

**PHYSICAL ACTIVITY LEVELS AND HYPERTENSION AMONG  
UNIVERSITY EMPLOYEES IN KIGALI-RWANDA.**

**BY**

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**A mini-thesis submitted to the Faculty of Community and Health Sciences of the  
University of the Western Cape, in partial fulfillment of the requirements for  
Master of Science degree in Physiotherapy**

**Supervisor: Prof. Julie Phillips**

## ABSTRACT

Hypertension is the leading cause of cardiovascular diseases worldwide. There is evidence of the rising incidence and prevalence of chronic diseases of lifestyle in developing countries. Physical activity has been regarded as a commonly accepted modality for treating hypertension. The aim of this study was to determine if physical activity levels are associated with hypertension among employees of Kigali Institute Science and Technology in Kigali, Rwanda. A quantitative, cross-sectional design was used and all staff members (325 employees) of Kigali Institute of Science and Technology (KIST) represented the study population. Random sampling was used to determine the study sample. Data was collected by means of a self-administered questionnaire adopted from The International Physical Activity Questionnaire (IPAQ). Data analysis was done using Statistical Package for Social Sciences (SPSS) software version 15.0. Descriptive statistics using frequencies, percentages, means, and standard deviations and inferential statistics using Chi-square tests were employed. The data were presented with use of tables, figures, graphs, and pie charts. Ethical issues including obtaining permission for conducting the study, informed consent, anonymity, confidentiality, voluntary participation, and the right to withdraw from the study was observed in this study. The study found a prevalence of 34% participants with hypertension. The prevalence of hypertension was associated with age, smoking, drinking alcohol, suffering for diabetes mellitus, and body mass index (BMI). Over one-fifth of the participants in the physically active group were hypertensive while 68% of the

participants in the physically inactive group were hypertensive. This study shows that hypertension status is strongly associated with physical activity levels [ $X^2 = 20.381$  with ( $P < 0.001$ )]. The study further showed that smoking and suffering from diabetes mellitus were also associated with levels of physical activity ( $P = 0.003$  and  $p = 0.004$  respectively). The current study concludes that physical activity is needed for employees at Kigali Institute of Science and Technology as part of preventive measures for chronic diseases of lifestyle. Therefore, the recommendations were proposed to various categories of people and stakeholders to be actively involved in the promotion of physical activity among employees of Kigali Universities in Rwanda.



**KEYWORDS:** Physical activity, Physical exercises, aerobic exercises, exercises, employees, high blood pressure, hypertension, university, Rwanda.

## DECLARATION

I declare that “**Physical activity levels and hypertension among university employees in Kigali-Rwanda**”, is my own work, and that it has not been submitted for any other degree or examination in any other University and that complete referencing have been made and acknowledged for all sources used and/or quoted.

Jacques Banyangiriki

March 2009

Signature:

.....



UNIVERSITY of the  
WESTERN CAPE

**Witness:** Professor Julie Phillips

.....

## **DEDICATION**

This work could not be completed without the love of my wife who had to keep awake throughout the nights that I wrote this work. The work is also dedicated to our daughter, Umwali Kellia.



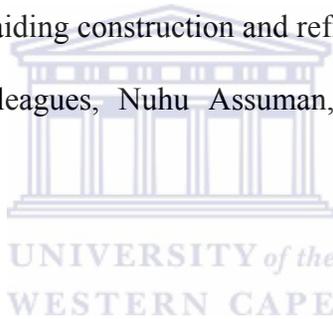
## ACKNOWLEDGEMENTS

My most sincere appreciation and thanks go to:

My Lord and Saviour Jesus Christ, the Almighty God, for His grace is sufficient.

Professor Julie Phillips, my supervisor, for extreme patience, motivation, material, and spiritual guidance throughout the study period.

Professor Patricia Struthers, Professor Frantz, Mrs Anthea Rhoda, Mr A. Latief and all PET lecturers, for collectively aiding construction and refinement of what I know, can do, and would pass on. My colleagues, Nuhu Assuman, Sagahutu Jean Baptiste, and Niyobuhungiro Philippe.



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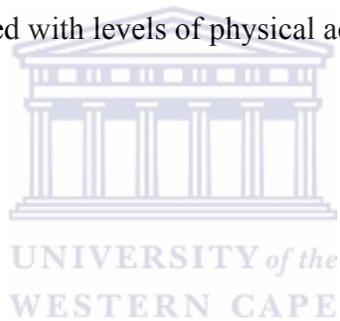
## **APPENDICES**

- Appendix A** Letter from Higher Degrees Committee of the University of the Western Cape South Africa.
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## ABBREVIATIONS

<b>BMI</b>	Body Masse Index
<b>PA</b>	Physical activity
<b>KIST</b>	Kigali Institute Science Technology
<b>HTN</b>	Hypertension
<b>SBP</b>	Systolic blood pressure
<b>DBP</b>	Diastolic blood pressure
<b>CHUK</b>	Centre Hospitalier Universitaire de Kigali
<b>WHO</b>	World Health Organisation
<b>NCDs</b>	Non-Communicable Diseases



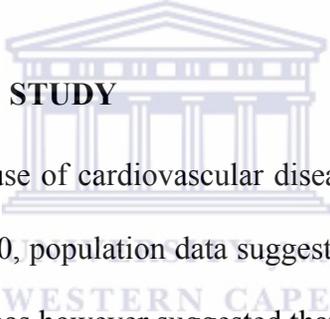
# CHAPTER ONE

## INTRODUCTION

### 1.1 INTRODUCTION

In this chapter, the background of the study is given. Furthermore the prevalence of hypertension and its link to physical inactivity is highlighted. The statement of the problem, the significance of the study and specific objectives of the study are also given.

### 1.2 BACKGROUND OF THE STUDY

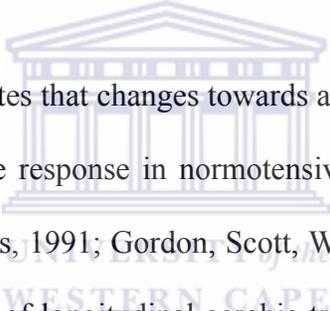


Hypertension is the leading cause of cardiovascular disease worldwide (Hajjar, Kotchen & Kotchen, 2006). Prior to 1990, population data suggested that hypertension prevalence was decreasing yet recent data has however suggested that it is on the rise again (Hajjar et al., 2006). Between 1999 and 2002, 28.6% of the United States population was diagnosed with hypertension (Hajjar et al., 2006). Incidence rates of hypertension range between 3% and 18% in the United States depending on the age and gender (Hajjar et al., 2006). Despite advances in hypertension treatment, control rates continue to be suboptimal. Only about one third of all hypertensive patients are controlled in the United States. Programs that can improve hypertension control rates as well as preventing hypertension are thus urgently needed (Hajjar et al., 2006).

There is also evidence of the rising incidence and prevalence of hypertension and other chronic diseases of lifestyle in developing countries (WHO, 2000; Nissinen, Barrios & Pekka, 2001; Sobngwi et al., 2002; Torun et al., 2002). It is estimated that by 2020, chronic diseases of lifestyle will constitute almost 50% of the burden of diseases in Sub-Saharan Africa. Various researchers have indeed shown that the prevalence of cardiovascular diseases is on the increase in Africa (Mufunda et al., 2006; Agyemang, 2006). They also state that hypertension, once rare in traditional African societies, is rapidly becoming a major public health problem. Rapid urbanisation with changes in lifestyles, especially dietary habits and physical activity patterns, could partially explain the ongoing epidemiological transition (Sobngwi et al., 2002).

Many studies reported that hypertension is associated with some modifiable risk factors. These factors include obesity, smoking, lowered physical activity, high alcohol consumption, high fat and salt intake and hyperglycemia. In addition, regular physical activity has been considered important for maintaining quality of life, especially for adults with hypertension (National Heart, Lung & Blood Institute, 2003). Furthermore, physical activity or exercising has been regarded as a commonly accepted modality for treating hypertension (Lee & Laffrey, 2006). According to the American Health Association (2007), regular physical activity can help control blood lipid abnormalities, diabetes and obesity. It was further stated that physical activity can also help to reduce blood pressure.

The high prevalence of hypertension in modern industrialised societies imposes a considerable public health problem (McMahon & Rodgers, 1994), and therefore, prevention of hypertension is a major public health objective. Hypertension is a serious health problem that increases the risk of coronary heart diseases, strokes, and kidney diseases (Ray & Carrasco, 2000). Physical inactivity has been shown to be associated with hypertension in epidemiological studies (Berlin & Colditz, 1990; Paffenbarger, Wing, Hyde & Jung, 1983). Hence, physical activity has been recommended in the prevention and treatment of hypertension (Fletcher, Balady & Blair, 1996; Joint National Committee on Detection, Evaluation & Treatment of High Blood Pressure, 1993).



A large body of data demonstrates that changes towards a more physically active lifestyle positively affect blood pressure response in normotensive and hypertensive individuals (Blair, Kohl, Barlow & Gibbons, 1991; Gordon, Scott, Wilkinson, Dunca & Blair, 1990; Predel, 2002). A meta-analysis of longitudinal aerobic training studies, in mild essential hypertensive subjects, demonstrated an average reduction in resting systolic and diastolic blood pressures of 10.8 and 8.2 mmHg, respectively (Gordon et al., 1990; Hamer & Chida, 2007). Therefore, participation in an exercise training program can be viewed as a non pharmacological approach for preventing and treating mild hypertension. In addition, high physical fitness is associated with lower blood pressure in both men and women (Blair et al., 1991).

Furthermore, it has been demonstrated that changing sedentary lifestyle habits to a more active lifestyle is coupled with a reduced risk of becoming hypertensive. Moreover, the

incidence of hypertension in a group that had stayed untrained was 32 per 1,000, as compared to only 18 per 1,000 in those who had improved their fitness category (Church, Kampert, Gibbons, Barlow & Blair, 2001; Gordon et al., 1990). Hence, enhanced levels of physical fitness play a significant primary prevention for hypertension (Church, et al., 2001; Gordon et al., 1990). The effects of fitness on mortality among hypertensive adults, either from cardiovascular diseases or from all causes, however, are not fully understood, especially among women (Evenson, Stevens, Thomas & Cai, 2004).

Previous studies have shown that a supervised exercise program leads to a decrease in blood pressure in humans with essential arterial hypertension (Hagberg, Park & Brown, 2000; Rogers et al., 1996). Men in the high fitness group with resting systolic blood pressure above or equal to 140 mmHg had a lower death rate than men in the low fitness group with resting systolic pressure below 140 mmHg. Nevertheless, although the reduction in blood pressure as a result of exercise training is detected in normal and hypertensive patients, the magnitude of reduction in systolic and diastolic blood pressure at rest and during sub maximal exercise is greater in hypertensive subjects (Blair, Kohl & Paffenbarger, 1989).

Evidence accumulated in the past few years show that non-pharmacological management should be the initial strategy to treat overweight individuals with mild to moderate hypertension (Appel, 1999; Viskoper, Shapira & Priluck, 2003). A single exercise session is known to decrease blood pressure in hypertensive individuals (Brandao-Rondon, Alves & Brag, 2002). Most of studies were restricted to supervised physical training programs

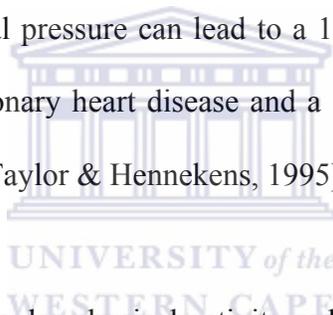
or cardiovascular rehabilitation programs in patients already affected by cardiac events (Brubaker, Rejeski & Smith, 2000; Kodis et al., 2001).

However little is known about the impact of a non supervised physical training programs on blood pressure. Aerobic training is not the only form of exercise found to decrease resting blood pressure. Strength training, in the form of circuit weight training, seems to produce the same effect on blood pressure as endurance training. Participation in resistive exercise was once thought to produce elevated resting arterial pressure by causing vascular hypertrophy and increased vascular resistance because of large increases in arterial pressure elicited by the isometric or resistive exercise. However, studies done have shown that this is not the case. Reductions in arterial pressure have been reported after isometric or resistive exercise training such as isometric handgrip exercise or weightlifting (Harris & Holly, 1987; Hurley, Hagberg & Goldberg, 1988; Koller, Huang, Sun & Kaley, 1995; Wiley, Dunn, Cox, Hueppchen & Scott, 1992). Furthermore, epidemiological data indicates that regular exposure to increased isometric activities at the workplace lowers the incidence of hypertension by as much as 29% (Buck & Donner, 1985).

These limited findings suggest that isometric exercise training may become an important part of a non-pharmacological intervention to prevent and combat hypertension. However, only a few studies have examined the effectiveness of purely isometric training on reducing arterial pressure (Harris & Holly, 1987; Howden, Lightfoot, Brown & Swaine, 2002). A reduction of about 4.7% in resting diastolic pressure after 9 weeks of a

circuit resistance training program has been documented (Likewise & Stewart, 2005). Furthermore, the study of Likewise and Stewart (2005) showed a reduction in mean resting blood pressure from 145/97 at baseline to 131/84 in mild hypertensive patients participating in the circuit weight training group after 10 weeks of training.

Several studies showed that isometric training elicits reductions in mean diastolic and mean arterial blood pressure at rest. Although the reported reduction in diastolic arterial blood pressure appears modest (2-5 mmHg), studies indicate that small reductions in diastolic arterial pressure in the population could have significant health benefits. A 2-mmHg drop in diastolic arterial pressure can lead to a 17% decrease in hypertension as well as a 6% reduction in coronary heart disease and a 15% reduction in stroke-related events (Cook, Cohen, Hebert, Taylor & Hennekens, 1995).

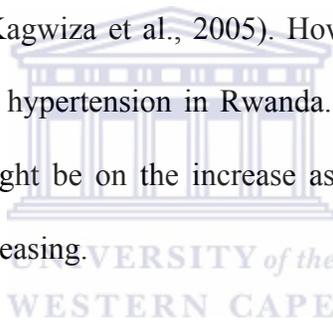


There is good evidence that regular physical activity reduces the risk for cardiovascular diseases. Part of this effect is thought to be mediated through reduced blood pressure (BP), improved lipid metabolism, and decreased body weight (Hu et al., 2004). Even though results from clinical trials and cross-sectional studies have indicated that physical activity or aerobic exercise are inversely associated with BP, the evidence of such an association from the prospective studies is still scant (Hu et al., 2004).

Until the 1990's, a low level of urbanization characterized Rwanda. The urban population was estimated at 10% of the total population. After the mid-1990's war, the urban population experienced very rapid growth. In Kigali, the capital city, the population

increased from 235 664 in 1991 to 600 000 in 2000 (Rwandan Ministry of Finance, 2001). It is now home to 45% of the total urban population. Some people migrated to urban areas from rural areas, in order to feel more secure after the war. Others returned from exile and did not have land or jobs so they decided to settle in urban areas (Kagwiza, Phillips & Struthers, 2005). The urban growth rate in Africa is estimated to be 4.3% annually, compared to 0.5% in Europe (Sobngwi et al., 2002).

According to a study done in Rwanda among working adults in an urban setting, 72% of the participants were classified as sedentary and only 28% of the participants were classified as physical active (Kagwiza et al., 2005). However, very little information is available on the prevalence of hypertension in Rwanda. It could be speculated that the prevalence of hypertension might be on the increase as urbanization is increasing and physical activity levels are decreasing.

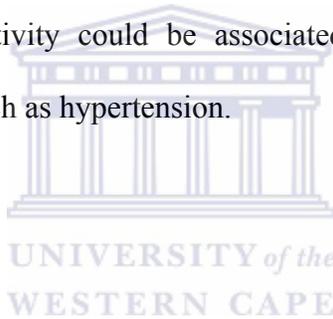


### **1.3 STATEMENT OF THE PROBLEM**

Chronic diseases of lifestyle such as hypertension are increasing in developing countries thus becoming a major public health concern in Africa. Various researchers have highlighted the fact that regular physical activity is an accepted modality to reduce hypertension. However, little research on the link between physical activity and hypertension has been done in Rwanda. Therefore, this study would focus on determining if an association between these two factors does exist in Rwanda.

#### **1.4 SIGNIFICANCE OF THE STUDY**

Low levels of physical activity have been reported among working adults in urban settings of Rwanda. Urbanization and modernizations have been linked to chronic diseases of lifestyle, such as hypertension, in literature. Kigali Institute of Science and Technology is located in Kigali, the capital city of Rwanda. Its urban location puts the employees at higher risk of physical inactivity and hypertension as is indicated in literature. Furthermore, working for an institution of higher learning can be accompanied by factors that predispose employees to stress and hypertension where the levels of physical activity is low as was indicated by Kagwiza et al., 2005. It could therefore be speculated that physical inactivity could be associated with possible occurrence of chronic diseases of lifestyle such as hypertension.



#### **1.5 RESEARCH QUESTION**

Are employees of Kigali Institute of Science and Technology that are physically inactive also more likely to be hypertensive?

#### **1.6 AIM OF THE STUDY**

The overall aim of this study is to establish if physical activity is associated with hypertension among employees of Kigali Institute of Science and Technology.

#### **1.7 OBJECTIVES OF THE STUDY**

1.7.1. To establish the prevalence of hypertension among employees of Kigali Institute of Science and Technology in Kigali, Rwanda.

1.7.2. To establish the levels of physical activity among employees of this institute.

1.7.3. To establish if a relationship exist between the physical activity levels and hypertension among employees of this institute.

1.7.4. To establish the factors associated with physical inactivity and hypertension among employees of Kigali Institute of Science and Technology.

## 1.8 DEFINITION OF KEYS TERMS

**Physical activity:** any bodily movement produced by skeletal muscles that results in energy expenditure and is positively correlated with physical fitness (Centre for Disease Control and Prevention, 2002).



**Sedentarism:** lifestyle of spends a lot of time sitting down or not moving (Hornby, 2000).

**Lifestyle:** the way a person or a group of people live(s) (Hornby, 2000).

**Health promotion:** it is a process of enabling people to increase control over and improve their health. in order to reach a state of complete physical, mental, and social well-being (Coulson, Goldstein & Ntuli, 2002).

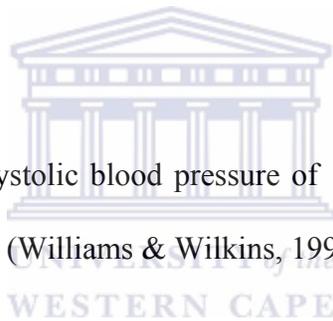
**Body Mass Index:** Body Mass Index (BMI) is calculated as weight (in kg) divided by height squared (in m squared) and expressed as a Standard deviation (SD) score relative to contemporary reference data (Cole, Freeman & Preece, 1990).

**Physical Fitness:** Physical Fitness is defined as a set of attributes that allow the body to respond or adapt to the demands of stress or physical activity (Caspersen & Merrit, 1995).

**Exercise:** Exercise is physical activity that is planned, structured, repetitive, where the purpose of improving or maintaining physical fitness is the intent. Exercise is a subset of physical activity (Pescatello, 2001).

**Obesity:** Subjects are classified as obese if they have a body mass index (BMI)  $\geq 30$  Kg/m<sup>2</sup> (WHO, 1999).

**Hypertension:** is defined as systolic blood pressure of 140mm Hg or a diastolic blood pressure of 90mm Hg or higher (Williams & Wilkins, 1996).



**METs:** Metabolic Equivalents is defined as the amount of oxygen consumed while sitting at rest and is equal to 3.5 ml O<sub>2</sub> per kg body weight x min. The MET concept represents a simple, practical, and easily understood procedure for expressing the energy cost of physical activities as a multiple of the resting metabolic rate (Jette, Sidney & Blumchen, 1990).

## **1.9 OUTLINE OF THE CHAPTERS IN THIS STUDY**

Chapter one describes the background of the current study. It describes the prevalence of hypertension and associated modifiable risk factors, the effects of physical activity on hypertensive adults. It shows the statement of the problem, the significance of the study, research question, aim of the study, and objectives of the study as well as definition of key terms.

Chapter two presents the burden of non-communicable diseases in general and hypertension in particular, the role of physical activity in prevention and management of hypertension, benefits of physical activity as health promotion strategies, and the role of physiotherapist in promotion of physical activity.

Chapter three describes the methodology used in the current study. It also describes research setting, study design, study population and sample, sampling method used, data collection instrument, the procedure used to collect data, pilot study, data analysis, and ethical consideration.

Chapter four describes the results of the current study. These results include descriptive findings, associations as well as the general pictures of this current study.

Chapter five discusses the main key findings of results relative to available literature. The impacts of the findings have on rehabilitation and public health and the limitations that were found in the process of the research and strengths of the study.

Chapter six includes a summary of the key issues findings from this study. Recommendations related to the findings of this study and conclusions about the finding have been presented in this chapter.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

This chapter presents the existing literature on the burden of non-communicable diseases in general and hypertension in particular, the role of physical activity in prevention and management of hypertension, benefits of physical activity as health promotion strategies, and the role of physiotherapist in this.

#### **2.2 GLOBAL BURDEN OF NON-COMMUNICABLE DISEASES AND HYPERTENSION**

##### **2.2.1 Non-communicable diseases**

Non-communicable diseases continue to be an important public health problem in the world, being responsible for sizeable mortality and morbidity. Non-communicable diseases (NCDs) are the leading cause of death and disability worldwide (Boutaye, 2006). In 2005, NCDs caused an estimated 35 million deaths. NCDs are responsible for 60% of all deaths globally. Furthermore, it is responsible for approximately 16 million deaths in people less than 70 years of age every year. Total deaths from NCDs are projected to increase by a further 17% over the next 10 years. Within the next 20 years, NCDs will be responsible for virtually half of the global burden of disease in the developing countries (Boutaye, 2006). Risk factors, such as tobacco and alcohol use, improper nutrition and sedentary behavior contribute substantially to the development of NCDs, which are sweeping the entire globe. Moreover, an increasing trend is mostly reported in

developing countries where scarce and ineffective health care facilities struggle to contain both the established burden of communicable diseases and the emerging challenge of NCDs (Boutaye, 2006).

A major feature of the developmental transition is the rapid urbanisation and the large shifts in population from rural to urban areas. Even rural people are increasingly adapting urbanised lifestyles. The changing pattern of lifestyle leads to the development of obesity, stroke, stress, atherosclerosis, cancer and other NCDs (Habib & Saha, 2008). Physical inactivity is an important modifiable risk factor for many chronic health problems such as cardiovascular diseases, hypertension, obesity, osteoporosis, diabetes mellitus, and mental health conditions (Van der Bij, Laurant & Wensing, 2002). NCDs include cardiovascular diseases (myocardial infarction, coronary heart disease, hypertension, etc) diabetes, cancer, and chronic pulmonary diseases. In general, reports from West, East and South Africa have similar prevalence rates for coronary artery diseases (Indris, Akinboboye & Akinkugbe, 2003). According to a study done at the University Hospital of Butare in Rwanda among adult patients, 17.2% of the patients had coronary artery diseases and 1% had confirmed myocardial infarction. Hypertension will get special attention in this review not only because of its fatal nature and epidemiological status but also because of its preventability and manageability.

## **2. 2.2 Hypertension**

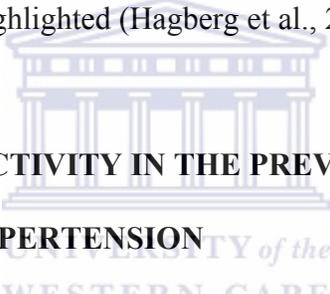
In many countries, hypertension is a disease and risk factor that is a serious public health problem. In all countries, the prevalence of hypertension has been increasing with an estimated 972 million people in the world suffering from it (Hajjar et al., 2006). As an

example, hypertension affects over sixty-five million adult Americans and it is also a major risk factor for myocardial infarction, stroke, and heart failure (Ong, Cheung, Man, Lau & Lam, 2007). Furthermore, hypertension is among the most common reasons for outpatient visits among Americans.

Age, body mass index, level of education, absence of community integration, absence of occupation, duration of residence over 20 years, protein-rich diet and absence of physical activity were identified as risk factors predisposing to hypertension suffering (Niakara et al., 2007). Hypertension prevalence is increasing whereas awareness of this condition and its control rates are suboptimal (Linda et al., 2004). The positive relationship between the risk of cardiovascular diseases (CVD) and blood pressure (BP) occurs with a BP of as low as 115/75 mm Hg and that doubles for each 20/10-mm Hg increase. A person with normal BP at 55 years of age has a 90% lifetime risk of developing hypertension. The BP classification of “prehypertension” (SBP 120-139 or DBP 80-89 mm Hg) has been introduced to stress to the public health the importance of reducing BP and preventing hypertension (HTN) via healthy lifestyle interventions for all people (Linda et al., 2004).

In Africa, the shift of many people from rural to urban areas has rendered hypertension an epidemic and with it comes “the burden of civilisation” which comprises cardiovascular diseases amongst others (Opier & Seedat, 2005). The population of Sub-Saharan Africa is now characterised by increasing longevity and westernisation and “hypertension has now changed from a relative rarity to a major problem.” An estimated ten to twenty million people in this region have hypertension (Opier & Seedat, 2005). One study revealed that

the prevalence of hypertension among adults in sub-Saharan Africa is estimated to be around 66.7% (Choukem, Kengne, Dehayem, Simo & Mbanya, 2007). The latest estimate of the World Health Organisation (WHO) is that more than 30 million people in Africa suffer from hypertension. The WHO further predicts that by 2020, three quarters of all deaths in Africa will be attributable to hypertension if nothing is done about the current situation (Opier, Yackoob, Linda & Brookers, 2006). According to the Ministry of Health (2006), 9816 cases of hypertension were clinically consulted at different hospitals in Kigali, Rwanda. In efforts to control this problem, the role that non-pharmacological interventions, including exercise training, play in the treatment of hypertension continues to be highlighted (Hagberg et al., 2000).

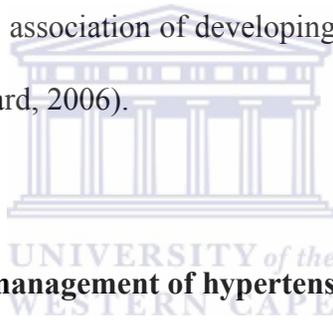


## **2.3 ROLE OF PHYSICAL ACTIVITY IN THE PREVENTION AND MANAGEMENT OF HYPERTENSION**

### **2.3.1 Physical activity in the prevention of hypertension**

It is widely accepted that physical inactivity is a risk factor for cardiovascular disease. Increasing physical activity has been repeatedly associated with a decrease in cardiovascular risks (Murphy, Nevill, Murtagh & Holder, 2007). Epidemiological studies indicate that greater physical activity or fitness is associated with a lower blood pressure (BP), and meta-analyses of randomised controlled trials have shown that chronic dynamic aerobic endurance training is able to reduce BP (Pescatello et al., 2004). Regular physical activity is considered a cornerstone in the prevention and management of hypertension (Chobanian et al., 2003). Furthermore, Kokkinos et al. (2006) found that the risk for developing hypertension is likely to be lowered if moderate intensity physical activity is

encouraged. Regular aerobic exercise is associated with the attenuation of age-related increases in arterial blood pressure (Tanaka, DeSouza & Seals, 1999; Seals, Silverman & Reiling, 1997). Recent findings indicate that regular aerobic exercises produce clinically significant reductions in blood pressure at rest in middle-aged and older adults with elevated baseline levels, and these reductions occur within the necessary time period based on current therapeutic guidelines (Seals et al., 1997; Ishikawa, Ohta, Zhang, Hashimoto & Tanaka, 1999). Therefore, sufficient evidence is available at this time to recommend regular exercise as primary prevention and secondary treatment of age-related increases in arterial blood pressure (Tanaka, DeSouza & Seals, 1999). However, it remains unclear how strong the association of developing hypertension is in relation with levels of physical activity (Fagard, 2006).

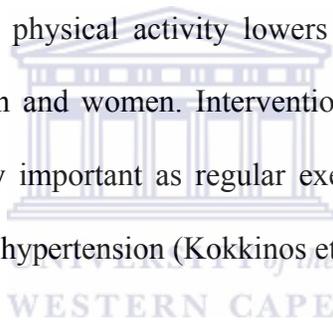


### **2.3.2 Physical activity in the management of hypertension**

Although blood pressure can be lowered pharmacologically in hypertensive individuals, antihypertensive medications are not effective for everyone. Furthermore, they may be costly, and may induce adverse effects that impairs the quality of life and reduces adherence (Blumenthal et al., 2000). Moreover, abnormalities associated with hypertension such as insulin resistance may persist or may even be exacerbated by some antihypertensive medications (Blumenthal et al., 2000). According to different studies done, non-pharmacological approaches to the treatment of hypertension are receiving growing attention. The 1997 report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommends that lifestyle

modifications should be the initial treatment strategy for lowering high BP (Blumenthal et al., 2000).

Regular dynamic physical exercises, which do not need to be vigorous and which can be gradually incorporated into everyday activities, can reduce blood pressure by 5 to 10 mmHg in people with hypertension (Cleaux, Feldman & Petrella, 1999). For example, brisk walking is a typical moderate-intensity exercise that can lead to such reductions when practiced for 3 hours per week. In addition to reducing hypertension, physical activity improves other cardiovascular risk factors (Cleraux et al., 1999). Furthermore, it has been found that moderate physical activity lowers blood pressure during a 24-hr period in pre-hypertensive men and women. Interventions to control blood pressure in this population are particularly important as regular exercise lowers blood pressure in patients with mild-to-moderate hypertension (Kokkinos et al., 1995).



## **2.4. BENEFITS OF PHYSICAL ACTIVITY HEALTH PROMOTION**

### **PROGRAMMES**

Physical inactivity and low cardio-respiratory fitness are associated with substantial increases in diabetes and cardiovascular disease risk such as hypertension (Marshall, Booth & Bauman, 2004). Decades of research indicate that physical activity is an important behavior for health promotion and disease prevention (Eyler et al., 1999).

Adults of any age who start to participate in regular moderate-intensity physical activity can improve their quality of life, and reduce the risk of subsequent mortality.

Furthermore, being active reduces the risk of falls and injuries among older people and adults and may improve mental health. Thus physical activity is an important component of any prevention strategy of different conditions hypertension being one of them (Marshall et al., 2005). The beneficial effect of physical activity may derive either from the influence of physical activity itself, from its effects on other risk factors, from pathophysiological mechanisms, or from the combined effect of all the above (Fagard, 2006).

Physical activity also has a significant impact for people with existing risk factors, such as raised blood pressure, adverse lipid profiles, overweight and obesity, insulin resistance, depression and social isolation (Briffa et al., 2006). Promotion of physical activity is much needed on the African continent since sedentarism remains high from country to another. For example, country prevalence of physical inactivity ranged from 1.6% (Comoros) to 51.7% (Mauritania) for men and from 3.8% (Comoros) to 71.2% (Mauritania) for women. Physical inactivity was generally high for older age groups and lower in rural as compared to urban areas (Guthold, Ono, Strong, Chatterji & Morabia, 2008).

Several epidemiological studies and clinical trials suggest that any type of physical activity reduces the risk of developing coronary heart disease, stroke, as well as various metabolic disorders, like hypertension and diabetes (Gordon et al., 2004). A physically active lifestyle also helps to control weight; contributes to healthy bones, muscles, and joints; reduces falls among adults; helps to relieve the pain of arthritis; reduces symptoms of anxiety and depression; and is also associated with fewer hospitalisations, physician

visits, and medications (Ogilvie et al., 2007). Since the 1980s, it has been repeatedly shown that regular exercise performed at low to moderate intensity is associated with improvements in traditional as well as emerging risk factors associated with cardiovascular diseases (Ogilvie et al., 2007). Recent evidence has suggested that individuals who have been very inactive for most of their life can benefit from the incorporation of light to moderate exercise programmes (Lee, Rexrode, Cook, Manson & Buring, 2001). However, for individuals who are fit, greater exercise intensity may be required to elicit any further health benefits (Lee, Hsieh & Paffenbarger, 1995).

Longitudinal studies in older people have found that regular physical activity improves survival and functional ability. There is also evidence that leisure time physical activity prevents hip fractures and that certain exercise programs can reduce falls (Lim, Stat & Taylor, 2005). High-intensity resistance exercise training was found to improve muscle strength. In the general population, physical activity has been shown to reduce the risk of coronary heart disease, non-insulin dependent diabetes, colon cancer, hypertension, and obesity; and it has a beneficial effect on anxiety and depression (Lim et al., 2005). Accumulation of body fat, particularly in truncal regions, is closely associated with an increased risk of morbidity and premature mortality (Stevens, Cai & Pamuk, 1998). Individuals who habitually exercise appear to accumulate less adipose tissue particularly in upper and central body regions with age (Kohrt, Malley & Dalsky, 1992). A period of aerobic exercise training can induce a preferential loss of fat from the central body regions (Schwartz, Shuman & Larson, 1991) favourably modifying the abdominal fat distribution profile (Kohrt et al., 1992). Thus, regular exercise appears to have the effect

of reducing the risk for metabolic disorders associated with upper body obesity. In sedentary humans, advancing age is associated with unfavorable changes in plasma lipid and lipoprotein levels (National Cholesterol Education Program, 1994). Therefore, a culture of physical activity would prevent cholesterol deposit. In general, a physically active lifestyle is associated with a more favourable lipid and lipoprotein profile in middle-aged and adults (Despres & Lamarche, 1994; Stevenson, Davy & Seals, 1995). The most consistent effect of regular aerobic exercise on plasma lipoprotein levels is an increase in the cardio protective high density lipoprotein-cholesterol levels (Despres & Lamarche, 1994). Whenever regular exercises reduce body weight, they bring about at the same time lowering of plasma density lipoprotein-cholesterol levels (Haskell, 1986).

Recently, several investigators began to address the influences of regular aerobic exercises on emerging risk factors in adults. In a recent study, it was found that the progressive declines in carotid arterial compliances as well as endothelial functions with age observed in sedentary men were markedly attenuated or even absent in endurance-trained men (DeSouza, Shapiro & Clevenger, 2000; Tanaka, Dinunno & Monahan, 2000).

Moreover, essentially daily aerobic exercises for 3 months significantly increased carotid artery compliances and endothelial functions in a group of previously sedentary middle-aged and older men (DeSouza et al., 2000; Tanaka et al., 2000). Thus, currently available evidence indicates that regular aerobic exercises exert beneficial influences on both traditional and emerging risk factors in middle-aged adults.

Increasing the effectiveness of physical activity was identified as high priority both for preventing inactivity-related health problems as well as for treating them when they did occur (Devitt, Snyder, Miller & Wilbur, 2006). Furthermore, physical activity has proven to be favourable for muscle strength, aerobic capacity, reduction of fracture risk, and general well-being in the adults. Therefore, the initiation and maintenance of regular exercises are important objectives of health promotion and crucial in delaying the onset or reducing the incidence and severity of many chronic diseases (Van der Bij et al., 2002).

Individuals who exercise regularly enjoy better health and have a greater degree of independence than those who are sedentary (Seefeldt, Malina & Clark, 2002). Scientific evidence in the last decade has unequivocally demonstrated that physical activity can improve the quality of life for adults of all ages and conditions (Seefeldt et al., 2002). Available data on inducements and interventions in various settings suggest some degree of success across cultural groups, age spans, gender and geographical locations. The extent and strength of the scientific evidence linking physical activity to improvements in individual health are clear and well-documented. Regular physical activity reduces the risk of overall mortality and, specifically, mortality from coronary heart diseases, and of developing diabetes mellitus, hypertension and colon cancer (Seefeldt et al., 2002).

Although the healthful benefits of moderate exercise are achievable by most individuals, more than 60% of adults in the Western world do not exercise on a regular basis, and 25% of adults are sedentary (Seefeldt et al., 2002). Physical inactivity is becoming

increasingly prevalent in industrialised countries and is recognised to be a significant risk factor for many common non-communicable diseases (Department of Health and Human Services, 1996). According to results of a Swiss Health Survey of 2002, 64% of the Swiss adult population does not achieve recommended levels of physical activity (Domboisa, Ndera & Dienerb, 2007). Increasing motorisation and broad access to cars have contributed to sedentary lifestyle and inactivity, and play a role in the obesity epidemic (Wen, Orr, Millett & Rissel, 2006). A recent US study reported that each additional hour spent in a car per day was associated with a 6% increase in the likelihood of obesity (Frank, Andresen & Schmid, 2004). A cohort of Chinese adults followed prospectively over 8 years showed that men who acquired motorised vehicles during the time of follow-up had a significantly increased risk of becoming obese (Bell, Ge & Popkin, 2002).

Furthermore, among black South African men, there is a concern since physical inactivity; sedentary lifestyles and related weight gain are associated with a risk for diabetes, hypertension, cardiovascular diseases, renal failure, certain cancers, and osteoporosis (Sparling et al., 1994). Low levels of leisure-time, physical activity and risk awareness of the health consequences of inactivity was found among black South African students (Peltzer, 2002). Furthermore, Kagwiza at al. (2005) reported low levels of physical activity among working Rwandan women. Tumusiime (2006) also found a low prevalence rate (28.38%) of physical activity among students at tertiary institutions in Rwanda. Despite recent public health recommendations to increase physical activity in the general population, it is unclear whether high levels of cardio respiratory fitness or high levels of physical activity energy expenditure (kilojoules per day) yield greater

cardiovascular and metabolic benefits including lowering of blood pressure (Dvorak et al., 2000). Furthermore, during research, age, gender and anthropometric characteristics are often controlled for, but activity levels have received considerably less attention (Nianga & McFadyen, 2005).

## **2.5 THE ROLE OF PHYSIOTHERAPISTS IN HEALTH PROMOTION**

As a profession integral to health promotion, prevention, acute care and rehabilitation physiotherapists play an essential role in the health care system (Higgs, Refshouge & Ellis, 2001). Moving away from the medical model, physiotherapists have emerged from under the cover of referrals and direction from medical practitioners to be first contact practitioners in their own right, and have increasingly emphasized their worth as a vital part of the health care system (Ritchie, 1999). Physiotherapists are increasingly working in community-based settings influenced by principles of primary health care such as community participation, partnership with clients and their families.

Paft (1995) suggested that health professionals should develop their role in promoting physical activity. It seems that physiotherapists are appropriately skilled and ideally suited to taking on such activities. We have identified that professional involvement in exercise schemes may improve adherence to exercise. Physiotherapists recognise the physical and psychological benefits of exercise and are well versed in the art of motivating people. The results from exercise programmes have demonstrated that when design and delivery are firmly rooted in physiological and psychological theory, the outcomes are better (Pert, 1997; Riddoch, Puig-Ribera & Cooper, 1998). Physiotherapists

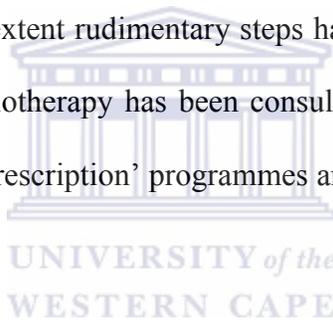
operate out of a strong theoretical base, and understand the importance of communicating this to their clients. They are skilled at calling upon this knowledge to tailor exercise appropriately to a cross-section of people with diverse health needs in group and one-to-one settings. They know how to address barriers to participation into exercises such as dislike of sport, fear of injury and lack of experience of enjoyment in exercise (Wills & Campbell, 1992).

Physiotherapists are highly skilled in motivating patients in healthcare settings, taking a holistic view of the individuals they meet and involving their clients in setting goals for treatment. Such skills would be easily transferred to exercise programmes for healthy adults. Furthermore, physiotherapists involved in such programmes would then be ideally placed to advise upon and treat any musculoskeletal injuries should they arise during the course of the exercise, as well as giving advice on footwear and exercise activities outside the class (Wills & Campbell, 1992).

Physiotherapists would be highly appropriate professionals to educate individuals, construct safe and effective exercise programmes, and within these frameworks, encourage enjoyment, independence, personal choice and individual effort' which have been identified as important to adherence (Paft, 1995). Nevertheless, while physiotherapists may be the ideal professionals to lead exercise programmes in such a campaign, it is recognised that long-term success will depend on a wide coordinated multilevel approach (Paft, 1995). Physiotherapists will therefore need to be part of a team of players that should include administrators, assistants, occupational health

professionals, dieticians, and potentially psychologists. Good communication between local government, physiotherapists and the team would lead to a two-way stream of effective referrals. Members of the team could also support each other in providing measurements of health improvements, which are valid and objective (Riddoch et al., 1998).

In addition to involvement in the field, it is suggested that physiotherapists at a professional level are well placed to be involved in developing, launching and coordinating a national exercise campaign aimed at promoting health in the workplace and the community. To some extent rudimentary steps have been taken in this direction; the Chartered Society of Physiotherapy has been consulted to evaluate existing referral schemes for the 'Exercise on Prescription' programmes and help create safe and effective new ones (Tonkin, 1999).



The current funding of physiotherapy in the National Health Service is directed towards the treatment of path physiological problems. Little support is provided for health education other than the advice given alongside treatment. This financial arrangement prevents physiotherapists from developing their role as promoters of health (Tonkin, 1999).

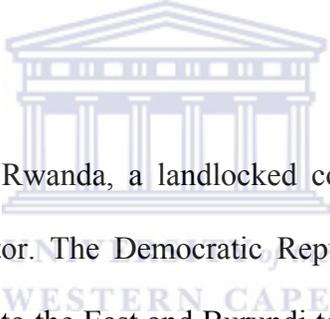
## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 INTRODUCTION**

This chapter discusses the methods used in the study. Research settings, study design, study population, sampling technique, data collection methods and procedures followed are also discussed. Furthermore, also included in the chapter are a description of the pilot study, data analysis and the ethical consideration regarding the study.

#### **3.2 RESEARCH SETTING**



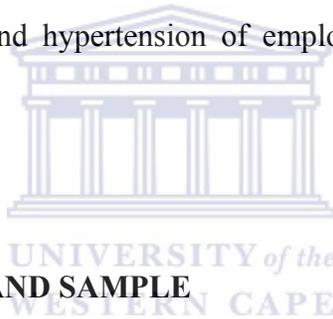
The study was carried out in Rwanda, a landlocked country situated in East Central Africa just south of the Equator. The Democratic Republic of Congo is to its West, Uganda to the North, Tanzania to the East and Burundi to the South. It covers an area of 26338 square kilometers with a total population of about 8.2 million people spread out in its 5 provinces. Altogether, 7.5% of the population (approximately 608141 people) resides in Kigali (Rwanda Country Report, 2004), its capital city. There are five Universities in Kigali and the researcher was able to negotiate easy access to the biggest university known as Kigali Institute of Science, Technology (KIST).

The Kigali Institute of Science, Technology (KIST) is the first public technological institute of higher learning in Rwanda. It came into existence as a UNDP project on November 1<sup>st</sup>, 1997 with a clear mandate to produce technical, scientific, administrative and managerial expertise of high caliber. This institution has an estimate of 325

employees with around 3700 students enrolled in 4 different faculties. The employees' age group varies between 25-70 years and all of them live in Kigali city. The majority of KIST employees are male lecturers.

### **3.3 STUDY DESIGN**

The study design used was a quantitative cross-sectional design. This type of research attempted to answer questions on the current status of the subject (Gay & Airasan, 1999) and was considered appropriate for this study as it would attempt to establish the current status of physical inactivity and hypertension of employees at the Kigali Institute of Science, Technology.



### **3.4 STUDY POPULATION AND SAMPLE**

The study was carried out at Kigali Institute of Science, Technology (KIST) where all staff members (325 employees) represented the study population. The study used Yamane's formula to determine the study sample size. The formula is as follows:  $n = \frac{N}{1 + N(e)^2}$  whereby n is the sample, N the study population, and e is a constant equal to

0.05 (Israel, 1992). Using this formula, the study sample had to be approximately 180 of the participants in this study.

A systematic random sampling technique was used. A list of all employees of KIST in alphabetic order was obtained from the Human Resources Department, and starting from

person number 001, every second person was approached to participate in the study until the required number of participants was reached.

### **3.5 DATA COLLECTION**

#### **3.5.1 Research instrumentation**

Data was collected by means of a self-administered questionnaire. The questionnaire consisted of two sections: The first section requested for socio-demographic information such as age, gender, and marital status from participants. Furthermore, height, weight and blood pressure readings were measured and recorded. The second section assessed the participant's levels of physical activity by using the International Physical Activity Questionnaire (IPAQ). It consisted of 15 questions which assessed the different categories of physical activities, such as: work-related, transport-related, leisure-time-related physical activities. Participants had to indicate their frequency of participation as well as their duration of participation in these physical activities.

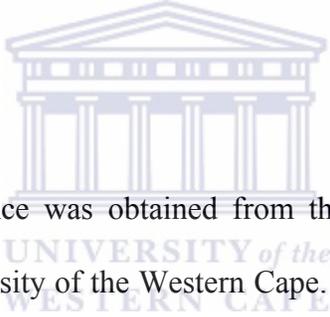
#### **3.5.2 Validity and Reliability**

To ensure reliability and validity of the research instrument, the items used in the current questionnaire was adapted from other questionnaires which were used in prior research related to physical activity. The International Physical Activity Questionnaire (IPAQ) had undergone extensive reliability and validity testing across 12 countries, suggesting that it was indeed had acceptable measurement properties for use in many settings and in

different languages. Its test-retest reliability was found to be good. Its Spearman's correlation coefficient was around 0.8 (Craig et al., 2003).

Blood pressure readings were taken after the participants had been seated for 5 minutes or longer. A qualified registered nurse was involved and used a sphygmomanometer and stethoscope to measure the blood pressure of the participants. Two measurements of blood pressure were taken with the mean of these two measurements recorded. Hypertension was defined as a systolic blood pressure of 140 mmHg or higher with a diastolic blood pressure of 90mm Hg or higher (Williams & Wilkins, 1996).

### **3.5.3 Procedure**

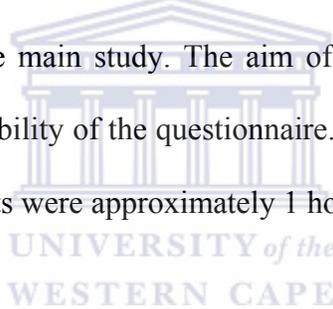


Permission and ethical clearance was obtained from the Senate Research Grants and Study Committee of the University of the Western Cape. Permission was requested from the rector of the Kigali Institute Science and Technology (KIST). Permission was also obtained from the Ministry of Health in Rwanda. Furthermore, permission and written informed consent was sought from participants. Furthermore, participants who had time completed the questionnaires immediately while the researcher was given a date to collect completed questionnaires from the others. Their blood pressures, heights and weights were recorded on the same day. Blood pressure readings were taken after the participants had been seated for 5 minutes or longer by the research assistant who is a trained registered nurse. The mean of two readings obtained were then recorded. A sphygmomanometer and stethoscope were used to measure the blood pressure of the participants. A digital scale was used to measure weight in light clothes to the nearest

0.05 kg. Tape measure was used to measure height to the nearest 0.1 cm. The participants were requested to stand on paper while the shoes were out in a straight position close to the wall and the line at the level of the head was selected for measurements. One nurse from Kigali University Hospital was trained as a research assistant and was therefore involved in the process. The purpose of this training was to explain his/her role in the study, the aim of the study, and its ethical issues. Data collection was done over a period of four weeks.

### **3.5.4 Pilot Study**

A pilot study with four members of the KIST staff was done. The results of the pilot study were not included in the main study. The aim of the pilot study was to test the understanding, clarity and reliability of the questionnaire. The time taken to complete the questionnaire and measurements were approximately 1 hour.



### **3.5.5 Data Analysis**

Statistical package for social sciences (SPSS) version 15.0 was used to analyze the data. Descriptive statistics was employed to summarize the demographic data of the study sample. The demographic data was expressed as percentages, means and standard deviations. Cross tabulations were used to determine if any associations existed between levels of physical activity, hypertension and socio-demographic variables. Chi-square test was used to test for significant associations between levels of physical activity and hypertension. Inferential statistics were reported as chi-squares, degrees of freedom and P-values. Alpha level was set at 0.05.

### **3.6 ETHICAL CONSIDERATIONS**

Ethical clearance and permission were sought from the Senate Research and Study Grants Committee of the University of the Western Cape. Permission was also obtained from the rector of Kigali Institute of Science and Technology. A letter stating the purpose of the study was addressed to all participants. Informed, written consent was obtained from all participants. Participation was voluntary and any member of the group was at liberty to withdraw from the study at any time. All collected information was strictly kept confidential, and individual anonymity strongly assured. Feedback of results to all stakeholders was given. Participants that were found to be hypertensive were referred to the Central University Hospital of Kigali, Rwanda (CHUK) for further management.



## CHAPTER FOUR

### RESULTS

#### 4.1 INTRODUCTION

This chapter contains the results of the statistical analysis that attempt to answer the objectives as stated in chapter one. The results are complimented with graphs and tables.

#### 4.2 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY SAMPLE

One hundred eighty (180) employees of Kigali Institute of Science, Technology (KIST) were randomly selected to participate in this study. However, only one hundred (100) agreed to participate and completed the questionnaires, thus an overall response rate of 55.6% was obtained. Participants were aged between 27 and 62 years (Mean = 38.79, SD = 9.494). The majority of the respondents were aged between 30 and 39 (44%) followed by those between 40 and 49 (24%) as is illustrated in table 4.1. The majority of the participants were males (69%) while 31% were females. More than a quarter of the participants (26%) reported that they were smokers and 52% of them reported that they drink alcohol. More than half of the participants (56%) were married while 31 (31%) were single. Less than one-tenth (3%) reported that they have had been diagnosed with hypertension, while 10% reported to suffer from diabetes mellitus.

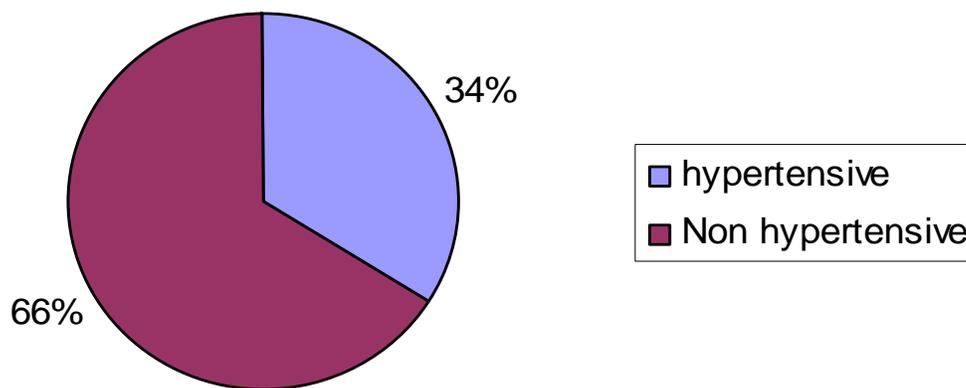
**Table 4.1 Distribution of selected socio-demographic characteristics of the study sample (n=100)**

<b>Variables</b>	<b>Characteristics</b>	<b>Frequency</b>	<b>Percentages (%)</b>
<b>Age group</b>	20-29	18	18
	30-39	44	44
	40-49	24	24
	50-59	11	11
	60-69	3	3
<b>Gender</b>	Males	69	69
	Females	31	31
<b>Marital Status</b>	Single	39	39
	Married	56	56
	Separated	2	2
	Divorced	2	2
	Widowed	1	1
<b>Smoking</b>	Yes	26	26
	No	74	74
<b>Alcohol use</b>	Yes	52	52
	No	48	48
<b>Diagnosed with Hypertension</b>	Yes	3	3
	No	97	97
<b>Medication</b>	Yes	1	1
	No	99	99
<b>Diagnosed with Diabetes Mellitus</b>	Yes	10	10
	No	90	90
<b>BMI Categories</b>	Under weight (<18.5)	22	22
	Normal weight (18.5-24.9)	37	37
	Over weight (25-29.9)	29	29
	Obesity (30 or greater)	12	12

The mean height of the study sample was 1.73 m (SD=0.06) and the mean weight was 76.11 kg (SD=13.89) Kg. Over one third (37%) of the participants were found to be normal weight (BMI=25-29.9) while (29%) were over-weight (BMI = 18.5-24.9). The mean BMI of the study sample was 23.15 (SD=5.098).

### 4.3 PREVALENCE OF HYPERTENSION

For the purpose of this study, participants with a systolic blood pressure (SBP) of 140 mm Hg or higher and/ or diastolic blood pressure of 90 mmHg or higher were classified as hypertensive (Williams & Wilkins, 1996). The mean systolic blood pressure (SBP) was 129.70 (SD=17.962) while the mean diastolic blood pressure (DBP) of the study sample was 80.50 (SD= 12.723). Using Williams & Wilkins (1996) categories about one third (34%) of the participants were classified as hypertensive as illustrated in Figure 4.1.



**Figure 4. 1 Percentage of participants classified as hypertensive (n = 100)**

#### 4.4 FACTORS ASSOCIATED WITH HYPERTENSION

Table 4.2 indicates the factors associated with hypertension. It compares hypertension and non hypertension with age group, gender, marital status, smoking, drinking alcohol, suffering from diabetes mellitus, and Body Mass Index (BMI). Chi-square test found that hypertension was related to age group ( $p = 0.000$ ), smoking ( $p = 0.013$ ), drinking alcohol ( $p = 0.025$ ), suffering from diabetes ( $p = 0.000$ ) and BMI ( $p = 0.000$ ) while gender and marital status were not related to hypertension with p-values of  $p = 0.834$  and  $p = 0.077$  respectively.



**Table 4.2 Factors associated with Hypertension (N=100)**

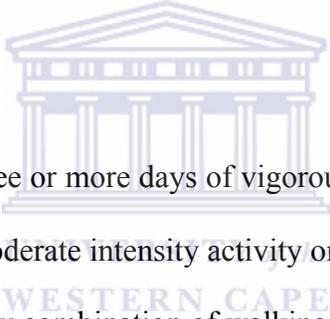
Variables	Characteristics	Hypertensive n (%)	Non Hypertensive n (%)	Total n
<b>Age group</b> **	20-29	0	17 (100)	17
	30-39	8(18.2)	36(81.8)	44
	40-49	12(50)	12(50)	24
	50-59	10(90.9)	1(9.1)	11
	60-69	3(100)	0	3
<b>Gender</b>	Male	23(33.3)	46(66.7)	69
	Female	11(35.5)	20(64.5)	31
<b>Marital status</b>	Single	9(23.1)	30(76.9)	39
	Married	21(37.5)	35(62.5)	56
	Separated	1(50)	1(50)	2
	Divorced	2(100)	0	2
	Widowed	1(100)	0	1
<b>Smoking *</b>	Yes	14(53.8)	12(46.2)	26
	No	20(27)	54(73)	74
<b>Alcohol use *</b>	Yes	23(44.2)	29(55.8)	52
	No	11(22.9)	37(77.1)	48
<b>Suffering from diabetes Mellitus **</b>	Yes	10(100)	0	10
	No	24(26.7)	66(73.3)	90
<b>BMI**</b>	Under-weight (<18.5)	3(13.6)	19(86.4)	22
	Normal weight (18.5-24.9)	7(18.9)	30(81.1)	37
	Over-weight (25-29.9)	13(44.8)	16(55.2)	29
	Obesity (30 or greater)	11(91.7)	1(8.3)	12

\*\* p<0.01, \* P<0.05

#### 4.5 LEVELS OF PHYSICAL ACTIVITY

The IPAQ requests for both the duration and number of days/sessions of physical activity. An overall total physical activity MET-minutes/week score were thus calculated. Participants were then categorized into different levels of physical activity based on their Metabolic Equivalent's (MET) minutes per week.

1. **High (category 1):** Vigorous-intensity activity of at least 3 days and accumulating for at least 1500 MET-minutes/week or 7 days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 3000 MET-minutes/week (Glance, 2005).

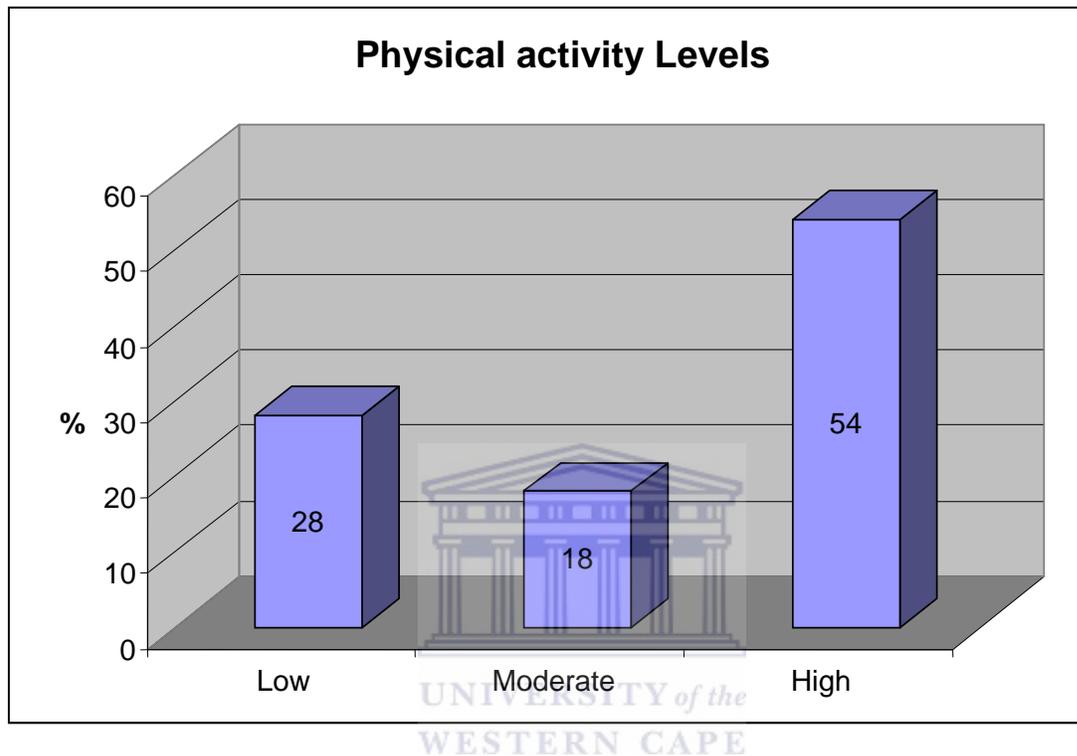


2. **Moderate (category 2):** Three or more days of vigorous activity of at least 20 minutes per day or 5 or more days of moderate intensity activity or walking for at least 30 minutes per day or 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 Metabolic Equivalents minute per week (MET-min/week) (Glance, 2005).

3. **Low (category 3):** This is the lowest level of physical activity. Those individuals who do not meet criteria for categories 2 or 3 are considered inactive (Glance, 2005).

Figure 4.2 illustrates the physical activity levels according to the above categories. More than half (54%) of the study sample were classified into the high category of physical

activity. The mean MET-minute per week for those in the high category was 1783.29 (SD = 2688.90) and the mean score of the total sample was 2651.10(SD = 3251.5).



**Figure 4. 2 Percentage of participants classified according to the levels of physical activity (N = 100)**

#### **4.5.1 Physical activity categories with mean MET-minutes per week**

Table 4.3 indicates mean MET-minutes (SD) per week in physical activity categories according to the four (4) domains measured by the IPAQ, i.e. job-related physical activity, transport-related physical activity, domestic and yard- related physical activity and leisure-time physical activity. The highest mean score was obtained in the job-related

physical activity category (1783.29) and the lowest mean score in the transport-related physical activity category (262.28).

**Table 4.3 Mean MET-minutes per week in physical activity categories (N=100)**

<b>Physical activity category (PA)</b>	<b>Mean</b>
<b>Job related PA</b>	1783.29
<b>Transportation PA</b>	262.28
<b>Housework PA</b>	309.63
<b>Recreation PA</b>	295.90
<b>Total PA Score</b>	<b>2651.10</b>

Table 4.4 indicates the mean MET-minutes per week in physical activity categories according to the four (4) domains measured by the IPAQ by gender, i.e. job-related physical activity, transport-related physical activity, domestic and yard- related physical activity and leisure-time physical activity. Females obtained higher mean scores than males in the job-related (2068.23) and leisure-time physical activity categories (421.39).

**Table 4.4 Mean MET-minutes per week in physical activity categories by gender (N=100).**

<b>Physical activity category (PA)</b>	<b>Male</b>	<b>Female</b>
<b>Job related PA</b>	1655.28	2068.23
<b>Transportation PA</b>	299.46	179.52
<b>Housework PA</b>	372.55	169.58
<b>Recreation PA</b>	239.52	421.39
<b>Total PA Levels</b>	2566.8	2838.7

#### **4.6 PHYSICAL ACTIVITY STATUS**

Physical activity levels were dichotomized into active versus sedentary. Participants who accumulated less than 599 MET-minutes/week were considered sedentary and those who accumulated 600 and more MET-minutes per week as active (Glance, 2005). Almost three-quarters (72%) of the participants were categorized as active as illustrated in Table 4.5.

**Table 4.5 Distribution of participants according to their physical activity status (N=100).**

<b>Physical activity status</b>	<b>Percentage</b>
Sedentary ( $\leq 599$ MET-minutes per week)	28
Active ( $\geq 600$ MET-minutes per week)	72

#### 4.7 FACTORS ASSOCIATED WITH PHYSICAL ACTIVITY LEVELS

The association between different socio-demographic factors and levels of physical activity are illustrated in Table 4.6.

**Table 4.6 Factors associated with levels of physical activity (N = 100)**

<b>Variable</b>	<b>Characteristics</b>	<b>Sedentary n (%)</b>	<b>Active n (%)</b>	<b>Total</b>
<b>Age group *</b>	20-29	3(16.7)	15(83.3)	18
	30-39	5(11.4)	39(88.6)	44
	40-49	13(54.2)	11(45.8)	24
	50-59	4(36.4)	7(63.6)	11
	60-69	33(100)	0	33
<b>Gender</b>	Male	20(29.2)	49(71)	69
	Female	8(25.8)	23(74.2)	31
<b>Marital status</b>	Single	8(20.5)	31(79.5)	39
	Married	17(30.4)	39(69.6)	56
	Separated	1(50)	1(50)	2
	Divorced	1(50)	1(50)	2
	Widowed	1(100)	0	1
<b>Smoking</b>	Yes	10(38.5)	16(61.5)	26
	No	18(24.3)	56(75.5)	74
<b>alcohol use</b>	Yes	18(34.6)	34(65.4)	52
	No	10(20.8)	38(79.2)	48
<b>Body Mass Index *</b>	Under weight<18,5	4(18.2)	18(81.8)	22
	Normal weight18.5-24.9	6(16.2)	31(83.8)	37
	Overweight25-29.9	9(31)	20(69)	29
	Obesity 30 or Greater	9(75)	3(25)	12
<b>Diabetes Mellitus *</b>	Diabetes	7(70)	3(30)	10
	No Diabetes	21(23.3)	61(76.7)	90

\* There is significant association with physical activity levels according to chi-square test.

Table 4.6 indicates the factors that were significantly associated with the levels of physical activity were age group ( $p=0.001$ ), Body Mass Index (BMI) ( $p=0.001$ ) and suffering from diabetes mellitus ( $p=0.002$ ).

#### **4.8 RELATIONSHIP BETWEEN PHYSICAL ACTIVITY LEVELS AND BLOOD PRESSURE**

Figure 4.3 illustrates the relationship between physical activity levels and blood pressure. A Pearson correlation of the systolic blood pressure (SBP) versus total physical activity score found a weak negative correlation ( $r = -0.304$ ) but this was found to be significant ( $p = 0.002$ ).

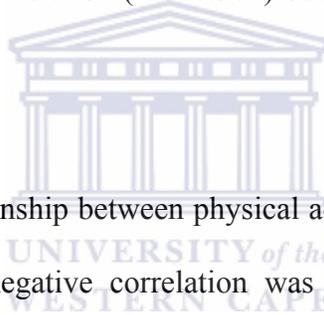
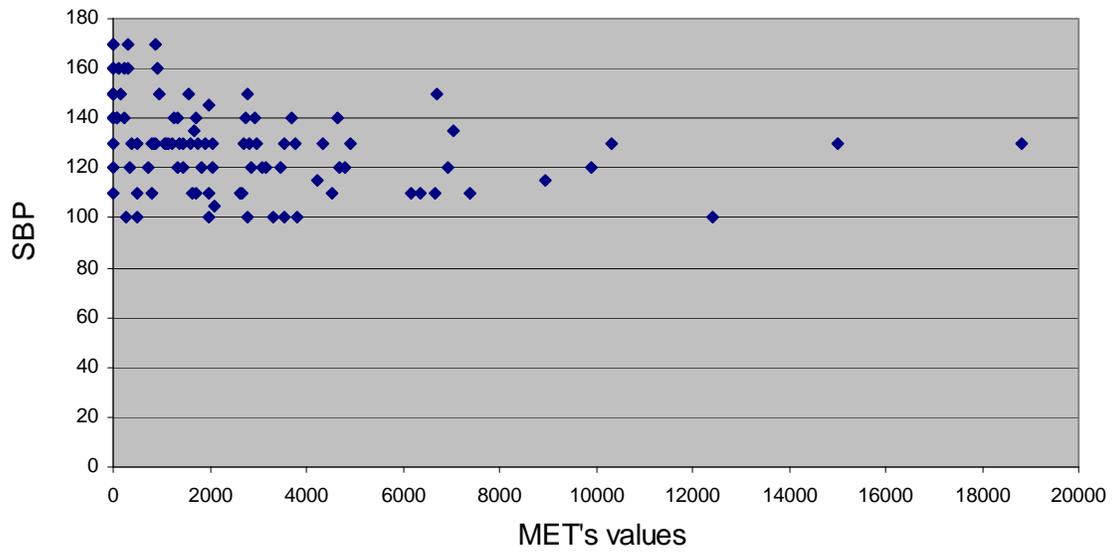
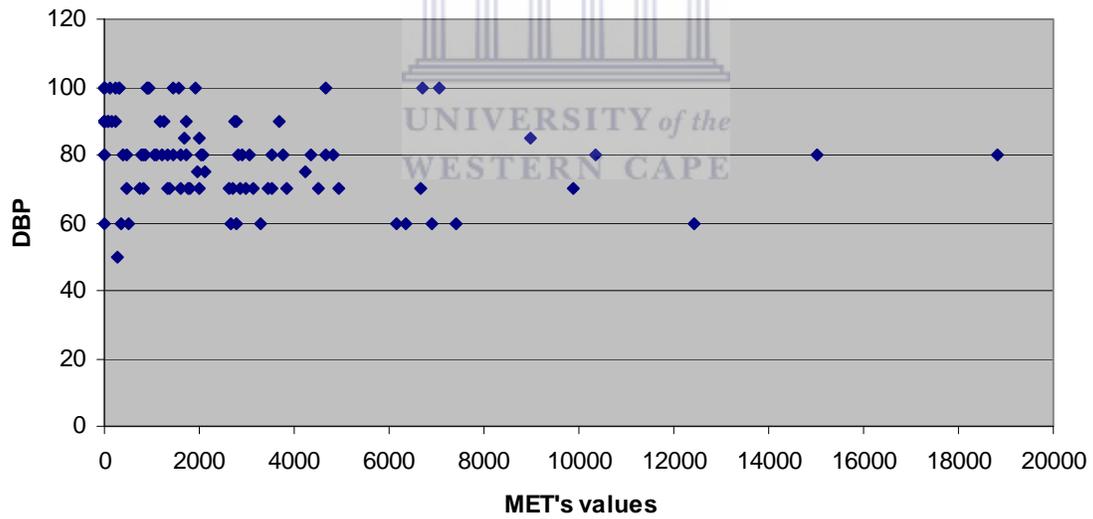


Figure 4.4 illustrates the relationship between physical activity levels and diastolic blood pressure. Similarly, a weak negative correlation was found between diastolic blood pressure (DBP) and total physical activity score ( $r = -0.256$ ;  $p = 0.01$ ). These results show how the variation of the level of physical activity is inversely related to the variation of the blood pressure.

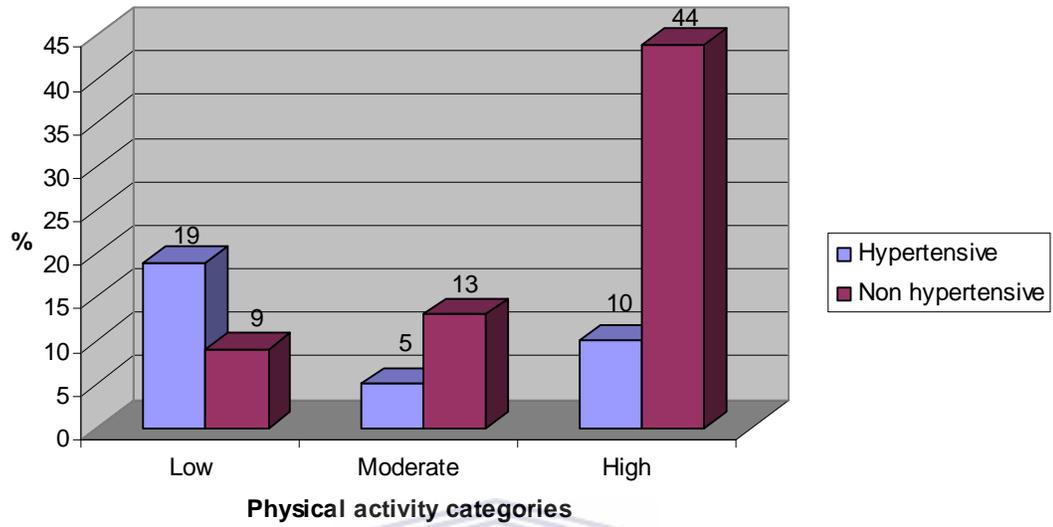


**Figure 4.3 Relationship between physical activity levels and blood pressure**

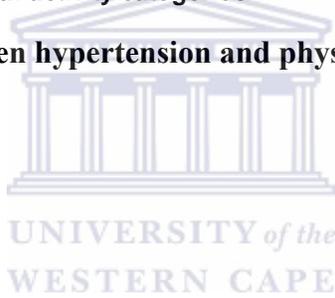


**Figure 4.4 Relationship between physical activity levels and blood pressure**

Figure 4.5 illustrates that hypertension status is strongly associated with physical activity levels ( $X^2= 20.381, P<0.001$ ).



**Figure 4.5 Association between hypertension and physical activity status**



## **CHAPTER FIVE**

### **DISCUSSION**

#### **5.1 INTRODUCTION**

This chapter discusses the findings of the current study, and compares it with the relevant literature. Finally, the limitations and strengths of the study are highlighted.

#### **5.2 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY SAMPLE**

##### **5.2.1 Demographic characteristics**

The response rate obtained in the current study was 55.6%. The low response rate was obtained due to the fact that the data collection period coincided with the period during which a large number of employees at tertiary institutions in Rwanda take leave. Participants in this study were predominantly male (69%), which is a reflection of the higher proportion of male among employees at KIST. The average age of the participants in the current study was 38.79 (SD=9.49) years ranging between 27 and 62 years.

The average BMI of the participants in this study was within the normal range although 41% of the participants were classified as overweight and obese. It is well known that BMI could be related to the risk of hypertension. The study conducted by Tesfaye et al. (2007) in several countries indicated that there was a positive correlation between BMI and blood pressure in general, and with hypertension prevalence in particular. Furthermore, the authors revealed that the risk of hypertension was higher among

population groups with overweight and obesity. The results of this study were similar to the study done by Tesfaye et al. (2007) where BMI was strongly associated with hypertension. In this study, 41% of the participants were overweight or obese which indicate that the employees of KIST are at risk of suffering hypertension. The relationship between hypertension and BMI has been found in many studies (Edwards et al., 2000 & Sun et al., 2008) and this was further seen in this study where 44% of overweight and 91% of obese were suffering from hypertension. There is therefore a need to minimize the occurrence of hypertension by preventing other factors such as overweight and obesity.



### **5.3 PREVALENCE OF HYPERTENSION**

Hypertension in Africa is an epidemic due to the shift of many people from rural to urban lifestyles, bringing with it the “burden of civilisation” such as increased cardiovascular diseases. Several authors noted that hypertension in Africa is a widespread problem due to its high prevalence in urban areas together with its complications (Opier & Seedat, 2005). This was highlighted by the results of the present study which found a prevalence of 34% of hypertension. This prevalence is somewhat higher than that found in the USA (Ong et al., 2007) and China (Gu et al., 2002) where  $\pm 28.7\%$  of the adults were found to be hypertensive. The prevalence observed in this study is high compared to the study conducted in Ghana (West-Africa) which found the prevalence of 29.4% (Agyemang, Bruijnzeels & Dabo, 2006). All the employees of KIST live in Kigali City which is an urban setting which is highly developed. It has been observed that urbanisation-related hypertension among the populations in lifestyle transition has increased hypertension

rates in urban compared with rural settings. It has been further estimated that 639million (625–654 million) of hypertensive people are in economically developing countries. (Kearney et al., 2005).

The results of the study conducted by Ong et al. (2007) indicate that 68.9% were aware of their diagnosis which is far more compared to the results observed in this study (3%). This indicates that a substantial number of employees at KIST were not diagnosed with hypertension and it could be assumed that this situation is the same in the population of Rwanda. It can be assumed that if those who have a higher educational level, and living in an urban setting does not know their blood pressure status, questions could be raised about those living in rural areas and having lower levels of education. All district and referral hospitals provide reports to the Ministry of Health, which indicate that the prevalence of hypertension is known for those attending hospitals. Very little however has been done to highlight the prevalence of hypertension among the general population and to raise awareness among them. Therefore, there is a need to increase awareness in the population of Rwanda especially those living in urban areas about hypertension. Furthermore as stated by Addo, Smeeth and Leon (2007) there is an urgent need to develop strategies to prevent, detect, treat, and control hypertension effectively.

#### **5.4 FACTORS ASSOCIATED WITH HYPERTENSION**

According to Macedo et al. (2003) the prevalence of hypertension increases as age increases. This is further emphasised by a study conducted among in urban areas which found the prevalence of hypertension to be higher among older adults (40.2%) compared

to young adults (29.4%) (Agyemang et al., 2006). Similar results were observed in the current study where age was highly related to hypertension. This might indicate that there is no major difference between the population of Rwanda and others as to the risk of hypertension with an increase in age.

Some researchers have highlighted the association between gender and hypertension (Edwards et al., 2000). The results of the current also indicate a higher prevalence of hypertension among female employees than the male employees at KIST. Similar results was observed in a study conducted in two areas of Tanzania where hypertension prevalence was 37% among men and 39.1% in women in Illala (urban), and 26.3% in men and 27.4% in women in Shari (rural) (Edwards et al., 2000). This could be due to the fact that females are more sedentary than males. In contrast to these findings, the systematic review conducted by Kearney et al. (2005) indicates that the pooled data from different regions of the world among adult population estimated that the overall prevalence of hypertension was higher among men (26.6%) than women (25.5%). This review however did not indicate the prevalence of hypertension according to the region to better understand its distribution across Africa and compare it with other continents.

It has been well documented that heavy smoking is a risk factor in the development of various cardiovascular disorders where cigarette smoking increases arterial stiffness and blood pressure (Rhee, Na, Kim, Lee & Kim, 2007). The results of the current study found an association between smoking and being hypertensive where more than half of the hypertensive participants reported to be smokers. Therefore, health promotion campaigns

are necessary in order to reduce or stop smoking among people in general and especially those suffering from hypertension.

In epidemiologic studies, higher blood pressure among persons reporting a usual intake of alcohol per day has been found in men and women, in several ethnic groups, and across all adult ages (Keil, Swales & Grobbee, 2000; Klatsky & Gunderson, 2006). This association has also been observed among KIST employees suggesting that it is not unique to a specific group where alcohol consumption constitutes a risk of developing hypertension. Therefore, alcohol consumption should not be recommended for non-drinkers and those who drink alcohol should be advised to limit their consumption. Thus, reduction in alcohol consumption, especially among heavy drinkers, has been recommended as an important mean of primary prevention of hypertension.

According to Govindarajan, James, Sowers and Stump (2006) the prevalence of hypertension in diabetic individuals appears to be higher than in the non-diabetic population. This concurs with the results of this study which indicate that all the participants suffering from diabetes mellitus were hypertensive. Govindarajan et al. (2006) further stated that the presence of hypertension in diabetic patients might substantially lead to an increase in the risks of a number of complications such as coronary heart disease, stroke, nephropathy and retinopathy. Therefore, the control and treatment of hypertension effectively is needed because their coexistence contributes to the overall morbidity and mortality of an already high-risk population.

## 5. 5 LEVELS OF PHYSICAL ACTIVITIES

Physical inactivity is associated with several health-related risk factors and is an independent risk factor for cardiovascular diseases, diabetes, and several types of cancer. The prevalence of physical inactivity and its negative health consequences are rapidly increasing in both developed and developing countries (Hu et al., 2004). The results of this study indicated that nearly three quarters of the participants were physically active which is a good sign indicating that the chances of developing chronic diseases of lifestyle especially hypertension are minimal. Similar results were observed among American adults where about 24% to 40% were reported to be completely sedentary while about 40% to 54% were reported to do some physical activities (Leon & Connett, 1991). The percentage of the participants found to be sedentary were predisposed to hypertension as stated by Anne et al. (2004) that low fitness is associated with about a 50% higher risk of developing hypertension as compared to subjects with high levels of fitness.

Physical activity was categorised according to four domains: Job-related physical activity, transportation physical activity, housework physical activity, and recreation, sport, and leisure-time physical activity. Job-related physical activity domain assessed all the activities that include paid jobs, farming, volunteer work, course work and any unpaid work that was done outside the home. The type of job was not assessed; therefore it was not possible to know which part of the job contributed to the job-related domain.

The transportation domain assessed how participants traveled from place to place including work, stores, churches etc. The means of transports were also assessed like the use of motor vehicle, train, buses, use of bicycle or walking. In the transport domain participants score less because many of them reported the use of motor vehicles as their means of transport. It has been documented that increasing motorisation and broad access to cars have contributed to sedentary lifestyle and inactivity, and play a role in the obesity epidemic. Housework, house maintenance, and caring for family assessed activities which were carried out in and around the home like housework, gardening, yard work, general maintenance work and caring for the family. Recreation, sport, and leisure-time domain assessed activities that were undertaken solely for recreation, sport, exercise or leisure like walking, aerobics, fast bicycling, fast swimming and other games considered vigorous. Both these domains were moderately scored indicating that the employees of KIST do not engage in vigorous housework and recreation activities. Therefore health promotion activities should aim to increase physical activity in these domains.

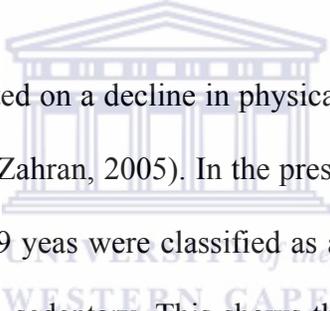
## **5.6 ASSOCIATION BETWEEN AGE GROUP, GENDER, AND BODY MASS INDEX (BMI) WITH PHYSICAL ACTIVITY LEVELS**

According to the most recent data from the National Health and Examination Survey, the prevalence of overweight and obesity among men 20 to 60 years old has increased, to 39.7% and 31.1%, respectively (Harris & George, 2008). This is of concern as both overweight and obesity are strongly related to an increased risk for several chronic conditions including cardiovascular disease, diabetes, high blood pressure, stroke, asthma, arthritis, certain cancers, and gallbladder disease (Harris & George, 2008). This

concur with the results of this study which observed the relationship between BMI and physical activity where 75% of obese participants were sedentary. Therefore weight reduction should be recommended for this population as it is believed that weight reduction is an important intervention for primary prevention of hypertension. The weight loss literature suggests that “lifestyle modification” or the combination of healthy diet, regular exercise, and behavior therapy is the foundation of obesity treatment (Harris & George, 2008). This could be initiated in early life of individuals because sustained weight reduction is so difficult to achieve. Therefore, more emphasis should be placed on prevention of weight gain, particularly in the young individuals with a high normal blood pressure and in families with a high prevalence of hypertension.

Many authors revealed that men are considered more physically active than women (Eyler et al., 2002). The present study however found that females were more physically active compared to males. Other research reporting on physical activity levels among urban children and youth in Norway have also shown that males are more active than females (Klasson-Heggebe & Anderssen, 2003). It is believed that women tend to be aware of their health more than men hence leading to acquire knowledge regarding their well being as stipulated by Newson and Kemp (2007), therefore their high prevalence levels of physical activity might be attributed to by the knowledge on health benefits of physical activity compared to men. This was further emphasized by the results of the current study which observed that female had higher scores in the domain of recreation and leisure-time physical activity. This indicates that in addition women engage more in physical activities in order to be healthy and in good shape. Women were found to be

physically active also in the older adults where females were more likely to be physically active than males (Kritz-Silverstein, Barrett-Connor & Corbeau, 2001). It is difficult however to draw conclusions due to the controversies observed in different studies. The difference in the levels of physical activity observed between the present study and other studies might be explained by the difference in the type of study and the methodology employed in the respective studies and more importantly the characteristics of the participants and the tool used. Despite the existing differences, the participation of women in physical activities should be enhanced and men should be educated and encouraged to participate in physical activities (Newson & Kemps, 2007).



Various researchers have reported on a decline in physical activity as people advances in age (Moriarty, Kobau, Zack & Zahran, 2005). In the present study, more than half of the participants below the age of 39 years were classified as active while two thirds of those above the age of 40 years were sedentary. This shows that as age increases the level of participation in physical activities decreases and this predispose older adults to the development of different conditions like hypertension. The results of this study which observed a decrease in physical activity participation with age were consistent with the work of Moriarty et al., (2005) who found that physical activity reduces with age. This shows that employees at KIST need special attention to counteract the development of chronic diseases that is associated with the increase in age and exacerbated by physical inactivity. Efforts to promote physical activity have focused on identifying its determinants and designing interventions that might effectively promote regular physical activity (Seefeldt et al., 2002). Age and gender were identified to be among the multitude

factors that are invariable which induce adults to initiate and maintain programmes of physical activity. Therefore health promotion programmes should be targeted at factors that are modifiable like behavioral and personality characteristics, environmental circumstances and community settings.

## **5.7 RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND BLOOD PRESSURE**

Epidemiological studies have shown a reduced risk of developing hypertension in physically active persons and showed the benefits of aerobic exercise in lowering raised systolic and diastolic blood pressures (Gordon et al., 1990). This concurs with the results of the present study which observed a statistically significant low systolic and diastolic blood pressure among the participants who were physically active. The results of this study were similar to the findings of the study conducted by Paffenbarger, Hyde, Wing and Hsieh, (1991) indicating an inverse relationship between sports participation and hypertension.

It has been documented that physical activity plays an important role in the management of hypertension being one of the core non-pharmacological regimens to control elevated blood pressure (Hagberg et al., 2000). This was supported by the study conducted by Lee, Blair and Jackson, (1999) which found that endurance exercises and training lower systolic and diastolic blood pressure to approximately 10 mm Hg. Therefore, those who are diagnosed with hypertension should be encouraged to engage in physical activities in order to control their raised blood pressures and other existing risk factors, such as

adverse lipid profiles, overweight and obesity, insulin resistance, depression and social isolation (Briffa et al., 2006).

It is widely accepted that physical inactivity is a risk factor for cardiovascular diseases and increasing physical activity has been repeatedly associated with a decrease in cardiovascular risks (Murphy et al., 2007). Therefore, physical activities could be recommended to people who are not suffering from hypertension as a primary prevention of this condition. Physical activity should be incorporated in everyday life because it is widely recognized as an important health behavior, providing benefits for both physical and psychological well-being and if appropriately structured, physical activity may also enhance social and moral development (Mulvihill, Rivers & Angleton, 2000).

## **5.8 LIMITATION AND STRENGTH OF THE STUDY**

The following limitations of this study should be noted: All data were self-reported, thus vulnerable to misrepresentation through errors in simplification or exaggeration. The employees at KIST were randomly selected from an alphabetical ordered list from Human Resources, therefore type of employment were not taken into consideration. This should be considered as a limitation as different kinds of employees/lecturers may have different workloads due to seniority. The questionnaire mainly consisted of close-ended, and a few open-ended responses. This limited the study to gain deeper information on the perceptions of physical activity. A triangulated study design would be better. However, this study was worthy since it is among the few studies in Africa seeking relationship between hypertension and physical activity.

## **CHAPTER SIX**

### **SUMMARY AND RECOMMENDATIONS**

#### **6.1 INTRODUCTION**

This final chapter includes the summary of the study where all relevant points of the study are outlined. Recommendations for the future approaches such as actions on the development of physical activity promotion programmes are also highlighted.

#### **6.2 SUMMARY**



The overall aim of this study was to establish whether employees of Kigali Institute Science and Technology in Rwanda that are physically inactive are also most likely to be hypertensive. The prevalence of hypertension, levels of physical activity, relationships that existed between physical activity levels and hypertension, and those factors associated with physical inactive and hypertension were established.

The motivation for the study was that, according to literature, regular, moderate to vigorous physical activity can provide adult people with important physical, chronically diseases of lifestyle like hypertension, mental and social benefits. Furthermore, physical activity can reduce health care cost and it also prevents disabilities thus improving the overall quality of life. Particularly from the World Health Organisation (WHO) there is

evidence of the rising incidence and prevalence of hypertension and other chronic diseases of lifestyle in developing countries.

Therefore, lack of physical activity is a major underlying cause of chronic diseases of lifestyle such as hypertension. Being physically inactive is increasing among the populations all over the world. Some populations are already living in technologically advanced societies. Rapid urbanization with changes in lifestyle in Africa and other developing countries such as Rwanda increases physical inactivity. Physical activity is influenced by a variety of social, cultural, psychological and environmental variables. Kigali Institute of Science and Technology in Rwanda were used as a research setting for the present study. A descriptive quantitative study was conducted for both female and male employees of Kigali Institute Science and Technology in Rwanda. One hundred eighty (180) employees of this institute were randomly selected for participation in this current study and 100 of them agreed to participate. Self-administered, open-ended questionnaires were used to collect data.

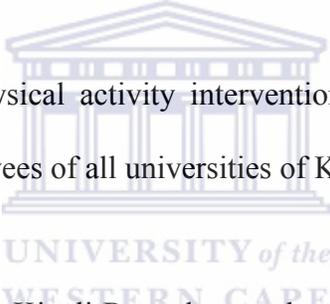
Chi-square, descriptive statistical analysis was done using Statistical Package for Social Science (SPSS). A response rate of 55% was obtained in this study. The age range of this study were ranged from 27 to 62 years the mean of body mass index (BMI) of the study sample was 23.15 (SD=5.098). The females hypertensive was constituted 35.5% of the sample thus indicate that female has higher hypertension than males where 33.5% has hypertension as indicated in this study. This current study indicates that 28% of the participants were not currently participating in physical activity whereas 34% has hypertension. According to the factors associated with hypertension chi-square test shows

that hypertension was currently related to significant differences of age, smoking, drinking alcohol, and suffering from diabetes mellitus and body mass index.

## **6.3 RECOMMENDATIONS**

### **6.3.1 Physical activity promotion**

The following recommendations are offered to employees of all Universities in Rwanda and the Ministry of Health, Education, culture and Sports together with other health promoters interested in increasing physical activity levels among employees of universities in Rwanda and Institution employees in Rwanda.

- 
1. It is recommended that physical activity interventions be incorporated as a health education aspect among employees of all universities of Kigali, Rwanda.
  2. Employees of Universities in Kigali Rwanda can also educate their fellow workmates who have never done physical activities before through positive messages and encouragement.
  3. The findings suggest that education regarding physical activity can contribute significantly to the availability of appropriate physical activity which leads to health benefits. Employees of Kigali Institute Science Technology with hypertension should, therefore, be encouraged to participate for at least 20 to 30 minutes at moderate to vigorous intensity of physical activity per day.

4. Universities should create socially attractive barrier free environments to increase access for employees to engage in physical activities. The competitions in sports should be encouraged among employees of university in Kigali-Rwanda.

5. Universities should create dialogue with the employees of Kigali Institute Science and Technology and their family to encourage cooperative choice of physical activities and attract social support.

6. Physicians should consider physical activity as a tool in the prevention and management of hypertension more often, since it is a cheaper if not free, treatment modality. Furthermore, exercises are safer than pharmacological treatment that may have side effects that easily harm the hypertensive peoples given their vulnerability.

7. Departments of public health should promote a nationwide campaign for physical activity among hypertensive individuals.

8. Physiotherapists should work closer with physicians to make the practice of physical exercises a reality. Therefore, physiotherapists should be involved in designing programmes for physical activity promotion.

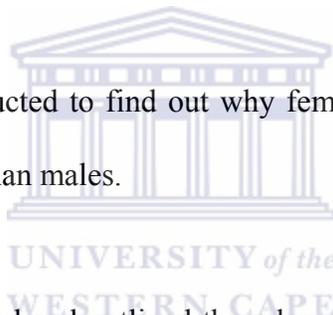
9. The ministry of Health should establish a policy of physical activity for universities employees in Rwanda that promotes physical activity participation in lifelong non-sedentary activities.

10. Physical activity must be incorporated in different institutions for employees in Rwanda. Marketing a leisure-time activities campaign and other physical activities of daily living such as walking and household activities, sports, all this through: the media, news papers, internet, television, radio and magazines.

### **6.3.2 FURTHER STUDIES**

1. Physical activity levels related to chronic diseases of lifestyle might differ among employees from urban areas and those from rural areas universities. Therefore, further studies are needed to see if there are real differences.

2. More research can be conducted to find out why females are more vulnerable to the development of hypertension than males.



Finally, this chapter summarized and outlined the relevant points of the current study. It made recommendations for future actions; including the development of physical activity promotion programme and future research on physical activity are needed.

### **6.4 CONCLUSION**

This cross-sectional study succeeded in providing knowledge regarding physical activity levels and hypertension among university employees in Kigali-Rwanda. The current study concludes that physical activities are needed for university employees of Kigali Institute of Science and Technology as part of a preventive measure for chronic diseases of lifestyle. The result showed that the prevalence of hypertension among the physically

active group was significantly lower than that of the physically inactive group. This study shows that hypertension status is strongly associated with physical activity levels. These results would undoubtedly inform the management of Kigali Institute of Science and Technology that physical activity policies and sports development are needed. This gives much hope for a successful intervention programme to promote physical activity of university employees in Rwanda.



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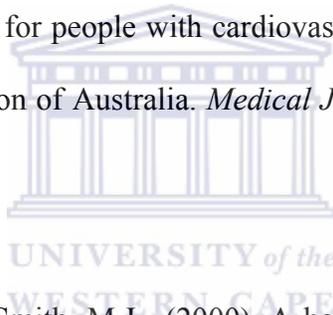
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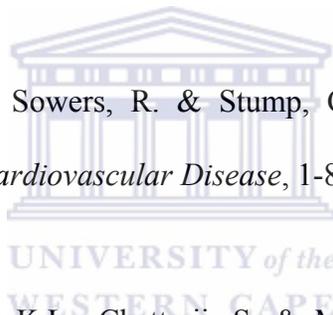
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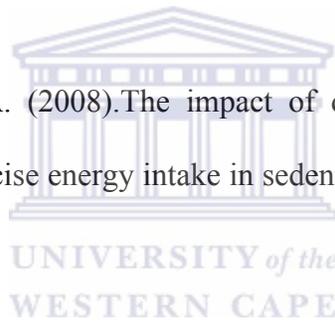


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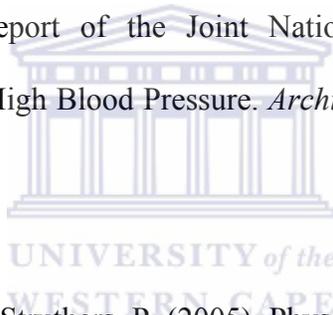
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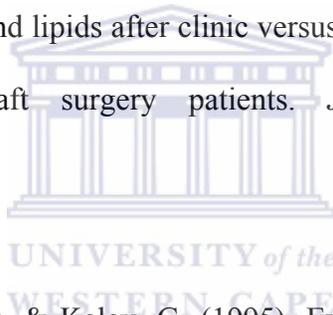
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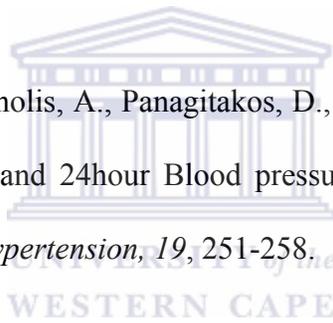
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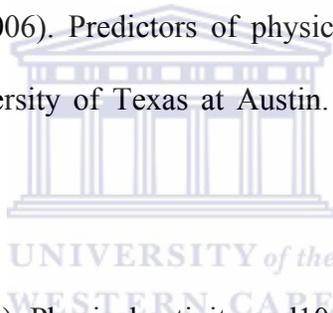
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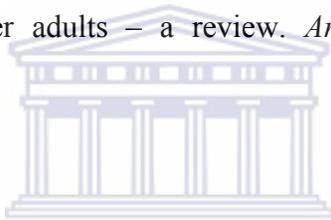
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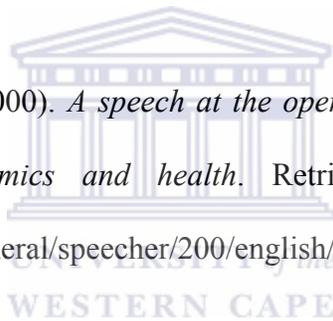
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## APPENDICES



UNIVERSITY *of the*  
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HIGHER DEGREES COMMITTEE

16th November 2007

TO WHOM IT MAY CONCERN

Dear Sir/Madam

**Research Project of Mr. Jacques Banyangiriki (Student Number: 2743362)**

This letter confirms that Mr. Banyangiriki is a registered student in the Faculty of Community and Health Sciences at the University of the Western Cape. His research proposal entitled "**Physical activity levels and Hypertension among university employees in Kigali, Rwanda**" submitted in fulfilment of the requirements for Masters in Physiotherapy has been examined by the Higher Degrees Committee and found to be of high scientific value, methodologically sound and ethical.

We fully support the research and kindly request that you allow him access to your organization.

Sincerely



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**DR GAVIN REAGON**  
Chairperson: Higher Degrees Committee



**APPENDIX C**

Private Bag X17, Bellville 7535  
South Africa  
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Website: www.uwc.ac.za

The Republic of Rwanda  
Rector: Kigali Institute Science Technology

November, 18<sup>th</sup> 2007

Dear Madam/sir,

**RE: Request to Conduct a Research Study in Kigali Institute Science Technology in Rwanda.**

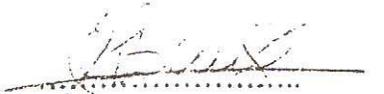
My name is Jacques Banyangiriki. I am currently doing a masters degree program in Physiotherapy at the University of the Western Cape in South Africa. I am expected to carry out a research project as a partial fulfillment of the requirements for master science (M.Sc.) Physiotherapy. The title of my research is: "Physical Activity Levels and Hypertension among University employees in Kigali, Rwanda."

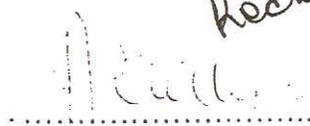
I kindly request permission to carry out this research study based above in Kigali Institute Science Technology in Rwanda. It is hoped that the results of the study would be helpful in developing physical activity promotion among University employees in Kigali Rwanda. Ministry of Education, Health and Sports in Rwanda.

The participation in this study will be anonymous and voluntary, the information gathered will be treated with confidentiality and the feedback of the results will be provided to stakeholders.

Looking forward to your assistance.

Yours faithfully

  
Mr. Jacques Banyangiriki  
Student Reseacher

  
Prof. Julie Phillips  
Research Supervisor

*P. Dir. Phillip & HR  
Permission has been granted by the Rector  
30/11/07  
SA TC*



*Recu reception le 26/11/07  
a. 13h20  
Sec Central*

REPUBULIKA Y'U RWANDA

Kigali, kuwa 21 DEC. 2007

N° 20/...../MIN/07

3353



MINISITERI Y'UBUZIMA

B.P 84 KIGALI

Website : [www.moh.gov.rw](http://www.moh.gov.rw)

IBIRO BYA MINISITIRI

FAX : (250) 576853

TEL : (250) 577253



Bwana BANYANGIRIKI Jacques  
University of the Western Cape  
Private Bag X 17, Bellville 7535  
SOUTH AFRICA

Impamvu: Uruhushya rwo gukora ubushashatsi

Bwana,

Mpereye ku ibaruwa yawe wanditse usaba uruhushya rwo gukora ubushakashatsi mu rwego rwa Physiotherapy muri Kigali Institute of Technology (KIST), nkwandikiye nshaka kukumenyeshya ko urwo ruhushya urwemerewe ariko kandi nkakugira inama yo kubanza kubiganiraho n'Abayobozi ba KIST.

Nkwifuriye akazi keza.

Minisitiri w'Ubuzima

Dr. Jean Damascène NTAWUKULIRYAYO

Bimenyeshejwe:

- Bwana Umunyamabanga wa Leta muri Minisitiri y'Ubuzima Ushinzwe Kurwanya SIDA n'Izindi Ndwarwa z'Ibyorezo
- Madamu Umunyamabanga Uhoraho muri Minisitiri y'Ubuzima
- Bwana Umuyobozi Mukuru wa KIST

A handwritten signature in purple ink, appearing to be 'Jean Damascène Ntawukuliryayo', with the date '20/12/07' written below it.



APPENDIX D



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959, Fax: 27 21-959

E-mail:

CONSENT FORM

Title of Research Project: **Physical activity levels and hypertension among university employees in Kigali, Rwanda.**

The study has been described to me in a language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's name.....

Participant's signature.....

Date.....



Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: Jacques BANYANGIRIKI

University of the Western Cape

Private Bag X17, Belville 7535

Cell: 0783559471, South Africa: 08225200, Rwanda.

Email: banyaj5@yahoo.fr

**APPENDIX E**

**QUESTIONNAIRE FOR KIST EMPLOYEES.**

All questions are strictly confidential. Please be as honest.

**SECTION A: DEMOGRAPHIC DATA**

1. How old are you? Years .....

2. Gender Male ..... Female .....

3. What is your marital status?

Single ..... Married .....

Separated ..... Divorced .....

Widowed .....

4. Do you currently smoke?

Yes..... No.....

5. Do you currently drink alcohol?

Yes..... No.....

6. Have you been diagnosed by your medical practioner as hypertensive?

Yes..... No.....

7. If you have been diagnosed with hypertension, are you currently on any medication?

Yes..... No.....

8. Do you suffer from any of the following condition? Diabetes mellitus.



Yes..... No.....

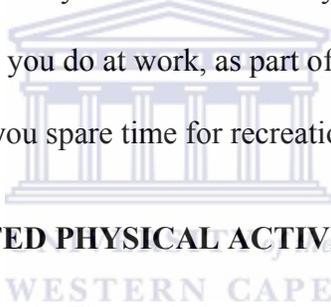
9. Height ..... Weight .....

10. Calculated BMI .....

11. Blood Pressure readings .....

**SECTION B: LEVELS OF PHYSICAL ACTIVITY PARTICIPATION**

This is an international physical activity questionnaire which will help us find out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.



▪ **PART 1: JOB-RELATED PHYSICAL ACTIVITY**

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any unpaid work that you did outside your home. Do not include unpaid work you might do around your home like housework, yard work, general maintenance, and caring for your family.

1. Do you currently have a job or do any unpaid work outside your home?

-----Yes

-----No

→

**(Skip to Part 2: Transportation)**

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include travelling to and from work.

**2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.....days per week**

.....No vigorous job-related physical activity → **(Skip to question 4)**

**3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?**

.....**hours per day**

..... **minutes per day**



**4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.**

.....**days per week**

.....No moderate job-related physical activity → **(Skip to question 6)**

**5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?**

.....**hours per day**

.....**minutes per day**

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

.....**days per week**

.....No job-related walking → **(Skip to Part 2: Transportation)**

7. How much time did you usually spend on one of those days **walking** as part of your work?

.....**hours per day**

.....**minutes per day**

▪ **PART 2: TRANSPORTATION PHYSICAL ACTIVITY**

These questions are about how you travelled from place to place, including to places like work, stores, churches, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a bus or car?

.....**days per week**

.....No travelling in a motor vehicle → **(Skip to question 10)**

9. How much time did you usually spend on one of those days **travelling** in a train, bus, car or other kind of motor vehicle?

.....**hours per day**

.....minutes per day

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go from place to place?

.....days per week

.....No bicycling from place to place → **(Skip to question 12)**

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

.....hours per day

.....minutes per day



12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go from place to place?

.....days per week

.....No walking from place to place → **(Skip to PART 3: Housework, house maintenance, and caring for family)**

13. How much time did you usually spend on one of those days **walking** from place to place?

.....hours per day

.....minutes per day

▪ **PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY**

This section is about some of the physical activity you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shovelling snow, or digging **in the garden or yard**?

.....days per week

.....No vigorous activity in the garden or yard → **(Skip to question 16)**

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

.....hours per day

.....minutes per day

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

.....days per week

.....No moderate activity in garden or yard → **(Skip to question 18)**

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

.....**hours per day**

.....**minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

.....**days per week**

.....No moderate activity inside home → **(Skip to PART4:**

**RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY)**

19. How much time did you usually spend on one of those days doing moderate physical activities inside your home?

.....**hours per day**

.....**minutes per day**

▪ **PART 4:RECREATION,SPORT,AND LEISURE-TIME PHYSICAL  
ACTIVITY**

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

.....**days per week**

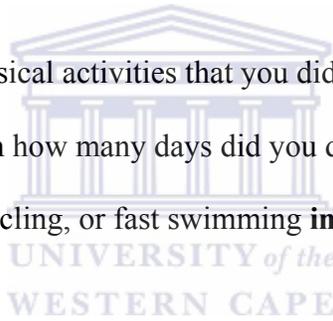
.....No walking in leisure time → **(Skip to question 22)**

21. How much time did you usually spend on one of those days **walking** in your leisure time?

.....**hours per day**

.....**minutes per day**

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?



.....**days per week**

.....No vigorous activity in leisure time → **(Skip to question 24)**

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

.....**hours per day**

.....**minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical

activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis  
**in your leisure time?**

.....**days per week**

.....no moderate activity in leisure time → **(Skip to PART 5:TIME SPENT SITTING)**

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?

.....**hours per day**

.....*minutes per day*



▪ **PART 5: TIME SPENT SITTING**

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

.....**hours per day**

.....**minutes per day**

27. During the **last 7 days**, how much time did you usually spend sitting on a **weekend day**?

.....**hours per day**

.....**minutes per day**

**Thank you very much for your time and patience.**

