

## Coronary Heart Diseases in Karbala Population Related to Central Obesity and Other Coexisting Risk Factors.

Omran, A.\*

Hussein, K. A. \*\*

\* University of Karbala, College of Medicine

\*\* University of Karbala, College of Science, Department of Chemistry

### Abstract

**Background:** central abdominal obesity is still considered to be important independent risk factor for CHD in addition to other risk factors.

**Objective:** To determine the relationship between CHD and central abdominal obesity measured by waist circumference (w.c) and coexisting risk factor including measurement of serum cholesterol , sugar , uric acid .

**Design:** Prospective study.

**Methods:** One hundred patients participated in this study from coronary care unite (CCU) admitted in AL Hussin hospital in Karbala governorate during period 1-12-2004 to 1-6-2005 .All patients were newly diagnosed as having CHD by selected criteria in relation to central abdominal obesity , body mass index (BMI) , age , sex , fat consumption , ECG , smoking , physical activity , alcohol , fruit eating , Diabetes mellitus , hypertension .

**Result:** Mean age (56  $\pm$  12) year males 76% ,females 24%, consumed saturated fat 90 % , cigarette smokers 63%, hypertension 20%, D.M 18%, alcoholics 4% , 59% got mixed anxiety and depression disorder, consumed fruit 23%, physical exercise 11%.

**Conclusion:** There is direct relation between CHD and central abdominal obesity in addition to other coexisting risk factors The life style of Karbala people (stress , smoking , physical activity , diet ) were considered as having important impact on increasing prevalence of CHD .

The study showed the impact of socio-economic, psychological, political, education, factors in the prevalence of coronary heart diseases (ACHD) in Iraq. The research has discovered the great defects in the health education programs directed to Iraqi population about (CHD) and the importance of changing life style among Karbala people as they are a picture of Iraqi population. The study is considered as important message to the health authorities in the ministry of health to change style of health education programs in Iraq for limiting the prevalence of risk factors leading to CHD.

**Key words:** coronary heart diseases, BMI, cholesterol, glucose, smoking, and fat.

### Introduction

In obese individuals, two distinct phenotypes are apparent: generalized obesity and central abdominal obesity. Abdominal obesity is recognized by measuring waist circumference. It

is a strong indicator for the development of coronary heart diseases (CHD)<sup>(1)</sup>.

These phenotypes are associated with metabolic syndrome (cluster of associated conditions: central obesity, hypertension, dyslipidemia, and diabetes mellitus (DM type II). Central obesity believed to be better predictor for

CHD. The distribution of fat rather than body mass index (BMI) <sup>(2)</sup> is strong marker of the risk for CHD <sup>(3)</sup>. There is clear interaction between these two variables. Waist circumference (WC) measures visceral fat content that considered important risk factor. There is evidence that coupled WC and BMI predict health risk better than BMI alone <sup>(4,5,6)</sup> as difficulties in self measure BMI <sup>(7,8,9)</sup>. In summery, obesity-related risk is explained by WC but not BMI <sup>(9)</sup>.

Very interestingly, epicardial fat has the same characteristic of visceral fat that has directly local effect into cardiac muscle. Visceral fat content differ from subcutaneous fat <sup>(11)</sup>. The weight alone is not the issue because metabolic syndrome <sup>(10)</sup> occurs in people who are not overweight but have substantial visceral fat <sup>(11, 12 13)</sup>. WC is an independent predictor of health risk <sup>(14)</sup>.

In a recent study, WC, BMI and hip circumference were significantly associated with cardiovascular risk, independent of other cardiovascular risk factors 36. However, WC appears to be a better predictor for cardiovascular risk than other parameters.

Insulin resistance in patients with type 2 Diabetes mellitus (D.M) or in patients with poorly controlled type 1 D.M is accompanied by hyper insulinemia which may elevate circulating insulin related glyated proteins and various local growth factors can stimulate the proliferation of fibro muscular component of atherosclerotic plaque<sup>31</sup>.

Smoking extents its atherogenic effects by inducing catecholamines release that may elevate fibrinogen level, activate monocytes, and increase platelets reactivity. This explains sudden cardiac death and CHD <sup>(31)</sup>. There is a substantial body of evidence, which strongly suggest that one synergetic interaction effect on CHD risk involves smoking and elevated lipids <sup>(16)</sup>.cigarette smokers are more likely than non smokers to develop large- vessel atherosclerosis as well as small vessel disease. Approximately 90% of peripheral vascular diseases in the non- diabetic population can be attributed to cigarette smoking as can 50% of aortic aneurysms. In contrast, 20

to 30% of coronary artery disease and -10% of occlusive cerebrovascular disease are caused by cigarette smoking .55

Considerable evidences indicate that physical activity (three times or more per week) is valuable for weight control, modifying lipids, and improving carbohydrates tolerance <sup>(17, 18, 19)</sup>. Physically active people have less risk of CHD than sedentary ones <sup>(20, 21)</sup>.

Prolong low intensity physical activity seems to induce greater change than short high intensity exercise <sup>(22, 23)</sup>, apparently through changes in enzymatic activity associated with lipoprotein metabolism.<sup>(56)</sup>

Alcohol (ethanol) decreases myocardial contractility and causes peripheral vasodilation, with a resulting mild decrease in blood pressure and a compensatory increase in cardiac output . The consumption of three or more drinks per day results in a dose- dependent increase in blood pressure, which returns to normal within weeks of abstinence. Chronic intake of modest doses of alcohol can have some beneficial effects. A maximum of one to two drinks per day may decrease the risk for C.V. death, perhaps through an increase in HDL-C or changes in clotting mechanisms. <sup>(31)</sup>

Consumption of fruit seems to offer significant protection against CHD of a particular interest, a 10% reduction in the coronary risk for every one piece of fruit consumed per day <sup>(3)</sup>. Another studies reported that increased consumption of fruits and vegetables could reduce cardio vascular deaths from 22 %. to 6% <sup>(61)</sup>

Consumption of 2 or more servings per week associated with about 70%reduction in relative risk. This translates to a considerable prevention of coronary events, carries a large public health potential, and emphasizes the importance of following dietary recommendations as a whole. However, several investigators reported that the antioxidant, potassium, fiber, and folate content of fruits and vegetables could at least partially explain their protective effect of CHD.59.60.

In recent years , it has been emphasized that stress may play a key role in the genesis of

heart dysfunction and also serves to aggravate or complicate existing heart disease. The consequences may manifest themselves cardiac symptoms such as palpitations, dyspnea, angina pectoris, myocardial infarction, or sudden death.<sup>52</sup> Although the overall mechanisms by which this occurs are somewhat obscure and incompletely understood, catecholamines are clearly implicated. In fact, over the last three decades catecholamines have been the target for research in psychological, psychiatric, psychosocial and pathophysiological overtones.<sup>32</sup> However, various reports now suggest that peptides are found in noradrenergic nerve endings. They modulate the release of norepinephrine (NE) by acting on a synaptic level. Neuropeptide Y (NPY) becomes suspect in coronary vasospasm that occurs without any perceptible enhancement in circulating, NE, Angiotensin II or other classic vasoconstrictors. There is no doubt that stressful conditions for a prolonged period of time are usually associated with high levels of circulating catecholamines and heart disease.<sup>(62, 64, 65)</sup>

Serum cholesterol and low-density lipoprotein (LDL) concentrations are associated strongly with dietary intake of total fat, saturated fatty acid and cholesterol (31). Saturated fat intake is associated with increased thrombosis.<sup>(31)</sup>

Since fifty years ago, modestly higher serum uric acid concentrations have been reported in patients with C.H.D than in controls and there have been suggestions that measurement of serum uric acid can enhance the prediction of C.H.D. <sup>48</sup>. Elevated serum uric acid is highly predictive of mortality in patients with heart failure or coronary artery disease and of cardiovascular events in patients with diabetes. Although the mechanism(s) by which uric acid may play a pathogenetic role in cardiovascular disease is unclear, hyperuricemia is associated with deleterious effects on endothelial dysfunction, oxidative metabolism, platelet adhesiveness, and aggregation<sup>(46)</sup>.

## **Patients & Methods**

One hundred Iraqi patients were participated in this study from coronary care unit admitted in Al-Hussein hospital in Karbala governorate during the period from 1-12-2004 till 1-6-2005. All patients were newly diagnosed as having CHD. The selected criteria for cardiac patients are, the diagnosis of CHD (acute MI or unstable angina with recent ECG changes, stable angina was excluded from the analysis) was defined by two features; electrocardiograph changes; compatible clinical symptoms (specific diagnostic enzyme elevations of SGOT, CPK, LDH, troponin T or I not available in Hussein Hospital). All participants were informed about the aims of the study and agreed to give request information. The study includes mean  $\pm$  standard deviation of the age, sex, W.C, BMI, D.M, Consumed fat, ECG. The psychological symptoms are mixed between anxiety and depression (co-morbidity) including, Apprehension, irritability, fear of impending disaster, palpitation, headache, loss of interest, suicidal thinking, disturb sleep. Current smokers were defined as those who smoke at least three cigarettes per day. Physical activity was defined as any type of non occupational physical exercise, at least 2-3 times / week during past year.

Current alcoholics were defined as those who consumed alcohol once/ week past year. Consumed fruits used in questionnaire is more than 3 times / week. Blood samples were collected from each patient immediately after reaching the CCU. (at any time) Serum was separated by centrifugation at 3000 cycle per 10 minutes and analyzed for cholesterol, glucose, and uric acid.

Blood pressure: both diastolic and systolic, was measured on the right arm using mercuric blood pressure apparatus with the participant seated and following a 5 min rest. (normal BP  $\leq$  140/90, hypertension  $>$  140/90)<sup>(70)</sup>

Anthropometrics: Measurement of WC and calculation of BMI were done according to standard techniques and equipment<sup>(24, 25)</sup>. WC was measured at the midway point between the

lowest rib and the iliac crest<sup>(24, 25)</sup>. BMI is weight / height<sup>2</sup>, Weight was measured in kilograms and height was measured in centimeters<sup>(24)</sup>. (Normal BMI 18.5-24.9 Kg /m2)<sup>(71)</sup>

Total cholesterol: Total cholesterol was determined by enzymatic methods using kit obtained from Biomareux® Company-France<sup>(26)</sup>. (Normal serum cholesterol 5.2/L

Random Blood Sugar Estimation: Serum glucose was determined enzymatically using kits from Randox® according to the enzymatic Colorimetric test (glucose oxidase method). (Normal FBS 3.6-6.1MM/L-random blood sugar ≤7.8MM/L)<sup>(73)</sup>

Principle of Uric Acid Estimation: Uric acid is oxidized by uricase enzyme to allantoin and hydrogen peroxide as described in the Randox® kit. (Normal serum Uric Acid 180-420 Micro mol)<sup>(74)</sup>

Statistical Analysis: Descriptive statistics (mean ± SD) were used to evaluate the characteristics of the 100 patients. Correlation coefficients were used to determine significant relations of WC and BMI with the measured variables. Unpaired Student's t test was used to compare subjects with lower and higher BMI and WC. A p-value < 0.05, is considered statistically significant.

## Results

The results presented in Table (1) showed that AMI is aged related disease and the mean ± standard deviation of the age were 56 ± 12 (males and females were (55.6 ± 12.1) and (57 ± 10.1) respectively). Most patients were male (76%) while females revealed only (24%) of cases. Sixty three patients were cigarette smokers and thirty seven were not smokers. Four males patients were consuming alcohol. Using the International Physical Activity Questionnaire<sup>(27)</sup>, the majority of participants was considered as sedentary life style that only 11% of males patients were doing exercises while non of females showed any interest in exercise. Ninety percent of patients consumed saturated fat in their normal diet and only ten used unsaturated fat (liquid) in their diet. Seventy-seven of the patients consumed fruits only one a week or less and only 23% who consumed fruits three times a week or more. Eighteen percent of patients were diabetic and most of them were in female group even its small part of the study. Twenty percent of patients were hypertensive during their reaching to the CCU. General psychological symptoms of mixed anxiety and depression were taken (co morbidity) of the patients in table1, 59patients got co-morbid symptoms. (Apprehension, palpitation, suicidal thinking, fatigability, weight change). When ECG of the patients classified, (table 1) the following results obtained (Anterior MI (A) =61%, Inferior MI (F) =36, and double MI (DAF) =3 %).

Table-1- Descriptive characteristics of patients in the study sample

Parameter	Subclasses of Parameter	Number		
		Male	Female	Total
Sex		76	24	
Age		55.6 ± 12.1	57.3±10.1	
Type of consumed fat	Saturated	70	20	(N=90)
	unsaturated	6	4	(N=10)
Diabetes	Diabetic	8	10	(N=18)
	Non diabetic	68	14	(N=82)
Blood Pressure	Low	3	2	(N=5)
	Normal	61	14	(N=75)
	High	12	8	(N=20)

ECG	A	48	13	(N=61)
	F	28	8	(N=36)
	DAF	0	3	(N=3)
Smoking	Smoker	53	10	(N=63)
	Nonsmoker	23	14	(N=37)
Psychological disorders	General symptoms of anxiety and depression	33	8	(N=41)
		43	16	(N=59)
Alcohol	Alcoholic	4	0	(N=4)
	Non-Alcoholic	72	24	(N=96)
Physical Activity	Familiar with exercise	11	0	(N=11)
	Not familiar with exercise	65	24	(N=89)
Frequent Fruit Eating	More than three a week	15	8	(N=23)
	Less than One a week	61	16	(N=77)

Note: low BP – (Hypotension)=systolic BP < 90 evaluation to normal patient BP (72)

Table -2- showed the results serum total cholesterol, random sugar, and uric acid in patients and control groups. Only cholesterol

showed a significant difference between control and patients (p= 0.004898).

Table -2- Serum concentration of some parameters in acute coronary syndrome patients in comparing with healthy control group.

Parameter	Serum Concentration		Unit	Significance (p<0.05)
	Patients	Control		
Random Blood Sugar	7.93 ± 3.50	4.87±2.56	Mmol/L	Not Significant
Cholesterol	5.50 ± 1.34	4.96±1.33	Mmol/L	Significant
Uric acid	327.58±87.96	294.65±95.70	μmol/L	Not Significant

The results of anthropometric values were shown in Table -3- that gave the following results: in female group; 14 out of 24 patients (about 58%) had BMI values more than 25 Kg/M<sup>2</sup> and 19 out of 24 patients (about 79%) had WC values more

than 88cm. In males group; 45 out of 76 patients (about 59%) had BMI values more than 25 Kg/M<sup>2</sup> and 28 out of 76 patients (about 37%) had WC values more than 102cm.

Table -3- Comparison between males and females acute coronary syndrome patients in anthropometric values.

Parameter	Anthropometric values		Unit	Significance (p<0.05)
	Male	Female		
Total Weight	70.9±14.1	66,5±16,01	Kilogram (Kg)	Not Significant
Total Length	1.65±0.09	1.56±0.11	Meter (M)	Significant
Total BMI	26.2±5.1	27.3 ±5.5	Kg/M <sup>2</sup>	Not Significant
In females Patients: BMI>25 Patients: BMI<25		14 10	Kg/M <sup>2</sup>	

In males Patients: BMI>25 Patients: BMI<25	45 31		Kg/M <sup>2</sup>	
Total W.C.	97.4±16.0	99.4±13.9	Centimeter (cm)	Not Significant
In females: Patients: W.C>88 Patients: W.C<88		19 5	Centimeter (cm)	
In males: Patients: W.C>102 Patients: W.C<102	28 48		Centimeter (cm)	

In order to find any correlation between the different measured parameters in AMI patients, Table -4- showed the correlation coefficients (r-values) for comparison between different

parameters in acute MI patients. In general, the results revealed no correlation between the compared parameters except the case between BMI and WC which had already related.

Table -4- Correlation coefficients (r-values) in comparison between different parameters in acute coronary syndrome patients.

Relationship	Correlation Coefficient ( r )
BMI vs. Age	0.17
BMI vs. Uric Acid	0.04
BMI vs. WC	0.67
BMI vs. Cholesterol	0.10
Uric Acid vs. Age	0.01
Uric acid vs. Cholesterol	0.13
Uric acid vs. Age	0.04
Uric acid vs. WC	0.07
WC vs. Cholesterol	0.02
WC vs. Age	0.04
Age vs. Cholesterol	0.06

## Discussion

The importance of the present prospective study is that it is unique in Karbala people that correlate between central obesity and CHD in relation with other coexisting risk factors.

In our study the mean age of CHD was (56 ± 12 year), in comparison with other studies in Europe (60, 68, 69 year) <sup>(76 86 9)</sup> while similar result appeared in study done in same CCU in Hussin hospital in Karbala (mean age 54 year) 66. The results showed that the males were at higher risk than females to be affected by CHD (76% males ,24% females) , Although it is known that in Iraqi people, females numbers are more than males (≥60%) due to the frequent wars and terrorism victims who are mainly men. This reversed result in males and females ratios can

not be explained scientifically because in our work males have risk factors (except smoking, fruit consumed, male gender) less prevalence than females (HT, DM, consuming fat, Psychological distress) and have more prevalence protection factors as physical activity and alcohol consuming. So our possible explanation for this puzzled case is that Iraqi people suffering continuous and chronic stresses including , social , economic, political, panics, wars, Terrorism, problems confirming that no body out of Iraq can easily understand the severity of this stress on Iraqi people for more than 3 decades reaching to the USA-led invasion till now that distributed deeply in the Iraqi life mostly inflict males as they have been facing all types of stresses leading to high prevalence of CHD (76%) . <sup>(52, 62, 64, 65)</sup>

BMI is independent risk factor but it is less practical for assessment of obesity risk than WC (8,9).

Data shows that BMI > 25 Kg/M<sup>2</sup> (females 59% - males 58%) that mean over weight and obesity are more than 50% of Karbala CCU patients, which is considered as an important risk factor predictor for CHD (table -3-).

The results in Table -3- showed that: in females group, 19 out of 24 patients (about 79%) have WC values more than 88cm may be explained by a sedentary life style and multiple pregnancies and fat consuming in Karbala people (most of women were housewives). In male group, 28 out of 76 patients (about 37%) have WC values more than 102cm. These results explained the significance of WC in CHD in CCU of Karbala people compared with the result of other study (26 %) So we can consider high WC as important risk factor in Karbala people (79% females, 37% males) leading to CHD and this result is considered as a message to the people to avoid WC above normal level. This different result in males and females involving BMI (equal ratio in males and females) and W.C indicate W.C was more significant than BMI and proved that the weight is not issue for increasing prevalence of CHD and explained the importance of abdominal fat content as predictor for CHD.

Diabetes mellitus Type II is an important risk factor and it causes dyslipidemia and atherogenic plaque (31). The result of the present work showed that 18% of patients had DM (the ratio in Kingdom of Saudi Arabia is 20%) (30) and it was more common in female than male. Hence, the ratio was approximately equal in Karbala city and Kingdom of Saudi Arabia given the socioeconomic difference in both communities 30.

In our study there were four cases of hyperglycemia without history of DM, hyperglycemia might be associated with impaired micro vascular function after A.M.I, resulting in a larger infarct size and worse functional recovery 50. In non D.M. patients with A.M.I hyperglycemia was a correlate of heart failure and therefore it is an important factor of prognosis 52.

The ratio of hypertensive patients (BP ≥ 140/90) (70) is 20% of our patients. Hypertension is great risk for CHD resulting from genetic and environmental causes. 15 In western countries, the risk of hypertension is higher and may reach 50% of adult population (15). Several studies have confirmed that lowering blood pressure is of significant value in reducing cardiovascular complications associated with untreated hypertension (15). Similar results of (hypertension 20.5 %, DM 16.4 %, mean age 54Y, sex males 72.6 % – females 20.4 %) discussed in study involving 146 patients admitted in same C.C.U of general Hussine hospital (66).

In the present study, there is an interesting result about Karbala people revealed that 90% of patients consumed saturated fat that led to harmful effects on C.V.D. Saturated fat led to dyslipidemia and thrombogenesis (31). This result indicates the poor health education about diet and poor socioeconomic state of the citizens of Karbala city in general. The saturated fat is widely used by Iraqi people because Ministry of the Trade is supplying this type of fat monthly through the distribution of food basket from embargo years (1990-2003) and till now. The used fat during this period is unhealthy and causes increase in the risk of CHD. The longed use of saturated fat (15 year) by this continuous regime is considered as major predictor of hypercholesteremia in Iraqi people leading to CHD. This high percentage (90%) of Karbala people using saturated fat must be considered as red line for authorities in the ministry of health to prevent supplying this type of cooking fat in Iraq.

The study shows significant difference in serum cholesterol level with healthy control group (table -2-). This gives attention to S. cholesterol as important risk factors in Karbala population leading to C.H.D as it may coexist with environment factor, by using saturated fat (90% of population), sedentary life style or due to genetic factor as familial combined hyperlipidemia (F.C.H.L) (28,54).

Approximately 20% of patients develop C.H.D before the age of 60 have F.C.H.L (in our study, mean age 56 +\_ males and 57+\_ females ).

Smoking is probably the most important avoidable cause of atherosclerotic vascular disease. Cessation of a cigarette smoking reduces the risk of second coronary event within 6 to 12 months.<sup>55</sup>. Sixty three percent of patients are smokers (42% of females and 70% of males' patients) that give gloomy pictures about life style in Karbala society leading to harmful impact on CHD that needs attention of primary health care for facing this great problem.

In present study, data show 59% of the patients complains of mixed a psychological symptoms (co-morbidity of anxiety and depression ) due to embargo time , wars , terrorism , poor socioeconomic state (although we expected more than 59% as patients denied psychological history due to social factors). These psychological disorders lead to chronic stress causing an increase of prevalence of CHD most common in males as they have been facing problematic life in Iraq. (76% males, 24% females)

For the analysis of ECG of the patients of the work, sixty one percent had anterior MI commonly involving left coronary artery leading mostly to pump failure and the arrhythmia with high morbidity and mortality in Karbala people.<sup>67</sup>. This common involvement of left coronary artery can not explained in this study. (table 1 )

The interesting fact about Karbala people is that only 4% of patients (males only) are alcohol drinkers because of religious factor and poor socioeconomic status of most people (table 1). A moderate intake of Alcohol (2 – 4 unit a day) appears to offer some protection from coronary disease. However, heavy drinking is associated with hypertension and excesses cardiac events. Higher alcohol consumption ( $\geq 21$  unit/week) is associated with central obesity irrespective of the type of the drink <sup>(33)</sup>.

Also chronic use of alcohol may lead to metabolic syndrome which is a predictor for CHD <sup>(2-4)</sup>. In a previous study, cardiovascular mortality was reduced by 30 to 40% among

individuals reporting one or more drinks daily compared to non drinkers, with over all mortality lowest among those consuming approximately one drink per day .<sup>56</sup>

The physical activities data give also gloomy picture about health education and prevention of CHD in Karbala people in that only 11% of all patients were doing exercise and of those patients non of them was females. The women play essential role at the home life in population and this sedentary life style of females plays an important role as a cause of CHD. Physical inactivity roughly doubles the risk of CHD and is a major risk factor for stroke. Regular exercise (20 min.2-3 times a week) appears to have protective effect which had related to increased HDL-C, lower blood pressure, reduced blood clotting and collateral vessel development (table 1) <sup>27</sup> .

Consumption of fruits seems to offer a significant protection against CHD and 10% reduction in disease risk. Furthermore, CHD decrease in fruit eating as a dietary habitat.<sup>59.60.61</sup>. Data showed only 23% of patients consume fruit regularly which give a dark prospect about health education and poor socio-economic state of Karbala population associated with poor health programs directed by health authorities leading to increase prevalence of CHD in Iraq. (table 1 )

Also in the result of table4 (r-value)uric acid is low with relation to other parameter indicate that S.uric acid is not crucial prevalent factor in CHD in study group. While other study emphasized that hyperuracemia after AMI is associated with development of heart failure .S.uric acid levels marker for predicting AMI related future adverse events ,and combination of Killips classification uric acid level after AMI is good predictor of mortality in patients who have AMI .(49 ) (table 2)

## **Conclusion & Recommendations**

CHD is a consequence of the interaction of various risk factors. Most of these factors are modifiable by preventive measures. The role of health intervention to improve quality of life



through focusing on the treatable risk factors especially by education about smoking, healthy diet, and exercise. There is a direct relation between CHD and central abdominal obesity in addition to other coexisting risk factors. The life style of Karbala people (stress, smoking,

physical activity, diet) is considered as having important impact on increasing prevalence of CHD. The study represents a message for health authorities for focusing on modifiable preventive measures and health education approaches in Iraqi people.

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