1. Introduction

Ischemic Heart Disease (IHD) is considered to be the leading cause of death globally and it is responsible for almost 7.1 million deaths worldwide (Lopez et al., 2006). 80 percent of vulnerable population reside in low and middle income countries including India (Yusuf et al., 2001a, Reddy, 2004). Till 2020 these diseases are expected to increase more than 100% in developing countries, compared with up to 60% in developed countries (Yusuf et al., 2001b).

IHD is the leading cause of mortality in India, and the adverse impact is expected to rise over the next two decades. It is projected that IHD will cause two and one-half million Indian deaths by 2020 (Karthikeyan et al., 2007).

Patients in India, who have Acute Coronary Syndrome (ACS) have a higher rate of ST-elevation MI than the patients in developed countries. Since most of these patients are poor, less likely to get evidence-based treatments, and have higher 30-day mortality, improving access to healthcare facilities and of affordable treatments can reduce morbidity and mortality (Xavier et al., 2008).

Acute Coronary Syndrome

Acute Coronary Syndrome (ACS) is a term used to describe a cluster of conditions including ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI) and unstable angina (UA). ACS is an important manifestation of IHD. Conventional risk factors such as abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, and alcohol, and no regular physical activity account for development of STEMI (Yusuf et al., 2004). In the INTERHEART study smoking and dyslipidaemia are attributed to have more greater risk pf developing STEMI (Teo et al., 2006).

The onset of symptoms and presentation at the hospital for the treatment of ACS is very crucial due to time sensitivity of the disease. This time lag between symptom onset to that of presentation at the hospital is more in India as compared to western countries (Malhotra et al., 2002, Rajagopalan et al., 2000). The CREATE registry has estimated this as median time of 300 minutes. The registry also identified reasons which include lack of symptom awareness, longer distances travelled to reach hospitals and problems of transportation (Xavier et al., 2008).
Once the confirmed diagnosis is made based on clinical presentation, Electrocardiogram (ECG) and cardiac-specific markers to determine the kind of condition patient is suffering from, pharmaceutical or invasive intervention will be chosen for treatment. The primary goal of the treatment in ACS is the prevention of thrombus, restoration of coronary flow, and reduction in myocardial oxygen demand.

There is wide variation in the treatment practices and hence the hospital care provided is determined by the type of hospital patient visit. A study conducted in south Indian states it was found that guidelines adherence for the treatment of STEMI was least in Government hospitals (George et al., 1998). Patients treated in hospitals affiliated to medical colleges were more likely to receive fibrinolytic treatment and beta blockers compared to the patients treated at non-teaching hospitals.

The medications used to achieve these goals include antiplatelet agents, anticoagulants, beta adrenergic blockers, calcium channel blockers, angiotensin-converting-enzyme (ACE) inhibitors, angiotensin receptor blocker (ARB) inhibitors and glycoprotein IIb/IIIa inhibitors. To restore the coronary flow, revascularization by percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) is performed (Cooper DH et al., 2007).

Among the medications used to treat ACS, antiplatelet agents play an important role in initial treatment and long term management of patients with ACS, especially in the conservative approach. Prasugrel was approved by the FDA on July 10, 2009, for the treatment of patients with ACS undergoing PCI. Although it has the same mechanism of action as clopidogrel, prasugrel's attractive pharmacokinetic profile allows for a faster onset and more potent platelet inhibition. Prasugrel may have fewer drug interactions as well as less variability in response than clopidogrel, but this needs to be further evaluated. Clopidogrel is indicated in the treatment of patients with ACS, as well as for patients with a recent history of MI, stroke, or established peripheral artery disease. These are populations that have not been evaluated for prasugrel and thus require further study. Although clinical trials have demonstrated stronger platelet inhibitory effects and better clinical efficacy with prasugrel compared to clopidogrel, higher rates of bleeding have been documented (Reinhart et al., 2009).

Anticoagulant therapy is a key component of the antithrombotic management of patients with ACS. Unfractionated heparin (UFH) has been used for anticoagulant therapy for nearly 60 years. UFH has a narrow therapeutic window and carries the risk of haemorrhage. The dose response characteristics of UFH vary significantly among patients necessitating close monitoring of anticoagulant effect which increases the cost of personnel and laboratory. UFH
therapy includes continuous treatment with intravenous infusion leading to increased hospitalization of patients, increasing the cost of hospitalization. UFH therapy is also associated with risk of heparin induced thrombocytopenia and osteoporosis.

Low molecular weight heparin (LMWH), on the other hand has longer plasma half-life permitting once or twice daily dosing. Hence, LMWH therapy can be given on outpatient bases, which reduces the cost of hospitalization. LMWH has greater bioavailability and more predictable dose response characteristics hence no need of close monitoring. This reduces the cost of personnel and laboratory.

Studies comparing UFH and LMWH have shown statistically significant reduction in MI and need for revascularization which is in favour of LMWH. While the observed differences were statistically significant, the absolute risk differences were small raising questions regarding the observed benefit of LMWH over UFH (Magee et al., 2003).

About six percent of the patients with ACS undergo primary angioplasty for STEMI. Primary PCI is not a feasible first choice for reperfusion treatment in India for reasons such as cost. The cost of PCI is 20 to 30 times more than that of streptokinase, and there are very less number of hospitals performing PCI, which are located in major cities (della Sopravvivenza nell’Infarto, 2005). Data from OASIS registry has concluded that treatment practice patterns in developed and developing countries are comparable in case of NSTEMI. This was true except in the rates of heparin use and angiography.

Stents are popularly used for the treatment of patients with ACS by revascularization. Despite improved technique and advances in stent design, Bare Metal Stent (BMS) implantation continues to be associated with a significant risk of in-stent restenosis. The occurrence of restenosis following BMS implantation is related to stent design, implantation technique and, most importantly, patient-related factors. A major advance in combating stent thrombosis has been the introduction of drug eluting stents (DES). Initial enthusiasm for DES implantation lessened, however, with reports of late and very late stent thrombosis being more frequent in DES recipients compared to BMS recipients (Drozd et al., 2010).

The recent meta-analysis of randomised clinical trials including 18,023 patients with CAD comparing BMS with DES. The use of serolemoid eluting stent is associated with reduction in the risk of MI (Stettler et al., 2007).

The difference in the procurement price of DESs compared to that of BMSs as well as long term cost of in stent restenosis make them an ideal candidate for comparative cost effectiveness analysis.
Pharmacoeconomics

Pharmacoeconomics is a collection of descriptive and analytic techniques for evaluating pharmaceutical interventions in healthcare system. Pharmacoeconomic techniques include cost effectiveness, cost minimization, cost utility, cost benefit and any other economic analytic technique that provides valuable information to healthcare decision makers for allocation of scarce resources.

Usefulness of pharmacoeconomic data would be in the areas of

1. Communications to prescribing physicians
2. Pharmaceutical reimbursement
3. Price negotiations, formulary discussions and
4. Clinical practice guideline development

The various analytic techniques used for pharmacoeconomic evaluation are as follows

Cost effectiveness analysis is a systematic method of comparing two or more alternative therapies by measuring cost and consequences of each.

Cost minimization analysis is a type of pharmacoeconomic analysis comparing two alternative therapies only in terms of cost because their outcomes (effectiveness and safety) are found to be or expected to be identical. The economic analysis of medical technologies, in general and pharmaceutical therapies in particular is based on the principle of comparing alternatives in terms of cost and healthcare outcomes.

Cost utility analysis is a methodology of economic analysis that compares two or more alternatives in terms of both cost and their outcomes where the outcomes are measured as Quality Adjusted Life Years (QALYs).

Cost benefit analysis: is an analytical technique derived from economic theory that enumerates and compares the net costs of a healthcare intervention with the benefits that arise as a consequence of applying interventions. For this technique both the net costs and benefit of healthcare intervention are expressed in monetary terms.

The success of pharmacoeconomic study depends upon continued accumulation and dissemination of robust information that can be utilized by different users under different circumstances (Smith MD et al., 2003).
Quality of life outcomes

Outcomes that matter to patients following treatment can be gauged most accurately using patient-reported outcomes measures (PROMs). Patient reported outcome instruments are typically used to measure health-related quality of life (HRQoL), health status, symptoms, adherence, and treatment satisfaction. The selection of appropriate PROM depends on the study design, nature of the intervention, and the target population.

Results from psychometrically validated PROMs can help us learn about overall patient treatment satisfaction, treatment effectiveness, and the impact of the drug on patients’ day-to-day lives. Physicians can gain useful feedback on prescribed treatments and could alter their course of treatment to improve the care delivered.

A cross sectional study conducted on 1217 patients with ACS for validating EQ-5D found the instrument to be valid for the usage among ACS patients (Ellis et al., 2005).

Studies have also reported the successful use of EQ-5D in cost effectiveness evaluations in patients with cancer and ACS compared to SF-36 which is more general and robust instrument for quality of life assessment (Lipscomb et al., 2007, Mushlin and Ghomrawi, 2010).

1.1 Need for the study

Socioeconomic environment influences occupation, lifestyle, and nutrition of social classes which in turn would influence the prevalence and profile of ACS. In India, there are wide social and economic disparities. Free healthcare facilities are available for the economically backward classes, but due to low level of education and occupational problems, these facilities are not always utilised optimally.

There are a number of studies on the cost treatment in patients with ACS from the developed countries very few from the developing countries. All expenditure incurred for the direct cost is met out-of-pocket by the patients. The treatment of ACS is expensive for a very large proportion of patients in developing countries like India.

In the Indian context the financial burden is often shared by kin of the patients. The money expended on healthcare and treatment and is a part of family’s limited financial resources. Although the amount spent by the upper and the lower income patients are similar, the percentage of the income spent is higher among the low income patients, due to their lower earning.
By reduction of delays in access to hospital and improving provision of affordable treatments can reduce morbidity and mortality in patients with ACS in India (Xavier et al., 2008, Schweikert et al., 2006).

The era, in which high-tech care is generally favoured, there is little likelihood that a less complex and cost effective therapy will emerge as preferred choice unless there is data to suggest the same. However, comparative cost effectiveness analysis can lead to such insights hence there is a need to carryout comparative cost-effective studies among patients receiving these therapies (Mushlin and Ghomrawi, 2010).