

Hypertension & Coronary Artery Disease: A Hospital Based Case Control Study

Dr. Rohit V. Ram*, Dr. Atul V. Trivedi**

*Assistant Professor, Department of Community Medicine, M. P. Shah Medical College, Jamnagar, 361006** Assistant Professor, Department of Community Medicine, B. J. Medical College, Ahmedabad.

Abstracts: Background & Objectives: Hypertension is one of the most important modifiable risk factor for coronary artery disease. This study was done to study the role of hypertension in occurrence of coronary artery disease. Methods: Present study was a hospital based paired matched case-control study, carried out at civil hospital, Ahmedabad. 135 newly diagnosed cases of coronary artery disease and 135 controls were studied after taking informed written consent. Data was analysed by using Epi-info version 3.5.1 computer package, Chi -square test, Z test and Odds ratio were calculated. Results: Among the total 135 cases 70.4% were male and 29.6% were female, most of the cases (40%) were belongs to the age group of 51-60 years. Positive family history of hypertension and Coronary Artery Disease were significantly associated with the occurrence of Coronary Artery Disease. Significant association was observed between hypertension and occurrence of Coronary Artery Disease (P<0.001) Conclusion: Hypertension is important etiological factors behind the occurrences of Coronary Artery Disease, but it is modifiable that highlight the need of appropriate control strategies and measures to avert significant proportion of premature morbidity & mortality due to Coronary Artery Disease. . [Ram R et al NJIRM 2012; 3(4) : 98-101]

Key Words: Case-control study, coronary artery disease, hypertension

Author for correspondence: Dr. Rohit V. Ram, Tirupati Society, "GIGEV KRUPA", Jamjodhpur-360530, Dist.- Jamnagar, Gujarat. E- mail:rohit.ram84@gmail.com

Introduction: Coronary heart disease has emerged as a major health problem in the developing countries including India. A substantial proportion of population in India is exhibiting increasing prevalence of cardio-vascular disease and associated risk factors.¹ Precious life is snatched away when person is in the most productive stage of life, when the social and family responsibilities are the greatest. Overall prevalence has increased from 2.06% in 1970 to 5% in 2002 in rural area and 1.04% in early 1960 to 13.02% in 2004 in urban area.²

Coronary Artery Disease (CAD) has been defined as "impairment of heart function due to inadequate blood flow to the heart compared to its needs, caused by obstructive changes in the coronary circulation to the heart" CAD manifests itself in many presentations like: Angina pectoris of effort, Myocardial infarction, Irregularities of the heart, Cardiac failure and sudden death.³ Coronary artery disease is a multifactorial disease. Hypertension is a one of the most important modifiable risk factor for coronary artery disease, even a blood pressure at the top end of normal range increases the risk.⁴ Epidemiological studies on hypertension suggests that less than half the hypertensive person in a population know that they have elevated blood pressure. The CUPS study suggests that the "rule of

halves" is still valid in Indian population making control of hypertension in the population inadequate.⁵ Taking into consideration of these facts this study was carried out at civil hospital, Ahmedabad to study the role of hypertension in occurrence of coronary artery disease.

Material and Methods: The present study was a paired matched case-control study, carried out at Civil hospital Ahmedabad, a tertiary care teaching hospital, for one year from March 2009 to April 2010. Permission was taken from the Ethical Committee, B. J. Medical College & Civil Hospital, Ahmedabad before carrying out the study. Informed written consent was taken from all the enrolled subjects after a full explanation of the purpose of study and liberty to drop out. This was done in Gujarati and Hindi languages for easy comprehension. All the patients were interviewed and examined while in hospital, all the information was filled up in a specially designed pretested questioner.

Sample size:The sample size of the study was determined using the formula.⁶

$$N = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 \bar{p} \bar{q} (r + 1)}{(P_1 - P_2)^2 r}$$

Where,

$\alpha = 0.05$ (allowed type I error)

$\beta = 0.02$ (allowed type II error)

So for these value of type I & type II errors the values of power of detecting these errors are as under;

$Z_{1-\alpha/2} = 1.96$ and

$Z_{1-\beta} = 0.84$

$P_1 = 0.34$ proportion of cases who were diagnosed hypertensive in pilot study

$P_2 = 0.19$ proportion of control who were diagnosed hypertensive in pilot study

$\bar{p} = (P_1 + P_2)/2 = 0.265$

$q = 1 - \bar{p} = 0.735$

$r =$ ratio of number of controls to cases, here it was 1.

Putting all these values to the above mentioned equation the desired sample size was found to be $135.970 \cong 135$. As the case: control ratio was kept 1: 1, the final total sample size of study was 270 (135 cases and 135 controls).

Selection of Cases: Definition of Case: Present study includes newly diagnosed cases of CAD. CAD patients were diagnosed as per the Monica criteria: (1) two or more ECG showing specific changes; (2) an ECG showing probable changes plus abnormal cardiac injury enzymes; or (3) typical symptoms such as a retrosternal pain plus abnormal enzymes.⁷

Eligibility criteria for cases:

- The patient who was diagnosed first time, to avoid bias arising from recall memory.
- Well conscious, co-operative, and well oriented with time, place and person, to avoid bias from respondent's answers.

Selection of Control: Definition of control: A control was defined as an individual who was admitted in civil hospital Ahmedabad on the same day or within seven days for conditions other than angina pectoris and myocardial infarction. For the selection of proper control person's prior history regarding CAD was asked and it was assured that the control had never been admitted to hospital or taken treatment for acute myocardial infarction and angina pectoris.

Eligibility criteria for control: Well conscious, co-operative, and well oriented with time, place and person, who voluntary agree to participate in the study to avoid bias from respondent's answers.

Matching: For each case one age and sex matched control was selected, age matching was done with the liability of ± 2 years of age.

The study subject was consider hypertensive if the person was confirmed by qualified medical person as a hypertensive then only the answer was encircled as yes otherwise it was no. Blood pressure of individual study subject was measured by standardized sphygmomanometer in sitting position at heart level from right radial artery according to WHO criteria.⁸

Classification of Blood pressure for adult aged 18 years and older was done according to Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure⁹ [Table 1].

Table 1: Classification of Blood Pressure

| Category | Blood pressure (mm of Hg) | | |
|------------------|---------------------------|-----|------------|
| | Systolic | | Diastolic |
| Normal | <120 | and | <80 |
| Pre hypertension | 120-139 | or | 80-89 |
| Stage-1 | 140-159 | or | 90-99 |
| Stage -2 | ≥ 160 | or | ≥ 100 |

Association of the risk factors under study was assessed by applying Chi Square test, Z test and to assess the strength of association the odds ratio was calculated. For all these statistical analysis Epi-info version 3.5.1 computer package was used.

Result: A total of 135 cases of Coronary Artery Disease and 135 matched controls were analysed. Among the cases 70.4% were males and 29.6% were females. Largest numbers of cases were in the age group of 51-60 years (40%). The mean age of cases and controls were 54 ± 10.50 years and 53.83 ± 10.66 years respectively and this difference was not statistically significant ($Z = 0.13$, $P > 0.05$) [Table 2]. Study of Socio-demographic characteristics did not reveal any significant difference between cases and controls.

Table 2: Age and Sex wise distribution of Cases and Controls

| Age group (in years) | Cases | | | Controls | | |
|----------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Male No. (%) | Female No. (%) | Total No. (%) | Male No. (%) | Female No. (%) | Total No. (%) |
| 31 – 40 | 11 (11.6) | 4 (10) | 15 (11.1) | 9 (9.5) | 5 (12.5) | 14 (10.4) |
| 41 – 50 | 28 (29.5) | 9 (22.5) | 37 (27.4) | 30 (31.6) | 9 (22.5) | 39 (28.9) |
| 51 – 60 | 39 (41.1) | 15 (37.5) | 54 (40.0) | 38 (40.0) | 14 (35.0) | 52 (38.5) |
| 61 – 70 | 12 (12.6) | 10 (25) | 22 (16.3) | 13 (13.7) | 8 (20.0) | 21 (15.6) |
| 71 – 80 | 4 (4.1) | 2 (5) | 6 (4.4) | 3 (3.1) | 4 (10.0) | 7 (5.2) |
| >80 | 1 (1.1) | 0 (0) | 1 (0.7) | 2 (2.1) | 0 (0) | 2 (1.5) |
| Total | 95 (70.4) | 40 (29.6) | 135 (100) | 95 (70.4) | 40 (29.6) | 135 (100) |

Around half of the cases (51.1%) have history of high blood pressure as compared to 25.5% of the controls, giving Odds ratio of 3.11 and this difference was also statistically

significant ($P < 0.001$). Positive family history of coronary artery disease and hypertension was reported in significantly higher number of cases as compared to controls [Table 3].

Table 3: Risk factors for coronary artery disease

| Risk Factors | Cases n=135 | Controls n=135 | OR | 95% CI | P value |
|-------------------------|-------------|----------------|------|-------------|---------|
| H/o hypertension | | | | | |
| Present | 69 (51.1) | 34 (25.5) | 3.11 | 1.80 - 5.38 | < 0.001 |
| Absent | 66 (48.9) | 101 (74.8) | | | |
| Family h/o CAD | | | | | |
| Present | 25 (18.5) | 12 (8.9) | 2.33 | 1.06 – 5.19 | < 0.05 |
| Absent | 110 (81.5) | 123 (91.1) | | | |
| Family h/o HT | | | | | |
| Present | 29 (21.5) | 13 (9.6) | 2.57 | 1.21 – 5.52 | < 0.01 |
| Absent | 106 (78.5) | 122 (90.4) | | | |

During the study, in examination hypertension was detected in significantly higher (37.76%) number of the cases as compared to the controls (14.07%)

and mean systolic and diastolic blood pressure was also significantly higher among cases as compared to controls [Table 4].

Table 4: Distribution of cases and controls according to hypertension detected during study.

| Hypertension | Cases (n=135) | Controls (n=135) | P value |
|------------------------------|--------------------|--------------------|------------------|
| Systolic \geq 140 mm of Hg | 9 (6.66%) | 3 (2.22%) | > 0.05 |
| Diastolic \geq 90 mm of Hg | 16 (11.85%) | 6 (4.44%) | < 0.05 |
| Both | 26 (19.25) | 9 (6.66%) | < 0.05 |
| Total | 51 (37.76%) | 19 (14.07%) | < 0.05 |
| Mean systolic BP | 133.58 \pm 14.46 | 127.31 \pm 11.34 | < 0.05 |
| Mean diastolic BP | 87.18 \pm 6.79 | 84.59 \pm 5.52 | < 0.05 |

Discussion: The present study was designed as Hospital based Case control study to study the role of hypertension in occurrence of CAD. A total of 270 subjects (135 cases and 135 controls) were studied. Among the total 135 cases 70.4% were

males and 29.6% were females, male predominance has been also reported by Zodypay et al.¹⁰

The mean age of cases was 54 ± 10.50 years, largest number of cases were present in the age group of 51-60 years (40%), followed by 41-50 years (27.4%), whereas 11.1% of the cases had faced their first attack of CAD before crossing the forty of their life, which is well correlated with the findings of Zodypay et al¹⁰

Family history of coronary artery disease is known to increase the risk of premature death. Genetic factors appear to play an important role along with conventional and emerging risk factors. In present study significant associations were observed between positive family history of hypertension and CAD with the occurrence of CAD, which is well correlated with the findings of Pinto et al¹¹ and Soumya Deb et al.¹²

In present study the Odds ration of person with hypertension as compared to person without hypertension was 3.11 it means that the risk of CAD is around 3 times higher in hypertensive as compared to normotensive individual. Sangeeta Gulati et al¹³ also observed that hypertension is significantly associated with the development of CAD. On examination high blood pressure was detected among the significantly higher number of cases (37.7%) as compared to controls, and which is also well correlated with the observations of Soumya Deb et al¹² and Prabhakaran D et al.¹⁴

Conclusion: To conclude the findings of our study suggest that hypertension is major aetiology behind the occurrence of CAD, but it is modifiable that highlights the need of appropriate control strategies and measures to avert significant proportion of premature morbidity and mortality due to CAD.

Acknowledgment: Authors acknowledge all the staff members of medicine department, civil hospital, Ahmedabad for their valuable support in this study.

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