OBESITY AND ITS RELATIONSHIP WITH HYPERTENSION IN 35 YEARS AND ABOVE POPULATION OF K.GURAIDHOO

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DECLARATION

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I hereby declare that this Project is the result of my own work, except for quotations and summaries, which have been duly acknowledged.

Signature: Date: 30th May 2013

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ABSTRACT

The association between overweight / obesity and hypertension has been proved in other parts of the world. Researches carried out nationally have proved that the obesity and hypertension were growing public health issues in Maldives. Therefore, this study was carried out to find the association of overweight / obesity and hypertension among the population of 35 years and above population of K.Guraidhoo.

A cross - sectional study of 87 participants of with males 259 and 225 females were included in the study. Additional measures such as height, weight, waist and hip circumference was taken. Obesity was determined based on the Body Mass Index and Waist Hip ratio.

Prevalence of prehypertension and hypertension were 16(18.4%) were and 27(31%). The study has shown that 32 (36.8%) were overweight while 18 (20.7%) were obese and 36 (41.4%) according to BMI. According to Waist, Hip Ratio 77% was higher than normal value of 8.5 to women and 9.0 to men. Correlation done on WHR and high blood pressure has shown 0.247(P value 0.027, CI 95%) and BMI and high blood pressure has shown 0.294(P value 0.006 CI 95%)

This study has shown that there was significant positive correlation of obesity and hypertension in the studied population.

It is recommended to conduct such survey on wider population to find the association of obesity and hypertension as this study has shown the positive significant relation between those two.

key words: Hypertension, waist hip ratio, body mass index, sympathetic nervous system (SNS)

List of Tables

List of abbreviations

WHP – Waist Hip Ratio

BMI- Body Mass Index

SNS - Sympathetic Nervous System

MSNA- Muscle Sympathetic Nerve Activity

RAS - Renin Angiotensin System

CS- Cigarette Smoker

CHAPTER - 1

INTRODUCTION

Background to the study

Increasing obesity and hypertension is emerging challenging issue, which worldwide has faced today. According to fact sheet of WHO on obesity (2013), in 2008, more than 1.4 billion adults, 20 and older, were overweight. Of these over 200 million men and nearly 300 million women were obese. The Global Brief on Hypertension(2013) has revealed that globally 17 million deaths occur due to cardiovascular diseases and 9.4 million of those deaths are due to complications of hypertension. The same report has stated about 45% of deaths of ischemic heart diseases and 51% deaths due to stroke ultimately is due to hypertension. The same report has stated in 2008, 40% of global population above 25 years have been diagnosed with hypertension and from 600 million in 1980, has increased to 1 billion in 2008. WHO (2013) fact sheet on obesity, has stated that overweight and obesityincreasesBP.These two factors contribute widely in causing non-communicable diseases (. According WHO(2013) fact sheet on Non communicable Diseases has stated, the non-communicable diseases has become an alarming issue worldwide with higher proportion in low income and developing countries and 80% of premature deaths occur due to non-communicable disease occur in developing countries.

Maldives health profile (WHO, 2010) has shown that the Hypertension is the top leading cause of the deaths in Maldives as it accounts 14.10 percentages of total

deaths occurred in Maldives in 2010 and in world ranking Maldives is in the seventh position. The STEP NCD risk factor survey (MOH, 2009) also found that in that there was 37.1% men and 41.4% women was hypertensive. In addition to that (NCDs POLICY BRIEF – Maldives, 2011) shows, the prevalence of obesity in the female population reaches 17% - while 9% for males. Besides, (NCDs POLICY BRIEF – Maldives, 2011) also shows prevalence of obesity increases with age: approximately 50% of women over 35 years are overweight and/or obese.

1.2 Problem statement

Hence, the global (Ananya, 2013)and Maldives situation has shown that the obesity and blood pressure are growing issue in Maldives (MOH, 2009). However, any research was not carried out or documented about the relation of these two issues in any part of the Maldives especially in K.Guraidhoo, this research would be a great help to find the situation of population of K.guraidhoo in regarding hypertension and overweight/ obesity.

1.3 Purpose of research

Main aim of this study is to find out correlation in between overweight, obesity and hypertension in 35 years and above population of K. Guraidhoo.

1.4 The objectives of this study

- To assess the prevalence of hypertension and obesity among 35 years and above population of K.Guraidhoo.
- To compare the difference in the prevalence rate of hypertension among men and women among 35 years and above population of K.Guraidhoo.

- To find the correlation between overweight / obesity and hypertension.

1.5 Research Question:

Is overweight and obesity a factor for hypertension among K.Guraidhoo 35 years and above population of K.Guraidhoo?

1.6 Hypotheses:

Null Hypothesis (Ho): the overweight, obesity is not a factor of hypertension in 35 years and above population of K. Guraidhoo.

Alternative Hypothesis (H1): the overweight, obesity is a factor of hypertension in 35 years and above population of K. Guraidhoo.

1.7 Significance of the study

The health statistics, which reveal present situation of the community, is very essential for formulating and in implementing health policy at all country settings. Hypertension, obesity and NCD risk factor data are crucial for predicting the future burden of chronic diseases in population and for identifying potential interventions to reduce the future burden. The relationship of both hypertension and obesity has proven in other countries with studies conducted in the population(Lee & Kim, 2005) and Narkiewicz (2005). However, in Maldives so far there was no study was conducted to find out this. Therefore, I feel that it is vital to do a situational analysis of the community to find how it is in this community, for further planning of health programs and establishing strategies to fight this burden of hypertension as it is the leading cause of death in Maldives. Therefore, this will reveal the situation of K.Guraidhoo population.

1.8 Scope of the study

This issue has been proved by many biological and non-biological researches carried out in other countries. Researches, such as (Fernandez, et al., 2007) and (Davy & Hall, 2004) and many more discussed in literature review have proved that obesity as a one of the major contributing factor for hypertension. Though there are many biological factors which was underlying in causing hypertension in overweight/obesity, this research was focused on finding the prevalence of hypertension in overweight/obese people and other social factors, which leads to hypertension in 35 years and above population of K.Guraidhoo.

1.9 Definition of terms

Hypertension: Based on the seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure ,normal BP is define as less than 120/80 mmHg, prehypertension as 120–139/80–89 mmHg, stage I hypertension as 140–159/90–99 mmHg, and stage II hypertension as equal to and above 160/100 mmHg.

Overweight and Obesity: Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health. Body mass index (BMI), a measurement that compares weight and height defines people as overweight. If their BMI is between 25 and 30 kg /m2, they are defined as pre – obese or overweight and obese when it is greater than 30 kg/m2 (WHO, 2011).

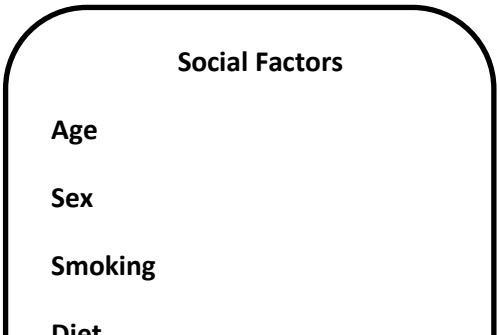
Correlation: Correlation is a mutual relationship or connection between two or more thing (Oxford University Press, 2013).

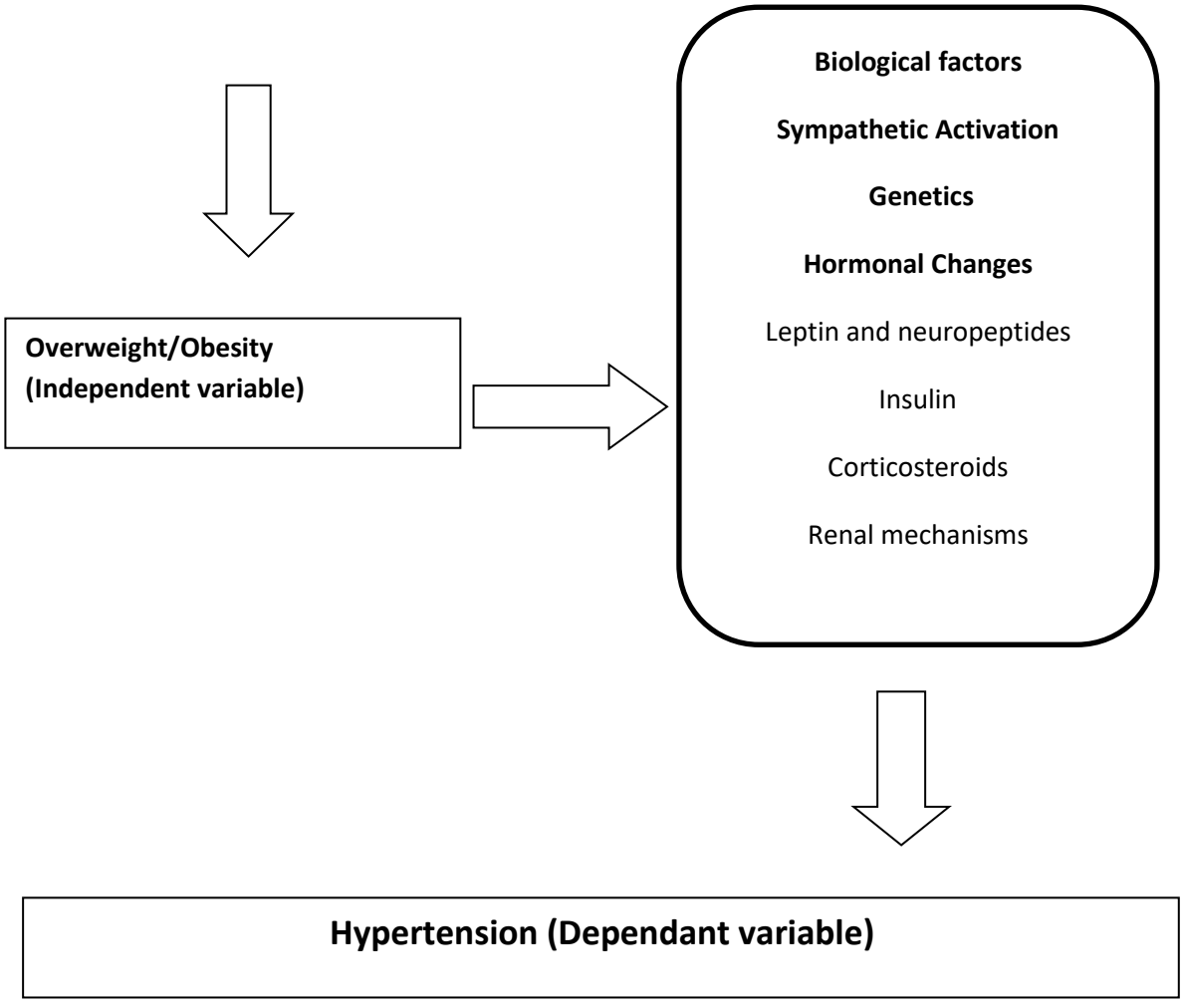
Prevalence: The proportion of individuals in a population having a disease or characteristic. Prevalence is a statistical concept referring to the number of cases of a disease that are present in a particular population at a given time, whereas incidence refers to the number of new cases that develop in a given period of time(Medicine Net,2013).

BMI: It is most appropriate simple indicator by which weight-for-height can be related to health outcome. BMIis calculated as weight (kg) divided by height in m squard. (WHO, 2000).

Waist Hip Ratio: The waist circumference divided by hip circumference (WHO, 2008)

Conceptual Frame Work of Blood Pressure




Biological factors
Sympathetic Activation
Genetics
Hormonal Changes
Leptin and neuropeptides
Insulin
Corticosteroids
Renal mechanisms
Overweight/Obesity
(Independent variable)
Hypertension (Dependant variable)

CHAPTER 2

LITREATURE REVIEW

This literature review will be mainly based on prevalence of hypertension globally and nationally,biological and social factors lead to hypertension. In biological factors, most importantly genetics,pathophysiology of rennin angiotensin mechanism, role of sympathetic nerve activity would be discussed in detail as it provides strongest evidence of relation of obesity and hypertension. Furthermore, other social factor, which contributes to hypertension such as diet, smoking, aging and stress would be discussed.

2.1 Prevalence of hypertension among people with high BMI

Prevalence of hypertension and obesity, are public health challenges, which is increasing worldwide. The risk of obesity to hypertension estimated by Farmingham Heart study suggests that 78% of the hypertension cases in men and 65% in women can be directly attributed to obesity (Ananya, 2013).According to the Jeffry (2005), global burden of hypertension may reach 1.5 billion by 2025 andthe prevalence rate of hypertension worldwide will increase from 26.4% in 2000 to 29.2 % in 2025 leading to 1.5 billion hypertensive patients globally. Jeffry, (2005) has also estimated that the number of adults with hypertension in 2000 worldwide is 972 million out of this 639 million were in developing countries. A study conducted by Mufunda et al. (2006) with a total of 2352 people in age groups 15 to 64 years has shown that the with high BMI, BP

increases and it has shown the effect of BMI was greater in males than in females, especially in the > 45 year age groups.

However, in Maldives, we do not have any study on to find correlation of obesity and hypertension.The studies conducted in other countries have proven that the hypertension and obesity go in hand in hand most of the time. The study conducted by Narkiewicz (2005) has indicated that the central obesity was strongly significantly correlated to hypertension and approximately 2/3 of prevalence of hypertension was directly caused by obesity.

A cohort study done in Korea (Lee & Kim,2005) with a population of1,467 men and 944 women aged 20 to 75 years who were normotensive at the time of their initial examination.After a mean follow-up period of 6.1 year (1990 to 2000) showedthat, the obesity powerfully give way to hypertension among the Korean population that was studied in the above cohort study. Similar findings were shown in the study conducted by (Clarice and Brown ,2000).

Since the developing and low-income countries are more vulnerable to such health problems, South East Asia region would be included in this vulnerable population. According to WHO, (2010) top leading cause of mortality are coronary heart diseases in majority countries of South East Asia. Moreover, a study done in India Pune, (Gothankar, 2011) also has proved that the obese people are more prone to be hypertensive. Research carried out by (Gupta, Patil, Khan, and Gupta, 2011) in Tamilnadu, also shown similar findings. Furthermore, a study conducted by Khan et al (2010) on prevalence of hypertension among

obese and non-obese patients with coronary artery disease in Pakistan also showed noticeable correlation as in their study, (55.5%) patients were hypertensive. Out of that, 60% wereobese, while40% were non-obese. Similarly, a study conducted in India by Mungreiphy, Satwanti Kapoor, Sinha (2011) found very strong correlation between obesity, and hypertension as it showed that BP increased with increase in BMI. Correlation coefficient showed that relationship of BMI with diastolic BP (0.378) was stronger than systolic BP (0.274).According to Yadav (2007), overweight or obese increased probability if having hypertension and pre-hypertension by 2.2 and 1.6 times respectively. Additionally, among subjects who were centrally obese, nearly 40 per cent were hypertensive and 30 per cent were pre-hypertensive.

Furthermore, a study conducted in Japan by Ikeda , Gakidou, Hasegawa & Murray (1986–2002) to find out cause of decreasingsystolic blood pressure in Japanese population they discovered principle factor behind that is decreasing of BMI followed by anti-hypertensive drugs.

Since Maldives does not have any research conducted to find the association between obesity and hypertension, it has statistics on hypertension and obesity separately. Maldives health profile (WHO, 2010) shows hypertension is the top leading cause of the deaths in Maldives. It accounts for 14.10 percentages of total deaths in Maldives in 2010 and in world ranking Maldives is in the seventh position. The STEP NCD risk factor survey also showed that 37.1% men and 41.4% women were hypertensive (MOH, 2009).

According to NCDs policy brief by World Bank (2011), the prevalence of obesity of theMaldives reaches 17% for females and 9% for males. Additionally, (NCDs POLICY BRIEF – Maldives, 2011) also, the same report shows that prevalence of obesity increases with age: approximately 50% of women over 35 years are overweight and/or obese in the Maldives.

2.2 Pathophysiology of hypertension in obesity

Obesity is considered as one of the causes of hypertension and this has been proved in a many researches. According to Bethesda (2004)almost two-thirds of the people suffering from obesity are at risk of hypertension. This has been supported by Paul (2006) as it stated 10 kg higher body weight is associated with a 3.0 mm Hg higher systolic and 2.3 mm Hg higher diastolic blood pressure. The same report also stated that prevalence high blood pressure more significant in people with abdominal or central obesity.

Vasilios, Stella, Sofia, Zoe and Gianfranco (2011) have stated that there are some pathophysiological conditions such as sympathetic nervous system activation, Leptin and neuropeptides and Renin Angiotensin and insulin that lead obese people are more hypertensive than lean people in the society.

The exact mechanism of how obesity cause for hypertension is not very sure. However, Sympathetic Nerve Activity, Renal mechanisms such as Impairment of pressure natriuresis, Structural changes in the kidney, Function of RAS in obesity hypertension are considered as factors, which may lead to hypertension in obesity. Furthermore, Hormonal changes such as insulin, corticosteroids and leptin and neuropeptides also have arole in leading to hypertension in obesity.

Moreover,endothelial dysfunction and changes in vascular also cause hypertension in obese individuals.

2.2.1Sympathetic Activationin Obesity

Activation of the sympathetic nervous system (SNS), measured with direct or indirect methods, has been considered to have a crucial function in the pathogenesis of hypertension among obese individuals. According to Kotsis, Stabouli, Papakatsika, Rizos and Parati(2010) that the high-caloric intake increases norepinephrine turnover in peripheral tissues, raises resting plasma norepinephrine concentration and indirect measurement of SNS activity—and amplifies the rise of plasma norepinephrine in response to stimuli such as upright posture. It also mentioned that high dietary content in fat and carbohydrate has been suggested to acutely stimulate peripheral alpha - and beta -adrenergic receptors, leading to elevated sympathetic activity and hypertension. Increased sympathetic outflow increases cardiac outputs, vasoconstriction of peripheral blood vessel are obvious examples of neural pathways leading to elevated BP (Schlaich et.al, 2012). Likewise, Hall, Brands, Hildebrandt, Kuo and Fitzgerald (2000) also suggest that the increased sympathetic nerve activities in obese people are a major factor in causing obesity-induced hypertension. Furthermore, Joyner, Charkoudian, and Wallin (2010) has stated that the normotensive people, who have higher Muscle Sympathetic Nerve Activity (MSNA) are more likely to be hypertensive in future. Joyner and his colleagues (2010) showed strong relation with aging and blood pressure after in women who had passed menopause age and suggests it could be due to reduced endothelial layer function. Lambert (2010) also found that young over weight/obese adults present

with higher BP, a less favorable metabolic profile, high MSNA, and demonstrable manifestation of heart, kidney, and endothelial damage compared with their lean counterparts in his study. More importantly, his study proved that SNS activity was closely related to the degree of subclinical organ damage.

2.2.3 Renal Mechanisms

In obesity, many alterations occur in the kidney. These physiological changes, in the kidney leads to hypertension. According to, Rahmouni, Correia, Haynes and Mark(2005) has describe as stimulation of the sympathetic nervous system and the RAS as well as rise in plasma aldosterone levels can cause abnormal sodium retention and raise arterial pressure. The high fat accumulation around the kidney compresses kidney leading to structural changes in the kidney ultimately leading physiological changes, which finally leads to hypertension.

2.2.4 Impairment of pressure natriuresis

Stabouli, Papakatsika, Rizos and Parati(2010) has stated that Starting from early phases of obesity lack of nephron function cause by injury of injury to glomerular leads sodium retention due to increase tubular reabsorption . Consequently this leads to increase pressure natriuresis leading to hypertension

2.2.5 Function of RAS in obesity

Walker, Whelton, Saito, Russell and Hermann (1979) were first to find the correlation between Renin Angiotensin System (RAS) with blood pressure. Stefan, Arya and Raymond (2000) have also supported this Stefan and his colleagues findings shows Renin Angiotensin System (RAS) is a well-recognized

contributor in controlling the blood pressure and renal electrolyte homeostasis in human. Likewise, Hall, Brands, Dixon and, Smith's study conducted in 1993, showed that plasma renin activity in the dogs after high fat diet fed for 5 weeks increased by two fold. In addition, the findings of Kotsis, Stabouli, Papakatsika, Rizos and Parati (2011) shows predominantly high levels of plasma renin activity, plasma angiotensinogen, Ang II and aldosterone values in association with human obesity. At the same time Thatcher, Yiannikouris, Gupte, and Cassis (2009) also showed that there is a positive correlation between ARS and elevated blood pressure in human.

Rapid weight gain causes increased regional blood flows, cardiac output, and arterial pressure in experimental animals and humans (Hall, Brands, Dixon, & Smith, 1993). In dogs placed on a high fat diet for five weeks with a constant intake of sodium, protein, and carbohydrates, showed a parallel increases in body weight and blood pressure, with arterial pressure increasing 15-20 mmHg Halletal, (1993). According to Halletal (1993) who conducted that study, those changes are, similar to the changes in blood pressure observed in the first few weeks after rapid weight gain or weight loss in humans. A high fat diet in dogs also markedly raised heart rate and cardiac output, with little change in stroke volume.

2.2.6 Hormonal Changes

Leptin and neuropeptides

Hyperleptinemia is another possible link between obesity and the development of hypertension. Leptin is a peptide hormone secreted from adipose tissue in direct proportion to adipose tissue mass. Adiponectin is an adipose tissue-derived peptide hormone, recently recognized as an energy-balance-regulating molecule. Karlsson, Lindell, Ottosson, Sjöström and Carlsson (1998) and Hainault et.al (2002) have revealed that the human adipose tissue, itself has Renin Angiotensin System. Adiponectin secretion in the adipose tissue and finally affecting the transmission of satiety signals from the gastrointestinal tract. It is, therefore, obvious that endocannabinoid system stimulation represents a source of multiple risk factors clustering, including visceral obesity, insulin resistance, glucose intolerance, and hyperlipidemia and reduced adiponectin.

Insulin

Increased insulin in diabetes has very significant role in increasing blood pressure as it largely affects sodium – potassium pump in cells by prevents potassium from getting inside the cells, creating an imbalance between sodium and potassium leading to high blood pressure. Furthermore, chronic elevated levels of insulin stimulate constriction of arteries and growth of smooth muscles in the arteries, causing blood pressure to rise. According to Tai, Chuang, Chen and Lin (1991) has revealed that age- and sex-adjusted prevalence of hypertension among diabetic subjects was twice that of non-diabetic subjects (30.6 vs. 16.4%, P <0.0005). It also showed that this acts vice versa as among hypertensive subjects, the prevalence of diabetes was 12.7% for those taking

antihypertensive drugs and 9.1% for those not taking any drug ($P < 0.05$). Epstein and Sowers (1992) in their review on Diabetes Mellitus and Hypertension has indicated that data drawn from death certificates, hypertension has been implicated in 44% of deaths coded to diabetes whereas diabetes is involved in 10% of deaths coded to hypertension and it has been estimated that 35-75% of diabetic complications can be attributed to hypertension.

Corticosteroids

Glucocorticoidsincrease food intake, reduce energy expenditure and they promote insulin resistance, fat accumulation and hypertension. Many rodent models of obesity, which are characterized hypercorticosteronemia with weight gain, displayed body weight normalization after adrenalectomy and reinstated by glucocorticoid replacement.The findings propose that a local activation of the adipose glucocorticoid action induce an activation of the RAS, which mediates salt-sensitive form hypertensionin obesity.

2.2.7 Genetics

Similarly, genetics or family history is also a one factor, which contributes to the hypertension. A study conducted by NIH, which was one of the biggest research (2011) stated that there were 29 genetic variations, which contribute to hypertension. The (NIH, 2011) discovered 16 previously unknown variations. Six were found in genes already suspected of regulating blood pressure. The remaining 10 were found in unexpected locations and provide new clues into how blood pressure is controlled. N Geller (2004) has stated that the genetic factors have proven that there is a single-gene disorder with primary effect on blood pressure by influencing on renal sodium reabsorption.

Besides, above mentioned physiological factors dysfunction of endothelial and hormones as if insulin also has proved contribution in making obese people more hypertensive.

2.2.8 Social Factors leading to Hypertension

Besides obesity, there are many other factors, which contribute to hypertension in human. In this, I would like to highlight about the relation of physical inactivity, genetics or, stress and smoking for some extent. Other than this age and race also plays some role in making people hypertensive.

2.2.9 Physical inactivity

The advancement in the technology and the busy daily schedule of everyone makes them physically more inactive day by day with increased health burden within the society. Sedentary life style is a major contributing factor for most non-communicable diseases such as hypertension, which ultimately leads cardiovascular diseases. Paffenbarger, Wing, Hyde and, Jung (1983) proven that people who did not engage in vigorous sports play were at 35% greater risk of hypertension than those who did, and this relationship applies to all ages between 35-74 years. At the same time, the study carried out to look for the relationship of physical inactivity and hypertension and obesity by Sobngwi et. al (2002) showed a strong relation in both, by revealing that, 11.4 vs 6.6% and 17.6 vs 9.1% in women and men in rural and urban areas. The urban subjects were characterized by lower physical activity ($P < 0.001$) with light occupation, high prevalence of multiple occupations, and reduced walking and cycling time in difference to rural subjects Sobngwi et al (2002). In addition to that, the study carried out by Parker, Schmitz, Jacobs, Dengel, and Schreiner (2007) discovered

that the people with less physical activity are more likely to suffer from hypertension when they passes middle age. Likewise, Hu, Barengo, Tuomilehto, Lakka, Nissinen, Jousilahti(2003) also supported that the physical inactivity leads to hypertension.

2.2.10 Stress

Same like physical activity, stress also plays an important role in making an individual hypertensive.Kulkarni,O'Farrell,Erasi and Kochar (1998) stimulated the nervous system to produce large amounts of vasoconstriction hormones that increase blood pressure. According to Kulkarni (1998), stress directly does not cause hypertension but repeated blood pressure elevation in stressful times may leads to hypertension in future. With increase physical activity and busy schedule with many responsibility to fulfill makes people to be in more stressful conditions. A study conducted by the Matthews(2003) with a cohort of >4100 normotensive black and white men and women (age at entry, 18 to 30 years) followed for 13 years has shown that showed the large difference in BP elevation in relation to acute stress have a relation to predict incident hypertension.

2.2.11 Aging

Likewise, age also has a vital role in causing hypertension in human as with increasing age incidence of hypertension also increases among the population. Aging causes many physiological changes in the body such as accumulation of collagen and loss of elasticity in arteries mainly in aorta. This leads to decrease the ability to expand the blood vessels and pumping the blood through it as heart pumps the blood. Finally, heart has to pump it with more pressure causing elevation of blood pressure. Cotroneo (2011) has mentioned that around 60% of

individuals with hypertension are physiologically sensitive to sodium intake. Salt sensitivity is also one of the causes of hypertension in old age. This happens due to hormonal changes and poor kidney functions. The America, national academy on an aging society (2000) has stated that 62 percent of the population with hypertension is aged 55 and older while in America, 15% of adult population is hypertensive, with 28 million Americans. A study conducted by Mungreiphy,Kapoor and Sinha (2011) in India showed the significant strong relation with elevation of BP and age as it stated thatsystolic BP increased steadily with age and the highest was found among the oldest age group while differences in mean systolic BP between different age groups were statistically non-significant.

2.2.12 Smoking

Smoking is an independent contributor, which would cause hypertension in individual. Though it is one factor which is easily preventable the number of deaths and disability due to that continuously increases globally. According to WHO fact sheet on smoking (2013)there are more than 4000 chemicals in tobacco smoke, of which at least 250 are known to be harmful and more than 50 are known to cause cancer. If current trends continue, it will cause up to one billion deaths in the 21st century and unchecked, tobacco-related deaths will increase to more than eight million per year by 2030 whereas more than 80% of those deaths will be in low- and middle-income countries. Kaplan (2012) has stated that the chronic cigarette smoker has arterial stiffness which may persist for a decade after cessation of smoking. Groppelli, Giorgi , Omboni, Parati and Mancia (1992) has revealed that the first cigarette after rest makes sudden

increase of blood pressure and heart rate and remains similar to remaining three cigarettes. At the same time Jatoi, Jerrard-Dunne, Feely and Mahmud (2007) has found that there was strong correlation between smoking and hypertension with significantly higher pulse wave velocity compared to nonsmokers.According to Talukder et.al (2010) BP showed a trend to increase at 16 weeks of CS exposure, and it was significantly higher at 32 weeks of CS exposure with SBP of 143 ± 3.5 versus 105 ± 2.2 mmHg ($P < 0.001$) and DBP of 110 ± 3.5 versus 77 ± 3.1 mmHg ($P < 0.001$).

2.2.13 Gender

The studies carried out on this by Minh (2005) in Vietnam have proven that the men has high blood pressure compared to women. Both mean systolic and diastolic pressure was higher in men with mean SBP and DBP were 124.9 and 76.9 mmHg in men and 117.7 and 72.0 in women. In this study has also shown same types of figures with mean systolic and diastolic pressure was higher in men with SBP and DBP for men was 124.3 and 79.5 while 116.3 and 78.5 in women. Moreover, the study conducted in India Tamilnadu by Gupta (2011) has shown very wide difference between both sex. This shows63.2% were males and 36.8% were females. The STEP survey carried out by MOH in 2009 has shown that 37.1% men and 41.4% women were hypertensive.

2.2.14 Diet

What we include in our daily diet is really affects very much our well-being. The researches has found out the level of sodium intake has significant effect on blood pressure. The Centre for Disease Control and Prevention (2013) stated that the increased salt intake is very bad for health and it causes hypertension

and cardio vascular diseases. The study conducted by Ikeda, Gakidou, Hasegawa & Murray (1986–2002) in Japan showed that reduced mean daily salt intake contributed significantly to decline of mean SBP by –0.4 to –0.2 mmHg in all age groups in both sexes.Furthermore, Karppanenand Mervaala(2006) also revealedthat the one-third decrease in the average salt intake has been accompanied by a more than 10-mm Hg fall in the population average of both systolic and diastolic blood pressure, and a 75% to 80% decrease in both stroke and coronary heart disease mortality in Finland.

It is being proved that biological factors, such as Renin Angiotensin System (RAS), Sympathetic nerve activity, and kidney dysfunction due to obesity cause hypertension in people. Besides obesity, diet, genetics, stress, age, physical inactivity and smoking are factors, which lead to hypertension.

CHAPTER 3

METHODOLOGY

This study is a quantitativecross - sectional,study conducted to find out the association of overweight/ obesity and hypertensionin K.Guraidhoo above 35 years of population. In this study, overweight/obesity is taken as independent variable while blood pressure has taken as dependent variable. The study was conducted by using structured questionnaire. All the interviews with participants have carried out by health professionals such as family health worker and nurse in K.Guraidhoo Health Centre. In addition to information measurements such as height, weight, blood pressure, waist and hip circumference was taken.

3.1.1Population and Sample

K.Guraidhoo has 484 people in 35 years and above population with males 259 and 225 females. People who were residing at the island at the time of conduction of surveywere 368. Again, from that 368 people 20 wereomitted, as they could not come to health center because of their old age or because of their ill health. 25% of the population 35 years and above , which is 87, is taken as a sample size. Study subjects took randomly after taking the list of the people above 35 years population of Guraidhoo. The sample interval was found by dividing survey population 368 by sample size needed, 87. The sample interval was 4, starting from 1 st every 4th subject was selected as a sample subject.

3.1.2 Inclusion criteria

The population of 35 years and above of the population was included in the survey.

3.1.3 Exclusion criteria

The population of under 35 years has not included in this sample population.

3.2Instrumentation

Questionnaire was developed based on the objectives to find correlation of the obesity and hypertension in the study population. The survey questioner has divided into six parts and it includes total 28 questions, which need to answer by the subject. The questionnaire was designed as follows.

3.2.1 General information

This part includes general information of the subject. This section includes four questions such as sex, age and contact number.

3.2.2 More detailed questions on personnel information

Thissection includes fourquestions, which would provide more detail of the personnel information. This includes educational level, marital status, occupational status, and income.

3.2.3 Health related information

The third part would give more information about health status of the subject. This part consists of six questions and it was about smoking, any treatment for chronic disease, taking treatment for pressure, diabetes, psychological disorder, and cholesterol, family history of hypertension, any history of rise of blood pressure and how often the subject check his/her blood pressure.

3.2.4 Physical activity.

The questions included in fourth part of the questions were based on the physical inactivity such as exercise and this section has seven questions. This part includes about the exercise, moderate and heavy exercise, how often and the duration of exercise.

3.2.5 Diet

This section has eight questions and all the questions were based on the diet of the subject. This consists of about taking fruits and vegetables in the diet the number of days and the amount of vegetables and fruits taken were included.

3.2.6 Anthropometric measures.

The last section of the questioner contains the anthropometric measurements taken in the survey.This includes height, weight, waist, hip circumference and blood pressure.

3.6 Data Collection procedures

Data was collected by interviewing the subjects with the help of pre prepared questioner. The interview of the first 40 sample and measurements were collected by myself and the rest of the sample was interviewed and measurements were taken by Family Health Worker of K.Guraidhoo Health Centre. The Family Health Worker was familiarized to the questioner with a2-hour session and she has been involved in taking the measurements and 5 interviews were performed with me beforehand and before handing it over it to her completely.

3.61 Height:

Height is taken by using a wooden measuring board fixed to the wall. The person was asked to stand against the board horizontally without shoes and asked to keep the sight of the person horizontal, with the heels, buttocks, shoulders, and head touching the wall. The assessor placed a piece of card board on the head at a right angle to the wall; carefully checks the height measurement; and record it immediately in centimeters so that correct measurement will not be forgotten.Height is assessed by using “Shorr Board” made by USA and its number is 052196. All those who participated in the survey were brought to the K. Guraidhoo Health Centre and height was measured with a fixed height measuring board.

3.62 Weight

Weight is taken by using solar weighing scale used in a K. Guraidhoo health centre. Before the person was asked to be on the scale, the scale was adjusted to zero and person was asked to remove shoes or slippers. The assessor took measurements in a well-lighted place and recorded immediately on the questionnaire. Weighing scale used to measure the weight was solar weighing scale used in K.Guraidhoo Health Centre. The light clothes were used by the participants. All the samples were measured by using the same scale to maintain the validity of the measurements.

3.63 Waist Circumference

Waist Circumferencesis a valuable indicator of fat distribution. To measure waist circumference, non-stretchable measuring tape was placed around the waist,midpoint between the lower border of the rib cage and the iliac crest. The

measure is taken at the end of normal expiration. It was ensured that the tape remains on a level horizontal plane on all sides. The tape is tightened slightly but without compressing it. The measurement was taken by using a measuring tape in centimeter scale.

3.64 Hip Circumference

Hip Circumferences is a valuable indicator of fat distribution. The hip measurement in centimetersis taken by keeping a non-stretchable tape around the widest part below the iliac crest.It was ensured that the tape remains on a level horizontal plane on all sides. The tape is tightened slightly but without compressing the skin.

3.65 Blood Pressure

Blood pressure was checked by using a “Reister” brand standard mercury sphygmomanometer, which has adult cuff that can be used to people with an arm circumference of 24 – 32 cm. Its number is 000566666. The same instrument was used to all throughout the survey. The subject was asked to sit relaxed in a chair with her/his arm supported comfortably and the pressure cuff was applied closely to the upper arm. The cuff was rapidly inflated to pressure above the level at which the radial pulse could no longer be felt. The stethoscope was placed lightly over the brachial artery and the mercury column was immediately allowed to fall at the rate of 2 mmHg per second. The first perception of the sound was taken as the systolic pressure and then the mercury was allowed to fall further till the sound ceased to be tapping in quality, became fully muffled, and finally disappeared. The level where it disappeared was taken as the diastolic pressure. The cuff was then deflated to zero pressure. The blood pressure readings were

taken from the right arm of all the patients .The measurement was repeated twice with 1 day interval and the average taken for accuracy.Abolfotouh,Sallam, Mohammed,Loutfy and Hasab (2011) and Minh, Byass, Chuc and Wall(2005) also taken only two readings of blood pressure and calculated average of that.

3.66 Body Mass Index (BMI)

Body mass index (BMI) is calculated as the weight in kilograms divided by the square of the height in meters (kg/m²). A BMI of over 25 kg/m² is defined as overweight, and a BMI of over 30 kg/m² as obese.

3.67 Waist Hip Ratio

It is calculated by dividing measurement of waist by measurement of hip.WHO (2008) has stated the waist hip ratio to be≥0.90 cm for men and ≥0.85 cm for women.

3.7 Pilot Test of the Questioner

The questioner was pretested by sending that to K.Guraidhoo. 7 people were interviewed from the population of 35 years and above population and places where doubt was raised were corrected before using that in the actual survey.

3.8 Validity and Reliability

Lot of measures was taken to maintain the reliability and validity of the data taken for the study. The questionnaire was pilot tested to make the information taken by it was valid and reliable. In addition to that, some questions were included to identify the previous question answered by the participant was answered was truly or not. For example, question, number 13 will provide more detail of

question number 11 and question number 17 – 21 will provide more detail of question number 15. This type of questions included to reveal the reliability and validity of the information provided by the subject during the interview. The measurements of weight, height, blood pressure and hip/waist circumference was taken by using same instruments to measure to make it more reliable and valid. Furthermore, the training session was taken to enumerator in filling the questionnaire to maintain the accuracy of the information. At the same time, random sampling was taken to maintain the validity and reliability of the information.

3.9Limitation

The biological factor, which may lead to hypertension in obesity, was not investigated due to unavailability of the facilities such as fund and other resources. Due to time constraints and being a student only two measurements of the blood pressure were taken and the average of two measurements was used in defining hypertension though it is better to take three readings to consider hypertension. The sample was limited to K.Guraidhoo, as being a student, cannot bear the cost and time of doing a research in a wider area.

3.10Ethical Issues

The consent from each participant was taken to prevent from arise of ethical issues. Apart from that no names or any identification was included in the questioner. The participants were informed that they have full authority in terminating from participation in the research at any time. Opportunity was provided to ask any question regarding the research or to clarify their doubt to make them more convinced with their decision in participating.

3.11Figure 2 - Framework of Data Analysis

Objective	Question	Hypothesis	Types of Data	Technique of analysis
To compare the difference in the prevalence rate of hypertension among men and women among 35 years and above population of K.Guraidhoo.o	Is overweight and obesity a factor for hypertension among K.Guraidhoo 35 years and above population of K.Guraidhoo?	Overweight/obesity is a factor of hypertension in K.Guraidhoo population	Quantitative/ Primary	SPSS/ Frequency
To assess the prevalence	Is overweight and obesity	Overweight/obesity is a factor of hypertension in	Quantitative/Primary	SPSS/Frequency

of hypertension among 35 years and above population of K.Guraidhoo.	a factor for hypertension among K.Guraidhoo 35 years and above population of K.Guraidhoo?	K.Guraidhoo populati		
To find the correlation between overweight and obesity and hypertension	Is overweight and obesity a factor for hypertension among K.Guraidhoo 35 years and above population of K.Guraidhoo?	Overweight/obesity is a factor of hypertension in K.Guraidhoo populati	Quantitative/Primary	SPSS/ Correlation

CHAPTER 4

RESULTS

4.1 Gender

The table in the below has shown the number of males and females participated in the study. There were 41(47.1%) males and 46(52.9%) females.

Table 1: Distribution of Participants by gender

Variable	Frequency N=87	Percent
Male	41	47.1
Female	46	52.9

The following table shows the cross tabulation carried out to find the relation of blood pressure and sex. It has shown that out of 40 male subjects 12 were in the prehypertension group where as 11 werein the hypertension group. At the sametime, it has shown out of 46 female subjects 7 were in prehypertension group whereas 16 were in the hypertension group and rest the rest of the both femal and male were normal.

Table 2: Cross Tabulation of Gender and Blood Pressure

	Blood Pressure			
Gender	**Normal**	**Prehypertension 130/80 (mmhg)**	**Hypertension 140/90(mmhg)**	**Total**
Male	18(38.2%)	12(25.5%)	11(23.3%)	41(47.1%)
Female	23(43.%)	7(13.2%)	16(30.2%)	46(52.9%)
Total	41(47.1%)	19(21.8)	27(31.03%)	87(100%)

Total 87 sample units with 46(52.9%) males and 41(47.1%) males participated in this study. Among them 25.5% men and 13.2% women were found to be prehypertensive and 23.3% men and 30.2% women were hypertensive.

4.2 Age

The table illstrated below shows the distribution of participants by age with 5 years difference. The most number of people of the surveyed population falls in the age group of above 60 years. There was 30 participants in this group.

Table 3: Distribution of Participants by Age

Variable	Frequency N=87	Percent
35-39 Years	12	13.8
40-44 Years	14	16.1
45-49 Years	14	16.1
50-54 years	10	11.5
55-59 Years	07	08.0
>60 Years	30	34.5
Total	87	100

The following table shows the mean age of the surveyed population was 55.5 years and median age was 54 years .The most number of people of the surveyed population falls in the age group of above 60 years. There was 30 participants in this group.

Table 4: Age composition

	N=100
Mean	55.5
Median	54.00
Mode	39
Std. Deviation	14.589

The following table showsthe cross tabulation of age and blood pressure showed as the highest number of people prehypertension and hypertension were in the age above 60 years where as the people of 35 – 39 years were all normal except one subject.

Table 5:Cross Tabulation of Age and Blood Pressure

				Total
Age	Normal	Prehypertension	Hypertension	
35-39 Years	11	0	1	12
40-44 Years	8	3	3	14
45-49 Years	4	2	4	10
50-54 years	3	2	2	7
55-59 Years	3	2	2	0
>60 Years	6	10	13	29
Total				

The table below shows the correlation of age and hypertension. This shows that there was a positive correlation between age and hypertension which was statistically significant with P vale 0.022 (CI 95%, 0.01 level).

Table 6: Correlation of age and hypertension

Characteristics		**Age**	**Hypertension**
Age	Pearson Correlation	1	.245
	Sig.(2- tailed)		.022
	N	87	87
Hypertension	Pearson Correlat	.245	1
	Sig.(2- tailed)	.022	
	N	87	87

4.3 Occupation

The following table shows from the studied population 57(65.5%)were not having any occupation and only 30(34.5%) were being employed. Among those who were not emloyed includes the retired age people who were above 65 years.

Table 7: Occupation Status

Variable	Frequency N=87	Percent
With Occupation	30	34.5
Without Occupation	57	65.5

4.5 Marital status

Among the surveyed population 65.5% were people without any jobs and 70.8% were married although 8% were divorced.

Table 8: Marital status

Characteristics	Numbers	Percent
Marriage	63	70.8
Not married	07	7.9
Divorced	13	8.0
Widowed	04	4.5
Never Married	00	00
Refused to answer	00	00
Total	87	100

4.6 Education

The educational standard of surveyed population was mainly primary education as 49.1% of the people in this group whereas 37.1 had only basic literacy education.

Table 9:Education level

Characteristics	Numbers	Percent
Basic literacy	33.0	37.1
education	44.0	49.1
Primary education	2.0	2.2
Secondary education	0.0	2.2
Others	1.0	1.1
Never attended to a school	0.0	0.0
Refused to answer		
Total	87	100

4.7 Treatment for chronic disease

The following tables describes the percentage and number of people who were taking treatment for any chronic disease . The 62(66.7%) were answered as they were not taking any treatment.

Table 10:Taking treatment for any chronic disease

Characteristics	Numbers	Percent
Taking treatment	25	28.1
Not taking any treatment	62	66.7
Total	87	100

4.8 Taking treatment

The following table shows the number and percentage of the people who take treatment for any of the disease given in the questionnaire . This shows 10.1% of the people take treatment for hypertension.

Table 11: Taking treatment for any of the following.

Characteristics	Numbers	Percent
Hypertension	09	10.1
Diabetes	02	2.2
Cholesterols	03	3.4
Psychological issue	02	2.2
Hypertension & diabetes	01	1.1
Diabetes and cholesterol	01	1.1
Hypertension, diabetes & psychological issues	01	1.1
Others	06	6.7
Did not take treatment	0.0	0.0
Total	62	69.7
	87	100

4.9 Smoking

The below table describedamong the surveyed population the highest number of people who participated in the survey was never smoke as it accounts 44.8% of the population while 37.9% was smoke now and 17.24% had smoke previously.

Table 12: Smoking status

Characteristics	Numbers	Percent
Never smoke	39	44.8
Now smoke	33	37.9
Before smoke	15	17.24
Total	87	100

4.1 0 Family History

Table below has shown that 49.4% of the population did not know whether their immediate parents had hypertension or not whereas 29.9% of that said their parents had hypertension and rest said there was no family history of hypertension.

Table 13: Family history of hypertension

Characteristics	Frequency	Percent
Yes	26	29.9
No	18	20.7
Not known	43	49.4
Total	87	100.0

4.11 History of Hypertension

The survey population has shown that 29.9% of them had history of rise in blood pressure and the doctor or Community Health Supervisor informed them. Also, 61(70.1%) has told that they were not having any history of hypertension.

Table 14: Any history of hypertension

Characteristics	Frequency	Percent(%)
Yes	26	29.9
No	61	70.1
Total	87	100.0

4.12 Checking blood pressure

of the population checked their blood pressure once in month and the same percent of people checked their blood pressure when they consulted to a doctor and 24.1% checked once in three months while only 1.1 % had never checked blood pressure.

Table 15: Checking blood pressure

	Frequency	Percent
Once in a month	31	35.6
Once in 3 months	21	24.1
Once in a year	3	3.4
When consult to a doctor	31	35.6
Never checked	1	1.1
Total	87	100.0

4.13 Exercise

The following table has shown that the more than half of the population such as 56.3% of them never exercises but 29.9% of them exercise every day. Among exercising population only 3.3% did heavy exercise whereas 38.2 % moderately exercised.

Table 16: Habit of Exercise

Characteristics	Frequency	Percent
Every day	26	29.9
Weekly 2-3 days	7	8.0
Sometimes	5	5.7
Never does	49	56.3
Total	87	100.0

Table 17: Heavy Exercise

Characteristics	Frequency	Percent
Weekly 0 – 3 days	1	1.1
Weekly 3 – 5 days	0	0.0
>5 days	2	2.2
Never does	84	94.4
Total	87	100

Table 18: Moderate Exercise

Characteristics	Frequency	Percent
Weekly 0 – 3 days	8	9.0
Weekly 3 – 5 days	6	6.7
>5 days	17	19.1
Never does	55	61.8
Total	87	100.0

4.14 Diet

The dietary behavior of the population has shown that 21.8% of the population has used fruits every day and the same percentage has used weekly 1-2 days. The least was those who used fruits weekly 4-5 days that was 10.3%. At the same time, the highest percentage of the people who used vegetable was those who used for weekly 1- 2 days and they accounts for 24.1% while the least group was same as fruit consumption which was the group of 4-5 days and it was 10.3%.

Table 19: Consumption of fruits/week

Characteristics	Frequency	Percent
Every day	19	21.8
Weekly 4 – 5 days	9	10.3
Weekly 3 – 4 days	10	11.5
Weekly 2 – 3 days	13	14.9
Weekly 1 – 2 days	19	21.8
Never consume	17	19.5
Total	87	100.0

Table 20: Consumption of Vegetables/week

Characteristics	Frequency	Percent
Every day	16	18.4
Weekly 4 – 5 days	9	10.3
Weekly 3 – 4 days	13	14.9
Weekly 2 – 3 days	17	19.5
Weekly 1 – 2 days	21	24.1
Never does	11	12.6
Total	87	100.0

4.14.2Consumption of fruits and vegetables /day

The following two table shows consumption of fruits per day has shown that the as the highest number of percentage used fruits per day was once, which was

42.5%, whereas the least percentage was used was more than three times a day which was 1.1%. Furthermore, survey has shown that the highest percentage of people who used vegetable per day was same as fruits as it was those who used once vegetables a day. The least group was who used at three times and that was 4.6% of the survey population.

Table 21: Consumption of fruits/ day

Characteristics	Frequency	Percent
Once	37	42.5
Twice	26	29.9
Thrice	6	6.9
>3 times	1	1.1
Never eat	17	19.5
Total	87	100.0

Table 22: Consumption of Vegetables/ day

Characteristics	Frequency	Percent
Once	41	47.1
Twice	26	29.9
Thrice	4	4.6
>3 times	5	5.7
Never eat	11	12.6
Total	87	100.0

4.14.3 Oil consumption

The Survey result has shown that the 72.4% of the survey population was used normal vegetable oil followed by the use of the sunflower oil, which was 18.4%. The least percentage of the people was the one, who use corn oil and that was 1.1% whereas 0% used butter, ghee or margarine.

Table 23: Type of oil consume

Characteristics	Frequency	Percent
Normal vegetable	63	72.4
Sunflower	16	18.4
Olive	5	5.7
Corn	1	1.1
Butter/ghee	0	0.0
Margarine	0	0.0
Nothing special	0	0.0
Do not use any	1	1.1
Do not know	0	0.0
Other	0	0.0
Total	87	100

4.15 Body Mass Index

The table below has shown the body mass index of the survey population. This shows the 41.4% of the population was normal. The above table shows the body mass index of the survey population. This shows the 41.4% of the population was normal whereas 32% was overweight, 20.7% was obese, and the least was 1.1%, which was underweight whereas 32% was overweight and 20.7% was obese and the least was 1.1%, which was underweight

Table 24: Body Mass Index

Characteristics	Frequency	Percent
Normal	36	41.4
Overweight	32	36.8
Obese	18	20.7
Underweight	1.0	1.1
Total	87	100

4.15 Blood Pressure

The above table has shown that the 50.6% of the research subjects were normotensive while 18.4% were fall in prehypertension and 27% were hypertensive.

Table 25: Blood pressure

Characteristics	Frequency	Percent
Normal	44	50.6
Pre hypertension	16	18.4
Hypertension	27	31
Total	87	100

The table below is showing the cross tabulation of overweight/obesity and hypertension. This table shows 19(61.2%) hypertensive people were overweight or obese while in prehypertension we could not find any difference as 46.05%were having normal BMI and 40.9% were being overweight or obese.

Table 26: Cross tabulation of hypertension and overweight / obesity

Table 24: Cross tabulation of the body mass index and blood pressure

		Body Mass Index Total			
		Normal	Overweight	Obese	
Blood Pressure	Normal	23	16	6	45
		9	2	6	17
	Prehypertension				
	Hypertension	6	13	6	27
Total		38	31	18	87

The correlation between the hypertension and overweight has weak correlation as “Pearson Correlation” is 0.210 (p value .026, CI 95)and however, the relations of the two variables are statistically significant as the value of sig. (2- tailed) is 0.006 is less than “0.05”. At the same time, it has shown that correlation of obesity overweight was hypertension obesity has weak significant positive correlation with .187 with P value of .042with 95% CI.

Table 27: The correlation of hypertension of obesity and overweight

Characteristics	Hypertension	Overweight	obesity
Hypertension	1	.210	.187
Pearson Correlation		.026	.042
Sig.(2- tailed)	87	87	87
N			
Obese			
Pearson Correlation	.187	.346	
Sig.(2- tailed)	.042	.001	
N	87		
Overweight			
Pearson Correlation	.210	1	.346
Sig.(2- tailed)	.026	87	.001
N			

4.16 Waist Hip Ratio

The below table shows the relation of waist hip ratio and hypertension. it shows 72 % of the studied population have higher value than WHO cut of points which is 8.5 for women and 9.0 for men. This also shows out of 77% of hypertensive cases were having higher waist hip ratio value and 60.9% prehypertensive cases also have waist hip ratio higher than it should be.

Table 28: The cross tabulation of blood pressure and waist hip ratio

		Waist hip ratio		
		Normal	Higher	Total
Blood Pressure	Normal	15	25	40
	Prehypertension	6	14	20
	Hypertension	3	24	27
Total		24	63	87

CHAPTER 5

DISCUSSION

This discussion would be mainly focused on the findings on overweight, obesity , gender, waist hip ratio, exercise and its relation to hypertension.

The main aim of this study was to find the find out the correlation of obesity and hypertension in 35 years and above population of K.Guraidhoo. However, other social factors such as diet, smoking, age, physical inactivity also studied in this research. Study population consist of 259 males and 225 females, total of 484 subjects. With a sample size 87 subjects with 46 females and 41males has taken randomly. The structured questioner used to take necessary information and anthropometric measurements was taken by using appropriate instruments.

5.1 Summary of main findings

This is a correlational quantitative study which was carried out to find the relation of overweight /obesity and hypertension in the 35 years and above population of K.Guraidhoo. 25 % of the research population which was 87 subjects were taken. This includes 41 males and 46 females. This study has shown the among studied population 32% was overweight and 20.7% was obese. At the same time it has shown 18.4% were prehypertensive and 27% were hypertensive.

5.2 Discussion of the results

5.2.1 BMI

The result of the study has shown that the 32 (36.8%) were overweight while 18 (20.7%) were obese and 36 (41.4%) were normal. The study also revealed that 44(50. %) were normal while 16(18.4) were prehypertensive and 27(31%) were hypertensive. The correlation of the two variables were done to find the how strong was relation and whether the relation was significant. Correlation run at SPSS program has revealed the relation of these two variables in the 35 years and above population of K. Guraidhoo has established positive correlation of 0.294. Which is highly significant with p value of < 0.006(CI 95% and 0.01level). The studies carried out by (Gothankar, 2011)and (Gupta et al, 2011) has found similar finding in their studies. Furthermore, the study conducted by Abolfotouh, Sallam, Mohammed, Loutfy, and Hasab in Egypt also has shown that there was highly significant relation between central obesity, BMI and HBP.

5.2.2 Waist hip ratio

According to WHO (2008) and Alvarez, Beske, Ballard, and Davy (2002) fat accumulation in the abdomen or visceral obesity has much relation to cardio vascular diseases. (WHO, 2008). Hence in this study, the waist hip ratio was measured and it has shown that 72.4% had the waist hip ratio higher than it should be which is >= 8.5 for females and >=9.0 for males. Among hypertensive cases 77% (24/27) were having higher waist hip ratio value than normal. This study also shows a significant positive correlation of 0.247 between hypertension and waist hip ratio in this study with P value of 0.027. However, this study has

shown the correlation the correlation of waist hip ratio and hypertension and BMI and hypertension as almost same. Abolfotouh, Sallam, Mohammed, Loutfy and Hasab (2011) has stated in their study subjects with hypertension were 7 times to obese with central obesity. At the same time, Paradis(2004) and Minh(2005)also had similar findings.

5.2.3 Age

This present study also has shown that hypertension and prehypertension also had statistically positive correlation with age with P value 0.022 (CI 95 %, 0.01 level). At the same time, America, national academy on an aging society (2000) and Sinha (2011) also have established significant relation with age and elevated blood pressure. Aging causes lot of anatomical as well as physiological changes to the body as a result, some of the organs could not carry out their function in a normal condition. Cotroneo (2011) has suggested with age as 60% of the people with hypertension were physiologically sensitive to salt intake, which was due to aging.

5.2.4 Gender

The studies carried out on this by Minh (2005) in Vietnam have proven that the men has high blood pressure compared to women. Both mean systolic and diastolic pressure was higher in men with mean SBP and DBP were 124.9 and 76.9 mmHg in men and 117.7 and 72.0 in women. In this study has also shown same types of figures with mean systolic and diastolic pressure was higher in men with SBP and DBP for men was 124.3 and 79.5 while 116.3 and 78.5 in women. Moreover, the study conducted in India Tamilnadu by Gupta (2011) has shown very wide difference between both sex. This shows63.2% were males and

36.8% were females. The STEP survey carried out by MOH in 2009 has shown that 37.1% men and 41.4% women were hypertensive. The present study also shows similar findings with 30.2% of women and 23.3% of men were hypertensive. Nevertheless, this study has shown that with prehypertensive cases men were more than women, with 48.8% and 43.4%. Hence, these findings show the status of hypertension was better in Guraidhoo compared to national status which revealed in STEP survey in 2009 by MOH. This study also has shown that mean waist hip ratio for women 0.92 and 47% of the women were above the value of 8.5 that is WHO cut off point for WHP ratio for women. At the same time this result has shown that mean value of WHP was for men 0.96 and 67% of men surveyed was having WHP value higher than the WHO cut off point 9.0.

5.2.5 Smoking

One of the social factors assessed in this study was smoking. The result of this study has shown 33 (37.9 %) were present smokers and 15(17.24%) were ex-smokers among those who participated in this research. It also showed that 12 of 20(52.2%) pre -hypertensive cases were either ex-smoker or present smoker. Likewise, the 16 of 27(51.5%) of hypertensive cases were either ex-smoker or present smoker. It has been proved that the physiological changes caused by smoking leads to hypertension especially in chronic smokers also there was sudden effect on blood pressure by first cigarette after resting. Kaplan (2012) has stated that the chronic cigarette smokers have arterial stiffness which may persist for a decade after cessation of smoking. Groppelli , Giorgi , Omboni, Parati and Mancia (1992) has revealed that the first cigarette after rest makes sudden

increase of blood pressure and heart rate and remains similar to remaining three cigarettes. At the same time Jatoi, Jerrard-Dunne, Feely and Mahmud (2007) has found that there was strong correlation between smoking and hypertension with significantly higher pulse wave velocity compared to nonsmokers.

5.2.6 Physical inactivity

In this study physical inactivity was measured by asking about exercise. Findings of the study has shown that 26(29.9%) have been exercising regularly, 7(8%) exercise 2-3 days a week, 5(5.7%) sometimes and 56.3% never exercise. Among those who exercise, 9(30.1%) were hypertensive people. From those who never exercise 16(28.4%) were hypertensive and 11(19.5%) falls in the group of prehypertensive. Paffenbarger, Wing, Hyde and Jung (1983) had also similar findings as they found that those who were physically inactive were more likely to be hypertensive.At the same time, Sobngwi et. al (2002) and Parker, Schmitz, Jacobs, Dengel, and Schreiner (2007) also found that there was strong relation between physical inactivity and hypertension. Furthermore, Hu, Barengo, Tuomilehto, Lakka, Nissinen, Jousilahti(2003) has found that the regular physical activity and weight control can reduce the increasing blood pressure.

This study has some limitations, which need to be considered in interpreting the result of this study. Firstly, the blood pressure reading was taken twice due to limited time and resources though it is recommended to take the blood pressure in at least three visits. Secondly, there are many biological factors underlying in leading to hypertension in obesity but due to lack of resources that cannot be

done in this study. Thirdly, information regarding the exercise, smoking and other social and personnel information was taken with a questioner. So, if the participants have not revealed the truth these findings may be biased. Another important thing is this study has carried out using a small sample hence; it could not be generalized to a larger population.

5.3 Conclusion

In conclusion, this study provides vital information about K.Guraidhoo population and this can be used as a base line to find the trend of how it changes in future. The result of this study has provedthat the body mass index and central obesity has positive significant correlation with hypertension among the population of 35 years and above. At the same time, it has proven that there was a positive correlation between hypertension and age as well as gender.

It also found that the physical inactivity leads to hypertension as this study also has revealed among those who do not do exercise there were higher percentage of hypertension. Moreover, results of this study also showed elevated blood pressure among cases of former or present smokers higher than non-smokers.

5.4 Implications and Recommendations

These finding emphasizes the importance of conducting further studies on same topic in that population to find the trend of changes with time and also the asses the awareness level of the population regarding hypertension and obesity.

Since highest percentage of researched population was having higher value of waist hip ratio, it is vital to frame strategies to minimize sedentary behaviours and promote physical activity and healthy nutrition among the population.

5.5 Directions for future research

Since this small sample study carried out has shown the positive correlation of obesity and hypertension so, it would be crucial to carry out such study in a large population or nationally.

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