



Original Article

A study on chronic hypertension associated cardiac complications (myocardial infarction): parametric analysis

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How to cite this article: Kaur A, Kaur K, Rohit, Raj K, Singh S. A study on chronic hypertension associated cardiac complications (myocardial infarction): parametric analysis. *Pharmaspire* 2019;11(4):112-116.

Source of Support: Nil,

Conflicts of Interest: None declared.

ABSTRACT

Background: The present study was aimed to determine hypertension associated to myocardial infarction (MI) as cardiac complication. **Materials and Methods:** This study was a prospective observational study conducted in private hospital, Jagraon. This study commenced for duration of 6 months from October 2017 to March 2018 as per inclusion and exclusion criteria. Data were collected from patient case sheet, laboratory tests reports, and patient interview into the specially designed data collection form after taking the written consent from patient diagnosed with hypertension and MI. Data analysis was performed using SPSS statistical software. **Results:** Among 100 study subjects, 63% of patients were male and 37% of patients were female. The mean age of the patients was found to be 68.92 years. The majority of them were from urban area. The common symptoms experienced by the study population were chest pain, perspiration, syncope, dyspnea, nausea, and vomiting. The majority of study population suffered hypertension from 11 to 15 years. Among study population, 65% have MI and 35% study subjects did not have MI. The Pearson correlation between duration of hypertension and myocardial infarction was found to be strong ($r = 0.769$) and statistically significant ($P < 0.01$) at 90% confidence interval. **Conclusion:** This study has found that the prevalence of hypertension induced MI was high in male population as compared to female counterparts and urban are more likely to be affected than people living in rural area. Further the duration of hypertension potentiates MI which suggests that MI may be hypertension induced over a brief period of exposure as comorbidity.

Keywords: Clinical profile, heart failure, hypertension, myocardial infarction

INTRODUCTION

Cardiovascular diseases are first leading cause of death globally attributing 17.7 million deaths in 2015.^[1] CAD has contributed to 17% of total deaths and 26% of adult deaths in 2001–2003 that raised to 23% of total and 32% of adult deaths in 2010–2013.^[2] Nowadays, incidence of cardiac arrest or sudden cardiac death increases therefore myocardial infarction (MI) is the most predominant from other cardiovascular diseases. In USA, 17.5 million deaths certified due to cardiac arrest that is one of every 7.4 death.^[3] MI is multifactorial,

progressive, and complex disease, affecting heart muscle suddenly and loses its blood supply. Without prompt treatment, this can lead to damage to the affected part of the heart. It sometimes called a heart attack or coronary thrombosis.^[4] Hypertension is a common risk factor of coronary artery disease. A general definition of hypertension is a systolic blood pressure of 140 mm Hg or higher or a diastolic blood pressure of 90 mm Hg or higher or both according to JNC classification of hypertension.

Hypertension is a common disease in industrialized countries and accounts for 6% of death worldwide. People with elevated blood pressure are at increased risk of cardiovascular diseases, stroke, and renal diseases. The risk for cardiovascular disease doubles with every 20 mm Hg increase in systolic and 10 mm Hg increase in diastolic

Access this article online

Website: www.isfcppharmaspire.com **P-ISSN:** 2321-4732
E-ISSN: XXXX-XXXX

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blood pressure above normal values.^{15]} Chronic increase in blood pressure is known to induce structural alterations in vasculature and in other organs. Thus, increasing levels of blood pressure or greater duration of hypertension can lead to atherosclerosis with increased stress on the myocardium caused by lack of aortic compliance. Hypertension is a powerful risk factor responsible for cardiac and blood vessel damage and is associated with high morbidity and mortality.^{16]} About 50% of first MI patients have blood pressure higher than 160/90 mmHg.

MI is strongly and positively associated with blood pressure in a graded, independent, and consistent pattern, as shown in a meta-analysis of nine major prospective studies. The antihypertensive and lipid-lowering treatment to prevent heart attack trial study clearly showed the benefit of antihypertensive treatment in subjects with other congestive heart failure (CHD) risk factors. Their results established hypertension as a major, casual risk factor for CHD. In the multiple risk factor intervention trial, a 6-year follow-up of 356,222 middle aged men showed that 32% of all CHD deaths could be attributed to diastolic blood pressure >80 mm Hg and 42% could be attributed to systolic blood pressure >120 mm Hg.^{17]}

MATERIALS AND METHODS

This prospective observational study was carried out for the period of 6 months from October 2017 to March 2018 at the Department of Medicine in Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India. A total of 100 study participants were recruited in the study based on inclusion criteria and exclusion criteria given below.

Inclusion criteria

The following criteria were included in the study:
Patients diagnosed with hypertension and coronary artery disease
Both the genders with age >60 years
Those are willing to participate in the study

Exclusion criteria

The following criteria were excluded from the study:

- Patients below the age of 60 years
- Incomplete information
- Those who are not willing to participate in the study.

Data were collected from patient case sheet, laboratory tests reports, and patient interview in to the specially designed data collection form after taking the written consent from the patient diagnosed with hypertension and MI. The data were analyzed using SPSS ver. 20.

RESULTS

Among a total of 100 study participants males, 63% were found to be more prevalent to MI than their female 37% counterparts. The gender ratio of the hypertensive subjects male:female was found to be 2:1 approximately. The mean age (mean±S.D) of study participants was found to be 68.92 ± 6.152 years and the median was 68.00

years. Most of the patients up to 36% belonged to 60–65 age group. The majority of the study participants up to 69% were from urban area and only 31% were from rural area. The mean weight of study participants (mean±S.D) was 64.61 ± 10.494 kg and the median was 65 kg. Large number of study participants up to 35% belonged to weight group of 51–60 kg. The majority of study population up to 58% was found to be smokers and only 42% were non-smokers. Details of socio-demographic characteristics of the study population are shown in Table 1.

On analyzing symptoms experienced by the patients, it was observed that the majority of the patients experienced chest pain 92%, followed by perspiration 62%, dyspnea 48%, syncope 26%, and only 17% of study participants experienced nausea and vomiting. Details are shown in Table 2.

The mean systolic blood pressure (mean±S.D) of the patients was 145.56 ± 31.676 mm Hg and the median was 150 mmHg. Test of proportion showed that the systolic blood pressure of most of the study participants was found to be 39% which belonged to the Stage II hypertension (above 160 mmHg) as per JNC-8 guidelines while the mean diastolic blood pressure (mean±S.D) of the patients was 87.67 ± 16.0769 mmHg and the median was 90 mmHg. Test of proportion showed that the diastolic blood pressure among majority of study participants 29% belonged to the Stage II hypertension between 90

Table 1: Socio-demographic characteristics of the study population (n=100)

Age distribution of patients (in years)	Percentage
60–55	36
66–70	30
71–75	18
76–80	11
>80	5
Gender distribution of patients	
Male	63
Female	37
Locality distribution of patients	
Urban	69
Rural	31
Weight distribution of patients	
40–50 kg	5
51–60 kg	35
61–70 kg	31
71–80 kg	21
81–90 kg	8
Smoking distribution of patients	
Smoker	58
Non-smoker	42

Table 2: Symptoms experienced by the patients (clinical profile)

Symptoms experienced by patients	Percentage
Chest pain	92
Perspiration	62
Syncope	26
Nausea and vomiting	17
Dyspnea	48

and 99 mmHg as per JNC-8 guidelines. Details of blood pressure among study population as per JNC-8 guidelines are shown in Table 3.

On evaluation of patients for lipid profile, the majority of them 62% had CHL level <200 mg/dl, majority 56% triglyceride (TG) level <150 mg/dl. Moreover, 34% had low-density lipoprotein (LDL) level between 100 and 129 mg/dl and maximum 52% had HDL level between 40 and 59mg/dl. Details of lipid profile of study population are shown in Table 4.

A large proportion of study population up to 37.0% suffered hypertension from 11 to 15 years, followed by 28.0% from 6 to 10 years, 18.0% from 1 to 5 years, and 17.0% from 16 to 20 years, respectively. Details are shown in Figure 1.

Among 100 hypertensive study participants, the majority of subject's up to 65% suffered from MI, followed by 35% did not had MI. Details are shown in Figure 2.

The Pearson correlation between duration of hypertension and MI was found to be strong, $r = 0.769$ and statistically significant ($P < 0.01$) at 90% confidence interval. Details are shown in Table 5.

DISCUSSION

Hypertension is a common risk factor for cardiac and vascular damage that is associated with high morbidity and mortality. In India, during

Table 3: Blood pressure among study population categorized as per JNC-8 guidelines

Systolic blood pressure	Percentage (%)	Diastolic blood pressure	Percentage (%)
Normal <120/80	18	Normal < 80	23
Pre-hypertension 120–139	19	Pre-hypertension 80–89	26
Stage I hypertension 140–159	24	Stage I hypertension 90–99	29
Stage II hypertension >160	39	Stage II hypertension > 100	22

Table 4: Lipid profile of study population

Lipid profile	Percentage
CHL	
<200 mg/dl	62
200–239 mg/dl	24
>240 mg/dl	14
TG	
<150 mg/dl	56
150–199 mg/dl	26
200–499 mg/dl	18
LDL	
100–129 mg/dl	34
130–159 mg/dl	31
160–189 mg/dl	25
>190 mg/dl	8
HDL	
Low 40 mg/dl or less	32
Medium 40-59mg/dl	52
High 60 mg/dl	16

CHL: Cholesterol, TG: Triglycerides, HDL: High-density lipoprotein, LDL: Low-density lipoprotein

the past 40 years, the prevalence of coronary artery disease has been raised four folds. Prolonged hypertension may progressively lead to atherosclerosis with enhance stress on the myocardium. The present study investigated the relationship between duration of hypertension and MI on 100 hypertensive patients.

Ahmed *et al.* 2014 conducted a cross-sectional study in patients with MI reported that the mean age of the study population was 68.3 years.^[8] Similarly, results of the present study found that the mean age of the patients with MI was to be 68.92 years.

In our study, the prevalence of MI in males suffering from hypertension was high as compared to female counterparts. Further, this finding was supported by Deshmukh *et al.* in a study conducted in South India.^[9]

Sekhri *et al.* demonstrated in his study that prevalence of CAD is high in the urban Indian population than rural population.^[10] Similarly, in

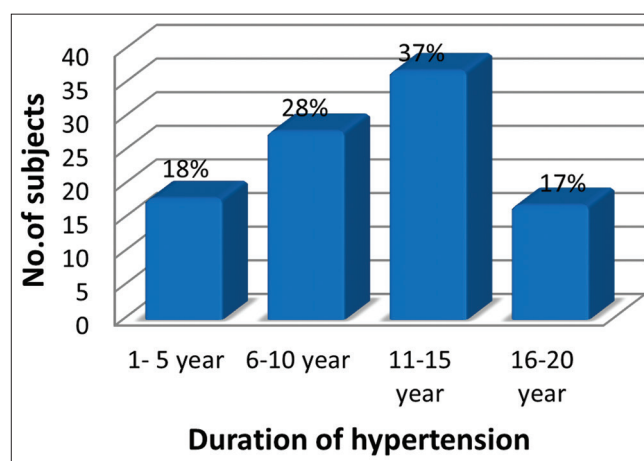


Figure 1: Duration of hypertension in study population

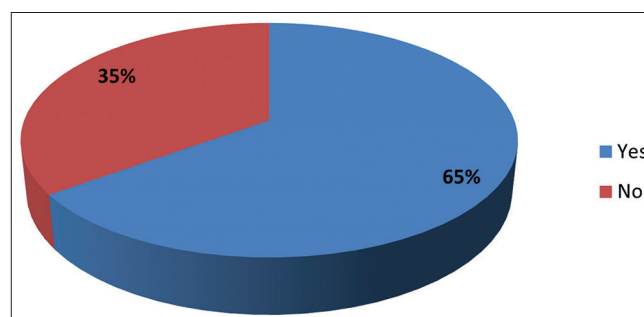


Figure 2: Presence of myocardial infarction among hypertensive study population

Table 5: Pearson correlation between duration of hypertension and myocardial infarction

Correlation	Duration of hypertension	Myocardial infarction
Duration of hypertension	Pearson Correlation	1
	Sig. (two-tailed)	0.769**
	N	100
Myocardial infarction	Pearson Correlation	0.769**
	Sig. (two-tailed)	0.000
	N	100

**Correlation is significant at the 0.01 level (one-tailed)

the present study, of 100 patients 69% were from urban area only 39% from rural area.

Choudhury *et al.* reported that in 80% of hypertensive persons have comorbidities such as obesity, glucose intolerance, and abnormalities in lipid metabolism.^[11] In our study results, the majority of population fall under weight categories 51–60 kg and their mean weight was found to be 64.61 kg.

Pandey *et al.* and Stallones reported in a study that smoking is a contributing risk factor for MI and hypertension.^[12,13] In our study, the majority of the patients 58% were smokers that could be a confounding factor for MI.

Kaplan *et al.* study the relationship between blood pressure and risk of MI among patient treated for hypertension.^[14] The results indicated that blood pressure level was directly related to risk of MI. In our study, the majority of hypertensive participants (65%) suffered from MI, followed by 35% did not had MI.

As per Dhadwal *et al.* study reported that chest pain was the first commonly experienced symptoms by MI patients followed by perspiration, dyspnea, nausea, and vomiting.^[15] Similarly, the results of our study found that 83% patients experienced chest pain, 72% dyspnea, 62% perspiration, and only 17% nausea and vomiting.

Stanley S. Franklin and Wong in his Framingham heart study showed that the systolic blood pressure is the major predictor of CAD than diastolic blood pressure.^[16] In the present study, the mean systolic blood pressure of MI patients was 145.56 mmHg and higher level of study population fall under the categories of Stage II hypertension, i.e., blood pressure more than 160 mmHg. The mean diastolic blood pressure was 87.67 mmHg and more study subjects belong to Stage I that is 90–99 mmHg. These results indicated that the systolic blood pressure is more in MI that is similar to Stanley Franklin *et al.* report.

Choudhury *et al.* conducted a prospective study in the northern region of Bangladesh found that in hypertensive patients the serum total cholesterol (TC), TG, and LDL levels were higher.^[11] However, in the present study, the TC, TG, and LDL in hypertensive patients were lie in normal range which is different from Choudhury *et al.* study report.

Perticone *et al.* conducted a study in hypertensive patients reported that serum alkaline phosphatase negatively affects endothelium-dependent vasodilation in hypertensive patients cause MI.^[17] Similarly, in the present study, serum alkaline phosphatase level was more in patient (150–200 mg/dl) that causes a MI.

Yusuf *et al.*, 2004, and Richards *et al.*, 2004, reported in his study that a history of hypertension was shown to be associated with an increased rate of adverse outcomes such as acute MI, stroke, heart failure, and cardiovascular death and also the hypertension is an independent predictor for MI.^[18,19] The present study result revealed that the mean duration of hypertension in myocardial patients was 11.28 years while the majority of patients having hypertension from 11 to 15 years. The Pearson Correlation between duration of hypertension and MI was

found to be strong, $r = 0.769$ and statistically significant ($P < 0.01$) at 90% confidence interval that show hypertension is independent risk factor for MI which is similar to Yusuf *et al.*, 2004 and Richards *et al.*, 2004 report.

Direction for future research

- Our study was consisted of small sample size. Future studies should focus on recruiting large number of study participants to gather strong evidence between duration of hypertension and incidence of MI
- The relationship between being overweight and incidence of MI among hypertensive patients of young age should be explored.

CONCLUSION

This study has found that the prevalence of hypertension induced MI was high in male population as compared to their female counterparts. People living in urban area are more likely to be affected by it than people living in rural area. There was a strong correlation between duration of hypertension and MI which suggests that MI may be hypertension induced over a brief period of exposure as comorbidity.

ACKNOWLEDGEMENT

The author is highly thankful to Chairman ISF College of Pharmacy, Sh, Parveen Garg for providing wonderful research platform and staff Jagraon hospital for helping in this study.

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