

**ASSOCIATION OF CORONARY HEART DISEASE AND OBESITY: A CROSS SECTIONAL STUDY FROM DARBHANGA DISTRICT OF BIHAR**Vijay Kumar Singh<sup>1</sup>, Bharat Kumar<sup>2</sup>, Sheela Kumari<sup>3</sup>, H. N. Jha<sup>4</sup>, Kashif Shahnawaz<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

Vijay Kumar Singh, Bharat Kumar, Sheela Kumari, H. N. Jha, Kashif Shahnawaz. "Association of Coronary Heart Disease and Obesity: A Cross Sectional Study from Darbhanga District of Bihar". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 67, August 20; Page: 11677-11685, DOI: 10.14260/jemds/2015/1684

**ABSTRACT: INTRODUCTION:** Overweight and Obesity has been found to be strongly associated with some cardiovascular risk factors like adverse lipid profiles, hypertension and glucose intolerance. Although, the contribution of obesity to coronary heart disease (CHD) incidence may be largely mediated through effect on major cardiovascular risk factors, obesity must be considered to be an important modifiable risk factor for the disease. **MATERIALS AND METHODS:** This was a cross-sectional study conducted from Jan. 2015 to March 2015 (3 months), involving staffs and doctors of Darbhanga Medical College & Hospital. They were selected by simple random sampling. Variables measured in the study were weight (In kilograms), height (In metres), and waist & hip circumference (In centimetres). **OBSERVATION:** The percentage of male members enrolled for the study was 98.58% and females were 1.22%. Majority of the respondents were in the age group of 30-<40 yrs. 3.25% of the males were found to be obese. 41.70% of the males were found to be overweight. The association of obesity with CHD in the present study was found to be statistically significant (for overweight  $p<0.05$  and for obese  $p<0.001$ ). 12.50% of the females were found to be obese. 37.50% of the female were found to be overweight. Truncal obesity among the males was found to be 20.27%. Truncal obesity among the females was found to be 50%. The association of truncal obesity with CHD in the present study was found to be statistically significant ( $p<0.01$ ). **CONCLUSION:** It was concluded that the overall prevalence of CHD in our present study was 5.16% and the maximum prevalence of CHD was found in the age group of 50-59 years. Obesity was present in 3.25% of the study subjects and 41.70% were overweight. The association of obesity with the prevalence of CHD was found to be statistically significant ( $p<0.001$ ). Truncal obesity was present in 20.27% of male and 50% of the female subjects. **RECOMMENDATIONS:** Proper health education should be given to people to prevent the development of overweight and obesity and also to avoid factors responsible for them. They should be motivated for regular physical exercises and avoiding sedentary life-styles. **KEYWORDS:** Coronary heart disease, Obesity, Overweight.

**INTRODUCTION:** Overweight and Obesity has been found to be strongly associated with some cardiovascular risk factors like adverse lipid profiles, hypertension and glucose intolerance. Change in weight is mirrored by corresponding changes in these cardiovascular risk factors (Ashley A & Kannel WB).<sup>1</sup> although, the contribution of obesity to coronary heart disease (CHD) incidence may be largely mediated through effect on major cardiovascular risk factors, obesity must be considered to be an important modifiable risk factor for the disease. There is also some evidence from the Framingham study that there is a net contribution of obesity to CHD incidence in men, even taking these risk factors into account, this evidence is corroborated by studies of Hawaiian Japanese and cohorts of young subjects (Kagan et al).<sup>2</sup> Obesity increases the work of the heart, and this organ hypertrophies with rising body weight. The cardiac output, stroke volume, and blood volume all

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increase and the blood pressure tends to rise (Bray G A in Kaplan and Stamler).<sup>3</sup> Weight reduction is associated with an associated reduction in both systolic and diastolic blood pressure. A weight loss of even 10% can significantly reduce some risk factors for cardiovascular diseases. Overweight is an important risk factor of ischaemic heart disease (Kannel WB et al).<sup>4</sup>

The relationship between obesity and the potentially attendant increase in cardiovascular risk may have its origin very early in life, in that weight gain in infancy and childhood appears to have substantial effects on the later propensity for the development of cardiovascular risk factors and atherosclerosis (Law C M et al<sup>5</sup>; Parsons T J et al;<sup>6</sup> Singhal A et al.<sup>7</sup>) Increased body weight in adulthood has also been strongly associated with many individual cardiovascular risk factors (Mokdad A H et al;<sup>8</sup> Lamon-Fava S et al.<sup>9</sup>) and with increased overall cardiovascular risk in many epidemiological studies (Hurbert H B et al;<sup>10</sup> Manson J E et al;<sup>11</sup> Rimm E B et al.<sup>12</sup>) In families known to be at high risk for premature CHD, the cardiovascular risk of overweight and obesity may be even more salient. Excess body weight has previously been found to be a moderately strong risk factor for CHD in most population based studies, in part through its impact on individual risk factors such as hypertension, diabetes, and dyslipidemia, but also independently (Nat. Inst. of Health;<sup>13</sup> Burton B et al.<sup>14</sup>) In the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Study, obesity was associated with accelerated atherosclerosis in autopsies of young men (Mc Gill H C Jr et al).<sup>15</sup> recently, obesity has been shown to affect the early development of atherosclerosis and shortens life expectancy (Fontaine K R et al;<sup>16</sup> Peeters A et al.<sup>17</sup>)

Adipose tissue is metabolically active, secreting various adipocytokines such as leptons and tumor necrosis factor, which may influence the expression of CHD by promoting insulin resistance, chronic inflammation, thrombosis, oxidation stress, or chronic upregulation of sympathetic tone (Haffner S et al;<sup>18</sup> Despres J P et al;<sup>19</sup> Grundy S M et al;<sup>20</sup> Hall J E et al.<sup>21</sup>)

Excess adiposity is also associated with atherogenic lipoprotein profiles (elevated triglycerides and low HDL cholesterol).

Truncal obesity has emerged as an important factor in genesis of atherosclerosis and CHD. In studies of south Asians living in Britain, it has been shown that increased WHR, a simple clinical marker of truncal obesity is an important coronary risk factor in both males and females. Other features of this syndrome are hypertension, increased left ventricular mass and certain poorly understood lipoprotein metabolic abnormalities. WHR >0.88 is associated with increased coronary risk. The second report of the US National Cholesterol Education Program recommends that the WHR should be less than 0.9 in males and less than 0.8 in females. No norms of WHR exist in developing countries. Results from many epidemic studies have shown that a high proportion of fat on trunk and abdomen was associated with an increased probability of developing cardiovascular disease (Gupta R et al).<sup>22</sup>

**MATERIALS AND METHODS:** The present study was carried out in the department of physiology, darbhanga medical college and hospital, Laheriasarai, Darbhanga, Bihar; to study an association of coronary heart disease (CHD) and obesity amongst all the staffs and doctors of Darbhanga medical college & hospital. Duration of the study was from Jan. 2015 to March 2015 (3 months).

### STUDY-DESIGN:

#### 1. Type of Study: Cross-sectional study

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2. **Population Under Study:** All the staffs and doctors of darbhanga medical college & hospital, aged 20 to 59 years.
3. **Period of Study:** From Jan-2015 to March-2015 (3 months).
4. **Sampling Design:** The staffs and doctors were selected by simple random sampling and enrolled for the study.
5. **Sample Size:** The sample size was calculated by using the formula (For the finite population)

$$n = \frac{4pq}{L^2 + \frac{4pq}{N}}$$

**Where:**

n = sample size

P = positive character

q = 1-p

L = allowable error (usually 10% - 20% of "p")

N = population size, i.e. 1300 (total number of staffs and doctors in darbhanga medical college), considering the "p" (prevalence of CHD) value of 7.3% in India and taking "L"= 20% of "p", the sample size was estimated to be 642.

6. **Variables:** The variables measured under this study are-  
Weight (in kilograms), Height (in metres), Waist & Hip circumference (in centimetres), systolic and diastolic blood pressures (in mm of Hg).
7. **Data Collection:** A pre-designed and pre-tested questionnaire (mainly covering questions on socio-economic factors, medical history, health behaviour and psychological factors) and measurement of height, weight, waist & hip circumference and blood pressure was performed.

**The subjects, both males and females were divided in the following groups:**

Group A: 20 to <30 yrs.

Group B: 30 to <40 yrs.

Group C: 40 to <50 yrs.

Group D: 50 to 59 yrs.

**Anthropometric Measurements:** All the anthropometric measurements were duly calibrated in the department of physiology, darbhanga medical college, and pre-tested before the actual study. Measurements were taken for weight & height, body mass index (BMI) was calculated and from the waist and hip circumference, the waist-hip ratio was calculated.

- a) **Height:** Height, in meters was recorded using an anthropometric rod.
- b) **Weight:** Weight, in kilograms was recorded on the bathroom scales, duly calibrated, especially for the study.
- c) **Waist-Circumference:** Waist circumference was measured at the level of the umbilicus in centimetres, while the person was breathing quietly, using a measuring tape [Chadha S L et al].<sup>23</sup>

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**d) Hip-Circumference:** A measuring tape was used to measure the hip circumference in centimetres at the inter-trochanteric level as per previously recommended technology [Mc Keigue P M et al].<sup>24</sup>

**e) Body-Mass Index (BMI):** BMI is calculated using the following formula:

$$\text{B.M.I} = \frac{\text{Weight (in kilograms)}}{[\text{Height (in metre)}]^2}$$

Overweight = B.M.I between 25 and 30.

Obesity was defined as – B.M.I > 30.0 (in males), &

B.M.I > 28.6 (in females)

[WHO TRS 724]

**f) Waist-Hip Ratio (WHR):** Truncal obesity was defined as:

W.H.R >1.0 (in males), &

W.H.R > 0.85 (in females)

[Gopalan C].<sup>25</sup>

**OBSERVATIONS:** The present study was conducted among the staffs and doctors of darbhanga medical college & hospital, under the department of Physiology in collaboration with the department of community medicine. In our present study, the estimated sample size was 642 which represents almost the half of the total population, but due to non-respondent only 562 personnel could be studied. The findings of our present study are summarized as follows.

AGE IN YEARS	MALE NUMBER (%)	FEMALE NUMBER (%)	TOTAL NUMBER (%)
20-<30 yrs.	166(100)	0(0)	166(29.54)
30-<40 yrs.	175(96.67)	6(3.31)	181(32.21)
40-<50 yrs.	162(98.78)	2(1.22)	164(29.18)
50-59 yrs.	51(100)	0(0)	51(9.07)
<b>TOTAL</b>	<b>554(98.58)</b>	<b>8(1.42)</b>	<b>562(100)</b>

Table 1

Age & Sex distribution of the study population

**From the above table it was found that:**

- I. The percentage of male enrolled for the study was 98.58% and females were 1.22%. Kg/m<sup>2</sup>
- II. Majority of the respondents were in the age group of 30- <40 yrs.

Body Mass Index (kg/m <sup>2</sup> )	Number of Male Participants	Prevalence (%)
<25 (Normal)	305	55.05
25-30 (Overweight)	231	41.70
>30 (Obese)	18	3.25
<b>TOTAL</b>	<b>554</b>	<b>100.00</b>

Table 2

Prevalence of Obesity amongst male study subjects

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### From the above table it was observed that:

- I. 3.25% of the males were found to be obese.
- II. 41.70% of the males were found to be overweight.
- III. The association of obesity with CHD in the present study was found to be statistically significant (for overweight  $p < 0.05$  and for obese  $p < 0.001$ ).

BODY MASS INDEX (Kg/m <sup>2</sup> )	NUMBER OF FEMALE PARTICIPANTS	PREVALENCE (%)
< 25 (Normal)	04	50.00
25-30 (Overweight)	03	37.50
>30 (Obese)	01	12.50
<b>TOTAL</b>	<b>08</b>	<b>100.00</b>

Table 3

Prevalence of Obesity amongst the female study subjects.

### From the above table it was found that:

- I. 12.50% of the females were found to be obese.
- II. 37.50% of the female were found to be overweight.
- III. The association of obesity with CHD in the present study was found to be statistically significant (for Overweight  $p < 0.05$  and for Obese  $p < 0.001$ ).

WAIST-HIP RATIO	NUMBERS OF POSITIVE CHARACTERS	PERCENTAGE (%)
IN FEMALE N=8 WHR > 0.85	04	50.00
IN MALE N=554 WHR > 1.00	112	20.27
<b>TOTAL</b>	<b>116</b>	<b>18.07</b>

Table 4

Gender wise prevalence of Truncal Obesity amongst the study population.

### From the above table it was found that:

- I. Truncal obesity among the males was found to be 20.27%.
- II. Truncal obesity among the females was found to be 50%.
- III. The association of truncal obesity with CHD in the present study was found to be statistically significant ( $p < 0.01$ ).

**DISCUSSION:** In our present study, the overall presence of obesity and overweight were 3.38% and 41.63%. 3.25% of the males are found to be obese (BMI>30kg/m<sup>2</sup>) and 41.70% of the males are found to be overweight (BMI=25-30kg/m<sup>2</sup>). The prevalence of obesity amongst females was found to be 12.50% and the prevalence of overweight among females was found to be 47.50%.

The association between obesity and CHD in the present study was found to be statistically highly significant ( $p < 0.001$ ).

Rastogi P et al,<sup>26</sup> observed that the prevalence of obesity among Nagpur policemen was 6.7% and the prevalence of overweight was 36.4%. Pinto V G et al,<sup>27</sup> reported the prevalence of obesity in

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urban community of Goa was 54.98% and its association with CHD is statistically highly significant ( $p < 0.001$ ).

In the Framingham and Maintoba study, obesity has been considered to be an independent risk factor for CHD (Luepker R V).<sup>28</sup> Athawale et al,<sup>29</sup> reported prevalence of overweight/obesity among the general employees of Nagpur municipal corporation to be 23%. Gupta R et al,<sup>30</sup> reported obesity in 6% of the study subjects. Gupta R et al,<sup>31</sup> reported an overall prevalence of obesity (Quetlet index > 27) to be 11% (Males 11% and Females 11%). Kutty et al,<sup>32</sup> reported a 5.5% of prevalence of obesity. The present study findings were somewhat nearly similar with the findings of Rastogi P et al.<sup>26</sup> and of Pinto V G et al.<sup>27</sup>

The prevalence of overweight and obesity in the study population is lower in comparison with the previous studies. The lower prevalence of obesity may be attributed to the active life-styles of the staffs and doctors selected in our present study.

Truncal obesity is associated with increased risk of CHD. In our present study 20.27% of the male and 50% of the female study subjects were found to have truncal obesity. Hazarika et al,<sup>33</sup> reported that truncal obesity in their study was found to be 33.4%. Gupta et al,<sup>30</sup> reported truncal obesity in 5% of the study population. Reddy et al,<sup>34</sup> reported high prevalence of truncal obesity, 39.1% in men and 70.9% in women in an urban and 32.4% in men and 42.3% in women in Delhi.

Gupta et al,<sup>31</sup> reported truncal obesity (WHR > 0.95) in 26% of the males and 17% of the females. The present study findings was somewhat similar with the findings of Hazarika et al.<sup>33</sup> and Gupta et al.<sup>31</sup> The higher prevalence of truncal obesity among females may be due to lesser number of female subjects included in the study.

**CONCLUSION:** It was concluded that the overall prevalence of CHD in our present study was 5.16% and the maximum prevalence of CHD was found in the age group of 50-59 years. Obesity was present in 3.25% of the study subjects and 41.70% were overweight. The association of obesity with the prevalence of CHD was found to be statistically significant ( $p < 0.001$ ). Truncal obesity was present in 20.27% of the male subjects and 50% of the female subjects.

**RECOMMENDATIONS:** Proper health education should be given to all to prevent the development of overweight and obesity and also avoiding the factors responsible for them. Periodic screening of some other diseases which are indirectly linked with obesity and CHD like hypertension, diabetes mellitus, hypercholesterolemia and hypertriglyceridemia should also be undertaken. Staffs should be motivated and encouraged to undergo regular physical exercises and to avoid sedentary life-styles.

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**FINANCIAL OR OTHER**

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Date of Submission: 29/07/2015.  
Date of Peer Review: 30/07/2015.  
Date of Acceptance: 13/08/2015.  
Date of Publishing: 19/08/2015.