…… SBP iye akari…….

34. DBP1…….DBP2……..DBP3…… DBP iye akari …….

35. SHIKHA SHA PRESHA IYE KAMAFUKI

36.Injekhe ☐ Iye angaki ☐ Iye angaki naabi



Appendix XII: Lusoga Assent Form



BISHOP STUART UNIVERSITY
Akakiiko akagemagania empisa mubyokunonenkereza
P.O Box 09 Mbarara-Uganda Eisimu: +256 485-433468
E-mail: rec@bsu.ac.ug

EKIWAANDIIKO EKIRAGA NTI OIKIRIIZA EKWETABA MUMUSOMO GUNO

Kino ekiwandiiko kiraga omusoma mukunonenkereza nebintu abetabye mukunonenkereza kuno byebasuubira. Kirina okuwandikibwa mululimi omuntu wabuliidho lwategeera era bakite ku bbaluwa ya BSU-REC.

Endagiriro.

Ebigambo ebyekiwaandiiko kino biragirirwa eri omuntu eyetabye muluno olusomo, aye ti BSU-REC

Ekigambo ekyikalangufu wekiba kikozeseibwa, inonola amakulu gaakyo nga wankamala okukikozesa era nebigambo byebawandiika mubumpimpi , olina okubinonola amakulu gaabyo nga wankabikozesa.

Buli bitundutundu mukino ekiwandiiko birina okwiduzibwamu nga tobitoiremu oba okukyuusa byebitegeeza.

Kozesa obunene obwebigambo obusobola okwawulibwa kubibuuzo mukino ekiwandiiko; obunene bwandibaire 12.

Omutwe gwomusomo

Okweyongera kwapuleesa yomusaayi mubaana abalwaire ba sukaali mumalwaliro amanene . amasatu.

Obunji, ebintu ebireetera, nokwikaikania sukaali

Akulira

Otawandiikawo kintu kyona kyona, wa ofiisi	WAKUKOZESEBWA OFIISI YA REC

ya REC: Sitampu ya BSU-REC	ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Okwandula

Kyolina okutegeera ku musomo guno

Osabiibwa okwingira mumusomo guno ogunonenkereza

Kino ekiwandiiko kinonola omusomo gwokunonenkereza era nikyolina okukola mumusomo.

Kisome bulunji era otwale obwire bwona bwona bwoyenda.

Oyambaku buyambe. Oyinza okusalawo obutenigiramu, era wooba nga oyingiiremu, osobola okuvaamu saawa yona yona yoyenze. Tibajakukubonereza wosalawo okuva mumusomo guno.

Ebitonotono ebigema kumusomo guno

Okubaawo wa sukaali ni puleesa omulundi omulala bakigemagainia ku bijakwolekebwa mumuntu mungeri yobulwaire obukosa emisiwa eminene nobusiwa obutono. (Khangura et al., 2018). Sukaali nipuleesa bipuleesa biniiniiza emikisa jokufa emirundi 7.2, nga era amawanga agali kukulankulana nagalina abantu abasinga okufa. (Vargas-Uricoechea & Caceres-Acosta, 2018). Nolwekyo, okutegeka okulunji okuluubirirwa okwetegereza puleesa ni sukaali kulina okukozesebwa mukwidandaba sukaali.

Okusoma okwasembayo mu Uganda kwaalopa obunji bwabalwaire bapuleesa era bainonola ebintu ebiviiraku puleesa mubalwaire abalina sukaali. (Muddu et al., 2018).

Aye, abaana abalina sukaali tibaabataamu muguno omusomo. Kino kirekawo eibanga mukutegeera kwobunji nebintu ebisobola okuvaaku puleesa mubaana naabavubuka abalina ekika kyasukaali ekisooka era guno omusomo gulija kuluubirirwa okwigalawo eibaanga lino.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC:	WAKUKOZESEBWA OFIISI YA REC

Sitampu ya BSU-REC	ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Ekirubirirwa kyokunonenkereza kuno

Kuzuula puleesa mubaana abalina sukaali mumalwaliro amanene amasatu: obunji, ebintu ebisobola okuvaaku sukaali, nokwikaikania sukaali. Abantu abasuubirwa okwetaba muguno omusomo bali 136, mwibbanga lyamyeezi esatu.

Lwaki osabiibwa okwenigira mumusomo guno?

Kubanga abalwaire mumusomo gwange abalina sukaali basobola okufuna puleesa olwasukaali mumubiri okuba waigulu buli kiseera.

Engeri yekirija okolebwaamu

Nga okubuuzibwa kuwoire, obuleeyi, obuzito, ni puleesa yomwana balija kubipima. Ekindi, omusaayi gwomwana gulija kubatoolebwaaku gutwalibwe mu laabu okukeberebwa.

Ebunkenke oba ebiyinza okukukalubiriza

Tiwaja kubaawo bunkenke bwona bwona yooli nomwanawo okutolaku obulumi bwajokufuna nga bamutoolaku omusaayi.

Ebyokuganulwamu

Kuno okusoma kulija kwigalawo amabaanga agabairewo mukutegeera puleesa mubaana abalwaire basukaali mumalwaliro amasatu amanene mu Uganda: obinji, ebireetera, nokwikaikania sukaali mumubiri. Okunonnenkereza kwa laabu kujakuba kwa bwereere, era ebiviiremu bijakuyambaku okwongera mukulabirira omulwaire. Era anonenkereza ajakusasulira ebisale mukunonenkereza.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC:	WAKUKOZESEBWA OFIISI YA REC ENNAKU DEBAJIKIRIIZAKU:

Sitampu ya BSU-REC	NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Okusasulira okwetaba mumusomo

Tiwajakubaawo magoba mukwetaba mumusomo guno

Okukuuma ebyaama

Okukakasa okukuuma ebyaama, omuntu ajakutwalibwa kuluya, mu yafeesi yomusawo ku woodi oba OPD, nga ezira muntu yena yena aja okuwulirisa.

Okukuuma obwananyini nga tusoloza obubaka

Namba donka nedirija okukozesebwa, nga timaina. Nebiwandiiko ebirija okukozesebwa birikuja kubonebwa anonenkereza yenka.

Eidembe okudeema oba okuvaamu.

Okuba kulusoma luno kyabweyendere. Osobola okukuvaamu kusaawa yona yona joyenze, era osobola okudeema okwiramu ebibuuzo byotenze.

Ki ekibaawo nga oviire mulusomo luno?

Okusalawo okwenigira oba obutenigira mulusomo luno kiri eri iwe. Osobola okuva mulusomo luno, era nobutairamu bibuuzo byotenze.

Tolikuja kubonerezebwa olwokusalawo kwonasalawo era tikuja kukosa engeri omwanawo yalikuja okwidandabibwamu.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC:	WAKUKOZESEBWA OFIISI YA REC

Sitampu ya BSU-REC	ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Naani gwembuuza oba gwenkubira nga nnina ekibuuzo oba ekizibu?

Taamu empulizigania yanonenkereza, sentebe, BSU-REC.

Dr. Godfrey Zaari Rukundo Chairman, BSU-REC P.O. Box 09 Mbarara

Tel: 0772663671

Omukonogwo oba ekinkumukyo kitegezaaki kukiwandiiko kino?

Omukonogwo kukiwandiiko kino gutegeeza

Otegezeibwa omugaso gwomusomo guno, engeri ebintu jebirija okutambulamu, byoja okuganulwamu nebiyinza okukukosa

Owereibwa omukisa okubuuza ebibuuzo nga okaali kutaaku mukono.

Oikiriiza okwetaba mumusomo guno awazira kukusasula.

Eriina lyomuntu omukulu Omukono gwomuntu Ennaku domwezi Eyetabye mumusomo eyetabye mumusomo

Eriina lyoyo alikusaba Omukono Ennaku domwezi

Olukusa

Eriina lyomudulizi Omukono oba ekinkumu Ennaku domwezi.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC:	WAKUKOZESEBWA OFIISI YA REC ENNAKU DEBAJIKIRIIZAKU:

Sitampu ya BSU-REC	NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Appendix XIII: Lango Assent consent

BISHOP STUART UNIVERSITY

RESEARCH ETHICS COMMITTEE

P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468 E-mail: rec@bsu.ac.ug

WARIGA AME MII INYANG ITE YEE

Balu man mio ngec akwako ikweda man kede gamo tam ajoo ame tye iyi ikweda man. Myero ocoo iyore ame dano room nyang kede kite ame dul odiro me ikweda me BishopSuard University mito kede (BSU-REC letterhead).

Jami me aluba

1. Ngec iyi wariga man myero cwal bot joo ame oye ni ikweda man tim ikomgi pe bot BSU- REC.
2. Ka ginoro ame nyango tek ocoo iyi balu man myero gony tere con iyi acaki me tic kede kede ka imito kobo ginoro iyo acek myero kong icoo oko ducu tyen me acel apwod pe icoo iyo acek.
3. Pat ducu ame tye iyi balu man myero tyek pongo aber abongo yiko onyo rwenyo kinoro keken iye.
4. Okwai me tic kede cagi me nyukta ame pokere kede en ame tye iyi apeny ame tye ibalu man. Aberere myero cagi 12 me nyukta.

Wii kwed man:

Pressa ame tye malu kede two pressa ikom otino ame tye kede two cukari ame tye idakatale a dek adongo me Uganda. TySe mere, jami ame kelo kede kite me gwoko lebul me cukari.

Atim ikweda man

Dr Charles Mwendwa Mutisya

Wie adongo mere

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Gin amyero inge ame lubere kede ikweda man:

1. Yin okwai me donyo ikwed man.
2. Wariga ame mii nyang eka kite yee ni mii inyang atut ikom ikweda man kede gin ame yin itimo iyi ikweda man.
3. Dong okwai me tero cawa alalac me kwano kun inyang aber.
4. Yin ibedo dano ame ojale ajala, dong ame iromo yero me donyo iyi ikweda man onyo akadi kono bedi idonyo itwero yaa weko ikweda man icawa moro keken ame cunyi winyo abongo pwodoro keken.

Ngec ace kame kwako ikweda man

Kubere iyia akina two cukari kede twoo pressa kelo cango agoro iyia akina ler atino kede en adongoame cwalo remo iyunge treatmen. (Khangura DS, Waqar Salam M, Brietzke SA, 2018).cukari kede pressa medo rwom me too kede 7.2 twal iyi akina lobe ame pwod tye adongadonga. (Vargas-Uricoechea & Cáceres-Acosta, 2018).En omio yo opore ame neon pressa adano kede cukari myero tekede me gengo.

Ikweda ame otimo con iyi Uganda nyuto dwong atwoo pressa kede jami mogo ame kelo pressa iyiakina joo ame tye kede two cukari (Muddu et al., 2018). Akadi kono bedamanono otino kede ojarawe onwongo pe oketo gi iyi ikweda ame otimo coniHowever, man mio ngec ame myero mok tye atwo pressa kede jami mogo ame kelo two pressa iyi akina joo ame tye kede two cukari me acel bot otino kede ojarawe dong ame pe ongeo, man enamio ikweda man ka omede anyim bino yaro ngec ameoyemi kanaler

Tam ame tye iyi ikweda man

Me nyang atut ikom mede apressa malu kede two pressa iyia akina otino ame tye kede two cukari me ace lame tye idakatale adek adongo me lobo Uganda: tye mere, jami ame kelo kedegwoko joo

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

ame tye kede cukari. Wel joo ame room 136 en aye tye amite me kwed man myero tim ikomgi kun bino tero dwete ame room adek.

Pingo omio yin okwai me tim ikweda man ikomi?

Pyen otwoe ame tye kede cukari iyi ikweda man tye kede gum adwong me bedo kede two pressa kede rwom me cukari ame bedo malu ikare ducu

Gin ame atiye ene

Alubere kede jami magi, borere, pekere kede pressa atini obino kwanyo. Medo ikom jami no remo atini dang obino kwanyo ote tero ilaboratory me apima.

Racere

Pet ye ginoro ame ogeso ni bino timere arac ikomi kede ikom atini apat ka kede arem moro anonok ame ibino nwongo icawa ame otikakwanyo remo ni.

Berere

Ikweda man tye me culu kaka ngec ame orem ikom gin ame mio pressa bedo malu kede two pressa iyia akina otino ame tye kede two cukari iyi dakatale adek adongo ame tye iuganda.tye mere, jami ame kelo kede gwoko joo ame cukari gi tye malu . pimere ducu me laboratory tye me nono , adwoki apimere man bino konyo atek pi gwoko otwoe kede me konyo atimikweda man me culu cente ame otiokede me pimere.

Cul pi donyo iyi ikweda

Myero inge ni pe tye culoro keken ame ibino nwongo ka iye ni kwed man tim ikomi.

Gwoko imung me komdano

Me gwoko imungDano ame apenyo obino kwanyo ote tero opici adoctor kaname ngatoro pe awinyo kop ame en akobo.

Gwoko imung icawa me rayo ngec.

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Obino tic ka kede number ame ongeo Akaka nying dano. Ngec ame orao nibeo iyi apeny obino gamo eka ote pungo oko iot kun ame oyeyi ka dano ame tye atimo ikweda man me neon kene

Twero me kwero onyo yaa oko iyi ikweda

Donyo iyi ikwed man obedo gin ame yin iyiko apiri dang itye agonya me weko icawa moro keken ame cunyi mito kede dang me kwero gamo apenyor ame yin pe imito.

Ngo atimere ka iyaa oko iyi ikweda?

Obedo mite ni me bedo onyo me weko ikweda man abongo dicoro keken. Itye agonya me weko kede pe me gamo apenye mogo ame pe rwate kede wii. Pe ngatoro bino ngolikop onyo me balo treatmen atini.

Jo mene ame myero ipeny ka itye kede peko?

Gin en iping kani

Dr. Godfrey Zaari
Rukundo Chairman, BSU-
REC
P.O. Box 09
Mbarara Tel:
0772663671

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Signing cingi onyo diyo cingi iwariga me nyang iteyee tere ni ngo?

Nyutu jami magi

- Yin omii nyang atut akwako tam ikweda man yore ame bino timere kede, berere kede racere.
- Yin dang omii twero me penyo kit apenye mogo ame kwako ikweda man ame pwod pe isigning cingi.
- Yin dang ijale apiri me donyo ikwed man

_ _ _ _

- Yin omii nyang atut akwako tam ikweda man yore ame bino timere kede, berere kede racere.
- Yin dang omii twero me penyo kit apenye mogo ame kwako ikweda man ame pwod pe isigning cingi.
- Yin dang ijale apiri me donyo ikwed man

Nying dano adit ame oyee Cinge danono onyo cingata acunge Nino dwee

Nying dano ame ame amiyo nyangName cinge nino dwee

Prnying acaden cinge nino dwee

Leave blank for REC office only: **BSU-REC Stamp:**	**REC OFFICE USE ONLY:** APPROVAL DATE: APPROVED CONSENT IRB VERSION NUMBER: PI NAME: IRB NO:

Appendix XIV: Lango Informed consent

3

BISHOP STUART UNIVERSITY
RESEARCH ETHICS COMMITTEE
P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468 E-mail: rec@bsu.ac.ug

WARIGA AME MII INYANG ITE YEE

Balu man mio ngec akwako ikweda man kede gamo tam ajoo ame tye iyi ikweda man. Myero ocoo iyore ame dano room nyang kede kite ame dul odiro me ikweda me BishopSuard University mito kede(BSU-REC letterhead).

Jami me aluba

1. Ngec iyi wariga man myero cwal bot joo ame oye ni ikweda man tim ikomgi pe bot BSU- REC.
2. Ka ginoro ame nyango tek ocoo iyi balu man myero gony tere con iyi acaki me tic kede kede ka imito kobo ginoro iyo acek myero kong icoo oko ducu tyen me acel apwod pe icoo iyo acek .
3. Pat ducu ame tye iyi balu man myero tyek pongo aber abongo yiko onyo rwenyo kinoro keken iye.
4. Okwai me tic kede cagi me nyukta ame pokere kede en ame tye iyi apeny ame tye ibalu man. Aberere myero cagi 12 me nyukta.

Wii kwed man:

Pressa ame tye malu kede two pressa ikom otino ame tye kede two cukari ame tye idakatale a dek adongo me Uganda. TySe mere, jami ame kelo kede kite me gwoko lebul me cukari .

Atim ikweda man

Dr Charles Mwendwa Mutisya

Wie adongo mere

Gin amyero inge ame lubere kede ikweda man:

Leave blank for REC office only: BSU-REC Stamp: BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA RESEARCH ETHICS COMMITTEE 28 SEP 2023	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-164

57

1. Yin okwai me donyo ikwed man.
2. Wariga ame mii nyang eka kite yee ni mii inyang atut ikom ikweda man kede gin ame yin itimo iyi ikweda man.
3. Dong okwai me tero cawa alalac me kwano kun inyang aber.
4. Yin ibedo dano ame ojale ajala ,dong ame iromo yero me donyo iyi ikweda man onyo akadi kono bedi idonyo itwero yaa weko ikweda man icawa moro keken ame cunyi winyo abongo pwodoro keken.

Ngec ace kame kwako ikweda man

Kubere iyia akina two cukari kede twoo pressa kelo cango agoro iyia akina ler atino kede en adongoame cwalo remo iyunge treatmen. (Khangura et al., 2018).cukari kede pressa medo rwom me too kede 7.2 twal iyi akina lobe ame pwod tye adongadonga. (Vargas-Uricoechea & Cáceres-Acosta, 2018).En omio yo opore ame neon pressa adano kede cukari myero tekede me gengo.

Ikweda ame otimo con iyi Uganda nyuto dwong atwoo pressa kede jami mogo ame kelo pressa iyiakina joo ame tye kede two cukari (Muddu et al., 2018). Akadi kono bedamanono otino kede ojarawe onwongo pe oketo gi iyi ikweda ame otimo coniHowever, man mio ngec ame myero mok tye atwo pressa kede jami mogo ame kelo two pressa iyi akina joo ame tye kede two cukari me acel bot otino kede ojarawe dong ame pe ongeo, man enamio ikweda man ka omede anyim bino yaro ngec ameoyemi kanaler

Leave blank for REC office only: BISHOP STUART UNIVERSITY P.O BOX 09, MBARARA 28 SEP 2023 **BSU-REC Stamp:** RESEARCH ETHICS COMMITTEE	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-184

Tam ame tye iyi ikweda man

Me nyang atut ikom mede apressa malu kede two pressa iyia akina otino ame tye kede two cukari me ace lame tye idakatale adek adongo me lobo Uganda: tye mere , jami ame kelo kedegwoko joo ame tye kede cukari . wel joo ame room 136 en aye tye amite me kwed man myero tim ikomgi kun bino tero dwete ame room adek.

Pingo omio yin okwai me tim ikweda man ikomi?

Pyen otwoe ame tye kede cukari iyi ikweda man tye kede gum adwong me bedo kede two pressa kede rwom me cukari ame bedo malu ikare ducu

Gin ame atiye ene

Alubere kede jami magi, borere , pekere kede pressa atini obino kwanyo. Medo ikom jami no remo atini dang obino kwanyo ote tero ilaboratory me apima.

Racere

Pet ye ginoro ame ogeso ni bino timere arac ikomi kede ikom atini apat ka kede arem moro anonok ame ibino nwongo icawa ame otikakwanyo remo ni.

Berere

Ikweda man tye me culu kaka ngec ame orem ikom gin ame mio pressa bedo malu kede two pressa iyia akina otino ame tye kede two cukari iyi dakatale adek adongo ame tye iuganda.tye mere, jami ame kelo kede gwoko joo ame cukari gi tye malu . pimere ducu me laboratory tye me nono , adwoki apimere man bino konyo atek pi gwoko otwoe kede me konyo atimikweda man me culu cente ame otiokede me pimere.

Leave blank for REC office only: 28 SEP 2023 **BSU-REC Stamp:** BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA RESEARCH ETHICS COMMITTEE	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA **IRB NO:** BSU-REC-2023-184

Cul pi donyo iyi ikweda
Myero inge ni pe tye culoro keken ame ibino nwongo ka iye ni kwed man tim ikomi.

Gwoko imung me komdano
Me gwoko imungDano ame apenyo obino kwanyo ote tero opici adoctor kaname ngatoro pe awinyo kop ame en akobo..

Gwoko imung icawa me rayo ngec.
Obino tic ka kede number ame ongeo Akaka nying dano. Ngec ame orao nibeo iyi apeny obino gamo eka ote pungo oko iot kun ame oyeyi ka dano ame tye atimo ikweda man me neon kene

Twero me kwero onyo yaa oko iyi ikweda
Donyo iyi ikwed man obedo gin ame yin iyiko apiri dang itye agonya me weko icawa moro keken ame cunyi mito kede dang me kwero gamo apenyor ame yin pe imito.

Ngo atimere ka iyaa oko iyi ikweda?
Obedo mite ni me bedo onyo me weko ikweda man abongo dicoro keken. Itye agonya me weko kede pe me gamo apenye mogo ame pe rwate kede wii. Pe ngatoro bino ngolikop onyo me balo treatmen atini.

Leave blank for REC office only: **BSU-REC Stamp:** 28 SEP 2023 BISHOP STUART UNIVERSITY P.O.BOX 09 MBARARA (U) RESEARCH ETHICS COMMITTEE	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-184

Jo mene ame myero ipeny ka itye kede peko?

Gin en iping kani

Dr. Godfrey Zaari
Rukundo Chairman, BSU-
REC
P.O. Box 09
Mbarara Tel:
0772663671

Leave blank for REC office only: **BSU-REC Stamp:** BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-184

Signing cingi onyo diyo cingi iwariga me nyang iteyee tere ni ngo?

Nyutu jami magi

- Yin omii nyang atut akwako tam ikweda man yore ame bino timere kede, berere kede racere.
- Yin dang omii twero me penyo kit apenye mogo ame kwako ikweda man ame pwod pe isigning cingi.
- Yin dang ijale apiri me donyo ikwed man

Nying dano adit ame oyee	Cinge danono onyo ci ngata acunge	Nino dwee
_nying dano ame ame amiyo nyangName	cinge	nino dwee
Prnying acaden	cinge	nino dwee

Leave blank for REC office only: **BSU-REC Stamp:** BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE	**REC OFFICE USE ONLY:** APPROVAL DATE: 13/09/2023 APPROVED CONSENT IRB VERSION NUMBER: 1 PI NAME: CHARLES MWENDWA MUTISYA IRB NO: BSU-REC-2023-184

BISHOP STUART UNIVERSITY

RESEARCH ETHICS COMMITTEE

P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468 E-mail: rec@bsu.ac.ug

WARIGA AME MII INYANG ITE YEE

Balu man mio ngec akwako ikweda man kede gamo tam ajoo ame tye iyi ikweda man. Myero ocoo iyore ame dano room nyang kede kite ame dul odiro me ikweda me BishopSuard University mito kede (BSU-REC letterhead).

Jami me aluba

5. Ngec iyi wariga man myero cwal bot joo ame oye ni ikweda man tim ikomgi pe bot BSU- REC.
6. Ka ginoro ame nyango tek ocoo iyi balu man myero gony tere con iyi acaki me tic kede kede ka imito kobo ginoro iyo acek myero kong icoo oko ducu tyen me acel apwod pe icoo iyo acek.
7. Pat ducu ame tye iyi balu man myero tyek pongo aber abongo yiko onyo rwenyo kinoro keken iye.
8. Okwai me tic kede cagi me nyukta ame pokere kede en ame tye iyi apeny ame tye ibalu man. Aberere myero cagi 12 me nyukta.

Wii kwed man:

Pressa ame tye malu kede two pressa ikom otino ame tye kede two cukari ame tye idakatale a dek adongo me Uganda. TySe mere, jami ame kelo kede kite me gwoko lebul me cukari.

Atim ikweda man

Dr Charles Mwendwa Mutisya

Wie adongo mere

Gin amyero inge ame lubere kede ikweda man:

5. Yin okwai me donyo ikwed man.
6. Wariga ame mii nyang eka kite yee ni mii inyang atut ikom ikweda man kede gin ame yin itimo iyi ikweda man.
7. Dong okwai me tero cawa alalac me kwano kun inyang aber.
8. Yin ibedo dano ame ojale ajala, dong ame iromo yero me donyo iyi ikweda man onyo akadi kono bedi idonyo itwero yaa weko ikweda man icawa moro keken ame cunyi winyo abongo pwodoro keken.

Ngec ace kame kwako ikweda man

Kubere iyia akina two cukari kede twoo pressa kelo cango agoro iyia akina ler atino kede en adongoame cwalo remo iyunge treatmen. (Khangura DS, Waqar Salam M, Brietzke SA, 2018).cukari kede pressa medo rwom me too kede 7.2 twal iyi akina lobe ame pwod tye adongadonga. (Vargas-Uricoechea & Cáceres-Acosta, 2018).En omio yo opore ame neon pressa adano kede cukari myero tekede me gengo.

Ikweda ame otimo con iyi Uganda nyuto dwong atwoo pressa kede jami mogo ame kelo pressa iyiakina joo ame tye kede two cukari (Muddu et al., 2018). Akadi kono bedamanono otino kede ojarawe onwongo pe oketo gi iyi ikweda ame otimo coniHowever, man mio ngec ame myero mok tye atwo pressa kede jami mogo ame kelo two pressa iyi akina joo ame tye kede two cukari me acel bot otino kede ojarawe dong ame pe ongeo, man enamio ikweda man ka omede anyim bino yaro ngec ameoyemi kanaler

Tam ame tye iyi ikweda man

Me nyang atut ikom mede apressa malu kede two pressa iyia akina otino ame tye kede two cukari me ace lame tye idakatale adek adongo me lobo Uganda: tye mere, jami ame kelo kedegwoko joo ame tye kede cukari. Wel joo ame room 136 en aye tye amite me kwed man myero tim ikomgi kun bino tero dwete ame room adek.

Pingo omio yin okwai me tim ikweda man ikomi?

Pyen otwoe ame tye kede cukari iyi ikweda man tye kede gum adwong me bedo kede two pressa kede rwom me cukari ame bedo malu ikare ducu

Gin ame atiye ene

Alubere kede jami magi, borere, pekere kede pressa atini obino kwanyo. Medo ikom jami no remo atini dang obino kwanyo ote tero ilaboratory me apima.

Racere

Pet ye ginoro ame ogeso ni bino timere arac ikomi kede ikom atini apat ka kede arem moro anonok ame ibino nwongo icawa ame otikakwanyo remo ni.

Berere

Ikweda man tye me culu kaka ngec ame orem ikom gin ame mio pressa bedo malu kede two pressa iyia akina otino ame tye kede two cukari iyi dakatale adek adongo ame tye iuganda.tye mere, jami ame kelo kede gwoko joo ame cukari gi tye malu . pimere ducu me laboratory tye me nono , adwoki apimere man bino konyo atek pi gwoko otwoe kede me konyo atimikweda man me culu cente ame otiokede me pimere.

Cul pi donyo iyi ikweda

Myero inge ni pe tye culoro keken ame ibino nwongo ka iye ni kwed man tim ikomi.

Gwoko imung me komdano

Me gwoko imungDano ame apenyo obino kwanyo ote tero opici adoctor kaname ngatoro pe awinyo kop ame en akobo.

Gwoko imung icawa me rayo ngec.

Obino tic ka kede number ame ongeo Akaka nying dano. Ngec ame orao nibeo iyi apeny obino gamo eka ote pungo oko iot kun ame oyeyi ka dano ame tye atimo ikweda man me neon kene

Twero me kwero onyo yaa oko iyi ikweda

Donyo iyi ikwed man obedo gin ame yin iyiko apiri dang itye agonya me weko icawa moro keken ame cunyi mito kede dang me kwero gamo apenyor ame yin pe imito.

Ngo atimere ka iyaa oko iyi ikweda?

Obedo mite ni me bedo onyo me weko ikweda man abongo dicoro keken. Itye agonya me weko kede pe me gamo apenye mogo ame pe rwate kede wii. Pe ngatoro bino ngolikop onyo me balo treatmen atini.

Jo mene ame myero ipeny ka itye kede peko?

Gin en iping kani

Dr. Godfrey Zaari
Rukundo Chairman, BSU-
REC
P.O. Box 09
Mbarara Tel:
0772663671

Signing cingi onyo diyo cingi iwariga me nyang iteyee tere ni ngo?

Nyutu jami magi

- Yin omii nyang atut akwako tam ikweda man yore ame bino timere kede, berere kede racere.
- Yin dang omii twero me penyo kit apenye mogo ame kwako ikweda man ame pwod pe isigning cingi.
- Yin dang ijale apiri me donyo ikwed man

Nying dano adit ame oyee	Cinge danono onyo ci ngata acunge	Nino dwee
_ nying dano ame ame amiyo nyangName	cinge	nino dwee
Prnying acaden	cinge	nino dwee

- Yin omii nyang atut akwako tam ikweda man yore ame bino timere kede, berere kede racere.
- Yin dang omii twero me penyo kit apenye mogo ame kwako ikweda man ame pwod pe isigning cingi.
- Yin dang ijale apiri me donyo ikwed man

Nying dano adit ame oyee	Cinge danono onyo cingata acunge	Nino dwee
Nying dano ame ame amiyo nyangName	cinge	nino dwee
Prnying acaden	cinge	nino dwee

Appendix XV: Lango Questionnaire

3

Questionnaire

Wii ikweda: "pressa atye malu kede two pressaiyiakina otino atye kede two me cukariiyi dakatale adek ame tye ilobo ugandatye mere , jami ame kelo kede gwoko joo amee cukari gi tye malu: prevalence, associated factors and glycemic control"

ID numba agama peny. …….. nino dwee……..……

PAT A: NGEC AME KWAKO KOMI

1. Mwaka atin (dwetw):……..nino dwee nywale……..

Atin ango?

Icoo ☐ Adako ☐

2. kwon cukul ango ame atin tye akwan iye

onyo ya ipaco ☐ butoabuta icukul ☐ N/A ☐

3. Mwaka angata amio kony

……

4. Kanibedo iye: Icalo☐ Town ☐

5. Ocara ngata miokony: pe ngeo ocaramere☐ < 200,00☐ 200,00-500,000☐ 500,000-1M☐ >1M☐

6. dini ni kono?

katolika ☐ Protestant☐ mulongkole ☐SDA ☐ enokene mere:.....

7. Rwom me kwani kono?

pe dong iwoto icukul☐ Purimary☐ Sinia ☐ kakwano tic ☐

8. Itio tic ango?

……

PAT B: NGEC AKWAKO YOTKOMI

9. Pi kare aromkwene ame ibedo kede two cukariHow ? mwaka adii.....

10. Adwogi resol me RBS……..

11. HBA1c…….

12. Kony me yat itye inwongo amani: Insulin☐ Oral hypoglycemic☐ gin aryo duc ☐

13. Nga ame mii yat? Yin ikomi ☐ ngatagwoki☐

BISHOP STUART UNIVERSITY
P.O.BOX 09, MBARARA
28 SEP 2023
RESEARCH ETHICS COMMITTEE

14. Anaka kong ibedo igure moro ame kwako joo ame tye kede two cukari? Ae ☐ Pe ☐

15. Atin tio kede yat kitmite kede ikare duc? Ae ☐ Pe ☐

16. Ngatoro tye kede two cukari iyi paco wu Ae ☐ Pe ☐

17. Anaka kong ibilo rac atwo cukari atekere Ae ☐ Pe ☐

18. Ka Ae kob dong racere no ame nwongo no?.....

19. Kong ogami itana pi racere ate kame inwongo no? Ae ☐ Pe ☐

20. Ngatoro me paco ame tye kede two cwee: Ae ☐ Pe ☐

21. Ngatoro me pacoame tye kede two pressa: Ae ☐ Pe ☐

22. Ngatoro me paco ame tye kede two angalura Ae ☐ Pe ☐

23. pekere....., borere..... MUAC.....

24. pekere iwi borere Z category.....

25. BMI.....

26. BMI Category .....

27. Anyut me cemaber: pek pekorot ☐ two cwee ☐ tye aber ☐ yotyotoro ☐

PAT C: LOLOKO CEM KEDE KITE ME KWO

28. Icamo cem ame okioko Ae ☐ Pe ☐

29. Imato jami ame lilim Ae ☐ Pe ☐

30. Imaro ngwec me timo exercise ikare ducu? Ae ☐ Pe ☐

31. Ite kare ni onyo itio kede yat ame olwono ni steroid ame aporere ene dexamethasone, prednisolone onyo hydrocortisone? Ae ☐ Pe ☐

32. Anaka kong onwongo two moro me tekwaro ikomi? Ae ☐ Pe ☐

PAT D: PIMO PRESSA

33. SBP1..... SBP2..... SBP3..... Average SBP.....

34. DBP1.....DBP2.....DBP3..... Average DBP.....

35. Blood pressure category

Pressa atye aber ☐ pressa atye malu ☐ two pressa ☐



Appendix XVI: Lusoga Informed consent

BISHOP STUART UNIVERSITY

Akakiiko akagemagania empisa mubyokunonenkereza
P.O Box 09 Mbarara-Uganda Eisimu: +256 485-433468
E-mail: rec@bsu.ac.ug

EKIWAANDIIKO EKIRAGA NTI OIKIRIIZA EKWETABA MUMUSOMO GUNO

Kino ekiwandiiko kiraga omusoma mukunonenkereza nebintu abetabye mukunonenkereza kuno byebasuubira. Kirina okuwandikibwa mululimi omuntu wabuliidho lwategeera era bakite ku bbaluwa ya BSU-REC.

Endagiriro.

1. Ebigambo ebyekiwaandiiko kino biragirirwa eri omuntu eyetabye muluno olusomo, aye ti BSU-REC
2. Ekigambo ekyikalangufu wekiba kikozeseibwa, inonola amakulu gaakyo nga wankamala okukikozesa era nebigambo byebawandiika mubumpimpi , olina okubinonola amakulu gaabyo nga wankabikozesa.
3. Buli bitundutundu mukino ekiwandiiko birina okwiduzibwamu nga tobitoiremu oba okukyuusa byebitegeeza.
4. Kozesa obunene obwebigambo obusobola okwawulibwa kubibuuzo mukino ekiwandiiko; obunene bwandibaire 12.

Omutwe gwomusomo
Okweyongera kwapuleesa yomusaayi mubaana abalwaire ba sukaali mumalwaliro amanene . amasatu. Obunji, ebintu ebireetera, nokwikaikania sukaali
Akulira
Dr. Charles Mwendwa Mutisya

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: BISHOP STUART UNIVERSITY P.O.BOX 09. MBARARA RESEARCH ETHICS COMMITTEE 28 SEP 2023 Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: 13/09/2023 NAMBA YA IRB ERAGA NTI BAIKIRIIZA: 1 ERIINA LYA PI: CHARLES MWENDWA MUTISYA NAMBA YA IRB: BSU-REC-2023-184

65

Okwandula

Kyolina okutegeera ku musomo guno

1. Osabiibwa okwingira mumusomo guno ogunonenkereza
2. Kino ekiwandiiko kinonola omusomo gwokunonenkereza era nikyolina okukola mumusomo.
3. Kisome bulunji era otwale obwire bwona bwona bwoyenda.
4. Oyambaku buyambe. Oyinza okusalawo obutenigiramu, era wooba nga oyingiiremu, osobola okuvaamu saawa yona yona yoyenze. Tibajakukubonereza wosalawo okuva mumusomo guno.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: BISHOP STUART UNIVERSITY P.O.BOX 09. MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: 13/09/2023 NAMBA YA IRB ERAGA NTI BAIKIRIIZA: 1 ERIINA LYA PI: CHARLES MWENDWA MUTSYA NAMBA YA IRB: BSU-REC-2023-184

Ebitonotono ebigema kumusomo guno

Okubaawo wa sukaali ni puleesa omulundi omulala bakigemagainia ku bijakwolekebwa mumuntu mungeri yobulwaire obukosa emisiwa eminene nobusiwa obutono. (Khangura et al., 2018). Sukaali nipuleesa bipuleesa biniiniiza emikisa jokufa emirundi 7.2, nga era amawanga agali kukulankulana nagalina abantu abasinga okufa. (Vargas-Uricoechea & Cáceres-Acosta, 2018). Nolwekyo, okutegeka okulunji okuluubirirwa okwetegereza puleesa ni sukaali kulina okukozesebwa mukwidandaba sukaali.

Okusoma okwasembayo mu Uganda kwaalopa obunji bwabalwaire bapuleesa era bainonola ebintu ebiviiraku puleesa mubalwaire abalina sukaali. (Muddu et al., 2018).

Aye, abaana abalina sukaali tibaabataamu muguno omusomo. Kino kirekawo eibanga mukutegeera kwobunji nebintu ebisobola okuvaaku puleesa mubaana naabavubuka abalina ekika kyasukaali ekisooka era guno omusomo gulija kuluubirirwa okwigalawo eibaanga lino.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: BISHOP STUART UNIVERSITY P.O.BOX 09. MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: 13/09/2023 NAMBA YA IRB ERAGA NTI BAIKIRIIZA: 1 ERIINA LYA PI: CHARLES MWENDWA MUTISYA NAMBA YA IRB: BSU-REC-2023-184

Ekirubirirwa kyokunonenkereza kuno
Kuzuula puleesa mubaana abalina sukaali mumalwaliro amanene amasatu: obunji, ebintu ebisobola okuvaaku sukaali, nokwikaikania sukaali. Abantu abasuubirwa okwetaba muguno omusomo bali 136, mwibbanga lyamyeezi esatu.

Lwaki osabiibwa okwenigira mumusomo guno?
Kubanga abalwaire mumusomo gwange abalina sukaali basobola okufuna puleesa olwasukaali mumubiri okuba waigulu buli kiseera.

Engeri yekirija okolebwaamu
Nga okubuuzibwa kuwoire, obuleeyi, obuzito, ni puleesa yomwana balija kubipima. Ekindi, omusaayi gwomwana gulija kubatoolebwaaku gutwalibwe mu laabu okukeberebwa.

Ebunkenke oba ebiyinza okukukalubiriza
Tiwaja kubaawo bunkenke bwona bwona yooli nomwanawo okutolaku obulumi bwajokufuna nga bamutoolaku omusaayi.

Ebyokuganulwamu
Kuno okusoma kulija kwigalawo amabaanga agabairewo mukutegeera puleesa mubaana abalwaire basukaali mumalwaliro amasatu amanene mu Uganda: obinji, ebireetera, nokwikaikania sukaali mumubiri. Okunonnenkereza kwa laabu kujakuba kwa bwereere, era ebiviiremu bijakuyambaku okwongera mukulabirira omulwaire. Era anonenkereza ajakusasulira ebisale mukunonenkereza

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC BISHOP STUART UNIVERSITY P.O.BOX 09. MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: 13/09/2023 NAMBA YA IRB ERAGA NTI BAIKIRIIZA: 1 ERIINA LYA PI: CHARLES MWENDWA MUTISYA NAMBA YA IRB: BSU-REC-2023-184

Okusasulira okwetaba mumusomo
Tiwajakubaawo magoba mukwetaba mumusomo guno
Okukuuma ebyaama
Okukakasa okukuuma ebyaama, omuntu ajakutwalibwa kuluya, mu yafeesi yomusawo ku woodi oba OPD, nga ezira muntu yena yena aja okuwulirisa.
Okukuuma obwananyini nga tusoloza obubaka
Namba donka nedirija okukozesebwa, nga timaina. Nebiwandiiko ebirija okukozesebwa birikuja kubonebwa anonenkereza yenka.

Eidembe okudeema oba okuvaamu.
Okuba kulusoma luno kyabweyendere. Osobola okukuvaamu kusaawa yona yona joyenze, era osobola okudeema okwiramu ebibuuzo byotenze.

Ki ekibaawo nga oviire mulusomo luno?
Okusalawo okwenigira oba obutenigira mulusomo luno kiri eri iwe. Osobola okuva mulusomo luno, era nobutairamu bibuuzo byotenze.
Tolikuja kubonerezebwa olwokusalawo kwonasalawo era tikuja kukosa engeri omwanawo yalikuja okwidandabibwamu.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: BISHOP STUART UNIVERSITY * P.O.BOX 09, MBARARA * RESEARCH ETHICS COMMITTEE 28 SEP 2023 Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: 13/09/2023 NAMBA YA IRB ERAGA NTI BAIKIRIIZA: 1 ERIINA LYA PI: CHARLES MWENDWA MUTISYA NAMBA YA IRB: BSU-REC-2023-184

Naani gwembuuza oba gwenkubira nga nnina ekibuuzo oba ekizibu?
Taamu empulizigania yanonenkereza, sentebe, BSU-REC.
Dr. Godfrey Zaari Rukundo
Chairman, BSU-REC
P.O. Box 09 Mbarara
Tel: 0772663671

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: Stampu ya BSU-REC BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: 13/09/2023 NAMBA YA IRB ERAGA NTI BAIKIRIIZA: 1 ERIINA LYA PI: CHARLES MWENDWA MUTISYA NAMBA YA IRB: BSU-REC-2023-184

Omukonogwo oba ekinkumukyo kitegezaaki kukiwandiiko kino?
Omukonogwo kukiwandiiko kino gutegeeza

- Otegezeibwa omugaso gwomusomo guno, engeri ebintu jebirija okutambulamu, byoja okuganulwamu nebiyinza okukukosa
- Owereibwa omukisa okubuuza ebibuuzo nga okaali kutaaku mukono.
- Oikiriiza okwetaba mumusomo guno awazira kukusasula.

Eriina lyomuntu omukulu Eyetabye mumusomo	Omukono gwomuntu eyetabye mumusomo	Ennaku domwezi
Eriina lyoyo alikusaba Olukusa	Omukono	Ennaku domwezi
Eriina lyomudulizi	Omukono oba ekinkumu	Ennaku domwezi

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA RESEARCH ETHICS COMMITTEE Sitampu ya BSU-REC 20 SEP 2023	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: 13/09/2023 NAMBA YA IRB ERAGA NTI BAIKIRIIZA: 1 ERIINA LYA PI: CHARLES MWENDWA MUTISYA NAMBA YA IRB: BSU-REC-2023-184

BISHOP STUART UNIVERSITY

Akakiiko akagemagania empisa mubyokunonenkereza

P.O Box 09 Mbarara-Uganda Eisimu: +256 485-433468

E-mail: rec@bsu.ac.ug

EKIWAANDIIKO EKIRAGA NTI OIKIRIIZA EKWETABA MUMUSOMO GUNO

Kino ekiwandiiko kiraga omusoma mukunonenkereza nebintu abetabye mukunonenkereza kuno byebasuubira. Kirina okuwandikibwa mululimi omuntu wabuliidho lwategeera era bakite ku bbaluwa ya BSU-REC.

Endagiriro.

1. Ebigambo ebyekiwaandiiko kino biragirirwa eri omuntu eyetabye muluno olusomo, aye ti BSU-REC
2. Ekigambo ekyikalangufu wekiba kikozeseibwa, inonola amakulu gaakyo nga wankamala okukikozesa era nebigambo byebawandiika mubumpimpi, olina okubinonola amakulu gaabyo nga wankabikozesa.
3. Buli bitundutundu mukino ekiwandiiko birina okwiduzibwamu nga tobitoiremu oba okukyuusa byebitegeeza.
4. Kozesa obunene obwebigambo obusobola okwawulibwa kubibuuzo mukino ekiwandiiko; obunene bwandibaire 12.

Omutwe gwomusomo

Okweyongera kwapuleesa yomusaayi mubaana abalwaire ba sukaali mumalwaliro amanene . amasatu. Obunji, ebintu ebireetera, nokwikaikania sukaali

Akulira

Dr. Charles Mwendwa Mutisya

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Okwandula

Kyolina okutegeera ku musomo guno

1. Osabiibwa okwingira mumusomo guno ogunonenkereza
2. Kino ekiwandiiko kinonola omusomo gwokunonenkereza era nikyolina okukola mumusomo.
3. Kisome bulunji era otwale obwire bwona bwona bwoyenda.
4. Oyambaku buyambe. Oyinza okusalawo obutenigiramu, era wooba nga oyingiiremu, osobola okuvaamu saawa yona yona yoyenze. Tibajakukubonereza wosalawo okuva mumusomo guno.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Ebitonotono ebigema kumusomo guno

Okubaawo wa sukaali ni puleesa omulundi omulala bakigemagainia ku bijakwolekebwa mumuntu mungeri yobulwaire obukosa emisiwa eminene nobusiwa obutono. (Khangura DS, Waqar Salam M, Brietzke SA, 2018). Sukaali nipuleesa bipuleesa biniiniiza emikisa jokufa emirundi 7.2, nga era amawanga agali kukulankulana nagalina abantu abasinga okufa. (Vargas-Uricoechea & Cáceres-Acosta, 2018). Nolwekyo, okutegeka okulunji okuluubirirwa okwetegereza puleesa ni sukaali kulina okukozesebwa mukwidandaba sukaali.

Okusoma okwasembayo mu Uganda kwaalopa obunji bwabalwaire bapuleesa era bainonola ebintu ebiviiraku puleesa mubalwaire abalina sukaali. (Muddu et al., 2018).

Aye, abaana abalina sukaali tibaabataamu muguno omusomo. Kino kirekawo eibanga mukutegeera kwobunji nebintu ebisobola okuvaaku puleesa mubaana naabavubuka abalina ekika kyasukaali ekisooka era guno omusomo gulija kuluubirirwa okwigalawo eibaanga lino.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Ekirubirirwa kyokunonenkereza kuno
Kuzuula puleesa mubaana abalina sukaali mumalwaliro amanene amasatu: obunji, ebintu ebisobola okuvaaku sukaali, nokwikaikania sukaali. Abantu abasuubirwa okwetaba muguno omusomo bali 136, mwibbanga lyamyeezi esatu.

Lwaki osabiibwa okwenigira mumusomo guno?
Kubanga abalwaire mumusomo gwange abalina sukaali basobola okufuna puleesa olwasukaali mumubiri okuba waigulu buli kiseera.

Engeri yekirija okolebwaamu
Nga okubuuzibwa kuwoire, obuleeyi, obuzito, ni puleesa yomwana balija kubipima. Ekindi, omusaayi gwomwana gulija kubatoolebwaaku gutwalibwe mu laabu okukeberebwa.

Ebunkenke oba ebiyinza okukukalubiriza
Tiwaja kubaawo bunkenke bwona bwona yooli nomwanawo okutolaku obulumi bwajokufuna nga bamutoolaku omusaayi.

Ebyokuganulwamu
Kuno okusoma kulija kwigalawo amabaanga agabairewo mukutegeera puleesa mubaana abalwaire basukaali mumalwaliro amasatu amanene mu Uganda: obinji, ebireetera, nokwikaikania sukaali mumubiri. Okunonnenkereza Kwa laabu kujakuba Kwa bwereere, era ebiviiremu bijakuyambaku okwongera mukulabirira omulwaire. Era anonenkereza ajakusasulira ebisale mukunonenkereza

.

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Okusasulira okwetaba mumusomo
Tiwajakubaawo magoba mukwetaba mumusomo guno
Okukuuma ebyaama
Okukakasa okukuuma ebyaama, omuntu ajakutwalibwa kuluya, mu yafeesi yomusawo ku woodi oba OPD, nga ezira muntu yena yena aja okuwulirisa.
Okukuuma obwananyini nga tusoloza obubaka
Namba donka nedirija okukozesebwa, nga timaina. Nebiwandiiko ebirija okukozesebwa birikuja kubonebwa anonenkereza yenka.

Eidembe okudeema oba okuvaamu.
Okuba kulusoma luno kyabweyendere. Osobola okukuvaamu kusaawa yona yona joyenze, era osobola okudeema okwiramu ebibuuzo byotenze.

Ki ekibaawo nga oviire mulusomo luno?
Okusalawo okwenigira oba obutenigira mulusomo luno kiri eri iwe. Osobola okuva mulusomo luno, era nobutairamu bibuuzo byotenze.
Tolikuja kubonerezebwa olwokusalawo kwonasalawo era tikuja kukosa engeri omwanawo yalikuja okwidandabibwamu.

Naani gwembuuza oba gwenkubira nga nnina ekibuuzo oba ekizibu?
Taamu empulizigania yanonenkereza, sentebe, BSU-REC.
Dr. Godfrey Zaari Rukundo
Chairman, BSU-REC
P.O. Box 09 Mbarara
Tel: 0772663671

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Omukonogwo oba ekinkumukyo kitegezaaki kukiwandiiko kino?
Omukonogwo kukiwandiiko kino gutegeeza

- Otegezeibwa omugaso gwomusomo guno, engeri ebintu jebirija okutambulamu, byoja okuganulwamu nebiyinza okukukosa
- Owereibwa omukisa okubuuza ebibuuzo nga okaali kutaaku mukono.
- Oikiriiza okwetaba mumusomo guno awazira kukusasula.

---------- ---------- ----------
Eriina lyomuntu omukulu Eyetabye mumusomo | Omukono gwomuntu eyetabye mumusomo | Ennaku domwezi

---------- ---------- ----------
Eriina lyoyo alikusaba Olukusa | Omukono | Ennaku domwezi

---------- ---------- ----------
Eriina lyomudulizi | Omukono oba ekinkumu | Ennaku domwezi

Otawandiikawo kintu kyona kyona, wa ofiisi ya REC: Sitampu ya BSU-REC	WAKUKOZESEBWA OFIISI YA REC YONKA ENNAKU DEBAJIKIRIIZAKU: NAMBA YA IRB ERAGA NTI BAIKIRIIZA: ERIINA LYA PI: NAMBA YA IRB:

Appendix XVII: Lusoga Questionnaire (Ekyolusoga)

Appendix IX: Ekiwandiiko kyebibuuzo (Ekyolusoga)

Omutwe: "Puleesa mubaana abalina sukaali, mumalwaliro amanene amasatu: obunji, ebintu ebireetera sukaali, nokwikaikania sukaali"

Namba yomuntu alikwiramu ebibuuzo. …….. Ennaku domwezi……..……

EKITUNDU EKISOOKA: EBIGEMA KUMBEERA YABULIIDO

1.Obukulu bwomwana(mumyeezi):……..Ennaku deyazaalibwa ……..

17. Omwanawo wakikulaki?

Mulenzi ☐ Muwala ☐

18. Isomeroki omwanawo lyasomeraku?

Aviira waka ☐ Kisulo ☐ N/A ☐

19. Emyaaka jomuntu alabirira omwana

……

20. Amaka galiwa?: Mukyaalo☐ Mukibuga ☐

21. Sente alabirira omwana daafuna omwezi: Azira sente daasubira☐ <200,00☐ 200,00-500,000☐500,000-1M☐ >1M☐

22. Oliwaidiiniki?

Mukatuliki ☐ Mupolotesisanti ☐ Pentekooti ☐ Museveniside ☐

Amadiini agandi:.....

23. Wasomaku paka wa?

Tinasomaku ☐ Puraimaale ☐ Sekendule ☐ Mwitendekero eryawaigulu ☐

24. Okola mulimoki?

……

EKITUNDU EKYOKUBIRI: EBIGEMA KUBULAMU

25. Kuvaali nga olina sukaali?.....(mumyaaka)

BISHOP STUART UNIVERSITY P.O.BOX 09, MBARARA 28 SEP 2023 RESEARCH ETHICS COMMITTEE

26. Ebyaava mukukebera sukaali okwasembayo……..

27. HBA1c……..

28. Eidagala lyasukaali lyokozesa kati: Insulin ☐ Eryokumira☐ Lyombi ☐

29. Ani akuwa eidagala? Mweene ☐ Andabirira ☐

30. Obangaku muporoguraamu yabalwaire basukaali? Iyi ☐ Mbe☐

31. Omwana amira eidagala nga webamukoba? Iyi ☐ Mbe ☐

32. Eyiro alina sukaali waka? Iyi ☐ Mbe☐

33. Ofunangaku obuzibu bwonabwona obuva kubulwaire bwasukaali? Iyi ☐ Mbe☐

34. Wekiba nga waigulu mu 18 kituufu, buzibuki?.....

35. Bakuwangaku ekitanda olwobuzibu obuleteibwa sukaali? Iyi ☐ Mbe☐

36. Mumaka mulimu abantu abanene eino ekiswiise?: Iyii ☐ Mbe ☐

37. Mufamire mulimu abalwaire ba puleesa?: Iyi ☐Mbe ☐

38. Mufamire mulimu abalwaire bensigo edisengeeda omusaayi? Iyi ☐ Mbe☐

39. Obuzito……,obuwanvu/obuleeyi…… MUAC……..

40. Obuzito kubuleeyi, Kikunsu kya Z…….

41. BMI……..

42. Mukikunsu kya BMI……

43. Ebyendya byomwana; Omubiri munene ☐ Omubiri Munene ino ekiswise ☐ Ebyendya bikalamu ☐ Omubiri mutono ☐

EKITUNDU EKYOKUSATU: ENDYA NENEYISA

44. Olya emmere jebakoleire mumakolero? Iyi ☐ Mbe☐

45. Onwa ebyokunwa ebiduuduula eino? Iyi ☐ Mbe☐

46. Okola dwiro buli lunaku? Iyi ☐ Mbe☐

47. Olikukozesaaku eidagala nga dexamethasone, prednisolone or hydrocortisone? Iyi ☐ Mbe☐



48. Bakuzuulangamu nobulwaire obwensikirano? Iyi ☐ Mbe ☐

EKITUNDU EKYONA: PULEESA YOMUSAAYI

49. SBP1…….. SBP2…….. SBP3…… SBP eyekigero…….

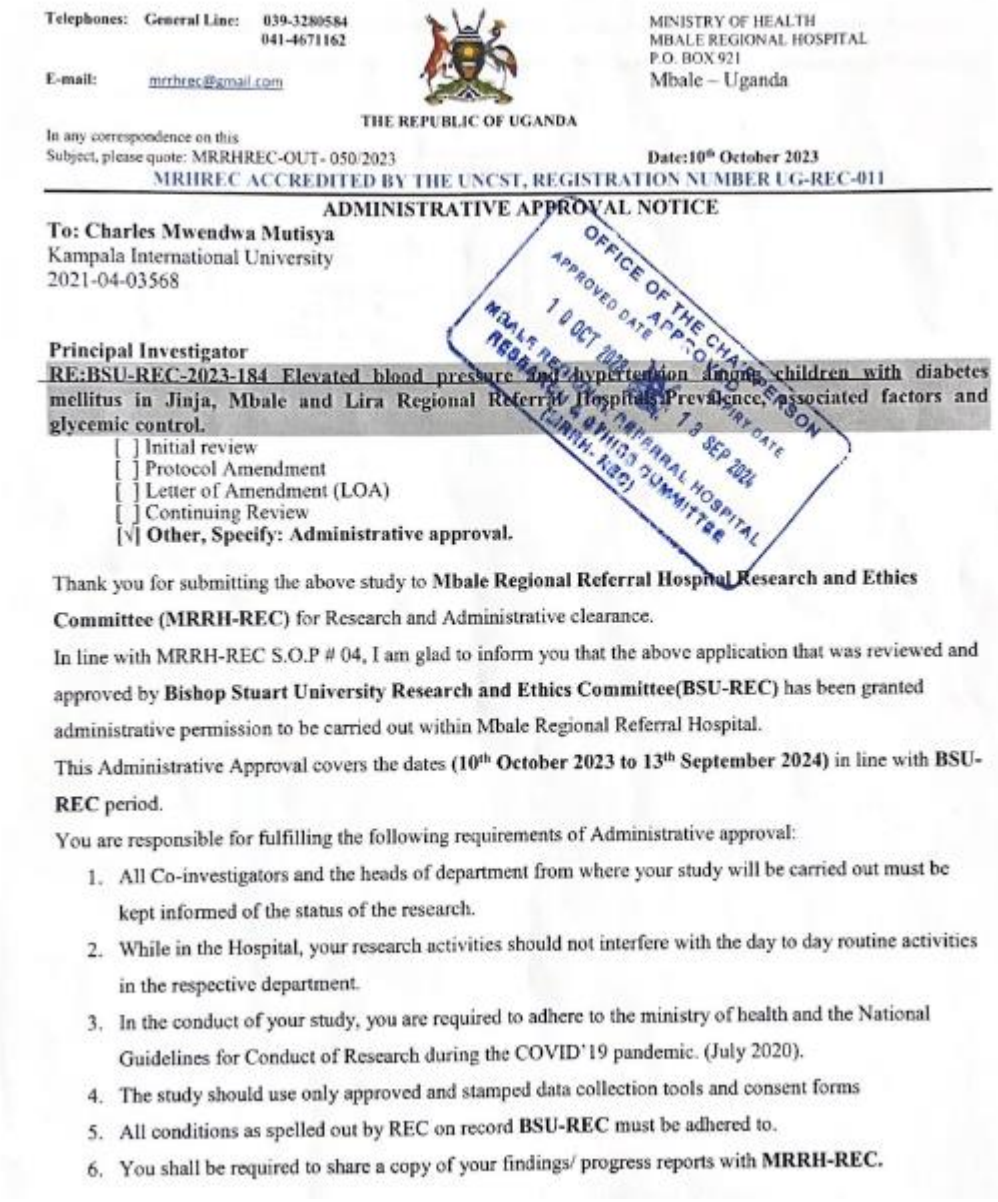
50. DBP1……..DBP2……..DBP3…… DBP eyekigero…….

51. Ekikunsu kyapuleesa omusaayigwo kyegulimu

Puleesa nnunji ☐ Puleesa yeyongeireku ☐ Puleesa eriwaigulu ino ☐



Appendix XVIII: Mbale Regional Referral Hospital Approval letter



Telephones: General Line: 039-3280584
041-4671162

E-mail: mrrhrec@gmail.com

MINISTRY OF HEALTH
MBALE REGIONAL HOSPITAL
P.O. BOX 921
Mbale – Uganda

THE REPUBLIC OF UGANDA

In any correspondence on this
Subject, please quote: MRRHREC-OUT- 050/2023

Date:10th October 2023

MRHREC ACCREDITED BY THE UNCST, REGISTRATION NUMBER UG-REC-011

ADMINISTRATIVE APPROVAL NOTICE

To: Charles Mwendwa Mutisya
Kampala International University
2021-04-03568

OFFICE OF THE CHAIRPERSON
APPROVED
APPROVED DATE
10 OCT 2023
EXPIRY DATE
13 SEP 2024
MBALE REGIONAL REFERRAL HOSPITAL
RESEARCH AND ETHICS COMMITTEE
(MRRH-REC)

Principal Investigator

RE:BSU-REC-2023-184 Elevated blood pressure and hypertension among children with diabetes mellitus in Jinja, Mbale and Lira Regional Referral Hospitals:Prevalence, associated factors and glycemic control.

[ ] Initial review
[ ] Protocol Amendment
[ ] Letter of Amendment (LOA)
[ ] Continuing Review
[√] **Other, Specify: Administrative approval.**

Thank you for submitting the above study to **Mbale Regional Referral Hospital Research and Ethics Committee (MRRH-REC)** for Research and Administrative clearance.

In line with MRRH-REC S.O.P # 04, I am glad to inform you that the above application that was reviewed and approved by **Bishop Stuart University Research and Ethics Committee(BSU-REC)** has been granted administrative permission to be carried out within Mbale Regional Referral Hospital.

This Administrative Approval covers the dates **(10th October 2023 to 13th September 2024)** in line with **BSU-REC** period.

You are responsible for fulfilling the following requirements of Administrative approval:

1. All Co-investigators and the heads of department from where your study will be carried out must be kept informed of the status of the research.
2. While in the Hospital, your research activities should not interfere with the day to day routine activities in the respective department.
3. In the conduct of your study, you are required to adhere to the ministry of health and the National Guidelines for Conduct of Research during the COVID'19 pandemic. (July 2020).
4. The study should use only approved and stamped data collection tools and consent forms
5. All conditions as spelled out by REC on record **BSU-REC** must be adhered to.
6. You shall be required to share a copy of your findings/ progress reports with **MRRH-REC.**

7. You are required to observe and abide by the policies governing **Mbale Regional Referral Hospital.**
8. You are required to register this study with **Uganda National Council for Science and Technology (UNCST).**

Yours sincerely,



Dr.Fred Bulamba, MBChB, MMed, cert-Med Educ.
Chairperson MRRH-REC

Appendix XIX: Lira Regional Referral Hospital Approval letter

Hospital Director: 0414672778
PHA: 0414673102
E-mail :lirarrh@gmail.com
In any correspondance on this
Subject, please quote

THE REPUBLIC OF UGANDA

MINISTRY OF HEALTH
LIRA REGIONAL REFERRAL HOSPITAL
P.O. BOX 2
Lira - Uganda

30 November 2023

To: Dr Charles Mwendwa Mutisya
Department of Paediatrics and Child Health
Kampala International University

RE: ELEVATED BLOOD PRESSURE AND HYPERTENSION AMONG CHILDREN WITH DIABETES MELLITUS IN JINJA, MBALE, AND LIRA REGIONAL REFERRAL HOSPITALS: PREVALENCE, ASSOCIATED FACTORS AND GLYCAEMIC CONTROL.

I am pleased to let you know that the research committee at Lira Regional Referral Hospital reviewed your proposal above, and found it meeting the criteria for administrative approval.

This letter therefore comes to let you know that Lira Regional Referral Hospital has granted you administrative clearance to conduct this study at the hospital as planned. Please note that this is an administrative approval and not IRB or regulatory approval.

As part of the administrative approval, the hospital expects that you submit a copy of proof of payment for the administrative fees before any study activities can be initiated. This being an academic research in partial fulfilment of the requirement for the award of a Master's degree, the committee has waived the requirement for UNCST approval. The hospital expects that you use GCP trained Research Assistants, you do not encroach on the hospital resources, and that you submit a copy of your research report to the research committee at the conclusion of your research, acknowledging and or including hospital staff that will have played a key role in the study, and acknowledging Lira Regional Referral Hospital on any manuscript that will arise from the study.

Congratulations and wish you a successful data collection process.

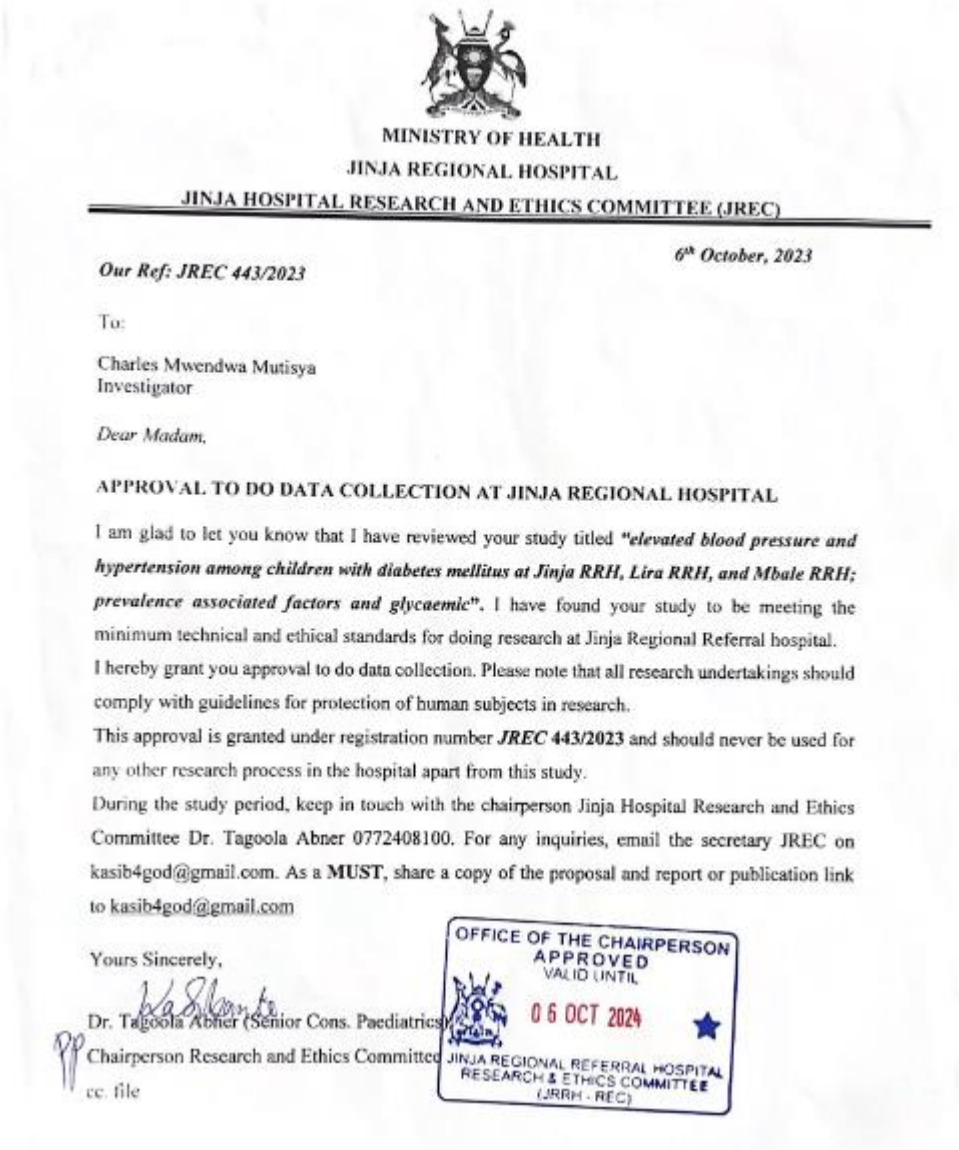
Sincerely

FOR: HOSPITAL DIRECTOR P.O. BOX 2 LIRA 30 NOV 2023 LIRA REGIONAL REFERRAL HOSPITAL

Francis Kiweewa
Chair Research Committee
Lira Regional Referral Hospital.

C.C. Hospital Director (HD)

Appendix XX: Jinja Regional Referral Hospital Approval letter



MINISTRY OF HEALTH
JINJA REGIONAL HOSPITAL
JINJA HOSPITAL RESEARCH AND ETHICS COMMITTEE (JREC)

Our Ref: JREC 443/2023

6th October, 2023

To:

Charles Mwendwa Mutisya
Investigator

Dear Madam,

APPROVAL TO DO DATA COLLECTION AT JINJA REGIONAL HOSPITAL

I am glad to let you know that I have reviewed your study titled ***"elevated blood pressure and hypertension among children with diabetes mellitus at Jinja RRH, Lira RRH, and Mbale RRH; prevalence associated factors and glycaemic"***. I have found your study to be meeting the minimum technical and ethical standards for doing research at Jinja Regional Referral hospital.

I hereby grant you approval to do data collection. Please note that all research undertakings should comply with guidelines for protection of human subjects in research.

This approval is granted under registration number ***JREC* 443/2023** and should never be used for any other research process in the hospital apart from this study.

During the study period, keep in touch with the chairperson Jinja Hospital Research and Ethics Committee Dr. Tagoola Abner 0772408100. For any inquiries, email the secretary JREC on kasib4god@gmail.com. As a **MUST**, share a copy of the proposal and report or publication link to kasib4god@gmail.com

Yours Sincerely,

Dr. Tagoola Abner (Senior Cons. Paediatrics)
Chairperson Research and Ethics Committee

cc. file

OFFICE OF THE CHAIRPERSON
APPROVED
VALID UNTIL
06 OCT 2024
JINJA REGIONAL REFERRAL HOSPITAL
RESEARCH & ETHICS COMMITTEE
(JRRH - REC)

APPENDIX XXI: REC Approval

BISHOP STUART UNIVERSITY
P.O.BOX 9, MBARARA

Tel: 0772 512551

Website: www.bsu.ac.ug
E-mail: rec@bsu.ac.ug/info@bsu.ac.ug

RESEARCH ETHICS COMMITTEE

BISHOP STUART UNIVERSITY
RESEARCH ETHICS COMMITTEE
13 SEP 2024
APPROVED VALID UNTIL DATE SHOWN ABOVE
P.O.BOX 09, MBARARA

13/09/2023

To: charles mutisya

kampala international university
0706751033

Type: Initial Review

Re: BSU-REC-2023-184: Elevated blood pressure and hypertension among children with Diabetes mellitus at three regional ugandan referral hospitals: prevalence, associated factors and glycemic control

I am pleased to inform you that at the **15** convened meeting on **17/08/2023**, the Bishop Stuart University (BSU) REC meeting voted to approve the above referenced application.
Approval of the research is for the period of **13/09/2023** to **13/09/2024.**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **13/09/2024** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Bishop Stuart University (BSU) REC:

No.	Document Title	Language	Version Number	Version Date
1	compliance report	ENGLISH	2	2023-08-30
2	Protocol	English	2 proposal tracked copy	2023-08-30
3	Protocol	English	2 proposal clean copy	2023-08-30
4	Translated consent if applicable to your study	lusoga	1	2023-07-31
5	Translated consent if applicable to your study	lugisu	1	2023-07-31
6	Translated consent if applicable to your study	lango	1	2023-07-31
7	Informed Consent forms	english	1	2023-07-31
8	Protocol	English	1	2023-07-31
9	Data collection tools	english	1	2023-07-31

Yours Sincerely

BISHOP STUART UNIVERSITY
RESEARCH ETHICS COMMITTEE
13 SEP 2024
APPROVED VALID UNTIL DATE SHOWN ABOVE
P.O.BOX 09, MBARARA

Godfrey Rukundo
For: Bishop Stuart University (BSU) REC