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PREVALENCE OF COGNITIVE IMPAIRMENT AMONG ELDERLY PATIENTS AT UNIVERSITY TEACHING HOSPITALS IN RWANDA.

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Kigali, August 31st, 2021

DECLARATION

I, Dr. Vincent NDAYIRAGIJE, to the best of my knowledge, hereby declare and certify that the work presented in this dissertation entitled "PREVALENCE OF COGNITIVE IMPAIRMENT AMONG ELDERLY PATIENTS AT UNIVERSITY TEACHING HOSPITALS IN RWANDA" is entirely my own and original work. It has never been presented or submitted for any other degree in whole or in part at the University of Rwanda or at any other university.

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Date: August 31st, 2021.

Supervisor I:
I hereby declare that this dissertation has been submitted by Dr. Vincent NDAYIRAGIJE with my approval as a supervisor.

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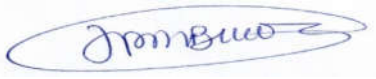
Signature: 
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Dr. Vincent NDAYIRAGIJE

ABSTRACT

Background

Cognitive impairment is a global challenge among elderly patients. It is associated with increased hospital stay, morbidity and mortality. Moreover, it affects short and long-term patients' functional capacity and negatively impact their activities of daily living and may increase the rate of readmission. We conducted this first study in Rwanda to determine the prevalence of cognitive impairment among elderly patients at two main university teaching hospitals in Rwanda.

Methods

It was a cross sectional study among elderly patients: aged 60s and above who attended the department of internal medicine at two main university teaching hospitals in Rwanda: CHUB and CHUK. Their cognitive function and health autonomy status were assessed using Mini-Mental State Examination (MMSE) and Activities of Daily Living (ADL) scales respectively. Probable precipitating factors were evaluated. One-time physical contact data were collected including biodemographic profile and clinical background as well as their scores on MMSE and ADL all compiled in one questionnaire through a consecutive recruitment over 6 months. Data analysis was done using the statistical package for the social science (SPSS) application.

Results

200 participants were recruited among which the females predominated 105(52.5%). The majority was aged between [60-65] years: 69(34.5%), followed by [66-70] years: 46(23%) and nearly similar from [71-80] years: around 15%**.** Continuous negative skewed representation of ages with a limited number of the participants with [81-90]:10% and above 90s: only represented by 3%**.** The overall prevalence of cognitive impairment revealed by our study was 61.5%. Its severity was distributed as: *mild*: 19%, *moderate*: 23% and *severe*: 19.5%. Mild cognitive impairment was more prevalent among females, 13.5% versus 5.5% of males, $p<0.001$. The overall top risk factors were: cardiovascular diseases (36.5%) followed by malignancies (14.5%), viral hepatitis C (10%), chronic lung diseases (9%) and diabetes mellitus (5.5%). Stroke (8.5%) was the leading cause of severe cognitive impairment as shown by the MMSE ≤ 10 among other medical conditions, followed by hypertension (8%) and malignancies (5%). 44% of the studied population was dependent as revealed by their low score on ADL scale. The associated risk factors were found to be similar to those of cognitive impairment where malignancies (33%), cardiovascular diseases (31%) and viral hepatitis C infection (6.5%), chronic lung diseases (5.5%) and diabetes mellitus (4.5%) were significantly associated with dependency among others.

Conclusion

The prevalence of cognitive impairment among elderly patients at our university teaching hospitals is significantly elevated with impaired health autonomy status. The main risk factors include, cardiovascular diseases, malignancies, viral hepatitis C infection, chronic lung diseases and diabetes mellitus.

Keywords: cognitive impairment, elderly patients, university teaching hospitals

ACRONYMS

ADL: Activities of Daily Living

CHUB : Centre Hospitalier Universitaire de Butare

CHUK : Centre Hospitalier Universitaire de Kigali

CI : Cognitive Impairment

CMHS: College of Medicine and Health Sciences

COVID-19: Coronavirus Disease 2019

HBV: Hepatitis B virus

HCV: Hepatitis C Virus

KFH: King Faisal Hospital

IADL: Instrumental Activities of Daily Living

IRB: Institutional Review Board

mCI: mild Cognitive Impairment

MMSE: Mini-Mental State Exam

MoHR: Ministry of Health of Rwanda

NIH: National Institutes of Health, nl: normal

OPD: Out Patient Department

RMH: Rwanda Military Hospital

SPSS: Statistical Package for the Social Sciences

UN: United Nations

UR: University of Rwanda

UTHB: University Teaching Hospital of Butare

UTHK: University Teaching Hospital of Kigali

WHO: World Health Organization

CONTENTS

DEDICATION

To God, the Omnipotent,

To my beloved family,

To my lovely wife Dr. Theodonata TUYISENGE,

To our beloved son ABAYO NEZA Beni Landry,

To our beloved daughter ABATONI Aela Maeva,

To my colleagues and friends,

To all my mentors and professors,

I dedicate this work.

CHAPTER.I INTRODUCTION

1.1 Background

Cognitive function reflects our daily life. The National Institute of Health (NIH) defines cognitive health as the ability to clearly think, learn, execute and remember. It is highlighted as a pillar of performing everyday activities(1). As long as we live there is a progressive physiological decline in this crucial aspect of human being. The consequences affect the whole world irrespective of economy(2).

Aging is an important risk factor of cognitive impairment. Worldwide, daily human efforts aim at a better health. This increases the longevity. The world population aged sixty and above is rising worldwide. Fertility declines while life expectancy rises(3). In 2014, the population aged above 60s was estimated at 2%(4). Three years later in 2017, they were estimated at 962 million. This was around 13% of the world population. The aging at sixty years and above was growing at a rate of 3% per year(3). From 2015 to 2030, the world's elderly population of 60years and above is assumed to rise by 56% from 900 million to 1.4 billion(5). By 2050 the United Nations(UN) projected the world population aged above 65 to be more than 1.5 billion(6). By that time in Sub-Saharan Africa(SSA) the population older than 60s is expected to increase by 260%(7). Those aged above 60s are estimated to increase from 40millions to 160million(8). By World Data Atlas on Rwanda in 2020, people aged 60s and above were around 663 thousand. They are expected to triple by 2050 and be more than fivefold 20years later(8). The eldership is associated with multiple health problems and morbidity. Aging is a remarkable risk factor of developing severe illness and death by the current COVID-19 pandemic. A recent study done in the United Kingdom found that people aged above 80s were more than 20times likely to die than those in 50s and more than 100times than those below 40s(6).

Cognitive dysfunction is one of the most common health conditions among this population. Cognition is a human's process of identifying, interpreting, selecting, storing and using information, knowledge and skills to make sense and interact with social and physical world in activities of daily living(9). In various literatures, authors refer to different domains of cognition like attention, memory, perception, language, psychomotor speed and executive function. The later includes: initiating, planning, organizing, controlling and evaluation of thinking and acting(9).

1.2 Literature Review

Cognitive impairment (CI) is an important predictor of functional capacity and need for care in elderly population(10). It is an acquired cognitive decline in one or more cognitive domains interfering with daily functioning and life. Affected individuals suffer from various health, social and economic adverse consequences. It is associated with poor work performance, family life and social activities as well as management of finances(2). The burden created is not limited to the family but extends to the country and by far the whole world.

There are two types of cognitive impairment: mild and major. *Mild Cognitive Impairment*(mCI) is an intermediate status between normal cognition and dementia with preserved functional capacity requiring more efforts. Among older population around 16% experience mild cognitive impairment without progressing to dementia. It is more prevalent in older men than women. MMSE score of less than 19 in black is considered as dementia(11). Annually, the rate of conversion to Alzheimer's disease or non-specific dementia ranges between 12% to 15% in comparison with 1 to 2% among healthy counterparts(10).

It is transition between age related cognition changes and criteria fulfilled dementia. Mild cognitive impairment is subclassified into amnestic and non-amnestic(12). Amnestic mild cognitive impairment is characterized by worsening forgetfulness without meeting diagnostic criteria for dementia. Non-amnestic type is described as elusive decline in other functions unrelated to memory, rather affecting attention, language or visuospatial skills(12). It is less common than amnestic and may be antecedent to dementias not related to Alzheimer's disease such as frontotemporal lobar degeneration or dementia with Lewy bodies.

In most clinical trials including patients with amnestic mild cognitive impairment more than 90% of those who progressed to dementia had signs of Alzheimer's disease. People with of mild cognitive impairment may later become normal, progress to dementia, schizophrenia or even death in the next five years(13). Major Cognitive Impairment (MCI) is similar to dementia and requires severe impairment in one or more cognitive domains as previously described.

In addition to aging, other various risk factors are related to sex, family history, educational level, hypertension, diabetes mellitus, hypercholesterolemia and tobacco, alcohol abuse, depression, physical inactivity, unhealthy diet, hyperhomocysteinemia and elevated serum C-reactive protein etc.(14). These are associated with cerebrovascular diseases and may contribute to the degenerative forms. The etiologies are multiple and include: Alzheimer's disease, cerebrovascular disease, frontotemporal lobar degeneration, Lewy body disease, Huntington's disease, HIV disease, etc.(15).

The prevalence of MCI which corresponds to dementia increases with aging. It doubles every five years after the age of sixty-five. In developed countries, it is 5 to 10% among people aged 65 and above. It is greater in women than men.

The worldwide systematic reviews and metanalyses suggested that it less prevalent in Sub-Saharan Africa and higher in the Latin America than somewhere else worldwide(16). The prevalence of dementia is expected to increase in low- and middle-income countries as life expectancy improves. The incidence of dementia steadily rises till around the age of 90.

The annual age related rate is estimated from 0.1% at 60 to 64 years to 8.6% at 95years of age(16). The prevalence of cognitive impairment in sub-Saharan Africa among patients above the age of fifty(>50years old) varies widely from 0-25% among countries(17).This can be due to genetic, demographic, medical, psychiatric, environmental and lifestyle behaviors. Moreover, there are also protective factors which can be education level, pharmacological and lifestyle(16).

In Sub-Saharan Africa (SSA), more than 2 million people were estimated to have cognitive impairment in 2015. This was projected to double every 20years and to be around 8million by 2050(18). Few studies have been done in Africa. As there is a wide variability and continuous rise, countries-based studies are needed to determine possible precipitating factors and further preventive measures for modifiable risks. According to a study done in a community in Tanzania, the prevalence of cognitive impairment was 7%(13). The increasing incidence related risk factors are multiple and variable.

1.3 Problem Statement

Cognitive health assessment is not part of routine healthcare practice in Rwanda. In our referral hospitals, there is underestimation of cognitive dysfunction among older patients due to unawareness amid healthcare providers and lack of local data about the amplitude of this particular health condition in our hospitals and community.

Currently, to the best of our knowledge there are no data available on the magnitude of cognitive impairment in Rwanda. We conceived this project to assess the prevalence of cognitive impairment among elderly patients at two main public university teaching hospitals in Rwanda.

1.4 Hypothesis

Cognitive impairment is more prevalent with various related risk factors among patients aged 60yesrs and older at university teaching hospitals in Rwanda.

1.5 Objectives

1.5. a Main objective

To determine the prevalence of cognitive impairment among patients aged 60years and above who are consulted and treated in internal medicine department at the university teaching hospitals in Rwanda.

1.5.b Specific objectives

- To assess cognitive dysfunction among older patients at these hospitals using standardized tools,
- To describe probable precipitating factors of cognitive impairment among these patients,
- To describe the health autonomy status of these patients.

CHAPTER II. METHODOLOGY

2.1 Study settings

Our healthcare system functions at main four levels of healthcare where patients are channeled according to their health conditions. There are: Community Health Workers (CHW) in the village who refer patients to the Health Center (HC). The later transfers patients to the District Hospitals (DH) where selected complex patients are referred to the tertiary hospitals. At this level there four hospitals and one dedicated cancer treatment center. This includes two main university teaching hospitals and other two tertiary referral hospitals. Patients at a tertiary level can be counter-referred back to the lower level for continuation of care depending on their diagnosis and need for follow up.

The study was carried out in the two main University Teaching Hospitals. They are *Centre Hospitalier Universitaire de Butare (CHUB)*/University Teaching Hospital of Butare (UTHB) in Huye city located in the southern province of the country and *Centre Hospitalier Universitaire de Kigali (CHUK)*/University Teaching Hospital of Kigali (UTHK) in Kigali city. These are two main public referral hospitals which serve the whole country where all patients with complex health conditions are treated and followed up, till they are can easily be treated at secondary and primary healthcare levels. We focused on patients who attended the Internal Medicine department in these two hospitals over six months from June to November 2020.

CHUB has a total of 500 beds(19). Medical specialized services are provided in around 8 major departments which include: Internal Medicine, Pediatrics, Surgery, Obstetrics and Gynecology, Accident and Emergency, Anesthesiology and Critical Care Medicine, Dialysis as well as Mental Health. There are also allied services provided in 7 departments including: Pathology, Imaging, Pharmacy, Physiotherapy and Functional Rehabilitation, Nutrition and Dietetics, Social Work as well as Community Health Supervision(20). The Internal Medicine department is the biggest where it occupies around 13% with 64 beds with a bed occupancy of 79%. It hosts the majority of inpatients and outpatients who met our inclusion criteria compared to other departments.

CHUK provides similar clinical and allied services with more subspecialties like: Neurosurgery, Pediatric surgery, Oncology and evolving Geriatrics. It has a slightly bigger capacity with 519 total beds. Its Internal medicine has 68 beds which takes 13,1% of the hospital inpatient capacity.

There are two categories of patients, including those who use Community-Based Health Insurance (CBHI) and others who use private health insurances as well as public employees' health insurance called Rwanda Social Security Board (RSSB). CBHI patients are required a transfer from a district hospital whereas RSSB and privately insured do not require any transfer to get treated at either hospital. They consist the highest and affordable quality of healthcare countrywide.

2.2 Study design

This was a cross sectional study among patients aged 60s and above, who attended the department of Internal Medicine at the two main university teaching hospitals in Rwanda during the study period.

2.3 Study population

Like in similar studies done in Africa, our study population was made of patients aged 60 and above(21). This age is considered as old in Sub-Saharan African(SSA) population which is the youngest worldwide(22). As described in this study about older population in Africa and according to population distribution by WHO, after this age their percentage count starts declining compared to their younger counterparts, while their co-morbidities and mortality remarkably increase(23). The ministry of local government in Rwanda considers old age as 60years and older for their national strategic planning where they are concerned by the expected increase of this key population of 115% by 2032(24).Cognitive impairment is feared by most middle aged people especially those who are educated from the age of 55(25). This would imply more apprehension amid older individuals.

Specifically for this study, our subjects were patients either admitted or followed up in outpatient of Internal Medicine department at CHUB and CHUK. As per WHO age standardization for population health studies, we have grouped ours in nearly clusters of 5years(26).We chose to use the UN definition of older people as those aged 60s and above given our younger population as in general for Africa(27). This was for a better understanding of the studied population rather than individual age consideration. Our bottom age was 60years and our top was 110 years. In total we had 11 age groups. The first group was from 60 to 65years then followed up by clusters of five from 66 to 70years etc. till the age of 110years where we made 10 groups and the last group of older than 110years as the recorded oldest person in Rwanda was approximatively 126years. For the purpose of this study as detailed we did not consider the subclasses of older population as described in some literature like young old, older and old old by nr.com in their article about age consideration in healthcare practice(28). We collected data among 200 patients distributed in mentioned groups, who met our inclusion criteria and after signing the consent form: 100 patients per each of the two hospitals.

2.4 Inclusion criteria

Our inclusion criteria were:

- Age of 60 and above.
- Patients treated in the Internal Medicine departments of the two main University Teaching Hospitals: CHUB and CHUK.
- Those who accepted to sign a consent form for participation by the patient or any of their representatives.

2.5 Exclusion criteria

- All patients who refused to sign a consent form.
- Age below 60 years.
- Patients with in hospital onset of loss of consciousness.
- Patients diagnosed with delirium.
- All patients with traumatic brain injury.

2.6 Sample size

The sample size was extrapolated using the average of the studies in similar settings(13). As we were not sure of regular patients' flow, we used consecutive recruitment where we saw patients who came during the data collection period. According to the review article by Charan J. and T. Biswas, describing sample size calculations for various studies, we applied the following formula(29) :

$$\text{Sample size} = \frac{Z_{1-\alpha/2}{}^2 p(1-p)}{d^2}$$

$Z_{1-\alpha/2}$: The standard normal variate which is 1.96 at $p<0.05$,

P: Expected proportion in previous similar study in close similar settings which was 7%(13).

D: Precision or error chosen (e.g 5%),

By applying the above formula, we estimated our sample size to 100 patients. As per consecutive recruitment, this was the estimated minimum.

2.7 Variables

Most of our variables were categorical including age groups, sex, province of origin, education level, occupation, current known medical conditions, daily life behavior like smoking and alcohol consumption, diet and spoken language(30). The scales of Mini-Mental State Examination scale (MMSE), Activities of Daily Living scale (ADL) and Instrumental Activities of Daily Living scale (IADL) were used to score them. The age was distributed in groups of 5years from the age 60. The origin was considered in five provinces: Eastern, Kigali city, Northern, Southern and Western. The education level was considered according to the formal three education levels from the primary school, high school and university. The current medical conditions were detailed to their different known diagnoses using their hospital records: digital and paper-based files. The diet was tailored into what they prefer to eat most. Spoken languages were considered as whatever other languages apart from the mother tongue: bilingual, trilingual, quadrilingual etc.

The MMSE scale was used among all participants and their scores were recorded and interpreted by severity of cognitive impairment. ADL and IADL scores well recorded. Relationship of some variables and cognitive impairment was assessed.

2.8 Data Collection

The data has been collected over a period of six months from June to November 2020 through a consecutive recruitment. The questionnaire was made of mainly two parts: 1) Biodemographic data and general health, 2) Research tools: Mini-Mental State Examination scale (MMSE), Self-maintenance scale: physical activities of daily living (ADLs) and instrumental activities of daily living (IADLs). These scales were applied on stabilized eligible patients in hospitalization. However, in out-patients, they were immediately applied on those who fulfilled the criteria after their consent.

We have been using physical contact hard copy data collection questionnaires. We did one contact data collection at the first contact with a patient who was eligible after signing the consent form. Trained medical students helped to collect data in the two hospitals. They were final year undergraduate medical students who were doing their last clinical rotation in Internal Medicine at either hospital. The Research questionnaire was discussed in details to ensure the same level of understanding. The English version questionnaire was translated and discussed in details with its Kinyarwanda version with the medical students to ensure advanced understanding as they are all native speaker. Before starting the data collection, ten questionnaires were piloted to different patients in both teaching hospital and the same questionnaire was maintained as there was same comprehensive data collection approach. The challenge was that the questionnaire was too long to go through from one patient to another. For those who could not be patient to allow the full time we had to split and come for MMSE alone after but on the same day. We had to find a time out of clinical inward activities to avoid interference with hospital duties. We also used patients' files and records to complete current medication information.

2.9 Data Analysis

The collected data were analyzed using the Statistical Package for the Social Science (SPSS). They were entered and analyzed in SPSS version 21. Descriptive analysis was mainly considered. Categorical data are presented using frequencies and percentages in tables. Mean and median values were considered according to continuous data distribution. Linear logistic regression and Chi-Square tests were used to study the relationship between outcomes and possible predictors. As usual p value of <0.05 with a confidence interval of 95% were considered as statistically significant.

2.10 Ethical Considerations

We obtained ethical approval from University of Rwanda/College of Medicine and Health Sciences/School of Medicine through the institutional review board (UR/CMHS). Our approval was: IRB No 046/CMHS IRB/2020. This was used to get research ethical approvals from the two main university teaching hospitals: CHUK and CHUB. We got the two approvals No: EC/CHUK/040/2020 and RC/UTHB/016/2020 with a reference No Ref: CHUB/DG/SA/08/2071/2020 respectively. All the approval letters are annexed to this manuscript.

Moreover, every member of this research ensured confidentiality for the participants. We focused on research questionnaire and avoided other unintended discussions. Complementary information was searched from patients' records. All the information was kept confidential. The principal investigator safeguarded all the collected data. All ethical research considerations were followed smoothly**.**

2.11 Study Management

The management team of this study is made of the PI and two Co-PIs. The later are specialists and lecturers in the internal medicine department at the University of Rwanda. Their clinical activities are mainly based at the university teaching hospitals. They acted as supervisors of the PI who is a resident in Internal Medicine. The team collaboration was consistent and they were committed to complete the work successfully. Further similar studies are expected for a more extended scope as Geriatrics evolve in Rwanda. There was no need of any special management team as this was a non-funded research for academic purpose.

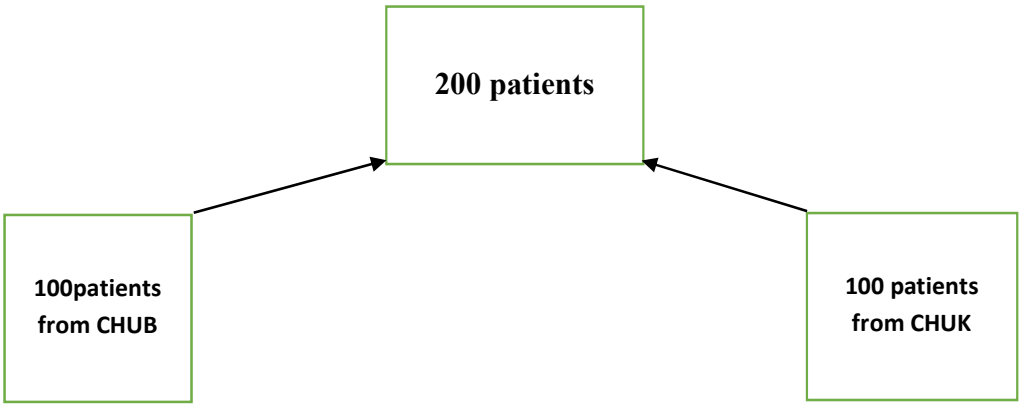
2.12 Study Tools

We used paper-based questionnaire. It included sub-questions about general bio-demographic data and general medical information as well as cognitive function and Health Autonomy Status (HAS) assessment. There are multiple tools used to assess cognition. One of the famous in our clinical practice is Mini-Mental State Examination scale (MMSE). It is standard tool used to assess cognitive function in clinical practice. It was approved by a Work Group of the National Institute of Neurological and Communicative Disorders and Stroke and Alzheimer's Disease and Related Disorders Association in the USA. It is effective to evaluate cognitive function in hospitals and community(31).We used it for every participant in this study to assess their cognitive function. It is made of eleven questions whereby patients were assessed and their scores are recorded. The final mark was given out of 30 and it determined their classification from normal cognition to mild, moderated and severe Cognitive Impairment (CI). The score above 25 was considered as normal.

From 20-25 out of 30 as Mild, 10-20: as Moderate and below 10 as Severe cognitive impairment. The HAS assessment was done by self-maintenance scales: Activities of Daily Living (ADL) and Instrumental Activities of Daily Living scales(IADL)(32)(33). ADL scale has six elements whereas IADL has eight. The highest score was defined as independent otherwise dependent for both scales. The degree of severity for impaired self-maintenance was not considered in this study. The expected clinical correlation between MMSE and ADL was assessed where patients with mild cognitive impairment may require either support or supervision, while those with moderate CI require 24h supervision and those with severe CI are completely dependent and require 24h supervision and assistance. All participants were assessed using those tools in the research questionnaire.

CHAPTER III. DATA ANALYSIS

Through a consecutive recruitment, a total of 200 participants were enrolled from CHUK and CHUB over a period of 6months from June to December 2020. There were 100 participants from each hospital. This total number fulfilled our inclusion criteria and consented. They were all considered for data analysis**.**



3.1 Biodemographic characteristics of participants

Our participants were categorized by sex, age, province of origin, level of education, occupation, spoken languages as well as probable risk factors of cognitive dysfunction. Furthermore, every patient was evaluated for Mini-Mental State Examination score, level of Health Autonomy by Activities of Daily Living scales.

As results in line of the above characteristics, female predominated male with (105)52.5% and (95)47.5% respectively. Concerning the age grouping, the majority were between [60-65] years: 69(34.5%), followed by [66-70] years: 46(23%) and nearly similar from [71-75] years:28(14%), [76-80]:31(15%) then they became fewer as age advances: [81-85]:16(8%), [86-90]:4(2%) to the least: [101-105]: only 1 patient recorded. The Five provinces of the country were represented. Most of them came from the Southern province: 106(53%), followed by Kigali City: 57(28.5%), Western: 20(10%), North: 10(5%) and the Eastern was the least represented with 7(3.5%). Illiteracy and primary level of education predominated: 97(48.5%) and 80(40%) respectively.

The majority of participants were farmers: 136(68%) and none of them was a healthcare provider. Mother tongue took a lead as a spoken language with 157(78.5%). Details are below in Table 1.

Table 1. Patients' Bio-Demographic Characteristics

Demographic characteristics	Frequency N=200	Percentage (%)
Age group, years n (%)		
60-65	69	34.5%
66-70	46	23%
71-75	28	14%
76-80	31	15.5%
81-85	16	8%
86-90	4	2%
91-95	2	1%
96-100	3	1.5%
101-105	1	0.5%
Gender n (%)		
Male	95	47.5%
Female	105	52.5%
Origin n (%)		
East	7	3.5%
North	10	5%
South	106	53%
West	20	10%
Kigali city	57	28.5%
Education level n (%)		
Illiterate	97	48.5%
Primary	80	40%
Secondary	14	7%
University	9	4.5%
Occupation n (%)		
Farmer	136	68%
Teacher/Instructor	6	3%
Leader/politician	0	0
Scientist	1	0.5%
Health care staff	0	0
Self-employed	11	5.5%
Business (Seller, etc)	26	13%
Work in office	12	6%
Languages n (%)		
Mother tongue	157	78.5%
Two languages	20	10%
Three languages	17	8.5%
Four languages	6	3%

Table 1. shows bio-demographic characteristics of the study population in this cohort. Majority of the population (34.5%) were ranging between 60-65 years of age; followed by 66-70 years old about 23%. Again majority were females 53% of the study participants.In addition, Southern province had a high proportion 53% of the participants compared to the rest of patients' origin. Then losts of the participants were farmer 68%. Also, then most commonly spoken language was mother tongue in about 78.5% of the study population.

3.2. Cognitive function status and related risk factors

Cognitive function was conserved in 77(38.5%) of all the participants. The prevalence of cognitive impairment (CI) was 61.5% (123). Considering risk factors associated with cognitive impairment in our study: Among 19.5% who had severe cognitive impairment: 8.5% had stroke, 8% had hypertension, 5% had malignancy followed by diabetes mellitus: 2%, HCV infection and chronic lung disease: 1.5%, heart disease: 1% and lastly HBV infection: 0.5% with overall significant p value<0.001. The same risk factors predominated in almost the same order in mild and moderate cognitive impairment. In general, the most significant risk factors of cognitive impairment in our population are: Hypertension: 20.5%, Malignancy: 14.5%, Stroke and HCV infection: 10%, Chronic lung disease: 9%, heart disease: 6%, DM: 5.5% and lastly HBV infection with overall significant p value of <0.001.

Furthermore, environmental and lifestyle risk factors were studied in this population. Significant factors associated with cognitive impairment were predominated by: alcohol: 42%, Smoking: 17% with p value <0.001. Details are described by tables 2, 3, 4&5.

Table 2 Association between age and Cognitive Function by MMSE (N=200)

	(MMSE>25:nl) n=76	(MMSE: 21-25:mild) n=38	MMSE: 11-20:mod.) n=46	(MMSE: 0-10:sev.) n=40
Age group (years)				p<0.065
60-65	33 (43%)	18 (47%)	9 (20%)	9 (22%)
66-70	22 (29%)	7 (18%)	8 (17%)	9 (22%)
71-75	10 (13%)	3 (8%)	8 (17%)	7 (17%)
76-80	7 (9%)	9 (24%)	8 (17%)	6 (15%)
81-85	4 (5%)	1 (3%)	7 (15%)	4 (10%)
86-90	0	0	3 (7%)	1 (2 %)
91-95	0	0	1 (2%)	1 (2%)
96-100	0	0	1 (2%)	2 (5%)
101-105	0	0	1 (2%)	1(2%)

Table. 2 shows a link between age and cognitive impairment by MMSE scores. In the youngest age group, mild cognitive impairment predominates. As aging progresses there is a shift to moderate and severe cognitive impairment. This confirms that aging is a major risk factor of cognitive function impairment.

Table 3 a. Relationship between patients' medical conditions and cognitive function (MMSE score)

Variables	MMSE (0-10)	MMSE (11-20)	MMSE (21-25)	MMSE>25	P value
	N=39	N=46	N=38	N=76	
Hypertension n (%)					p<0.022
	16 (8%)	16 (8%)	9 (4.5%)	41 (20.5%)	
Diabetes mellitus n (%)					p<0.001
	4 (2%)	3 (1.5%)	4 (2%)	18 (9%)	
Dyslipidemia n(%)					p<0.001
	0	0	0	1 (0.5%)	
Heart failure/Heart disease n (%)					p<0.069
	2 (1%)	8 (4%)	2 (1%)	16 (8%)	
Stroke n (%)					p<0.001
	17 (8.5%)	2 (1%)	1 (0.5%)	2 (1%)	
Obstructive Sleep apnea n (%)					
	0	0	0	0	
Chronic lung disease: asthma, COPD, ILD, PTED n (%)					p<0.001
	3 (1.5%)	8 (4%)	7 (3.5%)	10 (5%)	
Malignancy if any n (%)					p<0.001
	10 (5%)	12 (6%)	7 (3.5%)	11(5.5%)	
Recovered a severe illness if any n (%)					p<0.001
	2 (1%)	1 (0.5%)	0	0	
RVD (HIV) n (%)					p<0.001
	1 (0.5%)	2 (1%)	1 (0.5%)	2 (1%)	
HCV n (%)					p<0.001
	3 (1.5%)	8 (4%)	9 (4.5%)	8 (4%)	
HBV n (%)					p<0.001
	1(0.5%)	0	0	1 (0.5%)	
CKD n (%)					p<0.001
	0	0	1 (0.5%)	0	

Table 3 shows an association between patients' medical conditions and cognitive impairment by MMSE score. Stroke (8.5%) was the leading cause of severe cognitive impairment as evidenced by the MMSE score ≤ 10 among other medical conditions. It was followed by Hypertension (8%) and the third is malignancy (5%). On the other hand, a considerable number of hypertensive patients (20.5%) had a fair cognitive impairment based upon MMSE>25.

Table 3 b. Multivariate analysis of MMSE and associated risk factors

Variables	MMSE < 25)		MMSE ≥25		P value
	N	OR95%CI	N	OR95%CI	
Hypertension					0.026
No, n (%)	93 (78%)		25 (22%)		
Yes, n (%)	53 (64%)	1 [1, 1]	29 (35%)	0 [0, 0]	
Diabetes mellitus					0.082
No, n (%)	128 (75%)		42 (25%)		
Yes, n (%)	18 (60%)	1 [0, 1]	12 (40%)	0 [0, 1]	
Dyslipidemia n(%)					p<0.001
No, n (%)	145 (73%)		54 (27%)		
Yes, n (%)	1 (100%)	0 [0, 0]	0	-	
Heart failure/Heart disease n (%)					p<0.001
No, n (%)	127 (73%)		45 (27%)		
Yes, n (%)	19 (67%)	1 [0, 1]	9 (32%)	0 [0, 1]	
Stroke n (%)					0.012
No, n (%)	125 (71%)		53 (29%)		
Yes, n (%)	21 (95%)	0 [0, 0]	1 (4%)	6 [0, 45]	
Chronic lung disease: asthma, COPD, ILD, PTED n (%)					p<0.001
No, n (%)	125 (73%)		47 (27%)		
Yes, n (%)	21 (75%)	0 [0, 1]	7 (25%)	1 [0, 2]	
Malignancy if any n (%)					p<0.001
No, n (%)	108 (67%)		52 (32%)		
Yes, n (%)	68 (95%)	0 [0, 0]	2 (5%)	6 [1, 25]	
Recovered a severe illness if any n (%)					p<0.001
No, n (%)	144 (73%)		53 (27%)		
Yes, n (%)	2 (66%)	1 [0, 2]	1 (33%)	0 [0, 4]	
RVD (HIV) n (%)					p<0.001
No, n (%)	141 (72%)		53 (27%)		
Yes, n (%)	5 (83%)	0 [0, 1]	1 (16%)	1 [0, 9]	
HCV n (%)					p<0.001
No, n (%)	123 (72%)		49 (28%)		
Yes, n (%)	23 (82%)	0 [0, 1]	5 (17%)	1 [0, 3]	
HBV n (%)					p<0.001
No, n (%)	144 (73%)		54 (27%)		
Yes, n (%)	2 (100%)	0 [0, 0]	0	-	
CKD n (%)					p<0.001
No, n (%)	145 (73%)		54 (27%)		
Yes, n (%)	1 (100%)	0 [0, 0]	0	-	

Table 3 b. shows a multivariate analysis of MMSE and associated risk factors. Neither hypertension, 1 [1, 1] nor Diabetes mellitus, 1 [0, 1] nor heart failure, 1 [0, 1] was associated with a reduced MMSE. However, dyslipidemia, 0 [0, 0] or stroke, 0 [0, 0] or Chronic lung disease, 0 [0, 1] or Malignancy, 0 [0, 0] and RVD (HIV), 0 [0, 1] among others presented a lower odds of association between the exposure and outcome. None of the risk factors showed a greater odds of association with MMSE less than 25.

3.3 Health autonomy status and related risk factors

Their autonomy status and related risk factors was assessed by their ADL score. In general, 44% of the studied population were dependent as shown by their low score on ADL scale whereas 66% were completely independent. The Instrumental Activities of Daily Living (IADL) scale revealed a higher degree of dependency at 66.5% compared to 33.5% of patients who were independent. Malignancy, cardiovascular diseases and viral hepatitis C infection were significantly associated with dependency among other risk factors. Details are described by tables 4&5 below:

Table 4. Link between medical conditions and health autonomy (ADL scale)

Variables	Dependent (low ADL)	Independent (normal ADL)	P value
	Multivariate analysis		
	N= 88; OR95%CI	N=112; OR95%CI	
Hypertension n (%)			p<0.001
	33 (16.5%); 1 [0, 2]	49 (24.5); 0 [0, 1]	
Diabetes mellitus n (%)			p<0.094
	9 (4.5%); 1 [0, 2]	21 (10.5%); 0 [0, 1]	
Dyslipidemia n (%)			p< 0.063
	0	1 (0.5%); 0 [0, 0]	
Heart failure/Heart disease n (%)			p<0.001
	9 (4.5%); 1 [0, 2]	19 (9.5%); 0 [0, 1]	
Stroke n (%)			p<0.054
	20 (10%); 0 [0, 0]	2 (1%); 6 [1, 25]	
Obstructive Sleep apnea n (%)			
	0	0	
Chronic lung disease: asthma, COPD, ILD, PTED n (%)			p<0.001
	11 (5.5%); 1 [0, 1]	17 (8.5%); 0 [0, 1]	
Malignancy if any n (%)			p<0.001
	66 (33%); 0 [0, 1]	94 (47%); 1 [0, 4]	
Recovered a severe illness if any n (%)			p<0.001
	2 (1%); 0 [0, 1]	1 (0.5%); 1 [0, 8]	
RVD (HIV) n (%)			p<0.090
	3 (1.5%); 0 [0, 1]	3 (1.5%); 1 [0, 2]	
CKD n (%)			p< 0.063
	0	1 (0.5%); 0 [0, 0]	
HCV n (%)			p<0.078
	13 (6.5%); 0 [0, 1]	15 (7.5%); 1 [0, 1]	
HBV n (%)			p<0.001
	2 (1%); 0 [0, 0]	0	
Parkinson's disease n (%)			p<0.001
	2 (1%); 0 [0, 0]	0	

Table 4 shows a link between participants' medical conditions and their health autonomy status as described by their ADL score. There was no strong association between hypertension, 1 [0, 2] or Diabetes, 1 [0, 2] or heart failure, 1 [0, 2] and chronic lung disease, 1 [0, 1] with a lower ADL scale (dependent). But, stroke, 0 [0, 0], malignancy, HIV, HCV, Parkinson's disease among others showed lower odds of association between the exposure and outcome. Finally, none of the risk factors had a greater odds of association with a lower ADL scale.

Table 5. The link between cognitive impairment (MMSE) and health autonomy status (ADL)

	Dependent (low ADL)	Independent (nl ADL)	P value
Degree of cognitive impairment	N=88	N= 112	p<0.001
Fair (MMSE>25)	18 (9%)	58 (29%)	
Mild (MMSE: 21-25)	11 (6%)	27 (14%)	
Moderate (MMSE: 11-20)	23 (12%)	23 (12%)	
Severe (MMSE: 0-10)	36 (18%)	4 (2%)	

Table 5 shows a link between CI and autonomy. It revealed that severe cognitive impairment is associated with dependency, 36 (18%); p<0.001.

CHAPTER IV. DISCUSSION

This study showed the prevalence of 61,5% of cognitive impairment among 200 patients aged 60 and older at two main public university teaching hospitals: CHUB and CHUK, in Rwanda. While designing it, the sample size was calculated based on the average prevalence of cognitive impairment in similar previous studies in Africa(13). The formula of Charan J. and T. Biswas, describing sample size calculations for various studies was applied. It was estimated at 100patients. The present study doubled the calculated sample size as it involved 200patients.

There are multiple tools to diagnose cognitive impairment. In this study, we used Mini-Mental State Examination (MMSE). This is a common tool used in daily clinical practice for patients suspected to have cognitive dysfunction. For assessment of their health autonomy status, we have used Activities of Daily Living (ADL) as well as Instrumental Activities of Daily Living (IADL) scales.

The study population characteristics were mainly made of age groups, gender, origin, education level, occupation and spoken languages. Among the two hundred participants, the number per age groups declined as the age advanced. Sixty-nine of them were aged between 60 and 65 which represent 34.5%. They were followed by their elders who were 46 and represented 23%. Those who were aged 71 to 80 were 59 representing 29% of the studied cohort. This age group was less represented compared to the younger counterparts in the earliest young group who were 10 counts more. After the age of 85 where the related group of 81-85 years who represented 8%, there was a significant decline to age group representatives. The last three groups were less dense with only 10(5%) from the age of 86 to 105. The last groups were the least represented where only 1 participant represented the whole group of 101-105. As per normal age distribution there is relative decline in number of people as the age advances where the most advanced ages are very less represented. Ageing is a worldwide phenomenon whereby all countries are affected. Global elderly population is expected to increase in time. The United Nations global population report of 2019 highlighted that number of older people is expected to increase more than double by 2050. The largest rise was projected to occur in Asia followed by Sub-Saharan Africa by +218%.There is relatively slower progression in New Zealand and Australia , Europe and North America of +84 and+48 respectively(34). However, the evolving pandemic of covid19 which is still ravaging the older population may alter a gear a bit. According to one of the current pandemic WHO weekly report, around 95% of deaths occurred in people aged 60 years and older(35).

For gender characterization of our participants: we had two categories, where females dominated at 105(52.5%) while males were 95(47.5%). This gender distribution is similar to the usual Rwandan pattern where females outnumber males at 52% versus 48% respectively(36) (thematic gender report, Census 2012, Rwanda).

We studied the origin of the participants per province. The four provinces and Kigali city were represented. The results showed that most of them come from the South (53%), followed by Kigali City with 28.5%. The last three had a relatively small number where the Western had 10%, Northern: 5%. The Eastern province was least represented at 3.5%. This is reasonable because the southern province has CHUB as the main referral hospital whereas Kigali has other multiple private hospitals. For other provinces, the fewer representatives would be explained by the presence of provincial hospitals whereby few patients are transferred to the university teaching hospitals.

As far as the education level of the studied population is concerned, the majority of them were illiterate at 48.5% followed by the primary school level at 40%. Few of them reached the secondary school (7%) and university level (4.5%). This is due to historical discrepancies and reflects the history of education in Rwanda which is evolving to the best of all Rwandans.

For the occupation and profession, the majority of our participants were farmers at 68%. The rest of them shared other jobs whereby businesses occupied the second position with 13% and followed by office-based activities at 6%, self-employed: 5.5% and teacher: 3%. The least represented job was scientist which only had one participant (0.5%). This is line with the historical occupation of ancestry where agriculture was the main activity leading the national economy. Spoken languages were considered in the studied population. The results showed that most of our population speak the single mother tongue 'Kinyarwanda' at 78.5%. Those who speak two languages were 10% and three languages were 8.5%. Few of them speak four different languages. This is proportional to their level of education.

This prevalence of 61.5% was higher than most of other studies as described below. There is a wide variable range in different studies. Cardiovascular diseases are associated with increased prevalence. A metanalysis done by Eduarda Pereira et al. about prevalence of cognitive impairment among patients with Acute Coronary Syndrome(ACS) found the prevalence range of 10-66%(37).Our findings are in this range it was 61.5%. However, ACS is not studied yet in our country but cardiovascular diseases are emerging in developing countries including Rwanda. Thus, the current prevalence would be expected to raise in the future.

The average worldwide prevalence of mild cognitive impairment among patients aged 60 and above was reported to be 42% and subsequent metanalysis found an overall average of 16%(38). In 2002 a study done in the USA about prevalence of cognitive impairment among patients aged 71 and above found that 22% had mild cognitive impairment and more than 11% of them progressed to dementia in 1year with annual death rate of 8% which almost doubled in those who got into dementia(39). In Asia the prevalence of severe cognitive impairment ranges between 0.003 and 33%(40). This reflects the wide range of prevalence of cognitive dysfunction which applies elsewhere out of this most populous continent. A metanalysis done in China in 2010 found that the average prevalence of CI was 12.7%(41).

In a metanalysis done in Sub-Saharan Africa by L. Alain et al, the average prevalence was found to be 1-10% in community-based studies and 1-47% in hospital-based studies. The main risk factors were aging and female sex. HIV infection was found to be a major risk of neurocognitive dysfunction especially when it is not well treated and controlled. In the same study 47/144 publications were about HIV related neurocognitive impairment(42).

A study done in Cameroon published in 2019 about factors associated with prevalence of cognitive impairment among 501 patients aged at least 50 years, found that the prevalence was 33.3%(5). It is similar with the results of a study done in Spain where it was 35.2%(43). The prevalence found by our study was almost double theirs. Possible explanation might be that our study was done in patients who were attending the hospitals for other comorbidities mainly cardiovascular diseases, Hepatitis C infection and malignancies. A part from aging, those are major risk factors associated with neurocognitive dysfunction. They were either admitted or in outpatient clinic for follow up. This is likely the reason why the prevalence was higher than community based-studies where people are not sick at all. Lower prevalence was found in a study done in Benin where it was 10.4%(44).In Nigeria the prevalence was 19.6%(45). A systematic review about prevalence of cognitive impairment in Sub-Saharan Africa found that it has a wide range from 6% to 25%(46).In India, it was found to be 16% and it nearly doubled in a study done in outpatient department where it was found to be 31%(47). In Malysia it was found to be 36.5% and mainly related to aging. In studies done in developed countries like USA, the prevalence is around 30%(11). A study done in UK about cognitive impairment found it to be prevalent at 18.3% and it was mainly related to age and gender. A study done by Sabine B. et al about cognitive dysfunction and ADL dependency in a nursing home in Sweden published in 2016 found a higher prevalence of cognitive impairment at 67%(48).There is a large variation of prevalence of cognitive impairment worldwide in relation to various population biodemographic characteristics and specific epidemiology.

In our results the major risk factors corresponding to the severity of cognitive dysfunction were aging, cardiovascular diseases, malignancies, HCV infection, chronic lung diseases (asthma, COPD, etc). as well as diabetes mellitus. Furthermore, the risk factors revealed by our study are almost like those described in other literature. Aging, illiteracy, cardiovascular diseases, smoking, alcohol consumption, depression and metabolic syndrome were the most common risk factors related to cognitive function decline(49).

Specific considerations in our study, in addition to other risk factors were malignancies, viral hepatitis C infection which were also significantly related to increased prevalence of cognitive impairment in our settings. A possibility of related vascular complications might be considered though it was not part of this study. The study done in Rwanda by Jean Damascene Makuza et.al. about risk factors of hepatitis C found that its prevalence was 6.8% and the age of 65 and above was a significant risk among others(50).

Chronic viral hepatitis C infection is not limited to the liver. Once it is not treated it causes multisystemic extrahepatic manifestations where it affects many organs including: cardiovascular and respiratory systems leading to significant comorbidities: autoimmune vasculitis, cytopenias and lymphomas, pulmonary fibrosis and other interstitial lung diseases as well as diabetes mellitus(51). Advanced related liver disease leads to decompensated cirrhosis which results into hepatic encephalopathy. All these complications lead to multiple organs dysfunction where by cognitive impairment is one of them.

Furthermore, in our results, the degree of severity was almost equally distributed: slightly dominated by moderate CI. The distribution of this prevalence by severity was as follow: mild CI: 19% [MMSE score range:21-25], moderate CI: 23% [MMSE score range :11-20] and severe: 19.5% [MMSE score range 0-10]. The link between different risk factors and severity of cognitive impairment was studied. Cardiovascular diseases remained on top for mild and moderate cognitive impairment at 6% versus 8% respectively. From top down, the major risks of mild cognitive impairment were: cardiovascular diseases (CVD), hepatitis C(HCV), malignancies and chronic lung diseases (CLD), as well as diabetes mellitus (DM). For moderate cognitive impairment associated risks were: CVD (13%), Malignancies (6%), HCV&CLD (4%) and DM (1.5%). The risk factors associated with severe cognitive impairment in our study were: CVD: 17.5%, Malignancy: 5%, DM: 2% and lastly HCV&CLD: 1,5%. In general, as found by our study, the major five risk factors associated with cognitive impairment among the studied population were: CVD (Hypertension, stroke, heart failure) (36.5%), Malignancies (14.5%), HCV (10%), CLD (9%) and DM (5.5%). See details in table 3. A study done by Campbell et.al. about various risk factors of cognitive impairment and progression to severe disease found that CVD (coronary artery diseases and hypertension) were common among patients who were diagnosed for that condition. Overall, cardiovascular diseases were associated with severe cognitive impairment and increased risk of disease progression and related death among from those who had mild illness(52).

Moreover, health autonomy status of our participants in consideration of the above risk factors and cognitive impairment were studied. As shown by their low score on ADL scale: 44% of the studied population were dependent whereas 66% were completely independent. The Instrumental Activities of Daily Living (IADL) scale revealed a higher degree of dependency at 66.5% compared to 33.5% who were completely independent. The same risk factors of poor cognitive function were implicated. Malignancies, cardiovascular diseases and viral hepatitis C infection were significantly associated with dependency among other risk factors. As detailed in table 4 about the link between medical conditions and health autonomy status by ADL, the major risk factors associated with dependency in studied population were: Malignancies (33%), cardiovascular diseases (HTN, stroke, heart failure) (31%), hepatitis C (6.5%), chronic lung diseases (5.5%) and diabetes mellitus (4.5%). The same risk factors are notorious for cognitive impairment as described above. Older people with chronic diseases in general end up by needing holistic support when they live longer.

The mentioned risk factors are the major diseases categories associated with aging. The standard healthcare for older persons requires multidisciplinary and systematic approach. All health workers and most paramedics have their irreplaceable roles. The best teamwork brings to success(53).

The cognitive functional status corresponded to the autonomy status. A study published in 2016 in Sweden by Sabine B. et al about dependency on ADL in a nursing home found that 56% of residents were ADL-dependent(48). Health autonomy in activities of daily living is an important aspect of daily life. It is represented by self-maintenance in personal care: hygiene, eating, ambulating, dressing, and safe interaction with the environment(54). Age related decline in cognitive function commonly affects people's ability to make right decisions, care for themselves, interact with others and the surroundings adequately. The impact of this aspect to personal life depends on the degree of cognitive impairment. In health maintenance clinical practice, it is recommended that patients with significant cognitive dysfunction be assessed for self-maintenance by ADL scale to determine, plan and optimize the long-term health and family care. The support should focus on areas of deficit and foster the current ability as well as controlling ongoing risk factors of deterioration like ongoing comorbidities. The World Health Organization (WHO) insists that elderly people make an important contribution to the society. However, the cost of their care remains extensive. Further aging is associated with poorer health. This creates a burden to the individual, their family as well as the society in general. Those with multiple chronic diseases especially non communicable diseases (NCD) require continuous standard healthcare with regular follow up. Most of them will stay on multiple pills for life. If they live alone, it would require them an optimal cognitive function to adhere to their prescriptions and physician's instructions. One of the causes of poor NCD control is poor adherence to therapy and follow up. They necessitate multidisciplinary healthcare(53).In our context, there are challenges related to the geographical situation and evolving infrastructures where transport of an elderly patient is demanding despite scarce resources. One of the accessible means of transport is motorbike from remote are to the hospital. This might result into many complications in addition to ongoing comorbidities. Our elderly people are most likely to live alone or just with their grandchildren. Those who are dependent may require partial or full support to survive.

In developed countries, these patients are cared for in nursing homes. However, in developing countries, the family has to take responsibility for the care of a dependent family member. In Rwanda this situation is frequent and handled by the family where possible with the government support as required. Palliative care is less developed in our country. The few hospices we have are not affordable. As it was said by Turkel et.al, the connection of caring to health , healing and wellbeing of the whole person is focused within the setting of the family, community, society as well as the global environment(53). Fundamental values of healthcare should be focused on. In our situation, the family would not replace nursing home care but they should be aware of what their elderly parent or family member is able to do by self and related limitations in order to define and optimize needed assistance for long-term life support and healthcare.

The role of healthcare providers should go beyond treatment and explore the opportunity that the patient has in the family. There should be a regular goal-oriented family and patient education for optimal healthcare.

4.1. Strength and limitations

This was the first study done in the country assessing the cognitive dysfunction among elderly patients. It was conducted in the highest public healthcare quality hospitals in the country. The university hospitals are the largest national referral hospitals where almost the whole country patients are referred. The limitations were mainly refusal of consent to participate in the study as it was a new concept for both patients and healthcare professionals, lack of contextualized tools for this first assessment and the short time to collect data as well as likely more comorbid patients expected at this highest level of healthcare in Rwanda. The current settings of covid 19 pandemic created some challenge along the study as well. As it is noticed worldwide, elderly patients are at high risk of severe and critical illness by the Severe Acute Respiratory Syndrome Coronavirus 2(SARS-Cov2)(55). We have missed quite a number of our patients were affected by the pandemic. The fact that it was not considered during the research proposal made us exclude them as they were isolated to covid 19 ward. It changed life in all corners where working time was restricted to curfews and lockdowns. This has increased the time to collect data. As we had additional professional tasks to support covid19 patients, we have to work harder to overcome this challenge.

Moreover, as a resident with full time responsibilities to clinical duties and education it was difficult to get enough time to work on this study. It required much efforts to fulfill all requirements. Furthermore, this study was not funded. We had to self-fund to utmost cost to get the study done in addition to daily welfare.

4.2. Communication and dissemination

The study outcome will be shared and open access to the university teaching hospitals staffs, all participants and their representatives and the university community. We will proceed to publish in a peer-reviewed medical journal and present our results in at least one national or international conference.

CHAPTER V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This cross-sectional study showed the prevalence rate of 61.5% of cognitive impairment among elderly patients at two main university teaching hospitals in Rwanda through a consecutive recruitment over 6 months. The study population was made of patients aged 60years and older who were treated in Internal Medicine department either as inpatients or outpatients of CHUB and CHUK during the research period. This found significant and elevated prevalence compared to previous studies done in Africa and worldwide and the main hypothesis behind these findings is mainly related active comorbidities and likely low level of education.

In addition to aging the main risk factors in declining strength were cardiovascular diseases, malignancies, viral hepatitis C infection, chronic lung diseases and diabetes mellitus respectively. the severity of cognitive impairment and related risk factors correlated with health autonomy status in activities of daily living.

5.2 Recommendations

Clinical assessment of cognitive function is not a routine practice in our healthcare practice despite an elevated prevalence of cognitive impairment among elderly patients in our settings. We recommend extended research on a large-scale various population to assess the extent of this important medical problem among elderly people. To our main university teaching hospitals, we would recommend that cognitive function assessment among elderly patients be part of routine health care. This would be included in initial clinical assessment specifically among patients aged 60 and above. The health care plan and follow up should consider the severity of impairment as it is related to functional autonomy status in activities of daily living**.** This would attract more attention to the family and care givers in order to optimize related patients' healthcare. To all healthcare providers, we recommend that elderly patients be considered as special population especially in consideration of comorbidities which require long-term healthcare with multiple appointments, multidisciplinary care and many various medications. Finally, to the whole population: elder patients should always be assisted while seeking healthcare services and follow up especially those who are more elderly, have more comorbidities and require regular follow up in any healthcare facilities.

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VI. ANNEXES

6.1 BIOGRAPHIC AND MEDICAL QUESTIONNAIRE

Q1. Age range

a. 60-65 : 1
b. 66-70 : 2
c. 71-75 : 3
d. 76-80 : 4
e. 81-85 : 5
f. 86-90 : 6
g. 91-95 : 7
h. 96-100 : 8
i. 101-105 : 9
j. 106-110 : 10
k. Above 110 : 11

Q2. Gender/Sex

a. Male : 1
b. Female : 2
c. Others/Ambiguous : 3

Q3. Origin: PROVINCE

a. East : 1
b. North : 2
c. South : 3
d. West : 4
e. Kigali city : 5

Q4. Medical risk factors

a. Hypertension (Yes : 1/ No : 0)
b. Diabetes mellitus (Yes : 1/ No : 0)
c. Dyslipidemia (Yes : 1/ No : 0)
d. Heart failure/Heart disease (Yes : 1/ No : 0)
e. Stroke (Yes : 1/ No : 0)
f. Obstructive Sleep apnea (Yes: 1/ No : 0)
g. Chronic lung disease: asthma, COPD, ILD, PTED (Yes : 1/ No : 0)
h. Malignancy : any (Yes : 1/ No : 0)
i. Recovered a severe illness : any (Yes : 1/ No : 0)
j. RVD(HIV) (Yes : 1/ No : 0)
k. HCV (Yes : 1/ No : 0)
l. HBV (Yes : 1/ No : 0)

m. None

Q5. Psychiatric risk factors

a. Depression (Yes : 1/ No : 0)
b. Psychiatric disease/any in life (Yes : 1/ No : 0)
c. Post traumatic stress disorder(PTSD) (Yes : 1/ No : 0)
d. Anxiety (Yes : 1/ No : 0)

Q6. Head injury in the past

a. Yes(1)

b. No(0)

Q7. Life style and environmental risk factors:

a. Heavy alcohol (Yes : 1/ No : 0)
b. Never drunk alcohol (Yes : 1/ No : 0)
c. Occasional alcohol (Yes : 1/ No : 0)
d. Smoking (Yes : 1/ No : 0)
e. Use of pesticides : indoor spraying, (Yes : 1/ No : 0)
f. Physical inactivity (Yes : 1/ No : 0)
g. Undernutrition (Yes : 1/ No : 0)

Q8. Education level:

a. Never : 1
b. Primary school : 2
c. Secondary school : 3
d. University undergraduate : 4
e. Mastersdegree : 5
f. PhD : 6

Q9. Occupation

a. Farmer : 1
b. Teacher/instructor : 2
c. Leader/politician : 3
d. Scientist : 4
e. Nurse : 5
f. Midwife : 6
g. Medical doctor : 7
h. Self employed : Own a company : 8
i. Business (seller, etc) : 9
j. Work in office most of the time: 10

Q10. Spoken languages

a. Mother tongue : 1
b. Two languages : 2
c. Three languages : 3
d. Four languages : 4
e. Five languages : 5
f. More than five : 6

Q11. Pharmacological factors

a. NSAIDs(ibuprofen, aspirin, paracetamol, etc) : (Yes : 1/ No : 0)
b. Statins(any) (Yes : 1/ No : 0)
c. Hormones (OCPs, implants, injectables (Yes : 1/ No : 0)

Q12. Do you participate in any following activities?

a. Social : dance, religion/singing, cooperatives, etc (Yes : 1/ No : 0)
b. Sports : player/coach : (Yes : 1/ No : 0)

Q13. Diet : Do you prefer any of the following food ?

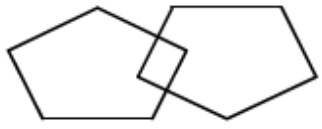
a. Vegetables (Yes : 1/ No : 0)
b. Fruits (Yes : 1/ No : 0)
c. White meat (Yes : 1/ No : 0)
d. Red meat (Yes : 1/ No : 0)
e. Bread (Yes : 1/ No : 0)
f. Traditional rwandan diet (Yes : 1/ No : 0)
g. Milk (Yes : 1/ No : 0)

Q14. Meals per day

a. Breakfast, lunch and dinner : 1
b. Lunch and dinner : 2
c. Breakfast and dinner ; 3
d. Breakfast and lunch : 4
e. Breakfast only : 5
f. Lunch only : 6
g. Dinner only : 7
h. One random meal a day : 8
i. Sometimes none : 9
j. Drink only : milk, porridge, juice ; 10

6.2. Mini-Mental State Examination (MMSE)

Instructions: Score one point for each correct response within each question or activity.

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day? Month?"
5		"Where are we now? State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly then the instructor asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible.
5		"I would like you to count backward from 100 by sevens."(93,86,79, 72, 65,…) Alternative:"Spell WORLD backwards."(D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wrist watch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs ,ands ,or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says."(Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything."(This sentence must contain a noun and a verb.)
1		"Please copy this picture."(The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		TOTAL

Interpretation of MMSE scores

Score	**Degree of Impairment**	**FormalPsychometric Assessment**	**Day-to-Day Functioning**
25-30	Questionably significant	If clinical signs of cognitive impairment are present, formal assessment of cognition may be valuable.	May have clinically significant but mild deficits. Likely to affect only most demanding activities of daily living.
20-25	Mild	Formal assessment may be helpful to better determine pattern and extent of deficits.	Significant effect. May require some supervision, support and assistance.
10-20	Moderate	Formal assessment may be helpful if there are specific clinical indications.	Clear impairment. May require 24-hour supervision.
0-10	Severe	Patient not likely to be testable.	Marked impairment. Likely to require 24-hour supervision and assistance with ADL.

6.3 Self-Maintenance Scale: Health Autonomy

1. PHYSICAL ACTIVITIES OF DAILY LIVING, or ADLs): In each category, circle the item that most closely describes the person's highest level of functioning and record the score assigned to that level (either 1 or 0) in the blank at the beginning of the category.

A. **Toilet**	_____	
1.	Care for self at toilet completely; no incontinence	1
2.	Needs to be reminded, or needs help in cleaning self, or has rare (weekly at most) accidents	0
3.	Soiling or wetting while asleep more than once a week	0
4.	Soiling or wetting while awake more than once a week	0
5.	No control of bowels or bladder	0
B. **Feeding**	_____	
1.	Eats without assistance	1
2.	Eats with minor assistance at meal times and/or with special preparation of food, or help in cleaning up after meals	0
3.	Feeds self with moderate assistance and is untidy	0
4.	Requires extensive assistance for all meals	0
5.	Does not feed self at all and resists efforts of others to feed him or her	0
C. Dressing	_____	
1.	Dresses, undresses, and selects clothes from own wardrobe	1
2.	Dresses and undresses self, with minor assistance	0
3.	Needs moderate assistance in dressing and selection of clothes.	0
4.	Needs major assistance in dressing, but cooperates with efforts of others to help	0
5.	Completely unable to dress self and resists efforts of others to help	0

D.Grooming	(Neatness, Hair, Nails, Hands, Face, Clothing)	
1.	Always neatly dressed, well-groomed, without assistance	1
2.	Grooms self adequately with occasional minor assistance, eg, with shaving	0
3.	Needs moderate and regular assistance or supervision with grooming	0
4.	Needs total grooming care, but can remain well-groomed after help from others	0
5.	Actively negates all efforts of others to maintain grooming	0
E. Physical Ambulation	_____	
1.	Goes about grounds or city	1
2.	Ambulates within residence on or about one block distant	0
3.	Ambulates with assistance of (check one)	0
	a ( ) another person, b ( ) railing, c ( ) cane, d ( ) walker, e ( ) wheelchair	0
	1.__Gets in and out without help. 2.__Needs help getting in and out	0
4.	Sits unsupported in chair or wheelchair, but cannot propel self without help	0
5.	Bedridden more than half the time	0
F. Bathing	_____	
1.	Bathes self (tub, shower, sponge bath) without help.	1
2.	Bathes self with help getting in and out of tub.	0
3.	Washes face and hands only, but cannot bathe rest of body	0
4.	Does not wash self, but is cooperative with those who bathe him or her.	0
5.	Does not try to wash self and resists efforts to keep him or her clean.	0

SPSS code: Total score 6/6: 0/6: low function: dependent (0) and 6/6: High function: independent (1)

6.4 Instrumental Activities of Daily Living Scale (IADLs)

In each category, circle the item that most closely describes the person's highest level of functioning and record the score assigned to that level (either 1 or 0) in the blank at the beginning of the category.

A. Ability to Use Telephone _____
1. Operates telephone on own initiative; looks up and dials numbers. 1
2. Dials a few well-known numbers. 0
3. Answers telephone, but does not dial. 0
4. Does not use telephone at all. 0

B. Shopping _____
1. Takes care of all shopping needs independently. 1
2. Shops independently for small purchases. 0
3. Needs to be accompanied on any shopping trip. 0
4. Completely unable to shop. 0

C. Food Preparation_____
1. Plans, prepares, and serves adequate meals independently. 1
2. Prepares adequate meals if supplied with ingredients. 0
3. Heats and serves prepared meals or prepares meals, but does not maintain adequate diet.0
4. Needs to have meals prepared and served. 0

D. Housekeeping_____
1. Maintains house alone or with occasional assistance (eg, heavy-work domestic help).1
2. Performs light daily tasks such as dishwashing, bedmaking. 0
3. Performs light daily tasks, but cannot maintain acceptable level of cleanliness. 0
4. Needs help with all home maintenance tasks.0
5. Does not participate in any housekeeping tasks. 0

E. Laundry_____
1. Does personal laundry completely. 1
2. Launders small items; rinses socks, stockings, etc. 0
3. All laundry must be done by others. 0

F. Mode of Transportation_____
1. Travels independently on public transportation or drives own car. 1
2. Arranges own travel via taxi, but does not otherwise use public transportation. 0
3. Travels on public transportation when assisted or accompanied by another. 0
4. Travel limited to taxi or automobile with assistance of another. 0
5. Does not travel at all. 0

G. Responsibility for Own Medications_____
1. Is responsible for taking medication in correct dosages at correct time. 1
2. Takes responsibility if medication is prepared in advance in separate dosages. 0
3. Is not capable of dispensing own medication. 0

H. Ability to Handle Finances_____
1. Manages financial matters independently (budgets, writes checks, pays rent and bills, goes to bank); collects and keeps track of income.1
2. Manages day-to-day purchases, but needs help with banking, major purchases, 0
3. Incapable of handling money. 0

SPSS: TOTAL SCORE: 8/8, : 0/8:low function(0)/ dependent, 8/8: high function/independent(1)

END OF QUESTIONNAIRE.

6.5. QUESTIONNAIRE IN KINYARWANDA

” IKIGERERANYO CY’ISOBWA RY’IMIKORERE Y’UBWONKO MU BARWAYI BEGEZE MU ZA BUKURU”

Inyandiko nkusanyamakuru: research questionnaire

6.5.1 IBIBAZO KU BUZIMA RUSANGE

Q1. Ikiciro cy’imyaka

a. 60-65
b. 66-70
c. 71-75
d. 76-80
e. 81-85
f. 86-90
g. 91-95
h. 96-100
i. 101-105
j. 106-110
k. Above 110

Q2. Igitsina

a. Gabo
b. Gore
c. Ibindi

Q3. Intara utuyemo

a. Uburasirazuba
b. Amajyaruguru
c. Amajyepfo
d. Uburengerazuba

Q4. Indwara usanganwe

a. Uburwayi bw'umuvuduko w'amaraso uri hejuru
b. Diyabete:isukari iri hejuru
c. Indwaray'ibinure
d. Uburwayi bw'umutima
e. Uburwayi bw'iziba cg iturika ry'imiyoboro y'amaraso mu bwonko
f. Kubura umwuka n'ijoro
g. Uburwayi bw' ibihaha
h. Kanseri
i. Indwara yakurembeje
j. Ubwandu bwa SIDA
k. Ubwandu bwa virusi y'umwijima ya C
l. Ubwandu bwa virusi y'umwijima ya B
m. Ntayo

Q5. Indwarazo mu mutwe

a. Agahinda gakabije
b. Izindi ndwara zo mu mutwe
c. Ihungabana
d. Ubwoba

Q6. Gukomereka umutwe n'ubwonko

a. Yego

b. Oya

Q7. Imibereho n'ibidukikije

a. Inzoga nyinshi
b. Nta nzoga nigeze nywa
c. Kunya inzoga rimwe na rimwe
d. Kunywaitabi
e. Gukoresha imiti yica udusimba
f. Imyitozo ngororangingo
g. Indryo mbi

Q8. Amashuri wize

a. Ntayo
b. Amashuri abanza
c. Ayisumbuye
d. Kaminuza
e. metirize
f. Philosophiya

Q9. Akazi

a. Umuhinzi
b. Mwarimu
c. Umuyobozi
d. Umumenyi
e. Umuforomo
f. Umubyaza
g. Muganda
h. Uwikorera
i. Umucuruzi
j. Umunyabiro

Q10. Indimi uvuga

a. Ururimi gakondo
b. Indimi ebyiri
c. Indimi eshatu
d. Indimi enye
e. Indimi eshanu
f. Indimi zirenga eshanu

Q11. Imiti ujya unywa cg ukunda kunywa.

a. Imiti y'ububabare no kubyimbirwa
b. Igabanya ibinure
c. Imisemburo yo kuboneza urubyaro

Q12. Ujya ukora ibikurikira

a. Ubusabane: kubyina/ gusengan'ibijyana nabyo
b. Siporo/umukinnyi/umutoza

Q13. Ibyo ukunda kurya

a. Imboga
b. Imbuto

c. Inyamazera
d. Inyama zitukura
e. Umugati
f. Indyo ya kinyarwanda
g. Amata

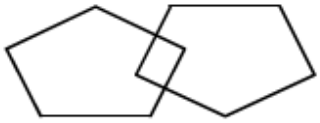
Q14. Inshuro urya kumunsi

a. Gatatu
b. Kabiri
c. Mu gitondo na nimugoroba gusa
d. Mu gitondo na sasita
e. Mu gitondo gusa
f. Sa sita gusa
g. Nimugoroba gusa
h. Ibyo ubonye rimwe
i. Rimwe na rimwe nturya
j. Kunywa gusa

6.5.2 ISUZUMA RY'IMIKORERE Y'UBWONKO(MMSE)

IMPINE Y'AMAZINA……IMYAKA AFITE……..ITARIKI……

BURI GISUBIZO NYACYO KIBARIRWA INOTA RIMWE IKITARI CYO NI ZERU

Amanotakukibazo	**Ayo ubazwa abonye**	**IBIBAZO**
5		Umwaka turimo?,indanga gihe?(icyi, urugaryi, itumba, umuhindo), italiki?, umunsi?, ukwezi?,
5		Aho turi?,Intara/umugi?, Akarere?, Ibitaro?, Inzuyihe (ibitaro, ahavurirwa abataha, mu cyumba rusange cg bwite)?
3		Subiramo amagambo atandatu ngiye kukubwira nitonze ndongera nyakubaze mu kanya: **umugezi, igihugu, urutoki**
5		Bara uhereye ku ijana ugende ukuramo 7: **93, 86, 79, 72, 65,58,** ….
3		Nyibutsa ya magambo 3 nakubwiye mu kanya kashize
2		Mbwira amazina y'ibyongiye kukwereka: **isaha, ikaramu**
1		Subiramo:**Ta inzo njyo uze urye inzuzi**
3		Fata urupapuro mu **kiganza cyawe cy'iburyo**, **uruzingemo kabiri**, **ururambike hasi**.
1		Soma ibyanditse ,ukore icyobivuga" **FUNGA AMASO**"
1		Kora interuro ushaka uyandike,
1		Subiramo iyi shusho: 
Total 30		

6.5.3 ISUZUMA KU MIRIMO Y'UBUZIMA BWA BURI MUNSI

A. GUKORESHA TELEFONI

1. Akoresha telefoni uko abishaka,ashakishamo cg akandi kanomero z'uwo ahamagara: 1
2. Yandikamo nomero asanzwe akoresha kenshi: 0
3. Aritaba ariko ntajya ahamagara: 0
4. Ntajya akoresha telephone: 0

B. GUHAHA

1. Ahaha ntabufasha akeneye:1
2. Yihahira wenyine ibyoroheje:0
3. Akenera umuherekeza guhaha:0
4. Ntashobora guhaha:0

C. GUTEGURA AMAFUNGURO

1. Agena kandi akanategura neza amafunguro ,akanagaburira abanda ku meza:1
2. Ategura amafunguro neza iyo aherejwe ibirungo: 0
3. Arashyushya akanagabura ibyatetswe cg agateka ariko ntabashe gukomeza inryo yuzuye:0
4. Aratekerwa akanagaburirwa:0

D. KWITA KU RUGO ATUYEMO

1. Yita kurugo cg rimwe na rimwe agakenera ubufasha kumirimo ivunanye: 1
2. Akora imirimo yoroheje yo mu rugo nko gusasa, koza ibikoresho : 0
3. Akora imirimo yoroheje ariko ntashobora kwita ku isuku neza muri rusange :0
4. Akenera ubufasha mu kwita kurugo atuyemo: 0
5. Nta murimo n'umwe agiramo uruhare: 0

E. ISUKU Y'IMYAMBARO:

1. Yita ku isuku y'imyambaro ye yose.: 1
2. Yita ku isuku y'imyamabaro yoroheje cg imwe n'imwe: kumesa amasogisi, etc. .: 0
3. Ntago ashobora kwita ku isuku y'imyambaro:0

F. GUTEGA NO KUGENDA N'IMODOKA

1. Yijyana mu modoka rusange cyangwa akitwara:1
2. Ashobora kwitegera ariko ntagenda n'imodoka rusange:0
3. Agenda mu modoka rusange ariko aherekejwe: 0
4. Agenda na taxi cg n'indi modoka bwite ariko aherekejwe: 0
5. Ntajya agenda mu modoka:0

G. KUNYWA IMITI:

1. Afata imiti uko yayihawe kandi ku gihe:1
2. Ashobora kunywa imiti iyo bayimutandukanyirije:0
3. Ntashobora kwinywesha imiti:0

H. GUKORESHA AMAFARANGA

1. Ashobora kubara no gukurikirana ikoreshwa ry'amafaranga, ibyinjira n'ibisohoka:1
2. Ashobora igura n'ibindi byoroheje ariko akenera ubufasha mu byabanki: 0
3. Ntashoba ikoreshwa ry' amafaranga: 0

6.5.4 ISUZUMA KU KWIYITAHO BYA BURI MUNSI

A.Ubwiherero	_____	
1.	Kwijayana mu bwiherero nta kibazo	1
2.	Acyenera gufashwa	0
3.	Yanduza aho yaryamye nibura rimwe mu cyumweru	0
4.	Yanduza ahoyaryamye adasinziriye	0
5.	Byose ntamenya igihe byabereye	0
B. Kurya	_____	
1.	Arigaburira ntakibazo	1
2.	Acyenera ubufasha bworoheje	0
3.	Acyenera ubufasha byisumbuye	0
4.	Acyenera gufashwa bihambaye	0
5.	Acyenera gufashwa kandi akagorana	0
C.Kwambara	_____	
1.	Ariyambika akaniyambura nta kibazo	1
2.	Acyenera ubufasha bworoheje	0
3.	Acyenera ubufasha bwisumbuye	0
4.	Acyenera ubufasha buhambaye ariko akabigiramo uruhare	0
5.	Ntabyo ashobora adafashijwe	0
D. Kwiyitaho	**(imisatsi, inzara, gusokoza, kwisiga)**	
1.	Arabyikorera kandi neza ntakibazo	1
2.	Acyenera ubufasha bworoheje	0
3.	Acyenera ubufasha bwisumbuye	0
4.	Acyenera ubufasha buhambaye ariko akabigiramo uruhare	0

5.	Ntabyo ashobora adafashijwe	0
E. Kwigenza	_____	
1.	Arigenza wenyine ntabufasha kandi akamenya ibyerekezo	1
2.	Abasha kugendagenda mu rugo	0
3.	Bamufasha Kugenda bitewe n'uburyo bwo kumutwara	
4.	Ashobora kwiyicaza mu ntebe mu rugo	0
5.	Ntava aho ari, ahora aryamye	0
F. Koga	_____	
1.	Ariyoza ntakibazo	1
2.	Asaba kujyanwa no kuvanwa mu bwogero	0
3.	Yiyoza ibiganza no mumaso gusa	0
4.	Ntashobora kwiyoza ariko yubahiriza abamufasha	0
5.	Ntiyemera kwiyoza kandi ntanasana ubufasha	0

6.5.5 IMFORMED CONSENT FORM FOR "PREVALENCE OF COGNITIVE IMPAIRMENT AMONG ELDERLY PATIENTS IN UNIVERSITY TEACHING HOSPITALS IN RWANDA"

This consent form is for those who are invited to participate in our study on "PREVALENCE OF COGNITIVE IMPAIRMENT AMONG ELDERLY PATIENTS IN UNIVERSITY TEACHING HOSPITALS IN RWANDA. These are the patients who consult the department of Internal Medicine, either admitted and in outpatient clinic at both Centre Hospitalier Universitaire de Butare (CHUB) and Centre Hospitalier Universitaire de Kigali (CHUK).

This form comprises of two sections:

- **Introduction to the study.**
- **Consent form.**

6.5.5.1. SECTION I: INTRODUCTION TO THE STUDY:

We are going to explain and invite you to participate in this study. You will think about it and ask questions if necessary, so that you understand the whole process, benefits and possible risks (although there are no expected risks) before you decide to accept to participate in this study.

My name is Vincent Ndayiragije, a medical doctor by profession.

I'm a third-year postgraduate student in Masters of Medicine in Internal Medicine, a specialization program at the University of Rwanda, College of Medicine and Health Sciences (CMHS) in the School of Medicine and Pharmacy. We are carrying out research on" PREVALENCE OF COGNITIVE IMPAIRMENT AMONG ELDERLY PATIENTS IN UNIVERSITY TEACHING HOSPITALS IN RWANDA at both CHUB and CHUK in order to keep improving the healthcare provided to these senior patients.

OBJECTIVE OF THE STUDY:

Cognitive impairment is acquired cognitive decline in one or more cognitive domains interfering with daily functioning and life. In addition to aging, other various risk factors are related to sex, family history, educational level, hypertension, diabetes mellitus, hypercholesterolemia and tobacco, alcohol abuse, depression, physical inactivity, unhealthy diet, hyperhomocysteinemia and elevated serum C-reactive protein, etc.

We aim at determining the prevalence of cognitive impairment among elderly patients who are consulted and treated at the university teaching hospitals in Rwanda. Our two specific objectives are:

- Describe precipitating factors of cognitive impairment among these patients,
- Describe the autonomy status of these patients

Methods of the study:

We will use a hard copy questionnaire where participants will freely answer a few questions. The provided information will be analyzed in line with our objectives. The results will be discussed in a manuscript which will be published for a common interest of healthcare improvement.

Participant selection:

We invite all patients admitted or consulted in outpatient clinic in internal medicine of both CHUB and CHUK to participate in our study. Only patients who meet our inclusion criteria will be involved.

Right to Participation:

Your participation in this study is fully voluntary. You will continue to get same treatments as you have been receiving and follow up even if you choose not to participate. You are allowed to stop your participation even during the process of the study. This will not affect in anyway your deserved treatments and follow up.

Duration of study:

This study will last for a 6months period. The questionnaire filling will take not more than 30. It will not delay your treatment and follow up schedules.

Risks:

This study is entirely safe there are no expected risks.

Benefits and reimbursement:

There is no reimbursement for any one's participation in this study.

Confidentiality:

The information that will be recorded from your chats or collected from you will be highly confidential.

This information will be stored on a secured file in our password protected computer. Our questionnaire files have not included a NAME to protect the participant and only the researchers will have access to them.

Sharing the results:

We plan to publish the results for academic and research purposes and we shall feed back to the treating team for the best of your care. Your confidentiality will always be protected throughout.

Contacts:

Doors for questions is always open and in case you can contact the following:

NDAYIRAGIJE Vincent : +250783332213, ndavictory@gmail.com

RWABIHAMA Jean Paul : +250780859127, jeanpaulrwabihama@gmail.com

CMHS IRB Chair Person: +250788490522.

CMHS IRB Deputy Chair Person: +250783340040.

6.5.5.2 SECTION II: CONSENT FORM.

I have read and understood information provided or read to me above, all my questions have been answered to my satisfaction. I consent voluntarily to participate in this study.

Printed name of the participant or representative :…….

Signature of the participant:…….

Dates: ……..

If illiterate

I have witnessed the accurate reading of study information and consent form to the potential participant, and the individual has had time to ask questions and obtain satisfying responses. I confirm that the individual has given consent freely.

Printed names of witness: ……..

Signature of witness:……

Thumb print of the participant:……

Dates:……..

STATEMENT BY THE RESEARCHER/INDIVIDUAL OBTAINING CONSENT:

I have accurately read out the information sheet to the potential participant, and made sure that the participant understands the above information to my best of ability.

I confirm that the participant was given opportunity to ask questions about the study, and all the questions have been answered correctly to the best of my knowledge.

I confirm that the individual has not been forced into giving consent, and the consent has been given freely.

A copy of this consent form has been provided to the participant.

Print name of Researcher/ person obtaining consent:…….

Signature of Researcher/ person obtaining consent:……

Dates :……

6.5.5.3 INYANDIKO ISABA UBURENGANZIRA MU KWITABIRA UBUSHAKASHATSI KU "KIGERERANYO CY'ISOBWA RY'IMIKORERE Y'UBWONKO MU BARWAYI BEGEZE MU ZA BUKURU"

Iyi nyandiko nsabaruhushya igenewe abantu bose batumiwe kwitabira ubu bushakashatsi ku "**KIGERERANYO CY'ISOBWA RY'IMIKORERE Y'UBWONKO MU BARWAYI BEGEZE MU ZA BUKURU"** mu bitaro bikuru bya Butare (CHUB) na Kigali (CHUK).

Ibisobanuro ku bushakashatsi:

Tugiye kubasobanurira tunabahamagarire kwitabira ubu bushakashatsi. Mbere yo gufata icyemezo musabwe kubitekerezaho mukanabaza ibibazo byose mwifuza kugira ngo murusheho gusobanukirwa uko ububushakashatsi buzakorwa n'ingaruka (nubwo ntazo) mwahura nazo mu gihe mwaba mwemeye kubwitabira.

Nitwa……..mu izina rya Dr.Vincent Ndayiragije, umuganga wabigize umwuga uri mu mwaka wa 3 w'ikiciro cya 3 cya kaminuza aho yitoza kuba inzobere mu ndwara z'umubiri muri Kaminuza y'u Rwanda ishami ry'ubuvuzi n'ubuzima. Tukaba turi gukora ubushakashatsi ku **KIGERERANYO CY'ISOBWA RY'IMIKORERE Y'UBWONKO MU BARWAYI BAGEZE MU ZA BUKURU"** mu bitaro bikuru bya Butare(CHUB) na Kigali(CHUK) mu rwego rwo mukunoza imivurirwe yabo.

Intego zacu ni" **Kumenya zimwe mu mpamvu zatuma bibaho imburagihe no Kumenya ubwigenge n'ubushobozi bwabo mu buzima bwa buri munsi"**

Uburyo ubu bushakashatsi buzakorwamo: Muri ubu bushakashatsi tuzifashisha urupapuro nkusanyamakuru muri ibibitaro byombi. Ubu buryo buzakoreshwa mu gukusanya amakuru. Ayo makuru azasesengurwa ashyirwe mu nyandiko imwe izifashishwan'abaganga ndetse n'abashakashatsi mu kunoza imivurirey'abobarwayi.

Ingaruka zava muri ubu bushakashatsi:

Nta ngaruka n'imwe bizatera umurwayi kwitabira ubu bushakashatsi. Ntabihembo biteganyirijwe kuwo ariwe wese uzitabira ubu bushakashatsi. Amakuru yose azagirwa ibanga kandi ntaho amazina y'umurwayi azagaragara.

Igice cya II: Urupapuro Nyemeza Ruhushya.

Nasobanukiwe amakuru yose nahawe ,nabajije ibibazo byose nifuje kandi ibisubizo nawe byanyuze. Nemeye ntagahato kwitabira ubu bushakashatsi.

Amazina y'umurwayi cg umuhagarariye :……

Umukono w'umurwayi:……

Amatariki :…….

Ubuhamya bw'umushakashatsi/uwakira uburenganzira:

Umurwayi n'abamuhagarariye bahawe ibisobanuro ku bushakashatsi kandi bemera kubugiramo uruhare ntagahato.

Amazina y'umushakashatsi:……..

Umukono w'umushakashashatsi:…….

Amatariki:……..

6.6 TIME LINE AND BUDGET OF THE STUDY

6.6.1 Time Line

	Activities	**Period**
1.	Design of the study proposal and seeking approval by the Faculty and the CMHS/IRB	November 2019–May 2020
2.	Data Collection	June 2020-December 2020
3.	Data analysis and discussion of results	January- May 2021
4.	Redaction of the final report	June-August 2021
5.	Submission for Publication	September-December 2021

6.6.2 BUDGET

ITEM	Quantity	Unit cost(RwFr)	Estimated COST((RwFr))	Source of Funds
Communication (Internet, Calls and Transport,)	For 6months	30000	180000	**PI**
Print outs and binding	1(all documents needed)	100000	100000	**PI**
Data collection	200 Questionnaires	5000	1000000	**PI**
Data entry	200 Questionnaires	5000	1000000	**PI**
Data analysis	1	400000	400000	**PI**
Writing up	1	300000	300000	**PI**
Correction	1	200000	200000	**PI**
Publication(Writing ups and corrections, related costs)	1	500000	500000	**PI**
Miscellaneous(10% of total)			**368000**	**PI**
TOTAL ESTIMATED COST	**ALL ITEMS**		**4048000**	**PI**

6.7 Institutional Review Boards Approvals

6.7.1 UR/CMHS Approval

UNIVERSITY of RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 18th/ March /2020

Dr NDAYIRAGIJE Vincent
School of Medicine and Pharmacy, CMHS, UR

Approval Notice: No 046/CMHS IRB/2020

Your Project Title ***"Prevalence of Cognitive Impairment among Elderly Patients in University Teaching Hospitals In Rwanda"*** has been evaluated by CMHS Institutional Review Board.

		Involved in the decision		
			No (Reason)	
Name of Members	**Institute**	Yes	**Absent**	**Withdrawn from the proceeding**
Prof Kato J. Njunwa	UR-CMHS		X	
Prof Jean Bosco Gahutu	UR-CMHS	X		
Dr Brenda Asiimwe-Kateera	UR-CMHS	X		
Prof Ntaganira Joseph	UR-CMHS	X		
Dr Tumusiime K. David	UR-CMHS	X		
Dr Kayonga N. Egide	UR-CMHS	X		
Mr Kanyoni Maurice	UR-CMHS		X	
Prof Munyanshongore Cyprien	UR-CMHS	X		
Mrs Ruzindana Landrine	Kicukiro district		X	
Dr Gisbonna Darius	UR-CMHS	X		
Dr Donatilla Mukamana	UR-CMHS	X		
Prof Kyamanywa Patrick	UR-CMHS		X	
Prof Condo Umutesi Jeannine	UR-CMHS		X	
Dr Nyirazinyoye Laetitia	UR-CMHS	X		
Dr Nkeramihigo Emmanuel	UR-CMHS		X	
Sr Maliboli Marie Josee	CHUK	X		
Dr Mudenge Charles	Centre Psycho-Social	X		

After reviewing your protocol during the IRB meeting of where quorum was met and revisions made on the advice of the CMHS IRB submitted on 12th March 2020, **Approval has been granted to your study.**

Please note that approval of the protocol and consent form is valid for **12 months**.

Email: researchcenter@ur.ac.rw P.O Box 3286 Kigali, Rwanda www.ur.ac.rw

You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrolment of participants.
3. All consent forms signed by subjects should be retained on file. The IRB may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the IRB in a timely fashion and before expiry of this approval
5. Failure to submit a continuing review application will result in termination of the study
6. Notify the IRB committee once the study is finished

Sincerely,

Date of Approval: The 18th March 2020

Expiration date: The 18th March 2021

Professor GAHUTU Jean Bosco
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:
- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate Studies, UR

6.7.2 CHUK APPROVAL

CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

Quality Health Care Training & Research

Ethics Committee / Comité d'éthique

04,Jun,2020 *Ref.:EC/CHUK/040/2020*

Review Approval Notice

Dear Vincent NDAYIRAGIJE,

Your research project: ***"PREVALENCE OF COGNITIVE IMPAIRMENT AMONG ELDERLY PATIENTS IN UNIVERSITY TEACHING HOSPITALS IN RWANDA "***

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 04,Jun,2020 to evaluate your request for ethical approval of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your research project.

You are required to present the results of your study to CHUK Ethics Committee before publication by using this link:www.chuk.rw/research/fullreport/?appid=105&&chuk.

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,

Dr Emmanuel Rusingiza Kamanzi
The Chairperson, Ethics Committee,
University Teaching Hospital of Kigali

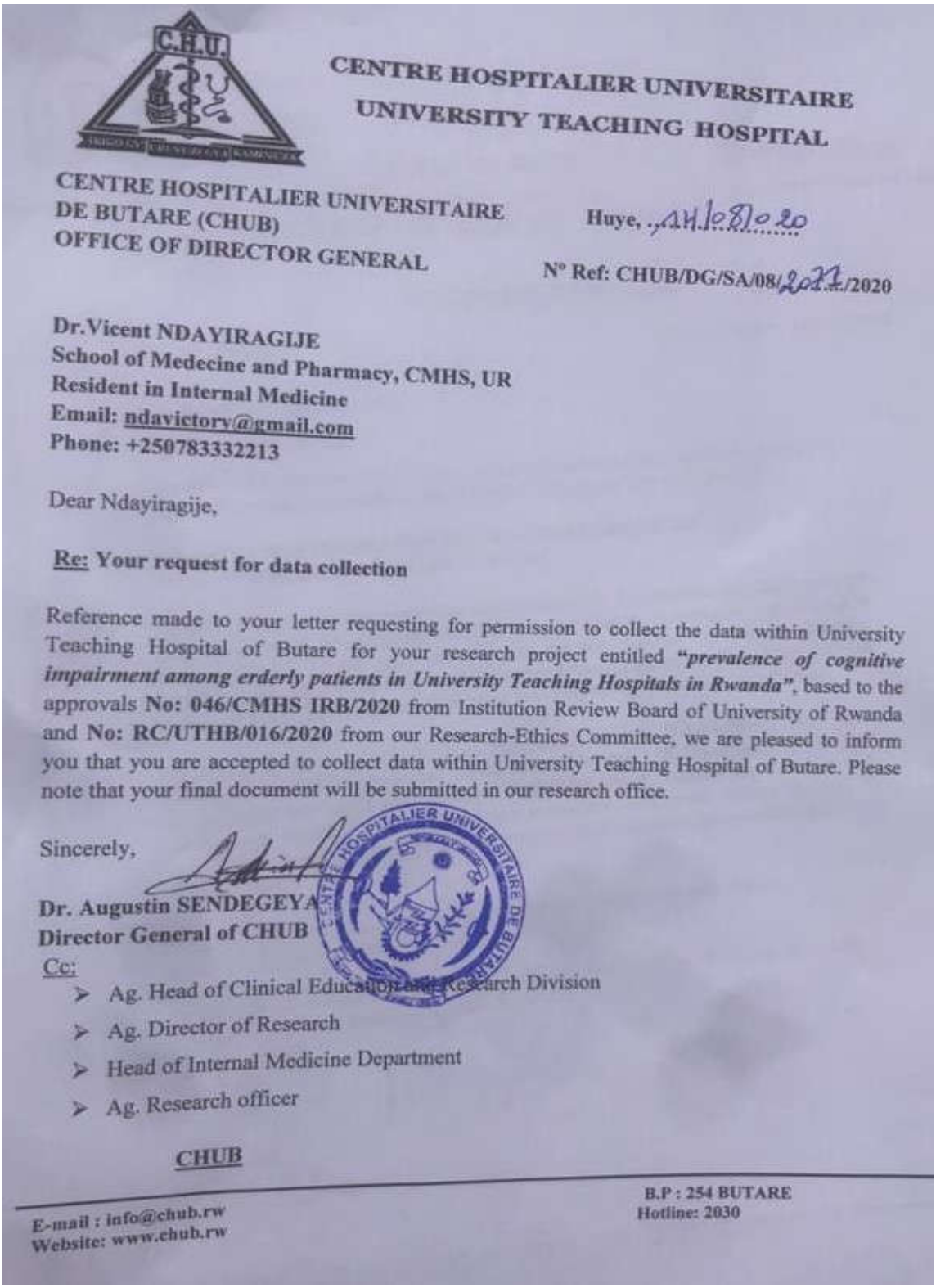
ETHICS COMMITTEE
CHUK

Scan code to verify.

" University teaching hospital of Kigali Ethics committee operates according to standard operating procedures (Sops) which are updated on an annual basis and in compliance with GCP and Ethics guidelines and regulations "

B.P. :565 Kigali- RWANDA www.chuk.rw Tél. Fax : 00 (250) 576635 E-mail :chuk.hospital@chukigali.rw

6.7.3 CHUB APPROVAL



CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

CENTRE HOSPITALIER UNIVERSITAIRE
DE BUTARE (CHUB)
OFFICE OF DIRECTOR GENERAL

Huye, 24/08/2020

N° Ref: CHUB/DG/SA/08/2077/2020

Dr.Vicent NDAYIRAGIJE
School of Medecine and Pharmacy, CMHS, UR
Resident in Internal Medicine
Email: ndavictory@gmail.com
Phone: +250783332213

Dear Ndayiragije,

Re: Your request for data collection

Reference made to your letter requesting for permission to collect the data within University Teaching Hospital of Butare for your research project entitled ***"prevalence of cognitive impairment among erderly patients in University Teaching Hospitals in Rwanda"***, based to the approvals **No: 046/CMHS IRB/2020** from Institution Review Board of University of Rwanda and **No: RC/UTHB/016/2020** from our Research-Ethics Committee, we are pleased to inform you that you are accepted to collect data within University Teaching Hospital of Butare. Please note that your final document will be submitted in our research office.

Sincerely,

Dr. Augustin SENDEGEYA
Director General of CHUB

Cc:

- Ag. Head of Clinical Education and Research Division
- Ag. Director of Research
- Head of Internal Medicine Department
- Ag. Research officer

CHUB

E-mail : info@chub.rw
Website: www.chub.rw

B.P : 254 BUTARE
Hotline: 2030