Risk Assessment for Congestive Heart Failure in a South Indian Population: A Clinical Pharmacist’s Perspective

N VANITHA RANI*, G KANNAN, VASANTRA J, P THENARASU, C UMA MAHESWARA REDDY

ABSTRACT

Congestive heart failure (CHF) is becoming an increasingly prevalent healthcare problem. Hypertension (HT) is a major risk factor for CHF and it commonly coexists with other cardiovascular risk factors. The quality of risk that HT represents has to be thoroughly compared with other risk factors. This could have significant implications for primary prevention strategies including drug treatment. A study was conducted in 137 heart failure patients, to assess the contribution of cardiovascular risk factors like age, sex, obesity, HT, diabetes, dyslipidemia, alcohol, smoking and family history, individually and in combination, in the progression of CHF using multivariate logistic regression analysis and odds ratio (OR) (95% confidence interval). Of the various individual factors, HT showed 3.8 times greater risk (p = 0.003; OR-3.773) for heart failure; dyslipidemia exhibited 2.5 times risk (p = 0.07; OR-2.49), followed by others. Patients with HT, but no diabetes or dyslipidemia had 1.2 times risk (OR-1.17) for CHF; patients with hypertension and diabetes had 1.7 times risk (OR-1.69) and patients with HT, diabetes and dyslipidemia had two times greater risk (OR-1.87). Though, the present study emphasizes that HT is the most common risk factor in the progression of heart failure, the risk is high when it coexists with other risk factors like diabetes and dyslipidemia. A clinical pharmacist can work in collaboration with healthcare team in achieving the goal of long-term control of hypertension and other cardiovascular risk factors in millions of patients, by providing services ranging from monitoring drug therapy and improving patients compliance to drug therapy, to, health maintenance care such as ordering screening procedures and counseling regarding lifestyle modification.

Keywords: Hypertension, heart failure, diabetes, dyslipidemia, cardiovascular risk factors

Congestive heart failure (CHF), also referred to as congestive cardiac failure (CCF) or just heart failure, is a condition that can result from any structural or functional cardiac disorder that impairs the ability of the heart to fill with or pump a sufficient amount of blood through the body.¹ It is becoming an increasingly prevalent healthcare problem with notable socioeconomic consequences.² Because not all patients have volume overload at the time of initial or subsequent evaluation, the term ‘heart failure’ is preferred over the older term ‘CHF’.³ Hypertension (HT) and chronic ischemic heart disease (one or the other or, more frequently, in association) are responsible for the highest percentage of cases of CHF in the industrialized world. Obesity, diabetes, sedentary lifestyle and smoking also play unmistakable roles, favoring the development of CHF. HT as such is an independent risk factor for heart failure and plays a key role in the evolution of the disease.⁴ In the Framingham heart study cohort, HT antedated the development of heart failure in 91% cases and was associated with 2- to 3-fold risk, after adjusting for age and other cardiovascular risk factors.⁵

The primary cardiac mechanism that underlies the clinical syndrome of heart failure is systolic and diastolic dysfunction, usually in combination.⁶ The earliest functional cardiac changes in HT are in left ventricular systolic and diastolic function, which evolve and progress to left ventricular hypertrophy (LVH) and then to left ventricular failure, which can be diagnosed by echocardiogram.⁷

The spectrum of HT, LVH and left ventricular failure represent an under-diagnosed and undertreated problem. Too few patients have their blood pressure (BP) under good control and too many progresses to heart failure. BP control continues to be important in reducing cardiovascular risk.
Major problems in control of BP are patient's noncompliance to drug therapy, lack of patient education about importance of BP control and high costs of medical and pharmaceutical care which can be effectively addressed by a clinical pharmacist. As a member of healthcare team, the clinical pharmacist can act as a bridge between the patients and the prescribers to achieve the goal of long-term control of the cardiovascular risk factors. A clinical pharmacist can work in collaboration with healthcare team in achieving the goal of long-term control of HT in millions of patients, by providing services ranging from monitoring drug therapy and improving patients compliance to drug therapy to, health maintenance care such as ordering screening procedures and counseling regarding lifestyle modification.

**METHODOLOGY**

The study was carried out for a period of eight months (January 2008 to August 2008) in the intensive coronary unit of a South Indian tertiary care teaching hospital after obtaining approval from the Institutional Ethics Committee and consent from the patients. The study population comprised of 137 patients (100 men and 37 women, age range 30-90 years; mean age 62.31 ± 12.09) and diagnosed with left ventricular failure. Detailed medical history elicitation including demographic data (age, sex, body mass index [BMI]), presence of contributing cardiovascular risk factors namely HT, diabetes mellitus, obesity, dyslipidemia, smoking, alcohol and family history of cardiovascular diseases were collected for each patient and recorded in the data collection forms designed exclusively for the study. Cardiovascular risk factors were defined as follows: Smoking was defined as current smoking of ≥1 pack/day, obesity as the BMI ≥ 30 kg/m², family history as history of cardiovascular disease or sudden cardiac death before the age of 55 years in the mother or any other first degree female relative, HT as having a BP of >140/90 mmHg on two separate examinations or usage of antihypertensive agents, diabetes mellitus as fasting glucose ≥126 mg/dl, postprandial glucose ≥200 mg/dl and random blood sugar ≥200 mg/dl, respectively or usage of insulin or antidiabetic drugs, metabolic dyslipidemia as the fasting cholesterol ≥200 mg/dl, triglyceride ≥150 mg/dl, low-density lipoprotein (LDL) ≥100 mg/dl, high-density lipoprotein (HDL) level <40 mg/dl in men and <50 mg/dl in women.

**STATISTICAL ANALYSIS**

All data were entered prospectively in a computerized data base. Analysis was done with the SPSS Statistical software (10.0 version). All categorical values were presented as mean ± standard deviation. A multivariate logistic regression analysis and odds ratio (OR) (95% confidence interval [CI]) was performed to identify the contribution of major cardiovascular risk factors in the progression of CHF in the study population. The risk of CHF when HT coexists with diabetes and dyslipidemia was also analyzed. A p value of <0.05 was considered significant.

**RESULTS**

A total of 137 patients with left ventricular dysfunction were included in the study of which, 100 (73.0%) were males and 37 (27.0%) were females. The mean age and standard deviation of males were 62.09 ± 12.39 and females were 61.41 ± 11.59. Prevalence of left ventricular dysfunction was higher in males (73%) than in females (27%) in this study.

**Risk Factor Profile**

The overall cardiovascular risk factor profile observed in the study population was HT in 105 (76.6%) patients, diabetes in 75 (54.7%), dyslipidemia in 32 (23.4%), alcoholics in 20 (14.6%), smoking in 38 (27.7%) and family history of cardiovascular disease in 31 (22.6%). The contribution of individual and combined risk factors in the progression of heart failure in the study population were analyzed using multivariate logistic regression analysis and OR (95% CI). The statistical analysis was carried out using all the cardiovascular risk factors (age, sex, BMI ≥ 30 kg/m², HT, diabetes, dyslipidemia, alcohol, smoking and family history) as independent variables and left ventricular dysfunction as dependent variable.

HT was found to be significant risk factor in the progression of left ventricular failure (p = 0.003) followed by dyslipidemia which was moderately significant (p = 0.07). Based on OR, HT showed 3.8 times greater risk (OR-3.773) for cardiac failure than other cardiovascular risk factors studied. Dyslipidemia exhibited 2.5 times greater risk (OR-2.49) for cardiac failure which establishes it to be a second major risk factor for the progression of heart failure (Table 1 and Fig. 1).

Based on the regression analysis and OR of combined risk factors, patients with HT without diabetes or
Table 1. Results of Multiple Logistic Regression Analysis of Risk Factors

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Reg. coeff ‘b’</th>
<th>Standard error of ‘b’</th>
<th>p value</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.026</td>
<td>0.016</td>
<td>0.120</td>
<td>1.026</td>
<td>0.993-1.060</td>
</tr>
<tr>
<td>Sex</td>
<td>0.136</td>
<td>0.466</td>
<td>0.780</td>
<td>0.878</td>
<td>0.352-2.188</td>
</tr>
<tr>
<td>BMI ≥30 kg/m²</td>
<td>0.82</td>
<td>0.062</td>
<td>0.185</td>
<td>1.086</td>
<td>0.962-1.226</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.329</td>
<td>0.446</td>
<td>0.003</td>
<td>3.773</td>
<td>1.575-9.052</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.274</td>
<td>0.384</td>
<td>0.476</td>
<td>1.315</td>
<td>0.619-2.792</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>0.914</td>
<td>0.518</td>
<td>0.078</td>
<td>2.494</td>
<td>0.903-6.887</td>
</tr>
<tr>
<td>Smoking</td>
<td>0.308</td>
<td>0.471</td>
<td>0.513</td>
<td>1.360</td>
<td>0.541-3.421</td>
</tr>
<tr>
<td>Family history</td>
<td>0.258</td>
<td>0.468</td>
<td>0.581</td>
<td>0.772</td>
<td>0.309-1.934</td>
</tr>
</tbody>
</table>

p value of <0.05 is considered significant.

Table 2. Results of Multiple Logistic Regression Analysis of Combined Risk Factors

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Reg. coeff ‘b’</th>
<th>Standard error of ‘b’</th>
<th>p value</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>0.159</td>
<td>0.4</td>
<td>0.692</td>
<td>1.172</td>
<td>0.535-2.568</td>
</tr>
<tr>
<td>Hypertension + Diabetes</td>
<td>0.525</td>
<td>0.374</td>
<td>0.16</td>
<td>1.69</td>
<td>0.813-3.516</td>
</tr>
<tr>
<td>Hypertension + Diabetes + Dyslipidemia</td>
<td>0.623</td>
<td>0.628</td>
<td>0.321</td>
<td>1.865</td>
<td>0.545-6.378</td>
</tr>
</tbody>
</table>

p value of <0.05 is considered significant.

Figure 1. Odds ratio of risk factors.

Dyslipidemia had 1.2 times risk (OR-1.17) for heart failure, whereas patients with HT and diabetes had 1.7 times risk (OR-1.69) and patients with HT, diabetes and dyslipidemia had two times greater risk (OR-1.87) (Table 2 and Fig. 2).

DISCUSSION

Heart failure is increasing in prevalence in many areas of the world. It can be defined as a progressive complex clinical syndrome characterized by inadequate systemic perfusion to meet the body’s metabolic demands as a result of impaired cardiac function. HT and ischemic heart disease are the two cardinal causes of heart failure and they commonly coexist. The relative contributions of hypertension and ischemic heart disease to heart failure have been difficult to disentangle. The mechanisms involved in progression from HT to heart failure have been the focus of many recent studies. HT should not be considered in isolation because other risk factors such as plasma lipid levels, cigarette smoking and presence of diabetes mellitus, obesity and family history of cardiovascular disease have also been a considerable impact on the progression of heart failure.

The quality of risk that HT represent has to be thoroughly compared with other factors. This could have significant implications for primary prevention strategies including drug treatment in the progression of heart failure. The Framingham heart study demonstrated HT to be the most common and one of the strongest risk factors for heart failure, especially in patients aged between 60-70 years.
In the present study, HT was found to be a major risk factor for the progression of heart failure in 76.6% of cases. This was followed by dyslipidemia, diabetes, smoking, obesity and family history of cardiovascular diseases. Hypertensive patients without diabetes or dyslipidemia had 1.2 times risk of heart failure, whereas patients with both HT and diabetes had 1.7 times risk and patients with HT, diabetes and dyslipidemia had 1.9 times greater risk.

A study done by Verdecchia 2000, had suggested that the risk of developing heart failure is 0.9% in the presence HT but if diabetes and dyslipidemia coexist then the risk of heart failure rises to 5.1%. Although, the contribution of HT in the progression of heart failure is high when compared to other risk factors, the absolute risk in individuals with HT remains low in the absence of other risk factors. HT clusters with other risk factors including hyperglycemia and hyperlipidemia, all of which have been implicated in intimal thickening and worsening after load.13

CONCLUSION

Though, the study shows that HT is a common cause for cardiac failure, practitioners need to realize that HT is typically accompanied by other cardiovascular risk factors, especially dyslipidemia and hyperglycemia, and that control of all these factors with appropriate therapy will have a positive effect on progression of heart failure. As a member of the healthcare team, a clinical pharmacist may play a pivotal role in effective control of the risk factors by educating the patients about early screening and regular monitoring of BP, blood sugar and serum cholesterol levels; the importance of compliance with the therapy and lifestyle modification.

REFERENCES

DISTURBED
BY
SIDE EFFECTS
OF HIGH
ELEMENTAL IRON?

NAUSEA
CONSTIPATION
G.I DISTURBANCE
IRON OVERLOAD

℞ DEXORANGE®
(Ferric Ammonium Citrate + Cyanocobalamin + Folic Acid) Syrup
(with Zinc advantage) Capsule

The Most Tolerated Iron Supplement
Pyridium® 200
Phenazopyridine Hydrochloride 200mg Tablets

...completes your prescription

- Exerts a local analgesic & anaesthetic effect on urinary tract mucosa¹
- Relieves pain during urination
- Recommended by reputed medical text books like Martindale and Goodman & Gilman

In UTI associated with....
- Catheterization
- Trauma
- Surgery
- Endoscopic procedure associated with
- Frequent urination
- Painful micturition

Action And Clinical Pharmacology: Phenazopyridine is excreted in the urine where it exerts a topical analgesic effect on the mucosa of the urinary tract. This action helps to relieve pain, burning, urgency and frequency. The precise mechanism of action is unknown. Phenazopyridine and its metabolites are rapidly excreted by the kidneys. Indications And Clinical Uses: For the symptomatic relief of pain, burning, urgency, frequency, and other discomforts resulting from irritation of the mucosa of the lower urinary tract caused by infection, trauma, surgery, endoscopic procedures, or the passage of sounds or catheters. The drug should be used for symptomatic relief of pain and not as a substitute for specific surgery or antimicrobial therapy. Phenazopyridine is compatible with antimicrobial therapy and can help relieve pain and discomfort during the interval before antimicrobial therapy controls the infection. Contra-Indications: In patients who are hypersensitive to the drug or its ingredients. Phenazopyridine is contraindicated in patients with renal insufficiency or severe liver disease. Dosage & Administration: Adults: 200 mg 3 times daily after meals. When used concomitantly with an antibacterial agent for the treatment of a urinary tract infection, the administration of phenazopyridine should not exceed 2 days. If symptoms persist, the patient should be re-evaluated.

References:

Invida India Private Limited
B-801, Safal Pegasus, Prahlad Nagar Road, Anand Nagar, Ahmedabad - 380 015 Gujrat, India Web: www.invida.co.in