International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Obesity, Dietary Habits and Coronary Heart Disease among Sudanese Patients Attending Sudan Heart Center

Somiya Gutbi Salim Mohammed

Abstract: ***Background:*** *Many researchers have suggested that obesity; especially abdominal obesity may have higher predictive value for coronary heart disease and its risk factors. Since abdominal fat predicts a higher risk for coronary heart disease, waist circumference provides more information on risk assessment than body mass index alone. Waist measurement and waist-height ratio have been used as Proxy measures of visceral adipose tissue, mainly in adults.* ***Objectives:*** *to determine the relation between the prevalence of the coronary heart disease and anthropometric indices.* ***Material and Method:*** *As ample of 250 patients from Sudan heart center, adults were assessed in the period of July – December 2011-2012 in cross sectional hospital base study for patients who attending Sudan heart center. Data collection included questionnaires, anthropometric measures, such as body mass index, waist circumference and waist-height ratio and food frequency was also investigated.* ***Results:*** *The prevalence of general obesity (body mass index) among coronary heart disease males patients was found to be, (overweight, 37.6%), (obese class1, 19.5%), (obese class2, 10.5%), and (obese class3, 0.8%). On the other hand the prevalence of general obesity (body mass index) among females patients was found to be, (overweight,46.2%), (12% obese class1), (7.7%, obese class2), and (2.6%, obese class3).High Waist circumference was observed among females patients, 7.7% had waist circumference ranges between 80 to 87.9 cm,87.2% had waist circumference equal 88 cm or more and 5.1% had normal waist circumference (less than 80cm).Regarding waist circumference among males,26.3% of male patients had normal waist circumference (less than 94cm), 20.3% their waist circumferences range between 94 to <102 cm, and 53.4% had waist circumference equal or more than 102cm. Concerning waist- to height ratio, it was equal to or more than 0.5 among patients males and females (97%), (96.6%) respectively. Significant correlation was found between anthropometric indices and some of food frequency items, particularly white bread lentils, tea and lamb meat. Also Strong correlation was observed between anthropometric indices and hypercholesterolemia in male's patients.* ***Conclusion:*** *Anthropometric measurement should be used as screening tool to identify at risk of coronary heart disease. An unhealthy diet contributes to develop coronary heart disease.*

Keywords: coronary heart disease, body mass index, obesity, waist circumference, waist-height ratio.

1. Introduction

Coronary heart disease (CHD) is the leading cause of death world-wide (1). Although men have higher rates than women at all ages, and coronary disease occurs up to 10 years later in women (2), CHD is a major cause of death for both sexes: the World Health Organization estimates that 3.8 million men and 3.4 million women around the world die from it each year (3).

The cause of heart disease is multi-factorial, which cannot be explained by a single factor. Though Lifestyles (such as dietary factors, physical inactivity and cigarette smoking), socio-economic status and hormonal factors all could contribute to the development of heart disease obesity is claimed as one of the most important predictors, it itself is also governed by a number of factors. Overweight and obesity are associated with increase in the risk of CHD, stroke, and all-cause mortality (4).

Obesity, i.e. excess body fat, is a growing health problem in most developed and some developing countries. It is a very important risk factor for cardiovascular disease as well as type 2 diabetes mellitus, hypertension, osteoarthritis, fatty liver, infertility and other problems collectively named metabolic syndrome. Different methods exist for clinical evaluation of obesity. The body mass index (BMI), waist circumference (WC), and (waist/hip ratio), enables health teams to evaluate obesity and fat distribution. As central fat distribution is considered more atherogenic than peripheral obesity, much attention has been focused on methods that can evaluate central obesity. (5)

Visceral fat is more metabolically active than subcutaneous fat and is closely correlated with insulin resistance. Waist circumference (abdominal girth) a measure of both subcutaneous and visceral fat is easily measured and is often used as a measure of visceral fat in epidemiologic studies (6).

The Framingham study has become synonymous with the risk factors concept which identified that lifestyle behaviors, such as tobacco smoking, high dietary fat and caloric intake, physical inactivity, stress, excess alcohol intake and obesity contribute to the development of coronary heart disease (7). These risk factors are known as modifiable risk factors. Unmodifiable risk factors include family history of CHD, personal history of CHD, age, and gender. The assessment and correction of modifiable risk factors through lifestyle changes poses a great challenge to health care professionals who also have an important role to play in the diagnosis and prevention of coronary heart disease.

Although presentations of ischemic heart disease such as myocardial infarction and angina are relatively uncommon in most parts of Africa, heart failure is often seen(8). The World Health Organization has reported that the number of disability adjusted life years lost to cardiovascular diseases and their related risk factors in sub-Saharan Africa rose from 5.3 million for men and 6.3 million for women in 1990 to 6.5 million and 6.9 million in 2000, and could rise to 8.1 million and 7.9 million in 2010(9).

The usual risk factors of obesity, smoking, heavy drinking, physical inactivity, and inappropriate diet are all relevant in

Africa. People often have multiple risk factors, as shown in a recent publication from South Africa which reported that 32.1% of men and 18.9%of women over 30 had a 20% or higher likelihood of developing cardiovascular disease in the next 10 years (10).

A lot of prospective and prevalence studies in the West demonstrated the relationship among adiposity, body fat distribution, cardiovascular risk factors (such as blood pressure serum lipid, diabetes mellitus and smoking) and mortality from coronary heart disease (CHD). Many of them have suggested that obesity; especially abdominal obesity may have higher predictive value for CHD and its risk factors (11).

Little is known about the association between obesity and cardiovascular diseases in Africa) (6).Policymakers, donors, and researchers hesitate to draw attention to obesity. Show that more and more Africans are becoming overweight or obese, and that this trend is not limited to the affluent. In Egypt, 70 percent of women and 48 percent of men are overweight or obese. In Morocco 40 percent of the population was overweight in 2004; in Kenya, 12 percent (12).

An empirical study conducted in Senegal and South Africa examined the association between obesity and chronic diseases. The results revealed that obese respondents are more likely to face the risks of heart diseases in South Africa and of heart diseases and asthma in Senegal than their leaner counterparts))(13).

Coronary heart disease (CHD) is the single most common cause of death among Middle-aged individuals around the world.
Obesity considered from the main risk factor s of coronary heart disease. As general and central fat distribution is considered more atherogenic than peripheral obesity, (5)

In Sudan due to lifestyle changes, new introduction of fast food nutritional transition of foreign restaurants which increase fast food delivery, which contribute to coronary heart disease incidences, as it contains more saturated fat, cholesterol and carbohydrates. Increased abdominal adiposity is clearly associated with increased risk for CVD and premature death (14).

At any rate, General and central obesity have received much attention in health risk assessment of excess body weight, but there is a gap in the Sudanese literature concerning this area. Few studies highlighting the relationship between obesity and coronary heart disease and their risk factors in Sudan (8).This drew the researcher's attention to establish a relationship between total fat, regional distribution of fat and coronary heart diseases.

The objectives of this study is to Identify relationship of selected anthropometric indices to coronary heart disease among patients attend Sudan heart center in Khartoum state.

Permission for collecting and using of data and results of the questionnaire was obtained from the hospital administration and from the respondents.

2. Material & Methods

The subjects in the present study are adult CHD patients of males and females above the age of 20 attending Sudan heart center. The study used three methods to obtain data and information. The first method was a questionnaire, designed furnish recall information on demographic and socio-economic characteristics of the patients. The second method involved the assessment of patient's bodies including weight and height to calculate BMI using a mathematical formula based on a person's height and weight which is equal to weight in kilograms divided by height in meters squared (BMI=Wt Kg/ Ht/m²)(3).

Waist circumference, the tape was inserted and passed around the midway point between the iliac crest and the lower rib, until reaching satisfactory position**.** The waist circumferences cut off points are: ≥80 for females and ≥94 for males. Waist-height ratio is calculated by dividing the waist size by the height, values of ≥0.5 was adopted as cut-off point. These Anthropometrics values were used to determine the extent of central obesity. (6). The third method was about food frequency sheet designed to determine the frequency consumption of different food items of the patients.

3. Results

The present studies were revealed significant results on the relationships between obesity, diet and coronary heart disease. Fifty nine percent of the patients females between the age group of 41to 60 years, (15.4%) were in the age group range between 20-40 years, and (25%) were equal or more than 61 years. As for patients males (42.1%) of them were between age group of 41-60 years, 9% were between age group of 20-40 years and (48.9%) were more than 61years old. Regarding education level the results demonstrated that 23.2% had khalwa education, 28.4 had primary education, 28.8 had secondary education and 16.8 had university or post graduate degrees education.

Table 1: correlation between anthropometric indices and food frequency items among males and females:

Male						
	BMI		WHtR		WC	
Variables	R	P	R	P	R	P
Rice	-.178*	.040	-.018	.839	-.041	.639
Lentils	.149	.086	-.185*	.033	.167	.055
Lamb meat	.158	.069	-.193*	.026	.212*	.014
Raw vegetables	.031	.722	.039	.654	.213*	.014
Tea	-.087	.322	.225*	.009	-.097	.266
Soft drinks	.121	.164	-.015	.864	.205*	.018
Female						
	BMI		WHtR		WC	
Variables	R	P	R	P	R	P
White bread	.686-.038		.195*	.036	-.139	.136
Rice	.161	.083	.229*	.013	-.190*	.041
Lentils	.224*	.015	-.020	.831	.125	.179
Egg	.192*	.038	-.017	.853	.024	.795
Raw vegetables	-.115	.216	.220*	.017	-.174	.063
Fresh Juices	-.183*	.048	.052	.575	-.036	.704

** Correlation is significant at 0.01 levels*/correlation is significant at 0.05 level

3.1 Frequency consumption of different food items among the patients:

It was observed that Foods that consumed daily were white Bread (88.8%), kissra (33.6%), milk (72%), yoghurt (43.6%), tea (86.4%), broad bean (58%), egg (30.8%), beef meat (50%), vegetable stew (66.8%), fresh vegetables (73.6%), fruit (32%), and juices (36.8%). Chicken (24.8%) was consumed twice/week. Rice (31.2%) and lentil (35.2%) were consumed once/ week. Fish was consumed either once (16.4%) or twice a month (17.2%). The present study also revealed that some foods were never consumed by the participants such as, Brown bread (86.4%), lamb meat (43.6%), cheese (31.2%), coffee (40.4%), sweets (44%), and fizzy drinks (44.8%). As shown in table (1) Significant correlation was found between anthropometric indices and the frequency of some food Items among patient's males and females.

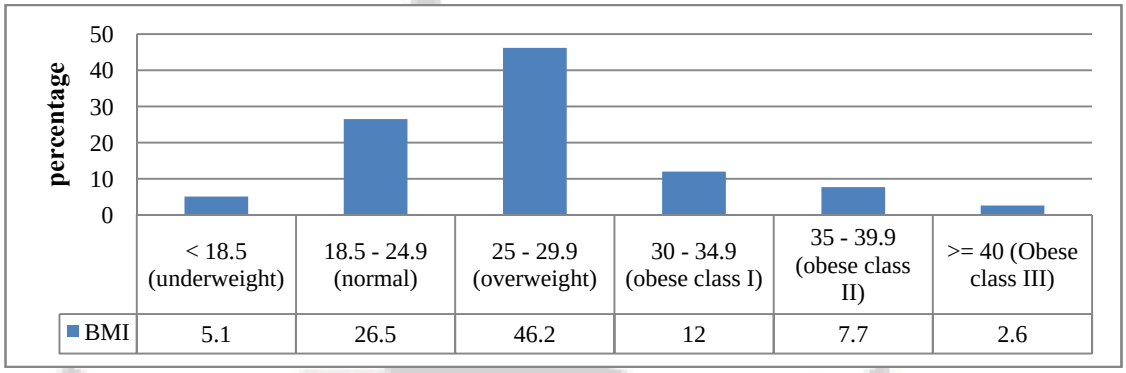


Figure 1: Distribution BMI among females

As seen in fig (1) 26.5% of females patients had normal weight,46.2% were overweight ,12% were obese class1, 7.7% were obese class2, 2.6% had morbid obesity, only 5.1% of the participants were under weight.

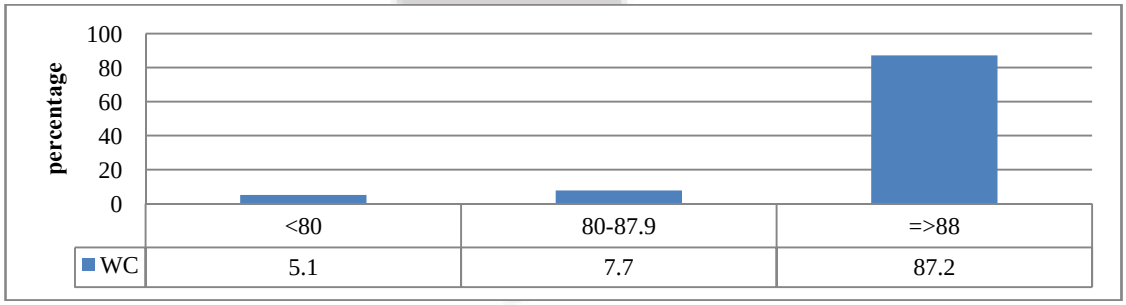
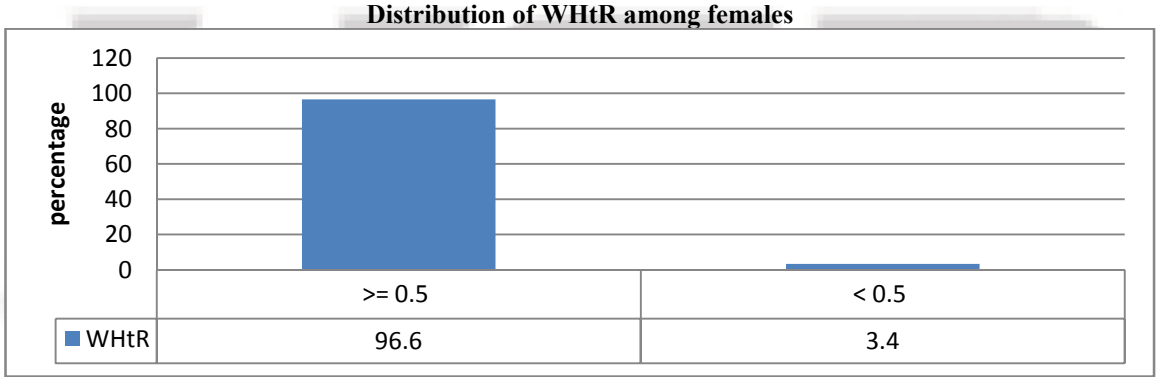


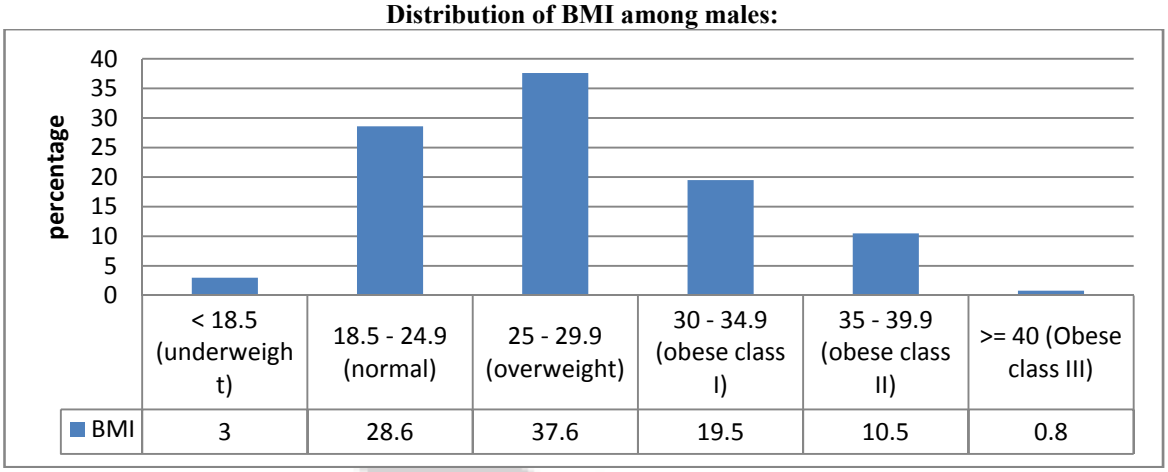
Figure 2: Distribution of WC among females

As seen in fig (2) 5.1% of the females patients had normal waist circumference (less than 80cm), 7.7% had waist circumference ranges between 80 to 87.9cm, and 87.2% had waist circumference more or equal 88 cm .



As seen in fig (4.1.15) the results reveal that almost all the females (96.6%) had a high waist- height ratio (equal or more than 0.5) and only (3.4%) had normal waist to height ratio (lee than 0.5).

Distribution of BMI among males:



In fig (4.1.16) 28.6% of the patients enjoy healthy normal weigh. 37.6% overweight, 19.5% were obese class1, 10.5% were obese class2, 0.8% had morbid obesity, only 3% of them were under weight.

Distribution of waist circumferences among males:

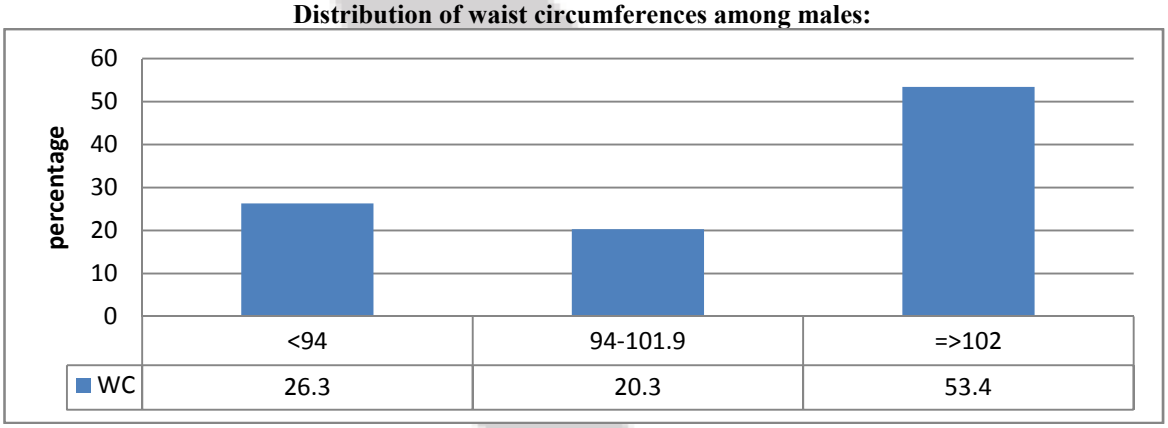


Fig 4 shows that 26.3% of males patients had normal waist circumference (less than 94cm), 20.3% their waist circumferences range between 94 to <102 cm and 53.4% were at waist circumference equal or more than 102cm.

Distribution of WHtR among males

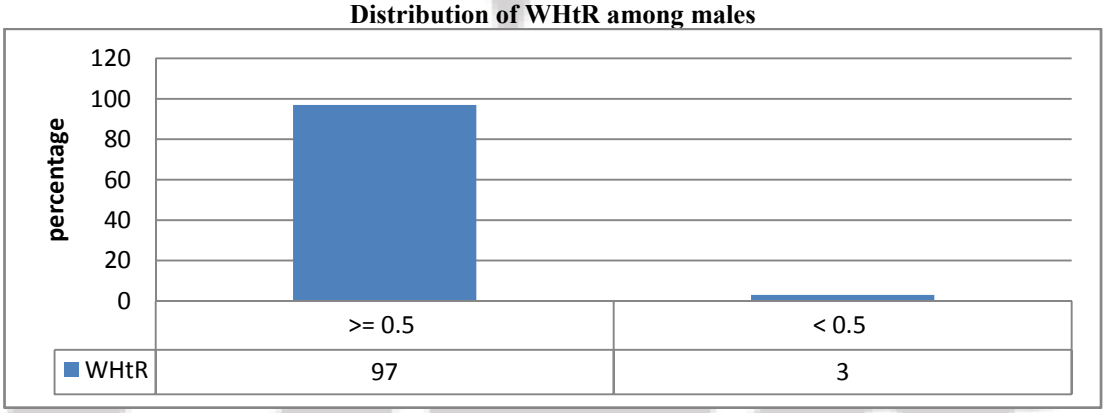


Fig (5) demonstrates that 97% had waist to height ratio more than the normal (equal to or more than 0.5) and only 3% were at normal waist to height ratio (less than 0.5).

Table 2:.Disease distribution among patients

	Yes		No		Total	
Variables	F	%	F	%	F	%
Diabetes	107	42.8%	143	57.2%	250	100.0%
Hypertension	152	60.8%	98	39.2%	250	100.0%
Hypercholesterolemia	92	36.8%	158	63.2%	250	100.0%

Table (2) demonstrates that (60.8%) of the patients had hypertension 42.8% had diabetes type2 and 36.8% had hypercholesterolemia.

Table 3: Correlation between risk factor diseases and anthropometric indices in males and females

Variables	Hypercholesterolemia		hypertension		Diabetes	
	R	P	R	P	R	P
BMI	.096	.271	-.092	.295	-.126	.150
WHtR	-.210*	.015	.045	.606	.146	.095
WC	.192*	.027	.068	.437	-.067	.440
Variables	Hypercholestremia		Hypertension		Diabetes	
	R	P	R	P	R	P
BMI	-.011	.907	-.068	.464	-.047	.615
WHtR	-.074	.426	.130	.163	-.018	.849
WC	.146	.117	-.067	.471	.071	.447

** Correlation is significant at 0.01 levels*/correlation is significant at 0.05 level

Hypercholesterolemia among males patients was significantly correlated with WHtR (R= -0.0210, P= 0.015) and WC (R= 0.192, P=0.027). On the other hand no significant correlation was observed between the participant's disease and the other anthropometric indices among females.

4. Discussion

4.1 Age and Coronary Heart Disease

The study revealed that more than half of the patients females between the age group of 41-60 years, while (42.1%) of males were between the age group of 41-60 years. Older age, Genetic or lifestyle factors cause plaque to build up in the arteries as individual age. By the time at the middle-aged or older, enough plaque has built up to cause signs or symptoms. Studies had shown that, In men, the risk for CHD increases after age 45. In women, the risk for CHD increases after age 55. Women at risk of coronary heart disease are at the menopausal period (≥55 years) As individual get older, the risk for CHD and heart attack rises. This is due in part to the slow buildup of plaque inside your heart arteries, which can start during childhood. Before age 55, women have a lower risk for CHD than men. Estrogen provides women with some protection against CHD before menopause. After age 55, however, the risk of CHD increases in both women and men. Some women may have gone through early menopause, either naturally or because they had the ovaries removed. If so, this twice as likely to develop CHD as women of the same age who aren't yet menopausal. Another reason why women are at increased risk for CHD after age 55 is that middle age is when you tend to develop other CHD risk factors. (15)(16).Regarding educational level, almost half of the participants had khalwa or primary education. previous Studies had shown that uneducated and less educated people have a higher prevalence of CHD (17).

4.2 Anthropometric indices and Coronary Heart Disease

As revealed by the present study overweight and obesity are presented 62.2 % among CHD females patient, 94.9% of the females had high waist circumference and 96.6% of them had high waist-height ratio. The findings confirm that a high BMI is associated with CHD and is a risk factor of developing the disease(18),moreover abdominal fat predicts a higher risk for CHD as waist circumference provides more information on risk assessment than BMI alone (1).

Regarding patients males 68.4% of them are overweight and obese, while 73.7% of the patient's males had waist circumference more than the normal. These findings lead to speculation that waist circumference may provide a useful index reflecting central obesity. However, more recently, waist circumference alone has been suggested as being more practical measure of intra-abdominal fat mass and total body fat. (19)Almost all of the patients males had a high waist-height ratio (97. %). In line with the literature waist to height ratio is advocated as the best predictor of intra- abdominal fat and is closely connected with cardiovascular risk factors, (20) (21).Waist-to /height ratio gives results that are associated with the distribution of the adipose tissue in the body and this indicates that men have most of their fat deposited in the abdomen area (apple shape) which is a strong risk factor of coronary heart disease.

4.3 Food habits and coronary Heart Disease

Significant correlation was found between white bread and WHtR (R= .195, P=0.036) The consumption of bread among the Sudanese in general is extremely high, yet their food habits do not usually distinguish between brown bread and white bread in terms of consumption; therefore, they are not fully aware of the risks that are likely to be entailed by consuming the so called refined white bread. Evidence from epidemiological studies revealed that brown bread is associated with a lower risk of obesity (16). Raw vegetable was significantly correlated with WC (R= 0.213, P= 0.014 and WHtR (R= 0.220, P= 0.017) In line with the literature an increase in the consumption of fresh fruits and vegetables to 400g a day has been advocated by national and international health professional groups to reduce the incidence of cancer and cardiovascular disease, the fibers in these foods help in fat excretion and lower obesity levels. Fish was rarely consumed by the participants either twice or once a month. Fish contain unsaturated fatty acids, which, when substituted for saturated fatty acids such as those in meat, may lower cholesterol level in the body. Omega-3 fatty acids are a type of unsaturated fatty acid that may reduce inflammation throughout the body. (26) lentils was also significantly correlated with, WHtR (R= -0.185, P= 0.033) and BMI (R= 0.224, P= 0.015). Lentils contain abundant amounts of protein, carbohydrates and fiber but are usually cooked as soup, half of the fat, or 0.5 g, in a serving of lentil soup is saturated fat which increase level of low density lipoprotein levels and this may lead to intra-abdominal fat (22).

Lamb meat was significantly correlated with WHtR (R= -0.193, P= 0.026) and WC (R= 0.212, P= 0.014).Although meats are rich protein sources but also rich in saturated fat which will influence body weight level over time leading to obesity and abdominal fat. Significant correlation was found between egg consumption and BMI (R= 0.192, P= 0.038). Eggs are rich in dietary cholesterol but are also a source of omega-3fatty acid (23). A typical Sudanese meal and the food habits associated with it in general, are hazardous as vegetables stews contain components ranging from oils (used daily and with excess), spices, sauces and meat, thus showing a strong potential of chronic disease risk factors. Fish consumption is associated with the reduction of coronary heart disease risk 24). Strong correlation was found between tea consumption and WHtR (R= 0.225, P= 0.009). Tea contains nutrients that may boost heart health and combat various diseases. It may have properties to reverse heart disease. Significant correlation was also found between soft drinks and WC (R= 0.205, P= 0.018). Soft drinks are a source of high calories and contribute to incidences of obesity (25).

4.4 Disease associated with Coronary Heart Diseases

Hypercholesterolemia was significantly correlated with WHtR among patients males (R= -0. 210, P= 0.015) and WC (R= 0.192, P=0.027). On the other hand no significant correlation was observed between diseases and anthropometric indices among female's patients. In a routine health examination study, it was found that waist to height ratio might be a better predictor of cardiovascular risk factors.

5. Conclusion and Recommendation

The result of the present study concluded that high levels of BMI, waist circumference and waist-height ratio were prevalent among coronary heart disease patients. Moreover, a high proportion of the patients were consume foods contains refined carbohydrates, and foods contain saturated fats that were correlated to High anthropometric measures. The study recommended that anthropometric measurement should be used as screening tool to identify at risk obesity-related illness due to total fat and abdominal fat distribution. Public health agencies need to take an active role in the prevention and management of CHD risk factors by increasing public awareness of the health risks associated with total fat and abdominal fat distribution and the importance of self-monitoring BMI and waist circumference. Further researches should be done to investigate the relationship between obesity and other cardiovascular disease among Sudanese population.

References

[1] Lofgren, 1. Herron. K.; Zern, T.; West, K.; Patalay. M.; Shachter. N.S., Koo. S.l. and Fernandez, M.L. (2004). Waist Circumference is a Better Predictor than Body Mass Index of Coronary Heart Disease Risk in Overweight Premenopausal Women. *Journal of Nutrition,* 134, 1071-1076.

[2] Mack, J. and Mensah, G. (2004) *atlas of heart disease and stroke,* Geneva: WHO

[3] World health organization (2007).health topics;obesityavailablefrom ;http;//www.who.int/topic/obesity/en/.accessedJanuary 4,2008

[4] Calle, E.E., Thun, M.J.; Petrelli, J.M.; Rodriguez, C., and Heath, C.W. (1999). Body-mass index and mortality in a prospective cohort of U.S. adults. *New England Journalof Medicine,* 341, 1097-1105

[5] M. Siavash, M.; Sadeghi, F.; Salarifar, M.; Amini, and F. Shojaee-Moradie, comparison of body mass index and waist/ height ratio in predicting definite coronary artery Disease. *Ann NutrMetab*2008;53: 162-166.

[6] .John H. Page, Kathryn M.; Rexrode, Frank Hu, Christine M.; Albert, Caludia U. Chae, and Jo Ann E. Manson waist – Height Ratio as a predictor of coronary Heart disease Among women. *Epidemplogy* 2009; 20: 361-366.

[7] Dawber, T. R.; Meadows.; G. F., and Moore, F. E. (1951). Epidemiological Approaches to Heart Disease: The Framingham Study. *American Journal ofPublic Health.* Vol.41, pp. 279-286.

[8] Fontbonne A, Thibult N., Eschwege E. and Ducimetiere P. Body fat distribution and coronary heart disease mortality in subjects with impaired glucose tolerance or diabetes mellitus: the Paris Prospective Study, a 15-year follow-up. *Diabetologia 1992*

[9] Bradshaw, D. (2005).What do we know about the burden of cardiovascular disease in South Africa? *Cardiovasc. J. South Afr;* 16: 140-1.

[10] Asfaw, A. (2006). The Effects of Obesity on Doctor-Diagnosed Chronic Diseases in Africa: Empirical Results from Senegal and South Africa. *Journal of Public Health Policy* 27 (3): 250–264.

[11] World health organization2007.health topics; obesity available from ;http;// www.who.int/topic/ obesity/en/. accessed January 4,2008.

[12] WHO,(2002),Globalization diet and Non communicable disease. WHO Library Cataloguing-in-Publication DataISBN 92 4 159041 6 (NLM classification: QT 235).

[13] Bradshaw, D. (2005).What do we know about the burden of cardiovascular disease in South Africa? *Cardiovasc. J. South Afr;* 16: 140-1.

[14] *Ahmad, NM ,Hassan DA, El Hussein ,AM, and NH AbdulhadiSudan Journal of Medical Sciences*> 5, No 4 (2011)

[15] Rexrtode, K.M.; Hennekens, C.H. and Willet, W.C. (1997).Prospective study of body mass index ,weight change and stroke in women *JAMA* 277,1539-1545[Abstract]

[16] Salim.S.G.,(2007) association between anthropometric indices and Dyslipidemia among Sudanese women in Khartoum state.

[17] Education status, coronary heart disease, and coronary risk factor prevalence in a rural population of India. *BMJ* 1994 Nov 19; 309(6965):1332-6.

[18] Calle, E.E., Thun, M.J.; Petrelli, J.M.; Rodriguez, C., and Heath, C.W. (1999). Body-mass index and mortality in a prospective cohort of U.S. adults. *New England Journalof Medicine,* 341, 1097-1105

[19] Pouliot M-C, Despre´s J-P, and Lemieux S. Waist circumference and abdominal sagittal diameter: best simple anthropometric indexes of abdominal visceral adipose tissue accumulation and related cardiovascular risk in men and women. *Am J Cardiol* 1994; 73: 460–8.

[20] Ashwell, M.; Cole, T.J. and Dixon, AK. (1985). Obesity: new insight into the anthropometric classification of fat distribution shown by computed Tomography. *BMJ;* 290:1692-4.

[21] Hsieh SD, and yoshinaga H. waist/height ratio as a simple and useful predictor of coronary heart disease risk factors in women. *Internet Med* 1995; 34 (12): 1147-52-]Full text]

[22] Signh, R.B.; Rastogi, S.S. and Niaz, M.A. (1992). Effect of fat –modified diet and fruit and vegetables –enriched diets on blood lipids in the Indian heart study .*Am J Cardiol* 1992;70:869-874

[23] Levy, Y.; Maor, I. and Presser, D. (1996). Consumption of eggs with meals increase the susceptibility of human plasma and low –density lipoprotein to lipid per oxidation .*Ann NutrMetab*;; 40:243-45.

[24] WHO. World health organization (2003) Diet, Nutrition and Prevention of Chronic Diseases. WHO Technical report Series 916 report of Joint FAO/HO Expert Consultation.

[25] Trapini, and Jillian B., "Student perceptions of the shift from soft drink vending machines to milk vending machines in schools" (2007) Masters Theses and Doctoral Dissertations. Paper 7Display Settings:

[26] Galli C[1], Risé P.(2009);Fish consumption, omega 3 fatty acids and cardiovascular disease. The science and the clinical trials.Nutr Health. 2009; 20(1):11-20.