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Cardiovascular *Commentary*

Post Myocardial Infarction – Heart Failure Recurrence and Outcomes, Does Gender Play an Important Role?

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This commentary is written in response of the article, "Gender Differences in Heart Failure Hospitalization Post-Myocardial Infarction", that was published in issue 1 of 2023 of Indian Journal of Cardiovascular Disease in Women.[1] This study comprised a total of 50 patients who presented with heart failure and had a previous history of myocardial infarction and were included in this study after due consent. Upon proper history taking and detailed physical examination, investigations that were sent were reviewed and the subjects followed up in the hospital stay to analyse the clinical outcomes. The data were compiled and was subjected to statistical analysis. The study concludes and demonstrates that women require more hospitalization than men for heart failure and myocardial infarction, but despite this, women have less mortality rate comparatively.

Heart failure (HF) complicates about 15–36% of patients following acute myocardial infarction (MI) and is a strong predictor of increased mortality. Women are at increased risk of HF and are older and have increased incidence of comorbidities such as hypertension, chronic obstructive pulmonary disease, stroke, and atrial fibrillation. HF can occur at admission, during hospitalization or post discharge.[2]

HF occurs to due to myocyte damage, stunning, reperfusion injury by oxidative stress, and microvascular dysfunction due to micro emboli and inflammation following infarction. Subsequently, there is neurohormonal activation which leads to adverse left ventricular remodeling. The presence of comorbidities, advanced age, also contributes to HF following MI. Females have HF incidence higher than in men following MI and worse prognosis. Several factors such as older age, greater prevalence of comorbidities, late presentation, gender difference of fewer angiograms, revascularization, and guide line directed medical therapy in women have been considered the cause of excess risk of HF, even though women tend to have less obstructive disease and single-vessel or double-vessel disease is more common in women.

In this Journal, Rongali *et al.* have shown in their study that HF hospitalization following MI is more common in women and also recurrent hospitalizations are more common. This study group was similar in comorbidities and age, although diabetes mellitus was more common in women, it was not statistically different. Percutaneous coronary intervention was also performed equally in men and women and there was no difference in the use of Angiotensin receptor neprilysn inhibitor (ARNI). Despite the similarities, women continued to have worse outcomes with increased incidence of first and recurrent HF events. There was no gender difference in mortality in this study, but the study group is small, and number of fatal events is too low, only three deaths, to appreciate any gender difference. However, a pointer to a trend similar to the other studies which have reported higher mortality in women is that all three deaths occurred

in women, though it did not reach statistical significance, probably due to the small study group. A notable feature in this study is the post-MI patients with HF presenting at an early age, 36% belonging to the 41–50 years and 26% in the 51–60 years. This predicts a huge burden of HF patients in their productive years below the age of 60, after surviving an acute coronary syndrome (ACS) event. A very high prevalence of diabetes, hypertension in more than two-thirds, 12% having associated CKD, and 6% having PVD is a reminder of the highly challenging cardiovascular risk management required in the post-MI HF patients.[3]

HF incidence following MI has been reported to be 13% in the first 30 days and 20–30% at 1st year. There is a decrease in incidence to 1.3–2.2% per year after the 1st year. This study fails to expand on the time from MI to HF event and cannot draw any conclusion on the gender variations in the timeline of HF from index ACS event. It would have been interesting to note any difference in the biomarker BNP levels between the genders. The GRACE registry showed KILLIP class, HF severity, and BNP levels to be powerful predictors of mortality in the post-MI group.[4]

In their study Gerber *et al*, in a prospective follow-up of post-MI patients for 7.6 years, HF was a strong predictor of mortality (Hazard ratio-3.31). Delayed onset HF had a worse prognosis than early onset HF. Both heart failure preserved ejection fraction (HFPEF) and heart failure reduced ejection fraction (HFREF) carried higher odds of mortality, the preserved type was more common in women and HFREF more in men.[5]

In a large scale study of more than 7 lakh women and 7 lakh men, trends in recurrent coronary events after MI over a 10 year period between 2008 and 2017, US, showed greater decline of recurrent MI, mortality in women as compared to men. HF was more common in women (58%) and more likely to have HFPEF as they have more concentric remodeling as compared to eccentric remodeling and HFREF in men. HF incidence also declined to greater extent in women over the years, but women were less likely to undergo coronary angiogram and revascularization and less likely to receive statins and high intensity statins.[6]

Infarct size determines the presence of HF. Conventional ECHO parameters alone are insufficient to quantify the extent of damage. Strain rate imaging and E/E' right ventricular function are useful measures to assess the risk of HF. Especially in women, microvascular dysfunction is an important determinant which can be measured by index of microvascular resistance (IMR). IMR values >40 are marker of increased mortality and HF. Hyperemic microvascular resistance and coronary flow reserve are other useful measures of myocardial perfusion. Cardiac magnetic resonance imaging can quantify left ventricular function, volumes, and extent of microvascular obstruction. F^{18}-fludeoxyglucose metabolic imaging can quantify the extent of myocardial damage. A combination of biomarkers such as quantitative troponin, N-Terminal pro B-type Natriuretic peptide (NT-Pro BNP) levels, Suppression of tumourigenicity-2 (ST2), and C-reactive protein can also predict future development of HF during the index MI.[7]

Even though, greater awareness of coronary artery disease in women and focus on women in guidelines, a lot of work needs to be done to understand the gender-based differences in etiopathogenesis, presentation, and management of MI and post-MI care in women.

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