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Correlation of waist-hip ratio, BMI and glycemic status with ischemic heart disease patients and their outcome

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Abstract
Background: Over last few years, Obesity associated comorbidities independent predictors for cardiovascular events has gained considerable attention as major public health problem. Study is aimed to determine correlation between WC, W/H ratio, BMI and Glycemic status with ischemic heart disease.
Material and Methods: An observational study conducted in 100UA patients. Sociodemographic and clinical data included: Biodata, height, weight, waist circumference (WC), waist hip ratio, Glycemic status (FBS, PP2BS, HbA1c), Troponin T and atherosclerotic risk factors.Complications were evaluated on OPD basis30 days after discharge.
Results Middle age men(mean 51.2±6.4yr) being M:F of 1.5:1.72% males and 88% females had high WC with mean W/H ratio was 0.95±0.1 for male and 0.89±0.2 for female.40 were overweight while 52 and 8 were obese and normal wt respectively with mean BMI was 25.1±1.2 kg/m2. 68% and 72% had high FBS and PP2BS level with mean FBS and PP2BS was 143±7 and 173±7 mg/dl respectively.75% and 25% had HbA1c level > 6 and<6 respectively.81.2% patients remained free of cardiac events,13.7% admitted with recurrent ischemia during 30 days follow up.
Conclusion: there is positive correlation between high W/H ratio, high BMI and Diabetes mellitus in UA patients. No difference found in 30 day cardiovascular events between normal weight, over weight, obese or very obese. Study showed no relationship between mortality risk and BMI, W/H ratio or WC in 30 days after hospital discharge consistent with "obesity paradox".

Keywords: waist circumference, waist hip ratio, BMI, diabetes mellitus, ischemic heart disease

Introduction
Coronary heart disease is the leading cause of death in western countries and now it is increasing problem in developing countries too. This sudden increase in incidence of heart disease is seen in Indian population as due to adoption of sedentary Westernized life style along with diet containing high fat, high salt and processed foods [1-3]. Coronary Heart Disease remain responsible for more than 54 million death in 2013 [2]. The risk factors for atherosclerosis are smoking, diabetes mellitus, dyslipidemia, sedentary life style, positive family history, hypertension and obesity [2, 3]. It is well known that obesity is the leading cause of cardiovascular morbidity and mortality. Overall, incidence rates of overweight have increased 2-fold and obesity more than 3-fold over the past 50 years [4]. Similarly, the Behavioral Risk Factor Surveillance System reported that the prevalence of obesity increased by 24% from 2000 to 2005. However, the prevalence of extreme and super obesity (body mass index [BMI] >40 and>50 kg/m2) increased by 50% and 75%, 2 and 3 times faster, respectively [5] Abdominal obesity acts as a short-and long-term prognostic factor in patients with established coronary artery disease [6, 7]. As obesity rates increase, so do associated We hypothesized that there might be a link between excess adiposity and occurrence of first Attack of Acute Coronary Syndrome on the basis of the expected clustering of risk factors and presence of high levels of systemic inflammation in the obese [6, 7]. Studies examining the relationship between obesity and acute coronary syndrome (ACS) have been limited to patients with confirmed diagnoses This study aims to evaluate the relationship between Waist Circumference, Waist Hip Ratio, BMI and Glycemic Status with 30-day cardiovascular outcomes in patients presenting with Unstable Angina. We hypothesized that elevated Anthropometric Parameters with Diabetes would be associated with increased risk of 30-day cardiovascular events.

Material and Methods
The present study was carried out in 100 patients of ischemic heart disease who were admitted for unstable angina in medicine department, G.G. Hospital, Jamnagar during period of October 2007 to Dec 2008 with approval of medicine department and ethics committee. In this prospective and observational study all patients we enrolled applying inclusion and exclusion criteria. The inclusion criteria were 1) newly diagnosed unstable angina presented with classical angina chest pain or anginal equivalents 2) ECG showing ST segment depression in two consecutive chest leads 3) normal serum trop –T level. Serum troponin T is sensitive marker of myocardial damage and it differentiates Non STEMI from Unstable Angina. The exclusion criteria were patients on lipid lowering therapy, oral contraceptive pills or other hormone therapy, hyperhomocysteinemia, patient on pioglitazone for

last month, suspected causes of prinzmetal angina, rheumatic heart disease, sickle cell anemia, established liver disease and chronic renal diseases.The demographic data, medical history and clinical data included: age, gender, height, weight, waist circumference (WC), Waist hip ratio, Fasting and Postprandial Glucose level, Glycated Haemoglobin (HbA1c), history of diabetes, hypertension, smoking and previous documented ischemic heart disease with past and family history especially for atherosclerosis risk factors including dietary habits and addiction were noted. All patients consent were taken. A complete physical examination was performed. Height was measured in standing position with a standard tape meter. Body mass index was calculated applyingWHO formula of wt (kg)/ht(m2). The Classification of obesity was done as per Asian Indian classification published in 2003.Waist measurement was measured at umbilical level. Hip measurement was measured at maximum girth at hip.]. We used the cut offs values of WC according to the NCEP-ATP [8] III (men > 102 cm and women > 88 cm). Waist To Hip ratio was calculated. Waist hip ratio cut off points were >0.9 for male and >0.8 for females. WHO [9] defines abdominal obesity as waist circumference ≥102 cm in male and ≥88 cm in females with waist to hip ratio≥0.9, Body mass index≥30kg/m2 or waist girth≥94 cm (37 inch). The prerequisite for biochemical investigations was atleast 12 hours of overnight fasting. All patients fasting blood samples were taken in presterile bulbs for sugar measurement. All patients were allowed to take routine breakfast and standard meal. After two hours of lunch, blood sample was collected for blood glucose measurement. The collected blood samples were sent to our laboratory. FPG (fasting plasma glucose) and PP2BS (Postprandial sugar) levels >110 mg% and >200 mg% were considered significant respectively.HbA1c>7 was considered as uncontrolled Diabetes. Statistical analysis was performed and data analysed in form of mean and standard deviation.t test was applied to test statistically significant difference in groups. The significance was decided on the basis of p value. p value <0.05 was considered as statistically significant.

Results

Table 1: Distribution according to age of first presentation of UA

Age	Male	Female	Total
30-40	16	10	26
41-50	23	20	43
51-60	14	07	21
>60	07	03	10
Total	60	40	100

In present study, out of 100 patients 60 were males and 40 were females being M:F ratio 1.5:1.So male predominance was observed. There were 43 patients in 41-50 age group next being 26 in 30-40 age group.While21 and 10 patients were in 51-60 and more than 60 years age group respectively. The mean age of presentation was 47.1±5.2 years.

Table 2: Distribution according to Male Waist Circumference

Waist Circumference in male	No. of patients
>102 cm	43
<102 cm	17
Total	60

In our study, 43 out of 60 (72%) patients had high waist circumference.

Table 3: Distribution according to Female Waist Circumference

Waist Circumference in female	No of patients
>88 cm	35
<88 cm	5
Total	40

In present study, 35 out of 40 females (88%) had high waist circumference.

Table 4: Distribution according to waist hip ratio and Gender

W-H Ratio	Male	Female	Total
Normal	23	06	29
High	37	34	71
Total	60	40	100

In Present study, 37 male patients (66%) and 34 female patients (77%) had high waist hip ratio. the mean waist hip ratio was 0.95±0.1 for male and 0.89±0.2 for females.

Table 5: Distribution according to Body mass index and Gender

BMI	Male	Female	Total
Normal	06	02	08
Overweight	25	15	40
GR-1 OBESITY	17	18	35
GR-2 OBESITY	10	04	14
GR-3 OBESITY	02	01	03
Total	60	40	100

In our study.40 patients were overweight, 52 were obese and only 8 patients had normal weight.23 males(41.1%) were overweight, 17 males (47.9%) were obese and 11% male had normal weight while 17 females (38.6%) were overweight, 25 females (56.9%) were obese and 4.5% females had normal weight. The mean BMI was 25.1±1.2 kg/m2.

Table 6: Distribution according to FPG (Fasting Plasma Glucose)

FPG(mg/Dl)	Male	Female	Total
>110	38	30	68
<110	22	10	32
Total	60	40	100

In our study, 68% patients had high FBS level with mean FBS was 143±7 mg/dl.

Table 7: Distribution according to PP2BS (2 hr Postprandial Plasma Glucose)

PP2BS	Male	Female	Total
>200	44	28	72
<200	16	12	28
Total	60	40	100

In our study, 72% had high PP2BS with mean PP2BS was 173±7 mg/dl.

Table 8: Distribution according to HbA1c level.

HbA1c	Male	Female	Total
>6	41	34	75
<6	19	6	25
Total	60	40	100

In our study, 75% patients had HbA1c level > 6 while 25% had <6.

Discussion

In present study, 60 were males and 40 were females. In present study, 69% patients were aged less than 55 years while 75% female and 62% male were aged less than 55 years with mean age of 51.2±6.4. These finding shows that middle aged patients are more likely to be selected for study like our study (p value <0.05). In hiroyasu *et al* study [10], 55% were male and 45% were females with an average of 55.1±6.3 years which correlates well with our study. In Similar finding seen in cohnis *et al* study [11]. In CREATE study [12] showed mean age of presentation was 57.5+12.1 with male predominance finding consistent with our study.

In Our study, 43 males (72%) had waist circumference >102 cm while 35 out of 40 (88%) had waist circumference > 88cm. Abdominal obesity was predominantly seen in females with mean of 101.38±9.23. our study correates well with naresh *et al*. [13] study which shows predominance female waist circumference with mean of 101.43±10.34 cm. versus 75% males with mean of 101.03±9.28. in present study, 66% male and 77% female patients had high waist hip ratio. The mean waist hip ratio was 0.94±0.1 for males and 0.89±0.02 for females. In rajshekharan *et al*. [14] study 74% were having high waist hip ratio with male and female were 72% and 78% high ratio subsequently.(ratio p value <0.01). Dexter *et al*. [15] showed that Waist hip ratio and waist circumference is more strongly and consistently predictive of coronary heart disease than BMI. So present study, Dexter study and rajshekharan study showed that high waist hip ratio is associated with risk of ischemic heart disease. And confirms earlier data that central obesity is associated with advanced heart disease.

In our study, 40% patients were overweight and 52% were obese according to Indian guidelines for classification of obesity. The mean BMI was 25.1±1.2 kg/m2. In hiroyasu *et al*. [10] study, only 13.33% patients were having normal weight, 25% were overweight patients were obese. The mean BMI was 26.4±1.9.our study correlates well with hiroyasu *et al* study [10]. This study confirms that obesity is one of the major risk factor for ischemic heart disease but increased BMI is not related to mortality in ischemic heart disease. Pablo *et al*. [16] showed that increased BMI was associated with increased adjusted survival after Acute Coronary Syndrome when compared to normal BMI. Jon Duley *et al*. [17] concluded that BMI is not associated with higher risk of cardiovascular outcomes in patients presented with potential Acute Coronary Syndrome at 30 days. This seemingly paradoxical finding needs to be confirmed with further research. Although no reports that overweight, type 1 or 2 obesity was related to increase risk of mortality compared to normal weight.

In our study, 60% males and 80% females were found to be diabetic. So 68 out of 100 (68%) patients were found to be suffering from diabetes mellitus. In hiroyasu *et al* study [10], 52.1% patients were diabetic with no gender significant difference found between male and female patients for presence of diabetes.In patients with ACS the presence of diabetes mellitus is associated with a very well known increased risk of morbidity and mortality. M. Greavue [18] study on Diabetes and Unstable angina showed 73% Diabetic patients with higher risk of death. While in Vinod *et al* study [19] 71% patients found to be Diabetic in unstable angina. Recent data shows conflicting data between cardiovascular events and values of HbA1c in patients with unstable angina. Some studies reported the lack of HbA1c plasma values and the short term cardiovascular outcome in diabetic patients admitted with Acute Coronary Syndrome [20]. In our study, 68% patients had high FBS level with mean FBS was 143±7 mg/dl. In our study, 72% had high PP2BS with mean PP2BS was 173±7 mg/dl.the HbA1c plasma levels were significantly higher in the 75% patients with mean of 7.9±2.1 which correlates well with M. Greavue [18] study showing 73.7% patients, the HbA1c plasma levels were significantly higher in the deceased than in the survivors group [8.3±2.4% versus 6.8±2.6) (p=0.04)]. These data confirms that presence of Diabetes mellitus even in young female is independent risk factor for ischemic heart disease. So there is strong correlation found between high FBS PP2BS level and high waist hip ratio. (p value 0.01 and 0.02). Our study showed that there is positive correlation between high waist hip ratio, high BMI and Diabetes mellitus in ischemic heart disease patients.

Overall hospital outcome was good.no mortality occurred during entire study period. 81.2% patients remained free of cardiac events during 30 days follow up while 13.7% admitted with recurrent angina. 81.2% patients remained free of cardiac events during 30 days follow up while only 13.7% were presented with recurrent ischemia with 72% were having uncontrolled Diabetes (HbA1c level> 7) Similar results found in Dionoso *et al* study [21] 76.4% patients remained free of cardiac events and 11.7% had readmission for unstable angina.There are conflicting data regarding the relationship between mortality risk and obesity in patients with acute coronary syndromes. Our study performed on patients with unstable angina showed no relationship between mortality risk and BMI or waist circumference in 30 days follow up after discharge from the hospital. Han *et al*. [22] sought to investigate how the number of cardiac risk factors might assist a physician in evaluating a patient with potential ACS. In a registry sample of 10,806 patients, they found that cardiac risk factor burden lacked clinical utility in defining the probability of ACS in patient solder than 40 years of age. In this context,

and taken together with reported findings, while we would agree that obesity leads to higher risk and worsened long term cardiovascular events, this condition may not assist clinicians in predicting short-term risk in patients presenting with potential Acute Coronary Syndrome.

Conclusion

Our study confirms earlier data that central obesity is associated with advanced heart disease Furthermore Waist hip ratio is better indicator than BMI in Unstable angina. Statistically significance correlation found between high waist hip ratio and Diabetes Mellitus with ischemic heart disease. Presence of Diabetes mellitus even in young female is independent risk factor for ischemic heart disease. High waist hip ratio and Diabetes Mellitus may considered as prognostic marker in Unstable Angina patients. No mortality occurred during entire study period. There was no difference in 30 day cardiovascular events between normal weight, overweight, obese or very obese. Our study performed on patients with Unstable angina showed no relationship between mortality risk and BMI or Waist Circumference in 30 days after discharge from the hospital and this is consistent with "the obesity paradox" described in the literature who describes a paradox in the correlation between body mass index and hospital mortality in patients with Acute Coronary Syndrome in whom the mortality rate decreases as the body mass index increases.

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