

**Epidemiology and Technology - The Past and Present:
Justification for Modifiers in Major Non-Communicable Diseases**

**Being A Paper Presented at the 25th Annual Lecture, Award of Honours and
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By

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Protocol

The Chairman of the Occasion: HRM Dr. Edmund Daukoru

Guest of Honour: H. E. Prince Dapo Abiodun

The Chairman of the Board of Trustees: Senator Olabiyi Durojaiye

Executive Director: Dr. Omolaraeni Awokoya-Adadevoh

Honourees: Dr. Layi Fatona; Amb. (Prof.) Lawrence B. Ekpebu & Mrs. Catherine Uju Ifejika

Family Members

All Invited Guests

Distinguished Ladies and Gentlemen

Gentlemen of the Print and Electronic Media.

It is with thanksgiving to God that I welcome you to this year's Annual Lecture of the Stephen Oluwole Awokoya Foundation for Science Education, which was instituted in March, 1995. I congratulate the chairman and members of the Board of Oluwole Awokoya Foundation for sustaining the series of Lecture held so far, and for the prizes that have been awarded to various recipients. This is the 25th lecture, in which 19 male guest lecturers and 6 female guest lecturers have made presentations on diverse subject areas. This is a unique year marking the beginning of a decade and in a month and day which is the celebration of my birthday. This I do not see as a coincidence, rather it is God's doing and it is marvellous in our sight. I am delighted to share my professional and academic experiences on the promotion of healthy living and longevity. My sojourn in the field of Exercise Physiology spans a period of three decades this year.

A quick look at the aims of the foundation provided the direction and the title for the 25th lecture which is: "Epidemiology and Technology - The Past and Present: Justification for Modifiers in Major Non-Communicable Diseases and Future Development".

Introduction

Primordial Forms of Physical Activity

Views about the place and status of physical activities have been changing from primitive times to the advent of civilization and technology (Otinwa, 2012). These changes have been classified into three stages: The Pre-Agrarian Era, the Agrarian Era, and the Post-Agrarian Era.

The Pre-Agrarian Era

At creation, God's original intention for humankind was that he should enjoy and have total control over all that He created, especially the rich agricultural Garden of Eden. The fall of man, however, marked the beginning of an altered lifestyle, which required humans to live in caves. At this point, humans were predominantly hunters, food gatherers and nomads. The prevailing environment was a hostile one; thus, humans had to be extremely active in order to survive their constant battles with nature. They naturally developed physical activity skills in hunting, spear throwing and stalking of animals. People ran because they were forced to run: they were either running after wild animals or were themselves running away from wild animals. Certainly, to cross rivers, the only choice they had was to swim. Other survival skills included walking long distances, running, jumping and wrestling. These activities were not in any way organized. The physical activity (PA) pattern of humans became a means of producing able-bodied soldiers while only the toughest and fittest individuals could survive the hostile environment of the era (Otinwa, 2014).

The Agrarian Era

Thousands of years later, pre-historic societies advanced and human beings started to live in settlements. Along the line they discovered farming and irrigation, as well as specializing in the production of agricultural goods and their exchange. They learned to domesticate animals, leading to reduction in nomadic activity and resulting in a gradual drop in PA as a way of life based on grazing of animals and planting of crops. People were no more forced to move as there was no longer need to pursue animals, and food production had expanded. In these societies, games were vestiges of warfare and practised as sport. This was how certain sports emerged. For example, when hunting and running were no longer useful in their original forms they evolved as Archery and Running events. Human beings had finally taken control of the environment, developed and organised themselves into a social structure. This marked the evolution of a complex civilisation.

This era witnessed a reduction in somatic energy expenditure but was marked by increase in food intake and more time for leisure and relaxation. Leisure activities grew from earlier survival skills and became a form of recreation (Otinwa, 2014).

In Africa, traditional sports like wrestling contests, games, tribal dances, moonlight plays, as well as arts, are used for various purposes such as marking ceremonies, special festivals and socialisation. In Nigeria, adults had their own forms of physical activities that came mainly from their everyday life pursuits such as farming, fishing, hunting, pottery, cattle rearing, swimming, canoeing, carving and cloth weaving. These activities naturally forced the indigenous people to develop strength and physical fitness. The adults, in turn, taught their children some of these physical and occupational skills through role-playing and imitation, especially those skills needed for adult living and for survival. It was the belief that the occupational skills taught to children were good enough for their physical growth, which in turn helped them in games and play activities (Otinwa, 2012).

The Post-Agrarian Era

However, civilization has forced rapid social changes on humankind in all spheres of life. One of the major social changes is the gradual transition from pre-agrarian daily living that contained high levels of somatic energy expenditure to an increasingly sedentary lifestyle in the modern era. Despite a looming energy crisis, a marked decrease in physical activity has occurred through industrialization, computerization, communication, transportation and urbanization. This does not exclude improved technology such as automobiles, elevators, electric household appliances and power tools that are being used extensively by practically everyone (Otinwa, 2012).

Over forty years ago, it was observed that:

In technologically advanced countries a large number of people who once worked with their hands are shifting over to work that they do with their minds, almost without direct contact with materials and tools; for example, in 1900, 18 out of 20 Americans earned their living by working with their hands, 10 of the 18 worked as farmers. By 1956 more than half of the work force had put on white collars. During this time only 5 out of 20 are in a vastly larger work force - did manual work, and only one worked on the farm. Similarly, Otinwa reported that (2014) many individuals have assumed sedentary lifestyles following the changes during these

eras. Various research works have shown that Nigerians of various ages and sex are not meeting up with the global recommended standard of physical activity level.

Today in many homes, factories and offices, machines now supply the power for most work. Machines have virtually eliminated the necessity for extensive walking, running, lifting or climbing in some countries. For example, television holds people in captive idleness for an average of 22 hours a week. Other forms of electrical devices are able to perform work so extensively and rapidly that the use of the musculoskeletal systems of the human body has been greatly diminished. Therefore, for many people, the task of daily living does not provide enough vigorous exercise for them to develop and maintain a satisfactory level of cardiovascular fitness, good muscle tone or the recommended body weight. Inactivity combined with poor personal health practices such as poor diet on the part of many, arising from modernisation, could pose massive physical fitness problems (Otinwa, 2014).

Physical Inactivity

Physical inactivity is also driving the increasing magnitude of Non-Communicable Diseases (NCDs). People who are insufficiently physically active have an increased risk of all-cause mortality, compared with those who engage in at least 30 minutes of moderate-intensity physical activity most days of the week. Additionally, physical inactivity increases the risk of stroke, hypertension, and depression. Recognizing these strong links between physical inactivity and physical and mental health, a global target of a 10% reduction in levels of physical inactivity by 2025 was adopted by Member States at the Sixty-sixth World Health Assembly in 2013. In 2018, World Health Organisation (WHO), launched a global action plan to promote physical activity, to provide updated guidance to countries and promote a framework of effective and feasible policy actions to increase physical activity at all levels (WHO, 2018).

Globally in 2016, 28% of all adults aged 18 years and older were insufficiently physically active which is defined as not meeting the WHO's recommendation to perform at least 150 minutes of moderate-intensity physical activity per week, or the equivalent. More than one third of the population was insufficiently physically active in one third of countries (55 of 168 countries). Women were found to be less active than men, with 32% of women and 23% of men not achieving the recommended levels for physical activity. This was not only the case globally but also in 159

out of the 168 countries analysed, and in nearly all WHO regions (WHO, 2016; Otinwa, & Adefarakan, 2006).

A clear relationship was also observed between physical inactivity and the income group to which a country belongs. High-income countries had more than double the prevalence of physical inactivity (37%) than low-income countries (16%) in 2016. Globally, levels of physical inactivity have not decreased in the past 15 years (29% in 2001; 28% in 2016) and currently, the world does not appear to be on track to meet the global 2025 target for reduced physical inactivity (WHO, 2016) .

Physical inactivity is a key risk factor for non-communicable diseases, and the fourth leading cause of early death globally (WHO, 2009). Recent estimates show that approximately 31% of the world's population does not undertake the recommended amount of physical activity to protect their health. Available data from 8 countries show levels of inactivity range from about 30% to as high as 70%. Of concern also, less than half of the countries in the Region have systematic monitoring of levels of physical activity in adults and children and very few countries have commenced any comprehensive action aimed at increasing levels of activity through sports, recreation, cycling and walking (WHO, 2018).

The Place of Technology in Physical Inactivity

Technology is a double-edged sword. On the one hand it contributes to the increase in sedentary lifestyle across different age groups and socioeconomic levels. On the other, the widespread of fitness technology such as smartphone applications and wearable technologies offers innovative solutions to increase and promote physical activity (Sullivan & Lachman, 2017). The increasing popularity of screen devices and video games has been working against getting individuals in our society to be active. Individuals would rather spend time on social media, watching movies, playing games, among others than go outside to actively take part in physical activities and sports.

The increased use of technology affects individuals' health behaviour. It reduces the cardiorespiratory fitness of individuals if they consistently use their mobile phones or other gadgets and embark on sedentary living instead of engaging in outdoor activities. Studies have shown mixed results among male and female students. In previous research, sedentary technology use

(i.e. desktop computers) was associated with less activity in males, but not in females. Additionally, sleep may impact physical activity. For instance, sleep is vital in maintaining normal function, but college or university students often experience sleep deprivation. In this case, short-term sleep loss might be associated with decreased levels of physical activity (Sullivan & Lachman, 2017).

When individuals use technology like computers, smart phones, video games or TVs, in most cases, they generally are not exercising. That's why there's an increasing body of research linking the overuse of digital devices to decreasing exercise and fitness levels. For example, in a study covering adults in Thailand, researchers found that individuals experiencing smartphone addiction participated in less physical activity compared to those who moderated their use. Logically, spending more time on the couch and watching TV or playing video games reduces the time individuals spend staying active. The exposure to unnatural blue light from TV and smart devices are associated with obesity (North West Primary Care, 2019).

Technological advancement has produced a generation of sedentary children globally. Most children are essentially glued to their seats at homes (more especially during school holiday periods or sometimes after school) focusing on television and videogames; surfing the internet and updating their status on the social network; thereby increasing their odds for excessive weight gain. Nigerian youths were observed to spend too much time watching television. According to a Nigerian Report Card on Physical Activity for Children and Youth, where it was observed that 90.9% of Nigerian children and youth spend over three hours on screen daily. Television viewing is put at 90.7%. The impact is that many Nigerians will be at risk of NCDs such as obesity and hypertension due to decreased physical activity (Chioma, 2014).

Research has also shown that an increased screen time plays a role in promoting physical inactivity. As earlier mentioned, watching television or videos, playing video games, and using computers contributes to diminished physical activity. Hence, the promotion of healthy active lifestyles in a holistic fashion is therefore essential in promoting the welfare of children and youth. Research conducted at Harvard School of Public Health had linked TV watching to obesity more than 25 years ago (Harvard School of Public Health, 2016). Since then, extensive research has confirmed the link between TV viewing and obesity in children and adults in countries around the world. And there's good evidence that cutting back on TV time can help with weight control; which is part of

the reason why many organizations recommend that children and teens limit TV/media time to no more than two hours per day (Harvard School of Public Health, 2016).

Overview and Epidemiology of Non-Communicable Diseases

Non-communicable diseases (NCDs) have remained a major public health problem globally, significantly contributing to the increase in morbidity and mortality rates especially in low-income and middle-income countries. Their devastating social, human, economic and public health impact is recognized as a global burden by all societies and economies (Gowshall, & Taylor-Robinson, 2018).

The health impact of NCDs in developing countries cannot be over-emphasized. The World Health Organisation (WHO) estimated that 36 million deaths in 2008 were due to NCDs, of which 9 million were in people younger than 60 years, and 80% of the 36 million deaths occurred in developing countries (WHO, 2019). Likewise, its burden also brings a significant impact on the quality of life among the affected population, with a high Disability-Adjusted Life Year (DALY) (Gowshall, & Taylor-Robinson, 2018).

Arguably, NCDs are as much an economic problem as they are a health epidemic (Bukhman, Mocumbi, & Horton, 2015). Cumulative economic losses from NCDs and mental disorders could surpass US\$47 trillion (which is more than 75% of global GDP) by 2030 (Juma, Juma, Mohamed, Owuor, Wanyoike, & Mulabi, 2019). Recent studies have increasingly shown the intimate link between NCDs and poverty, in which NCDs drain household resources, diminish labour supply and productivity as well as impose catastrophic expenditures on poor and uninsured households during treatment of chronic NCD conditions (Alam & Mahal, 2014; Jan, Laba, Essue, Gheorghe, Muhunthan & Engelgau, 2018). Majority of low-income NCD patients tend to use out of pocket payment when seeking medical care (Wang, Fu, Brenner, Kalmus, Banda & De Allegri, 2015). Out-of-pocket payments for health care services drive about 100 million people into poverty every year. Therefore, emerging market economies (such as those in Sub-Saharan Africa) will be hit harder, even as they continue to grow if the rising NCD burden remains unchecked (Xu, Evans, Carrin, Aguilar-Rivera, Musgrove & Evans, 2007).

The four most common NCDs are cardiovascular diseases (CVDs), chronic respiratory diseases, cancer and diabetes. Together, these are responsible for 82% of all NCD deaths (Al-Mawali, 2015).

The NCDs tend to be of long duration with slow progression and are, consequently, often referred to as chronic diseases. They are caused by a combination of both modifiable and non-modifiable risk factors, including genetic, metabolic, behavioural and environmental factors. However, majority of NCDs are preventable and there is much that can be done to reverse the impact of this menace (Islam, Purnat, Phuong, Mwingira, Schacht & Fröschl, 2014).

According to WHO (2016) report, cardiovascular diseases accounted for 11%, cancer 4%, chronic respiratory diseases 2%, diabetes 1% while other NCDs accounted for 12% of all mortality in Nigeria. A total of 617,300 Nigerians died from NCDs in 2016, with 293,700 being male while 323,600 are females. NCDs accounted for about 29% of all deaths in Nigeria annually (WHO, 2016).

Cardiovascular Diseases

Globally, cardiovascular diseases (CVDs) are the number one cause of death accounting for 17.5 million deaths annually with high blood pressure being the leading risk factor. Cardiovascular diseases are disorders of the heart plus blood vessels and they include coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions. Four out of five CVD deaths are due to heart attacks and strokes (WHO, 2018). It has been projected that by 2030, more than 22.2 million people will die annually from CVDs, with greater impact among the developing and underdeveloped nations. Currently, populations in low and middle income countries now contribute 75% of CVDs deaths worldwide, leading to 7% reduction of Gross Domestic Product in these countries (Ruan, Guo, Zheng, Huang, Sun & Kowal, 2018).

A larger proportion of the global morbidity burden of CVDs is present in low and middle income countries than in high income countries (Islam, Purnat, Phuong, Mwingira, Schacht & Fröschl, 2014). Given the high prevalence of CVD among older adults in these countries, the projected increases in this population will be a major challenge for the health care system. Twenty-three percent of the total global burden of disease was attributed to disorders in people aged 60 years and older. Reliable and comparable analysis of risks to CVD is especially important for projecting future disease burden and for shaping disease prevention efforts (Dorairaj, Panniyammakal & Ambuj, 2016).

A number of population-based studies from lower income countries have suggested that socio-demographic characteristics are associated with CVD, with increasing age, female gender and lower education consistently associated with higher prevalence of CVD. Some epidemiological evidence also suggests that CVD is associated with behavioural risk factors such as smoking, alcohol use, low physical activity levels, and insufficient vegetable and fruit intake. Hypertension is also regarded as a very important risk factor for CVD. Independently or in combination, these risk factors present an opportunity for interventions to reduce future CVD burdens, especially in ageing populations in low and middle-income countries (Otinwa, Phillip, & Mbakwem, 2006; Wu, Guo, Chatterji, Zheng, Naidoo & Jiang, 2015).

In research, Nigeria, like other developing countries, though faced with increasing burden of cardiovascular diseases, have the least contribution in articles published on cardiovascular research. A retrospective study carried out among 4103 patients by Mukadas and Misbau (2009) in two teaching hospitals in the North-Western part of the country reported that the highest incidence of CVDs was observed between the age range of 40-49 years (22.09 %) while the lowest incidence was among population less than 19 years (3.97%). According to a report by the World Health Organization (2016), over 234,000 Nigerians died from cardiovascular diseases in 2016 out of a recorded total death of 2,128,000 in the country.

Cancer

The burden of cancer has increased worldwide. Despite improvements in treatment and prognosis over the past decades, cancer at present is the second most common cause of death in the United States, with an estimated 1,630 cancer deaths each day (Arem & Loftfield, 2017). Alarming, the World Health Organization (WHO) predicts that the number of new cancer cases is expected to rise by approximately 70% over the next 20 years (Wu, Guo, Chatterji, Zheng, Naidoo & Jiang, 2015). While there is considerable overlap in common types of cancers worldwide, developing countries tend to have higher incidence and death rates for viral infection–related cancers such as hepatitis-related liver cancer and human papillomavirus (HPV)-related cervical cancer (Dorairaj, Panniyammakal & Ambuj, 2016). An estimated one third to one half of cancers could be prevented by healthy lifestyle choices such as eliminating tobacco use, maintaining a healthy body mass index (BMI), moderating alcohol consumption, and maintaining an active lifestyle.

There are 11 cancer Registries in Nigeria, located in various tertiary hospitals in various parts of the country. Most of these Registries are poorly funded and cancer screening programme is at minimal level except probably The Ibadan Cancer Registry. However, they all produce hospital-based data, which in some cases are incomplete. Cancer pattern in Nigeria as extracted from the Nigeria National System of Cancer Registries shows that there were 4,209 cases of cancer recorded from two registration centres in Lagos State between 2009 and 2013. This is the highest among all the states of the nation during the same period. One-fourth (25.9%) of this figure are male while 74.1% are female. The next in scale after Lagos is Enugu centre with total cancer cases of 3,282 of which 40% are male and 60% are female. Edo and Anambra states reported 2,230 and 2,024 cases of cancer respectively. The least cases of cancer were recorded in Bayelsa and Kogi with 140 and 187 cancer cases respectively (Sabiou, 2017).

The most common cancer recorded in the Lagos University Teaching Hospital (LUTH), one of Lagos cancer registries, for the period 2009 - 2013 for male were prostate (7.1%) and colorectal (3.4%) while that of female were breast (41.2%), cervix (14.5%) and colorectal (3.1%). In the Lagos State University Teaching Hospital (LASUTH), another centre in Lagos, prostate (5.3%), connective soft tissue (4.4%), and colorectal (3.3%) for male and breast (38.9%), cervix (9.2%) and uterus (6.6%) were recorded for females (Sabiou, 2017). According to a report by the World Health Organization (2016), over 85,000 Nigerians died from various forms of cancer in 2016 out of a total death of 2,128,000.

Chronic Respiratory Disease

Chronic respiratory diseases (CRDs) describe a range of diseases of the airways and the other structures of the lungs. They include asthma and respiratory allergies, chronic obstructive pulmonary disease (COPD), occupational lung diseases and sleep apnoea syndrome. Allergic rhinitis or “hay fever” and pulmonary hypertension are other chronic respiratory conditions that affect the lives of millions worldwide. With an aging global population, chronic respiratory diseases are becoming a more prominent cause of death and disability (Yokota, Berger, Nusselder, Robine, Tafforeau & Deboosere, 2015). Age-standardised death rates from chronic obstructive pulmonary disease (COPD) are highest in low-income regions of the world, particularly South Asia and sub-Saharan Africa. Given that these places have relatively low smoking rates and relatively low levels of airflow obstruction, this seems at first sight paradoxical (Al-Mawali, 2015).

More recent evidence suggests that there is a further genetic link between the atopic diseases, asthma, eczema and hay fever that is independent of the link to allergy. Asthma is a much rarer cause of death than COPD, as it affects a younger age group. Death from asthma nevertheless increases markedly with age and is much more common in older adults than in children, where it should be rare (WHO, 2018). According to a report by the World Health Organization (2016), over 42,500 Nigerians died from various chronic respiratory diseases in 2016 out of a total death of 2,128,000.

Diabetes

Diabetes is a chronic disease caused either because the pancreas does not produce enough insulin (type 1 diabetes) or because the body is unable to effectively use the insulin it produces (type 2 diabetes). Since insulin is a hormone which regulates blood sugar, both types of diabetes result in raised blood glucose. However, over time this can cause serious damage to the body. The heart, blood vessels, eyes, kidneys and nerves are all especially affected, with possible complications including heart attack, stroke, kidney failure, lower limb amputation, blindness and nerve damage. Diabetes is therefore a serious threat to public health, and an important cause of morbidity, mortality, and high health-system costs across the world. It is one of the four priority NCDs targeted for action by world leaders in the 2011 political declaration on the prevention and control of NCDs (WHO, 2018).

The prevalence of diabetes in adults worldwide was estimated to be 4.0% in 1995 and is expected to rise to 5.4% by the year 2025. It is higher in developed than in developing countries, however the impact of the disease burden is more prevalent in developing countries. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million in the year 2025. The major part of this numerical increase will occur in developing countries.

Interestingly, there has been an increase in the prevalence of diabetes in Nigeria. All regions of the country have been affected, with the highest prevalence seen in the south-south geopolitical zone. Urban dwelling, physical inactivity, advanced age, and unhealthy diet are important risk factors for diabetes that have been identified among Nigerians. The overall pooled prevalence of diabetes in Nigeria was 5.77%. The prevalence in the six geopolitical zones of Nigeria was 3.0% in the north-west, 5.9% in the north-east, 3.8% in the north-central zone, 5.5% in the south-west, 4.6% in the south-east, and 9.8% (in the south-south zone (Uloko, Musa, Ramalan, Gezawa, Puepet &

Uloko, 2018). According to a report by the WHO (2016), over 21,000 Nigerians died from diabetes in 2016 out of a total death of 2,128,000.

Risk Factors of Non-Communicable Diseases (NCDs)

These diseases are linked by common risk factors:

- a) Tobacco
- b) Alcohol
- c) Physical Inactivity
- d) Poor Nutrition

These risk factors can be modifiable and non-modifiable.

Non-modifiable Risk Factors refer to characteristics that cannot be changed by an individual (or the environment) and these include age, gender, and genetic make-up. Although they cannot be the primary targets of interventions, they remain important factors since they affect and partly determine the effectiveness of many prevention and treatment approaches.

Modifiable Risk Factors are characteristics that societies or individuals can change to improve health outcomes. World Health Organization typically refers to four major ones for NCDs: physical inactivity, poor diet, tobacco use, and harmful alcohol use.

The Global status report on non-communicable diseases 2010 reports that contrary to popular opinion, available data demonstrate that nearly 80% of Non-Communicable Diseases (NCDs) deaths occur in low and middle-income countries. NCDs are caused, to a large extent, by four behavioural risk factors that are pervasive aspects of economic transition, rapid urbanisation and 21st-century lifestyles: tobacco use, unhealthy diet, insufficient physical activity and the harmful use of alcohol.

The greatest effects of these risk factors fall increasingly on low and middle-income countries, and on poorer people within all countries, mirroring the underlying socioeconomic determinants. Among these populations, a vicious cycle may ensue: poverty exposes people to behavioural risk factors for NCDs and, in turn, the resulting NCDs may become an important driver to the downward spiral that leads families towards poverty.

Tobacco

Tobacco use, including smoking and use of smokeless tobacco, is currently one of the leading global risk factors for illness and death from major NCDs. These poor health outcomes are not only caused by the direct consumption of tobacco, but also by exposure of non-smokers to second-hand smoke. In order to reduce the health threat of tobacco, the global target included in the Global NCD Action Plan was a 30% relative reduction in the prevalence of current tobacco use in individuals aged 15 years and older by 2025. Globally in 2016, around 34% of men and 6% of women aged 15 years and older were current smokers of tobacco (WHO, 2018).

Alcohol

The harmful use of alcohol is a major risk factor for premature deaths and disabilities in the world, and is known to cause heart diseases, cancers, liver diseases, a range of mental and behavioural disorders, other non-communicable conditions, and communicable diseases. Both total consumption of alcohol and drinking patterns, such as heavy episodic drinking, contribute to alcohol-related harm. The World Health Assembly endorsed a global strategy to reduce the harmful use of alcohol which set a global NCD target of at least a 10% relative reduction in the harmful use of alcohol, within the national context, by 2025. In 2016, the level of alcohol consumption worldwide was 6.4 litres of pure alcohol per person aged 15 years or older, with consumption levels and trends varying across WHO regions (WHO, 2016).

Physical Inactivity: A Major Risk Factor for Non-Communicable Diseases

Physical inactivity is used to refer to inability to achieve the recommended levels of physical activity for health. Some people worldwide fail to achieve the recommended 30 minutes of regular, moderate-intensity physical activity on most days throughout a person's life. Physical inactivity is now described as a pandemic that needs urgent action. Research showed that one in four adults in the world are inactive. Globally, more than 80% of the adolescent population is physically inactive. It is evidenced that physically inactive people are 20-30% times more likely at risk of death compared to active individuals (Haileamlak, 2019).

Physical inactivity has been reported to be associated with an increase in the occurrence of NCDs; thus, physical inactivity contributes to deaths and disabilities (Das & Horton, 2012). In particular, physical inactivity has major effects on the occurrence of coronary heart disease, type 2 diabetes and cancer, specifically breast and colon cancers. A study published in 2012 reported that (6 –

10%) of global deaths from NCDs were directly related to physical inactivity. Conversely, improvement in physical activity contributes to NCD prevention-(Lee, Shiroma, Lobelo, Puska, Blair & Katzmarzyk, 2012).

Poor Nutrition

Aligning varying sources and types of data to generate overall estimations of unhealthy diet prevalence is very demanding. For that reason, the WHO estimates the specific elements of unhealthy diets linked to various Non-Communicable Diseases:

- **Fruit and Vegetable Consumption**

Approximately 1.7 million (2.8%) of deaths worldwide are attributable to low fruit and vegetable consumption. Adequate consumption of fruit and vegetables reduces the risk for cardiovascular diseases, stomach cancer and colorectal cancer. There is convincing evidence that the consumption of high levels of high-energy foods, such as processed foods that are high in fats and sugars, promotes obesity compared to low-energy foods such as fruits and vegetables (WHO, 2018).

- **Fat Intake**

High consumption of saturated fats and trans-fatty acids is linked to heart disease; replacement with polyunsaturated vegetable oils lowers coronary heart disease risk. Higher unsaturated fatty acids from vegetable sources and polyunsaturated fatty acids have also been shown to reduce risk of type 2 diabetes.

- **Salt/Sodium Intake**

Consuming a diet high in salt contributes to elevated blood pressure and increases the risk of heart disease and stroke. To reduce the risk, the recommended daily intake of sodium is less than 2 grams of sodium or 5 grams of salt. The global NCD targets include a sodium reduction target of a 30% relative reduction in mean population salt intake by 2025. Currently, data on mean population intake of sodium are not widely available, although there is encouraging progress among countries to measure and report on this. Estimates show that globally, people consume an average of 9–12 grams of salt each day – twice the recommended daily intake. The World Health Organisation suggests consuming 2,000 mg (2 grams) of sodium per day, and the American Heart Association advises a much lower intake of 1,500 mg (1.5 grams) per day (WHO, 2016).

Obesity

Throughout the life course, being overweight and obese is associated with multiple adverse health consequences. Obesity is linked to an increased risk of hypertension, many NCDs (such as diabetes, coronary heart disease, stroke, and cancers), and conditions including obstructive sleep apnoea and osteoarthritis (The NCD Alliance, 2011).

In 2016, more than 1.9 billion people aged 18 and older were overweight, with more than 650 million considered obese. Obesity is not solely an issue for adults: in 2016, 340 million children and adolescents aged 5–19 years, and around 40 million children under the age of 5 years, were considered overweight or obese. Some 7% of the population in low income countries were obese, compared with 25% of the population in high-income countries. Between 2000 and 2016, obesity trends showed a steady increase in all WHO regions and income groups, with global prevalence increasing from 9% in 2000 to 13% in 2016 (WHO, 2018).

Raised Blood Pressure

Raised blood pressure, also known as hypertension, is a major risk factor for coronary heart disease, chronic kidney disease, and ischaemic as well as haemorrhagic and stroke. If left uncontrolled, complications from raised blood pressure include heart failure, peripheral vascular disease, renal failure, retinal haemorrhage, visual impairment, stroke and dementia. Although, in the majority of cases, the exact cause of raised blood pressure is unknown, several modifiable risk factors such as a high salt intake, being overweight or obese, the harmful use of alcohol, physical inactivity, stress, air pollution and smoking increases its likelihood. The global NCD target for hypertension is a 25% relative reduction in the prevalence of raised blood pressure by 2025 (WHO, 2018).

In 2017, new guidelines from the American Heart Association, the American College of Cardiology, and nine other health organizations lowered the number for the diagnosis of hypertension (high blood pressure) to 130/80 millimetres of mercury (mm Hg) and higher for all adults. The previous guidelines set the threshold at 140/90 mm Hg for people younger than age 65 and 150/80 mm Hg for those aged 65 and older. This means 70% to 79% of men; aged 55 and older are now classified as having hypertension (WHO, 2018).

The prevalence of raised blood pressure varies across WHO regions and by the income group to which a country belongs. The highest prevalence of raised blood pressure was seen in the African Region (27%); while the Region of the Americas had the lowest (18%). Prevalence of raised blood pressure in adults has declined in high-income countries over the past few decades and is also now declining in some middle-income countries. In contrast, it has been stable or increasing in other low-and middle income countries (WHO, 2018). In 2015, 28% of the population in low income countries had high blood pressure, compared with 18% of the population in high-income countries (WHO, 2016).

Current Research in Physical Activity

For the purpose of this presentation, a research was carried out to evaluate the level of physical activity among various occupations. It was delimited to a tertiary institution while respondents were drawn from three categories of workers such as; secretaries, cab drivers and shop owners within the institution. The modified-International Physical Activity Questionnaire (IPAQ) was used to assess the physical activity status of the participants. While a descriptive statistics method was used to analyse the data collected; the Metabolic Equivalent (MET) was evaluated from the responses provided through the IPAQ and their physical activity status was graded from low to high based on their MET value.

Physical Activity Status of Respondents

Descriptive Analysis of Data

Table 1: Distribution of Participants by Gender, Age, Job and Physical Activity Status.

Gender	N	Percent (%)
Male	47	45.63
Female	56	54.37
Total	103	100.0

Age	N	Percent (%)
30-39 years	18	17.48
40-49 years	35	33.98
50-59 years	44	42.72
60-69 years	6	5.83
Total	103	100.0

Job	N	Percent (%)
Cab Drivers	40	38.83
Shop Owners	33	32.04
Secretaries	30	29.13
Total	103	100.00

PA Status	N	Percent (%)
Low	89	86.41
Moderate	11	10.68
High	3	2.91
Total	103	100.00

The table above presents the distribution of respondents by gender, age, job and physical activity status. By gender, majority of the participants were female. By age, the highest number of participants was between 50 – 59 years while the lowest number of participants based on their age was between 60 – 69 years. Most of the participants also had a low physical activity status.

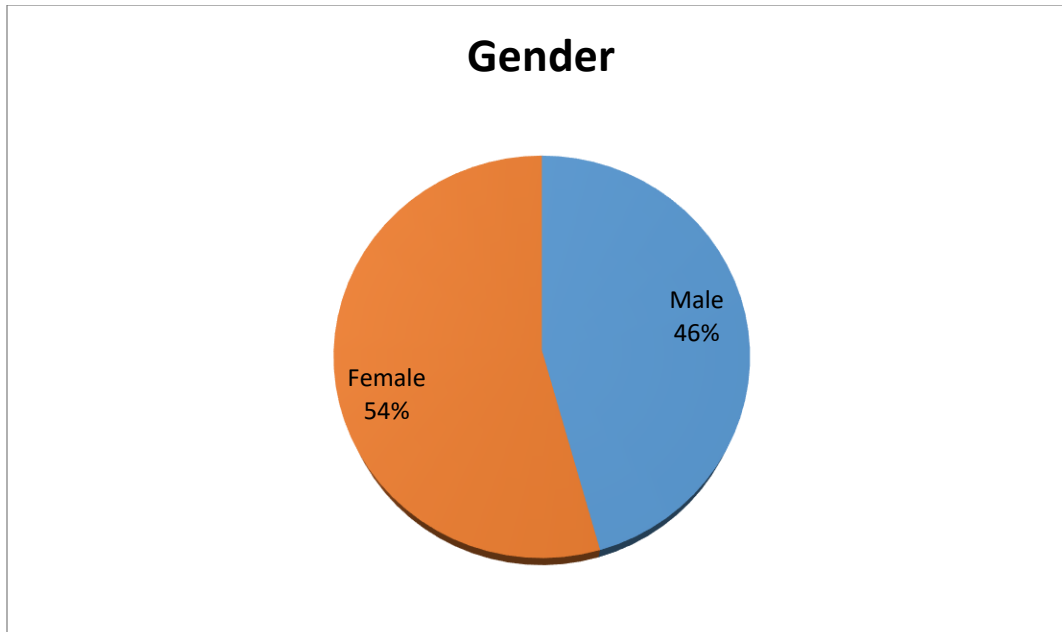


Figure I: Chart Representation of Participants by Gender

It was observed from the chart above that majority of the respondents were female.

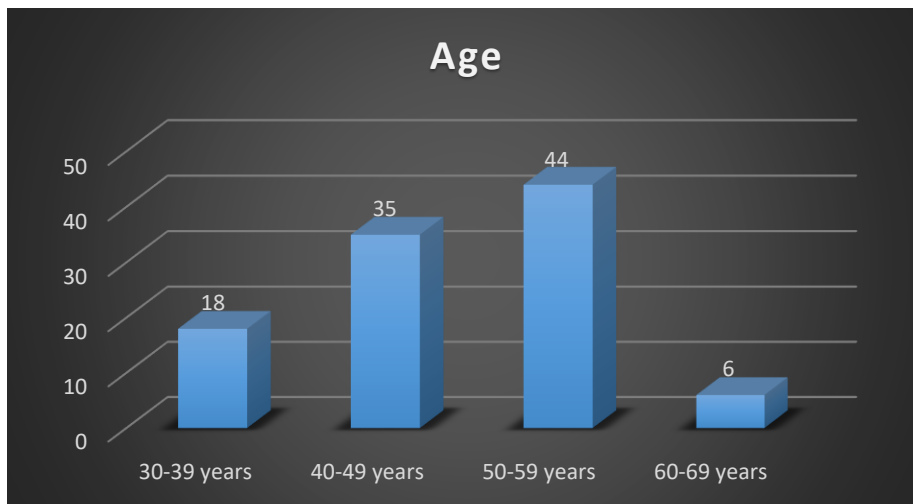


Figure II: Chart Representation of Participants by Age

This chart shows that majority of the respondents were between 50 – 59 years old and closely followed by those between 40 – 49 years old.

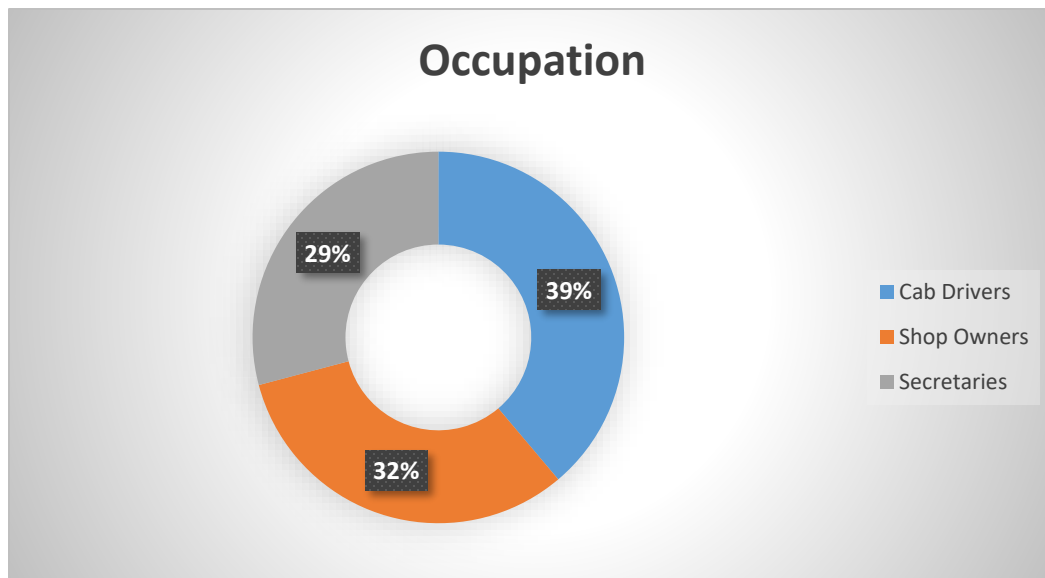


Figure III: Chart Representation of Participants by Group.

It was observed from the chart above that majority of the respondents were cab drivers, closely followed by shop owners.

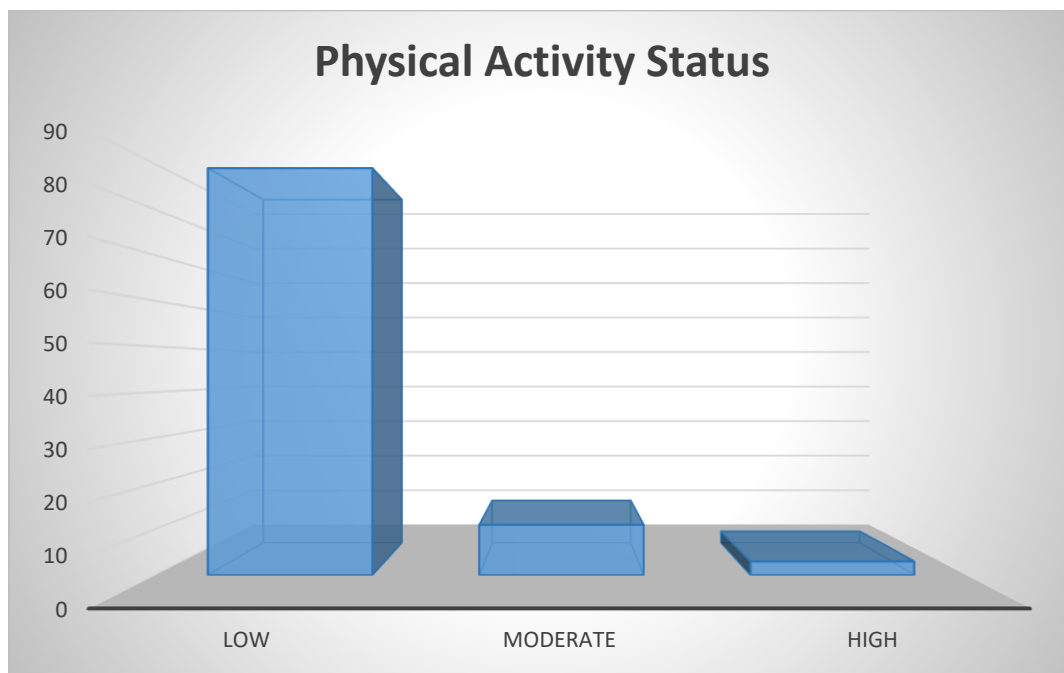


Figure IV: Chart Representation of Participants by Physical Activity Status

The Chart above shows that majority of the respondents have low level of physical activity.

Table 2: Distribution of Participants' Physical Activity Status by Gender

PA Status (MET)	N	SD	MEAN	t-cal	Sig	Remarks
Male	47	129.07	150.43	0.678	0.499	Not Significant
Female	56	144.02	168.86			

The table and chart above indicated that both genders had a low mean physical activity status. although female had a slightly higher mean MET than male participants.

Table 3: Distribution of Participants' Physical Activity Status by Occupation

PA Status (MET)	N	SD	MEAN	F-value	Sig	Remarks
Secretaries	30	164.98	190.7	1.048	0.355	Not Significant
Cab Drivers	40	122.80	145.48			
Shop Owners	33	124.88	151.09			

The table and chart above indicate that the three occupations studied have a low mean physical activity status. Although secretaries have a slightly higher mean MET than shop owners and cab drivers. This implies that secretaries are relatively more active than cab drivers and shop owners.

Findings on the level of physical inactivity shows that majority of the respondents (86.41%) have low physical activity status, while 10.6% are of moderate status and 2.91% are of high status. It also reveals that women are slightly more physically active than men (Otinwa *et.al*, 2020). This corroborates WHO (2016) report, where 28% of all adults aged 18 years and older are classified as insufficiently physically active. This implies that most people do not meet the WHO recommendation to perform at least 150 minutes of moderate-intensity physical activity per week, or the equivalent, which is in line with current study. Furthermore, WHO report also shows that women are less active than men globally, with 32% of women and 23% of men not achieving the recommended levels for physical activity (WHO, 2016). The current finding is slightly different for women who had MET of 168.86 were found to be more active than men with MET of 150.43.

Taken as group, participants in the study being reported here did not meet the recommended physical activity level by World Health Organization.

Exercise as Medicine

Role of Fitness Technology in the Promotion of Physical Activity and Reduction of Diseases

To prevent or reduce the rate of physical inactivity, the adoption of technology cannot be overemphasised. Studies have provided evidence on the efficacy of Fitness technology in engaging inactive population in exercise programmes. A systematic review reports positive results such as weight loss and changes in health risk behaviour in inactive individuals in several studies that used mixed technology-based physical activity interventions (web-based technology, mobile phones and accelerometers) (Hassett, Berg, Van Den, Lindley, Crotty, Mccluskey, Ploeg, Van Der, & Sherrington, 2016).

A study by Bravata, *et al*, (2007) reveals a 27% increase of physical activity levels reported by pedometer users. Pedometer-based walking programmes are also associated with significant decreases in body mass index, body weight, and systolic blood pressure. Many fitness centres and schools are now offering interactive games to promote physical activity of children, adolescents, and older adults.. Interactive games are not exclusive for children but also hold promise for promoting functional independence, improving balance, preventing falls, reducing premature disability, and maintaining health by increasing the physical activity levels of adults and seniors.

Fitness technology often utilises behaviour change techniques such as goal setting, feedback, rewards, and social factors. Tackling behavioural modifications can increase the individual's adherence to physical activity. Providing feedback is essential for tracking goals and increasing activity levels. Reminders, text messages and real-time alerts are examples of feedback tools used by fitness apps. Fitness trackers may also vibrate, make a noise, or display a congratulatory message or friendly face when an exercise goal has been reached. Users can

share their progress with their friends on social media easily which is found to be a great motivational tool (Sullivan & Lachman, 2017).

Some smartphone applications provide professional virtual reality coaching to motivate increases in physical activity. Technology-based fitness tools provide a relatively cheaper alternative to objective research tools. Furthermore, they are user friendly and provide simple meaningful data to users. Studies found that modern fitness trackers have acceptable reliability and validity comparable to research-standard devices in the laboratory (Physiopedia, 2019).

Electronic devices can be adopted to monitor adherence as long as they are used in a systematic manner. However, there is a large gap between self-reported physical activity and measured physical activity, as self-reported physical activity level is known not to be always reliable. For this reason, PA programmes are better implemented with the use of human interface and monitoring technology such as web sites, mobile devices, apps, and wearable devices (Thompson, 2018). Additionally, the presence of an objective goal (daily steps or exercise minutes) can be a key-factor to successfully increase PA. Without it the desired improvements may be limited or even absent. Wearable technology was identified as the leading fitness trend in 2019 (Physiopedia, 2019).

Indeed, fitness technology was identified by the American College of Sports Medicine (ACSM) certified professionals as a tool that can positively change physical activity behaviour. Activity and exercise metrics such as step counts, distance covered, active or walking time can be tracked by pedometers, in addition, and more recently energy expenditure, activity types, and intensity can be monitored by accelerometer and heart rate sensors implemented on wearable or, in some cases, on smartphones. Recently, global positioning systems are being often used for physical and exercise activity tracking. The added value of technology is not confined to monitoring patients' PA objectively, but it extends to patients' stimulation and engagement to increase adherence. For instance, human interface technology can reduce the gap between therapists and patients, who may feel more responsible to adhere when directly supervised. Furthermore, technology tools offer the possibility for a more enjoyable and motivational approach to PA programmes. Taken together, this evidence suggests the high potential of the monitoring and user-interface technology in

promoting an active lifestyle in persons with disabilities and chronic diseases (Sullivan & Lachman, 2017).

According to Global System for Mobile Applications (GSMA), the real-time intelligence data, there are now over 5.15 Billion people with mobile devices worldwide. This means that 66.60% of the world's population has a mobile device (cell phone, tablet or cellular enabled devices). A 2019 analysis reveal that there are over 45,000 health and fitness apps currently available to the public via Google Play store and iTunes (e.g., Map My Walk, Runkeeper, My Fitness Pal etc), and over half of smartphone users report having downloaded such applications (GSMA, 2019).

Examples of Devices that Measure and Track Physical Activities

- **Pedometers:** these are used to count and monitor the number of steps taken during ambulatory activities such as walking, jogging, and running. They can also estimate distance and caloric expenditure even though they are often less accurate. Pedometers can be carried in a pocket or a bag held close to the body but for more accurate counting they need to be attached to a waistband, around the ankle or in a shoe (Physiopedia, 2019).
- **Accelerometers:** are used to record body acceleration minute by minute, providing detailed information about the frequency, duration, intensity, and patterns of movement. They are relatively more expensive than pedometers and used more widely in research.
- **Heart Rate Monitors:** are used primarily to assess exercise intensity for individuals with cardiac conditions and highly trained competitive athletes. These devices can also estimate the exercise energy expenditure.
- **Smart Fabric and Sensor Technology** provides monitoring systems which can remotely record/monitor physiological responses; they are fully integrated within clothing.
- **Interactive Video Games:** these include Dance Dance Revolution (DDR), Wii Sports, Wii Fit, Sony Play Station, Navix, and Eye Toy games.
- **Fitness trackers:** such as Fit Bit, Garmin, Xiaomi and Misfit can monitor daily steps, heart rate, sports activities and sleep statistics. The data from these trackers can be packed

up on the user's online account so that it can be used to monitor the personal goals of such user. Another advantage of the data from these trackers is that it can be shared by users with health care providers.

- **Smartphone Applications:** allow users to track jogging/biking routes, workout data and comprehensive workout history, distance and time, control music, and share performance levels through social media applications (Sullivan & Lachman, 2017).

Recommendations on the Use of Fitness Technology

Over time, less active users are more likely to abandon fitness technology and go back to old habits compared to more active users. Some have even suggested that more than half of fitness tracker owners abandon their devices within the first month. To promote adherence, it is encouraging that fitness technology often includes behavioural strategies such as barrier identification and action planning. Such strategies would allow users to examine their schedule for the day and determine times in which they can increase their exercise. They can then make a specific plan for how they will increase their activity. These behavioural strategies can help one increase both perceived control over exercise behaviours and exercise self-efficacy. The placement of the tracker on the body is a subject of debate, with some areas more accurate than others, and recommended places on the body changing with age. The waist-worn pedometers, and the hip-worn pedometers were found reliable when compared to researcher-measured step counts and estimates of energy expenditure (EE) and suggest that the hip monitor is more accurate than the wrist (Physiopedia, 2019).

There are some viable options for providing fitness trackers to large, diverse groups of people. For instance, many companies have started providing fitness trackers to their employees for free or at a reduced price. In one study, fitness trackers increased productivity and decreased the amount of sick days taken, suggesting their powerful potential if adopted by more companies. Recent reports suggest that many doctors are now prescribing exercise to their patients with chronic health conditions such as diabetes, hypertension, or cardiovascular disease. If fitness trackers were covered via health insurance, it could help both doctors and patients track day-to-day exercise, along with other metrics like diet, heart rate, or sleep. Such

programmes may be able to connect doctors to patients in ways that were not previously possible (Town Jr, Ory & Smith, 2017).

Effective Exercise Programme

An effective exercise programme can be achieved when the following components are included:

1. Warm-up
2. Main workout
3. Cool down

Warm-up

Warm-up refers to light exercise and stretches done prior to the actual walking activity. This is done to improve transition from rest to exercise state. The emphasis at the start of an exercise session is to gradually increase the level of activity until the proper intensity is reached. It is to get the heart and other muscles ready for the workout to follow. This type of warm-up takes five to ten minutes and should include slow walking and gentle stretching.

- **Slow walking:** entails starting slowly and increasing speed gradually to increase exercise heart rate. The essence of this is that walking motion will become smoother and easier as muscles and joints respond to the warm-up.
- **Gentle stretching:** Stretches done at this stage is slow and gentle. This is because vigorous stretching of cold muscles can result in muscle soreness and muscle tear. Stretches will increase the range of motion at the joints.

Main workout

This is the main exercise, which is done at a target heart rate for the prescribed amount of time, and is often faster than warm-up. This also depends on the target heart rate zone and the goal of working out. Exercise could be:

- **Aerobic (Endurance) Exercise:** This type of exercise helps keep the circulatory system and lungs healthy. It can also help to fight off cardiovascular diseases and build up endurance. Some common aerobic activities include: brisk walking, jogging, swimming, dancing, cycling etc.
- **Strength Exercises:** They help keep bone and muscles in shape and make them strong. Examples of strength training exercise include: using resistance machine at the gym or at home, lifting free weights like dumbbells, using resistance bands etc.
- **Flexibility Exercises:** help keep the body in shape and also maintain a wide range of motion. This is important as having an improved range of motion can lead to improved general health help in injury prevention and in improving and maintaining good postural alignment. Flexibility exercise include: triceps stretch, frog stretch, side bend stretch etc.
- **Balance Exercises:** Balance exercises can help prevent falls especially in older adults and can also help in strengthening the body core. Example of balance exercise are: heel to toe walking, standing on one foot etc.

Exercise Training Principles

To start an exercise programme, there are some general principles of exercise training that can assist in planning and developing one's own exercise programme. The guidelines are frequency, intensity, duration, mode and progressive overload.

- Frequency:** This refers to how often exercise should be done in a week. The recommended frequency for an effective exercise programme is three to five days. The frequency of exercise also depends on the individual's fitness level. Fitness exercise must be performed regularly on the selected days of the week.
- Intensity:** This is an indication of how fast or how hard one needs to exercise per an exercise bout. Exercise heart rate helps to determine how fast or how hard one is exercising. Exercise heart rate should be 60 – 90 percent of maximum heart rate (MHR).

To determine heart rate target

- Subtract age from 220 to find MHR

- Subtract resting heart rate (RHR) from MHR to determine heart rate reserve (HRR)
- Take 60% of HRR to determine heart rate raise
- Add heart rate raise to resting heart rate to give you your target heart rate.
 - For example, 60 % training intensity for a 30year old with a resting heart rate of 68 beats per minute will be as follows:

$$\text{MHR: } 220 - 30 = 190 \text{ bpm}$$

$$\text{RHR: } 68 \text{ bpm}$$

$$\text{HRR: } 190 - 68 = 122 \text{ bpm}$$

$$60\% \text{ Target Heart Rate (THR)} = (122 * 0.60) + 68 = 141 \text{ bpm}$$

Exercise intensity could be low (less than 50% of MHR), moderate (50 – 70% of MHR) or vigorous (70% - 85% of MHR) Otinwa, (2011).

- iii. **Duration:** This gives one an idea of how much time should be spent each day for fitness exercise. It has been suggested that each session should take 30 – 60 minutes of prescribed exercise heart rate. Beginners should keep the intensity low and duration short.
- iv. **Mode:** Mode has to do with the type of exercise and how one wants to execute the exercise.
- v. **Progressive Overload:** This is the gradual increase in exercise demands on one's bodies as often as one possibly can, within realm of safety and proper form.

Exercise Prescription for Different Population in the Prevention of Non-Communicable Diseases

The "Global Recommendations on Physical Activity for Health" address three age groups: Young adults (5–17 years old), Adults (18–64 years old) and Older Adults (65 years old and above). These age groups were selected taking into consideration the nature and availability of the scientific evidence relevant to the prevention of non-communicable diseases through physical activity (WHO, 2018).

Recommended Levels of Physical Activity for Young Persons (Children Aged 5 - 17 Years)

For children and young people, physical activity includes play, games, sports, transportation, chores, recreation, physical education, or planned exercise in the context of family, school, and community activities.

In order to improve cardiorespiratory and muscular fitness, bone health, and cardiovascular and metabolic health biomarkers, the following should be adhered to:

- a) Children and youth aged 5 – 17 should accumulate at least 60 minutes of moderate-to vigorous-intensity physical activity daily.
- b) For additional health benefits they should increase their physical activity to more than 60 minutes as they progress in their exercise.
- c) Most of the daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone*, at least 3 times per week.

For this age group, bone-loading activities can be performed as part of playing games, running, turning or jumping.

Benefits of Physical Activity for Young Persons

Appropriate practice of physical activity assists young people to:

- a) Develop healthy musculoskeletal tissues (i.e. bones, muscles and joints);
- b) Develop a healthy cardiovascular system (i.e. heart and lungs);
- c) Develop neuromuscular awareness (i.e. coordination and movement control);
- d) Maintain a healthy body weight.

Physical activity has also been associated with psychological benefits in young people by improving their control over symptoms of anxiety and depression. Similarly, participation in physical activity can assist in the social development of young people by providing opportunities for self-expression, building self-confidence, social interaction and integration. It has also been suggested that physically active young people more readily adopt other healthy

behaviours (e.g. avoidance of tobacco, alcohol and drug use) and demonstrate higher academic performance at school (WHO, 2018).

Recommended Levels of Physical Activity for Adults (aged 18 - 64 years)

In adults aged 18 – 64, physical activity includes leisure time physical activity (for example: walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise in the context of daily, family, and community activities. In order to improve cardiorespiratory and muscular fitness, bone health, reduce the risk of NCDs and depression, the following are essential:

- a) Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
- b) Aerobic activity should be performed in bouts of at least 10 minutes' duration.
- c) For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity.
- d) Muscle-strengthening activities should be done involving major muscle groups on two or more days a week.

Benefits of Physical Activity for Adults

Overall, strong evidence demonstrates that compared to less active adult men and women, individuals who are more active:

- a) have lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, colon and breast cancer, and depression;
- b) are likely to have less risk of a hip or vertebral fracture:

- c) exhibit a higher level of cardiorespiratory and muscular fitness; and
- d) are more likely to achieve weight maintenance, have a healthier body mass and composition.

Recommended Levels of Physical Activity for Older Adults (Aged 65 and Above)

In adults aged 65 years and above, physical activity includes leisure time physical activity (for example: walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational (if the individual is still engaged in work), household chores, play, games, sports or planned exercise in the context of daily, family, and community activities (WHO, 2018).

This is in order to improve cardiorespiratory and muscular fitness, bone and functional health, reduce the risk of NCDs, depression and cognitive decline:

- a) Older adults should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
- b) Aerobic activity should be performed in bouts of at least 10 minutes' duration.
- c) For additional health benefits, older adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate-and vigorous-intensity activity.
- d) Older adults, with poor mobility, should perform physical activity to enhance balance and prevent falls on three or more days per week.
- e) Muscle-strengthening activities, involving major muscle groups, should be done on two or more days a week.
- f) When older adults cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

Benefits of Physical Activity for Older Adults

Overall, strong evidence demonstrates that compared to less active men and women, older adults who are physically active:

- a) have lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, type 2 diabetes, colon cancer and breast cancer, a higher level of cardiorespiratory and muscular fitness, healthier body mass and composition;
- b) have a biomarker profile that is more favourable for the prevention of cardiovascular disease, type 2 diabetes and the enhancement of bone health; and
- c) exhibit higher levels of functional health, a lower risk of falling, and better cognitive function; have reduced risk of moderate and severe functional limitations and role limitations.

Physical Activity for Older Adults and Individuals with Non-Communicable Diseases

Currently, a variety of recommendations exists to meet the minimum requirement for physical activity. Most of these recommendations indicate that individuals need to engage in moderate or vigorous intensity physical activity for a certain amount of time per week. At least 30 minutes of moderate-intensity physical activity, five days per week/ or 20 minutes of more intense physical activities, 3 days per week, is recommended. The World Health Organization (2015) recommends that adults aged between 18 and 64 years should accumulate at least 150 minutes of moderate-intensity aerobic physical activity throughout the week. (Das & Horton, 2012).

These guidelines are relevant to all healthy adults aged 65 years and above. They are also relevant to individuals in this age range with chronic NCD conditions. Individuals with specific health conditions such as cardiovascular disease and diabetes, may need to take extra precautions and seek medical advice before striving to achieve the recommended levels of physical activity for older adults (WHO, 2018).

There are a number of ways older adults can accumulate the total of 150 minutes per week. The concept of accumulation refers to meeting the goal of 150 minutes per week by performing activities in multiple shorter bouts, of at least 10 minutes each, spread throughout the week, and

then adding together the time spent during each of these bouts: e.g. 30 minutes of moderate-intensity activity 5 times per week (WHO, 2018).

These recommendations are applicable to all older adults irrespective of gender, race, ethnicity or income level. The recommendations can even be applied to older adults with disabilities. However, adjustments for each individual based on their exercise capacity and specific health risks or limitations may be needed. Older adults who are inactive or who have some disease limitations will have added health benefits if they move from the category of “no activity” to “some levels” of activity. Older adults who currently do not meet the recommendations for physical activity should aim to increase duration, frequency and finally intensity as a target to achieving them (WHO, 2018).

Conclusion

It is clearly observed from various research works, that there is a decline in the level of physical activity globally and that this decline in global physical activity level has brought about an increase in the prevalence of NCDs as physical inactivity remains the major risk factor.

The study has also revealed that the advent of technology can act as a double edged sword to either improve or bring about decline in the level of physical activity, depending on how it is harnessed. It is, therefore, hoped that researchers and funding agents would rise to the occasion as to how to go about using technology to improve on the national physical activity levels, so as to stem the tide of NCDs prevalence in Nigeria, and thus save the country from losing the scarce economic, time and human resources.

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