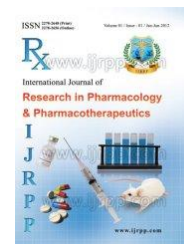




## International Journal of Research in Pharmacology & Pharmacotherapeutics



ISSN Print: 2278-2648

IJRPP |Vol.4 | Issue 3 | Jul-Sep-2015

ISSN Online: 2278-2656

Journal Home page: [www.ijrpp.com](http://www.ijrpp.com)

Research article

Open Access

### Gender based assessment of 10 year cardiovascular risk in hypertensive patients

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#### ABSTRACT

##### BACKGROUND

Cardiovascular disease develops 7 to 10 years later in women than in men and is still the major cause of death in women. The risk of heart disease in women is often underestimated due to the misperception that females are 'protected' against cardiovascular disease.

##### AIM

To determine 10 year cardiovascular risk in hypertensive patients of either sex with emphasis on specific risk factors predisposing to morbidity and mortality from cardiovascular disease in both sexes.

##### MATERIALS AND METHODS

This cross-sectional observational study was conducted in the Cardiology outpatient department (OPD) at Rajindra Hospital, Patiala. A total of 150 patients were included in the study. The data pertaining to four risk factors-ages, smoking history, blood pressure and serum cholesterol level was collected from all the patients. Data collected was used to calculate 10 year risk of morbidity and mortality from cardiovascular disease by using Framingham Risk Score.

##### RESULTS

In the present study patients were in the age group of 35-60 years and out of 150 patients 85 were females and 65 were males. It was observed that serum cholesterol was in borderline range in 46.15% of females and 29.4% of males whereas raised serum cholesterol levels were observed in 23.5% females and 15.38% males. 52.9% of females and 92.3% of males were having stage 1 hypertension and stage 2 hypertension was risk factor in 47.05% of females and 23.07% of males. Smoking history was present in 4.7% of females and 61.5% of males. According to Framingham Heart Score, 8.2% of females and 26.15% males were in low risk category (calculated risk<10%). Moderate risk (calculated risk between 10-20%) was observed in 35.29% females and 33.84% males whereas high risk (calculated score more than 20%) was observed in 56.4% females and 55.38% males.

**KEY WORDS:** Hypertension, cholesterol, smoking and Framingham Heart Score

#### INTRODUCTION

Cardiovascular disease develops 7 to 10 years later in women than in men and is still the major cause of death in women over the age of 65 years. The

risk of heart disease in women is often underestimated due to the misperception that females are 'protected' against cardiovascular disease. Recent data from the National Health and

Nutrition Examination Surveys (NHANES) have shown that over the past two decades the prevalence of myocardial infarctions has increased in midlife (35 to 54 years) women, while declining in similarly aged men.<sup>[1]</sup> It is assumed that exposure to endogenous oestrogens during the fertile period of life delays the manifestation of atherosclerotic disease in women. Before menopause the CHD event rate in women is low and predominantly attributed to smoking.<sup>[2]</sup> Women with an early menopause (<40 years) have a two-year lower life expectancy compared with women with a normal or late menopause.<sup>[3]</sup> Data from the Framingham Heart Study suggest that a harmful cardiovascular risk profile may be more cause than consequence of age at menopause. In the Women's Ischemia Syndrome Evaluation (WISE) study it was shown that young women with endogenous oestrogen deficiency have a more than sevenfold increase in coronary artery risk.<sup>[4]</sup> Oestrogens have a regulating effect on several metabolic factors, such as lipids, inflammatory markers and the coagulant system. They also promote a direct vasodilatory effect through the  $\beta$  receptors in the vessel wall. Furthermore, signs of subclinical atherosclerosis, as visualised by intima-media thickness measurements, can already be found in women before menopause, especially when several CHD risk factors are present.<sup>[5]</sup> Women with clinically manifest CHD are in general older than men, with a higher expression of cardiovascular risk factors.<sup>[6,7]</sup> Although women and men share most classic risk factors, the significance and the relative weighting of these factors are different. At younger ages (<50 years) *smoking* is more deleterious in women than in men, with a larger negative impact of the total number of cigarettes smoked per day.<sup>[2,8]</sup> Smoking increases the risk of a first acute myocardial infarction (AMI) relatively more in females than in men. In young premenopausal women smoking causes a down regulation of the oestrogen-dependent vasodilatation of the endothelial wall.<sup>[9]</sup> Body *weight* may increase during the first years since menopause and body fat distribution changes from a gynoid to a more android pattern. Central obesity with an increase in visceral fat occurs more frequently after menopause, with a higher presence of comorbid risk factors and components of the metabolic syndrome in women compared with ageing men.<sup>[10]</sup> With the increasing incidence of obesity there is a parallel increase in the prevalence

of type 2 diabetes. Women with *diabetes* are at greater risk for cardiovascular complications than their male counterparts. In a meta-analysis of 37 prospective cohort studies, the risk of fatal CHD is 50% higher in women with diabetes compared with male diabetics.<sup>[11]</sup> Systolic *blood pressure* rises more steeply in ageing women compared with men, and this may be related to the decline in oestrogen levels in menopause transition.<sup>[12,13,14]</sup> After menopause there is an up regulation of the renin-angiotensin system, with an increase in plasma-renin activity. Salt sensitivity and sympathetic activity are also increased in postmenopausal compared with premenopausal women. At older age (>75 years) isolated systolic hypertension is 14% more prevalent in women and an important cause of left ventricular hypertrophy, (diastolic) heart failure and strokes. Moderate or borderline hypertension (<140/90 mmHg) causes more endothelial dysfunction and cardiovascular complications in women than in men.<sup>[15]</sup> Hypertension often starts in the menopausal transition period and can cause a variety of complaints, such as chest pain, palpitations, headaches and even sensations of hot flashes.<sup>[16]</sup> These complaints are often attributed to menopause but are less prevalent when elevated blood pressure is adequately treated.<sup>[17]</sup> It is controversial whether women who have relatively more vaso-vegetative symptoms during menopause transition are at greater risk for CHD.<sup>[18]</sup> At younger age, the relative risk of *hypercholesterolaemia* is lower in women compared with men. During menopause, total cholesterol and low-density lipoprotein (LDL) levels rise by 10 and 14% respectively and lipoprotein (a) increases 4 to 8%, whereas high-density lipoprotein (HDL) cholesterol levels remain unchanged.<sup>[19, 20]</sup> It may therefore be important to (re)evaluate the lipid profile after menopause when borderline premenopausal values were found. Above 65 years of age mean LDL cholesterol is higher in women compared with men. At all ages HDL-cholesterol levels are 0.26 to 0.36 mmol/l higher in women but from the Framingham study it is known that a low HDL cholesterol implicates a higher CHD risk in women than in men.<sup>[21]</sup> Although women have often been under-represented in many statin trials in the past, there is currently no doubt that in secondary prevention LDL reduction in women leads to an equally lower CHD mortality as in men.<sup>[22]</sup> On the other hand, in primary prevention

the role of statin therapy in women is still controversial. Caution is needed, however, as women have a lower absolute risk in the age groups that have been studied thus far. A recent large Japanese study showed clear benefits of primary prevention with statins in women with moderately elevated cholesterol levels above the age of 55 years.<sup>[23]</sup> The age difference in the occurrence of CHD events among men and women was accounted for in the JUPITER trial, where comparable benefits of primary prevention with a statin were found in healthy men  $\geq 50$  years and in women  $\geq 60$  years with normal LDL levels but elevated hs-CRP levels.<sup>[24]</sup> Women with a history of *hypertensive diseases in pregnancy* are at increased risk for hypertension and premature cardiovascular disease later in life. Especially in women after preeclampsia, defined as hypertension ( $\geq 140/90$  mmHg) and proteinuria ( $\geq 0.3$  g/24 h) after 20 weeks of gestation, the risk of future CHD is twice as high compared with women who were normotensive during pregnancy.<sup>[25]</sup> Women with a placental syndrome in combination with poor foetal growth or intrauterine death are considered to be at greatest risk.<sup>[26]</sup> Hypertensive disorders are thought to be associated with an abnormal placentation leading to aberrant autonomic control and inappropriate release of vasoactive substances causing endothelial dysfunction in the maternal and foetal circulation. In women with *gestational diabetes* the relative risk to develop type 2 diabetes is even 7 to 12 times higher compared with women with normoglycaemic pregnancies.<sup>[27]</sup> The characteristics of pregnancy-related disorders provide a unique opportunity for a better cardiovascular risk assessment and prevention, but have not yet been incorporated in the latest guidelines for CHD prevention in women.<sup>[28]</sup> Cardiovascular disease is the major cause of death in women and is still under-recognized and undertreated. A greater awareness of the differences in presentation of angina pectoris and ACS between men and women, with gender-based interpretation of diagnostic tests, is mandatory for health care professionals to improve therapeutic strategies and outcomes in women. Cardiology guidelines should be more focused on sex-related differences when appropriate. Further, women themselves need to be more aware of their own risk factors and clinical signs of CHD. Many biological differences in atherosclerosis between men and

women are not yet clarified and will need further research in the future.

## MATERIALS AND METHODS

### STUDY DESIGN

This cross-sectional observational study was conducted in the Cardiology outpatient department (OPD) at Rajindra Hospital, Patiala. A total of 150 patients were included in the study. The data pertaining to four risk factors-ages, smoking history, blood pressure and serum cholesterol level was collected from all the patients. Data collected was used to calculate 10 year risk of morbidity and mortality from cardiovascular disease by using Framingham Risk Score.

### INCLUSION CRITERIA

- Patients with hypertension in stage I/stage II
- Newly diagnosed and old patients of hypertension
- Hypertensive patients with or without comorbidities

### EXCLUSION CRITERIA

- Pregnant patients with hypertension
- Patients with systolic BP  $> 210$  and/or diastolic BP  $> 120$  mm Hg, requiring emergency care

### STUDY SEQUENCE

All the patients were informed about the study in layman language and written informed consent was taken. The patients coming to the outpatient department of Cardiology, Rajindra Hospital, and Patiala were included in the study. A total of 150 patients were included in the study. The data pertaining to four risk factors-ages, smoking history, blood pressure and serum cholesterol level was collected from all the patients. Data collected was used to calculate 10 year risk of morbidity and mortality from cardiovascular disease by using Framingham Risk Score.

### STATISTICAL ANALYSIS

Descriptive statistics had been applied for the analysis of data. Data was expressed in proportion and percentage form and represented in the form of tables, charts and bar diagrams.

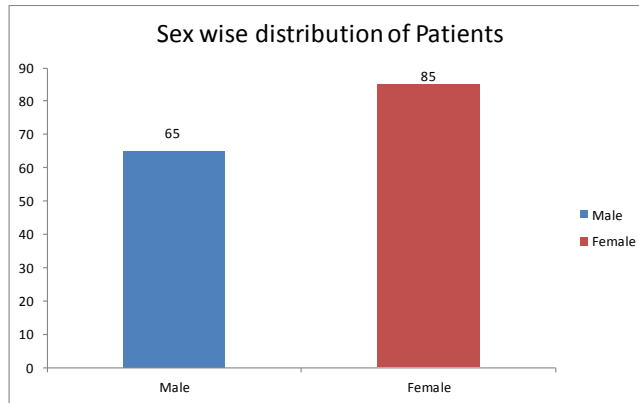
## RESULTS

A total of 150 patients were included in the study. Patients of either sex, or only out-patients were

included in the study. The data pertaining to four risk factors-ages, smoking history, blood pressure and serum cholesterol level was collected from all the patients. Data collected was used to calculate

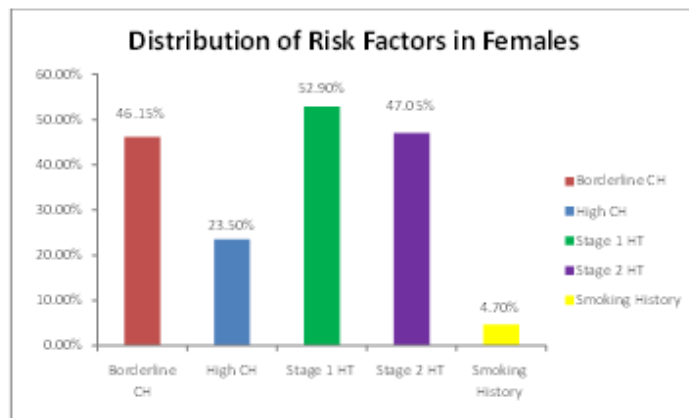
10 year risk of morbidity and mortality from cardiovascular disease by using Framingham Risk Score.

**GRAPH-1**



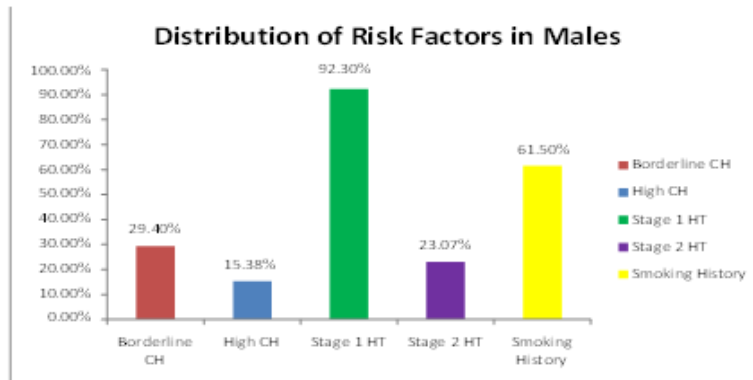
As shown in the graph, out of 150 patients 65 were males and 85 were females.

**GRAPH-2**



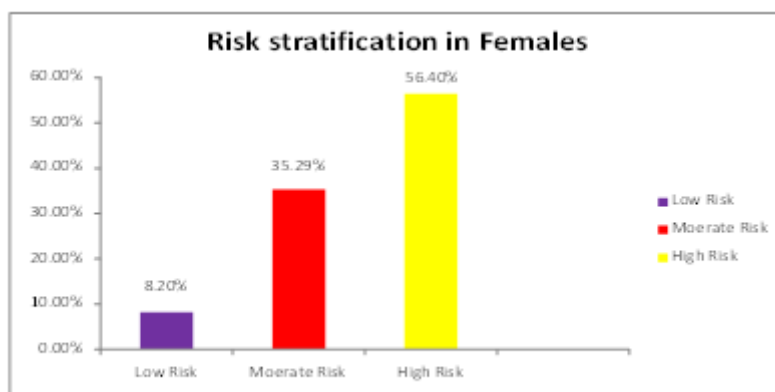
As shown in the above graph, the most common risk factor for cardiovascular diseases in females is stage 1 hypertension followed by borderline cholesterol levels.

**GRAPH-3**



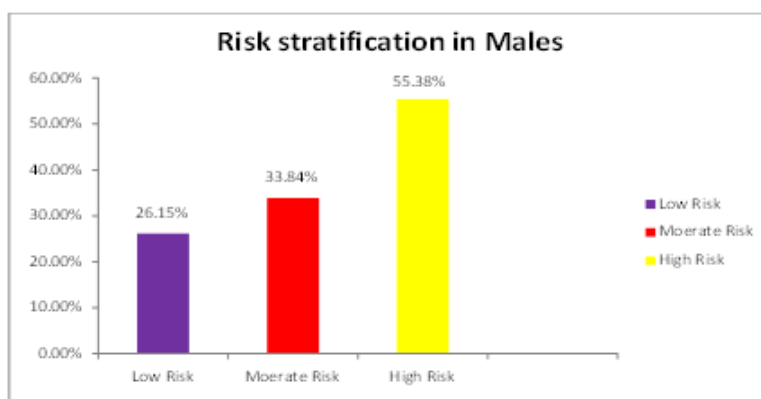
As shown in the above graph, the most common risk factor for cardiovascular diseases in males is stage 1 hypertension followed by smoking history.

**GRAPH-4**



As shown in the above graph, 56.4% of females were having high risk for cardiovascular diseases whereas 35.29% females were having moderate risk and 8.2% were having low risk.

**GRAPH-5**



As shown in the above graph, 55.38% of males were having high risk for cardiovascular diseases whereas 33.84% males were having moderate risk and 26.1% were having low risk.

**DISCUSSION**

In the present study patients were in the age group of 35-60 years and out of 150 patients 85 were females and 65 were males. It was observed that serum cholesterol was in borderline range in 46.15% of females and 29.4% of males whereas raised serum cholesterol levels were observed in 23.5% females and 15.38% males. 52.9% of females and 92.3% of males were having stage 1 hypertension and stage 2 hypertension was risk factor in 47.05% of females and 23.07% of males. Smoking history was present in 4.7% of females and 61.5% of males. According to Framingham Heart Score, 8.2% of females and 26.15% males were in low risk category (calculated risk < 10%). Moderate risk (calculated risk between 10-20%) was observed in 35.29% females and 33.84% males

whereas high risk (calculated score more than 20%) was observed in 56.4% females and 55.38% males.

**CONCLUSION**

In the present study, raised cholesterol levels and stage 2 hypertension were most common risk factors for cardiovascular disease in females and in male's stage 1 hypertension and smoking were the most common risk factors. Calculated Framingham heart score showed that 91.69% of the females were in moderate and high risk category (78 out of 85) i.e. their score was more than 10%. In males, 89.22% were in moderate and high risk category. In females only 8.2% were in low risk category whereas 26.15% of males were in low risk category. It could be concluded that females were

having higher risk of morbidity and mortality from cardiovascular disease in next 10 years as compared to males.

## ACKNOWLEDGEMENT

The authors would like to thank Dr. Anjleen Kaur, Dr. Neetu Sharma and Dr. Kiranpreet for their kind collaboration in the preparation of this article.

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