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Gender disparities in cardiovascular care access and delivery in India: Insights from the American College of Cardiology's PINNACLE India Quality Improvement Program (PIQIP)

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ABSTRACT

Background: Limited data are available to assess whether access to and quality of cardiovascular disease (CVD) care are comparable among men and women in India. We analyzed data from the American College of Cardiology's PINNACLE (Practice Innovation and Clinical Excellence) India Quality Improvement Program (PIQIP) to evaluate gender disparities in CVD care delivery.

Methods and results: Between 2011 and 2015, we collected data on performance measures for patients with coronary artery disease (CAD) (n = 14,010), heart failure (HF) (n = 11,965) and atrial fibrillation (AF) (n = 496) in PIQIP, among 17 participating practices.

The total number of women was 31,796 (32.0%). Women had fewer total encounters compared to men during the study interval (mean number of encounters = 2.59 vs. 2.82 for women and men, respectively, $p \le 0.001$). Women were significantly younger (48.9 years vs. 51.5 years, $p \le 0.01$), but had a higher co-morbidity burden compared to men — hypertension (62.0% vs. 45.6%, $p \le 0.01$), diabetes (39.4% vs. 35%, $p \le 0.01$), and hyperlipidemia (3.7% vs. 3.1%, $p = 0.19$). On the contrary, the guideline-directed medication prescriptions were strikingly lower in women with CAD compared to men — aspirin (38% vs. 50.4%, $p \le 0.001$), aspirin or thienopyridine combination (46.9% vs. 57.2%, $p \le 0.001$), and beta-blockers (36.8% vs. 47.8%, $p \le 0.001$). Similarly, among women with ejection fraction ≤40%, the use of guideline-directed medical therapy was significantly lower compared to men for beta-blockers (30.8% vs. 37.0%, $p \le 0.001$), angiotensin-converting enzyme inhibitors (ACE-i) or angiotensin receptor blockers (ARBs) (29.3% vs. 34.9%, $p \le 0.001$), and beta-blockers/ACE-i or ARBs (24.6% vs. 31.0%, $p \le 0.001$). Among patients with atrial fibrillation and CHADS2 score ≥ 2, more women were on oral anticoagulation (19.6% vs. 14.6%, $p = 0.34$), although this was not significantly different, and the overall number of patients with atrial fibrillation was low.

Conclusions: Despite a significantly higher co-morbidity burden in women, we found fewer women receiving guideline-directed medical therapy for CVD compared with men. If such disparities are confirmed in the larger Indian population, it is important to find potential causes for, and seek solutions to narrow this gap.

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1. Introduction

Cardiovascular diseases (CVD) are the leading cause of death, and a major cause of morbidity among women in India [1]. Data from high-income countries has demonstrated that women are less likely to receive aspirin and reperfusion therapy, have higher mortality rates following acute myocardial infarction compared to men [2], and are more likely to get re-hospitalized after an acute coronary syndrome event

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compared to men [3]. Limited data are available to assess whether access to and quality of CVD care are comparable among men and women in India [4]. We therefore analyzed data from the American College of Cardiology (ACC)'s PINNACLE (Practice Innovation and Clinical Excellence) India Quality Improvement Program (PIQIP) to evaluate whether CVD care differs by gender. PIQIP is the first outpatient CVD care-related data collection and reporting program implemented in India [5].

2. Methods

2.1. Study population

Between 2011 and 2015, we collected data on guideline-directed medical therapy (GDMT) for patients with coronary artery disease (CAD) (n = 14,010), heart failure (HF) (n = 11,965) and atrial fibrillation (AF) (n = 496) among 17 participating practices in the PIQIP. Details about data collection in the PIQIP have been previously described [5]. Briefly, trained personnel who held a bachelor's degree in pharmacy collected the data by scanning each outpatient department (OPD) card, which was assigned to each patient visiting a cardiology clinic, and contained patient's demographic information, diagnoses, pertinent laboratory results and prescriptions. Diagnoses of hypertension, diabetes mellitus, hyperlipidemia, CAD, HF and AF were extracted from OPD cards into the PIQIP Patient Care Tool and then uploaded to a tablet computer that physicians used to track patients' progress on a longitudinal basis [5]. Disease states were defined based on physicians' documentation in the OPD card [5]. Data on medication use in different CVD states represent use of medications by unique patients at any encounter, and integrity was ensured by a 3-tier process involving a) frontline data entry, b) quality assurance by randomly sampling 25% OPD cards, and c) auditing 5% OPD cards [5].

2.1.1. Outcomes

GDMT for patients with CAD included prescription of aspirin, aspirin ± thienopyridine, and beta-blockers. For patients with HF, GDMT included prescription of beta-blockers, angiotensin-converting enzyme inhibitors (ACE-i) or angiotensin receptor blockers (ARBs), and/or their combination. GDMT for AF comprised warfarin or non-vitamin K oral anticoagulants (NOACs). The number of patient encounters was also measured as an end-point to evaluate for gender gap in cardiovascular care access.

2.2. Informed consent

The PINNACLE registry in the United States had a waiver of informed consent. Due to a lack of local standards governing patient data collection, the PIQIP did not undergo institutional review board application in India. However, our methods for data collection were held to the standards of the Health Insurance Portability and Accountability Act practices, and the same vendor that was used in the PINNACLE registry in the United States conducted data entry in the PIQIP. Participation in the registry was voluntary, and all patients receiving care in these practices were eligible for entry into the registry. Drs. Kalra and Virani had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

2.3. Statistical analysis

Chi-square test was used for categorical variables, and t-test for continuous variables. Two-sided p values were used, and a p value < 0.05 was considered statistically significant. All analyses were conducted with SAS version 9.3 (SAS Institute).

3. Results

3.1. Baseline characteristics

The total number of women was 31,796 (32.0%). Compared to men (n = 66,245), women were younger (mean age 48.9 years vs. 51.5 years, p ≤ 0.01). The number of women with CAD, ejection fraction ≤40%, and AF in the registry were 2271, 2816 and 92 respectively, compared to 11,739, 9149 and 123 men, respectively. Women with CAD had a higher prevalence of co-morbidities — hypertension in 1407 (62.0% vs. 45.6% for men, p ≤ 0.01), diabetes in 894 (39.4% vs. 35% for men, p ≤ 0.01), and hyperlipidemia in 83 (3.7% vs. 3.1% for men, p = 0.19) (Table 1).

3.2. Medication prescription

Documentation of evidence-based medication prescriptions (Fig. 1, Table 2) was lower in women than men with CAD — aspirin (38% (n = 862) vs. 50.4% (n = 5918), p ≤ 0.001), aspirin or thienopyridine combination (46.9% (n = 1066) vs. 57.2% (n = 6714), p ≤ 0.001), and beta-blockers (36.8% (n = 835) vs. 47.8% (n = 5616), p ≤ 0.001). Similarly, among patients with ejection fraction ≤40%, the use of GDMT was significantly lower in women compared to men for beta-blockers (30.8% (n = 867) vs. 37.0% (n = 3389), p ≤ 0.001), ACE-i or ARBs (29.3% (n = 825) vs. 34.9% (n = 3196), p ≤ 0.001), or the combination of beta-blockers/ACE-i or ARBs (24.6% (n = 694) vs. 31.0% (n = 2840), p ≤ 0.001). Among patients with AF and CHADS2 score ≥ 2, there was no significant difference in receiving oral anticoagulation with warfarin or NOACs between women and men (19.6% (n = 18) vs. 14.6% (n = 18), p = 0.34), although the overall number of patients with atrial fibrillation was low.

3.3. Patient encounters

Women also had fewer encounters compared to men (mean number of encounters during the study period = 2.59 vs. 2.82, p ≤ 0.001).

4. Discussion

Data on CVD care and outcomes among women in India are generally lacking, and the little data that are available suggest suboptimal CVD care in women in rural areas and in younger women [4]. In the World Health Organization (WHO) PREMISE (Prevention and Recurrences of Myocardial Infarction and Stroke) study that recruited 10,000 CVD patients from outpatient clinics in Brazil, Egypt, India, Indonesia, Iran, Pakistan, Russia and Sri Lanka, men were more likely to receive aspirin or statin therapy for secondary prevention of major adverse cardiovascular events compared to women [4]. However, no country-specific analyses were conducted to further delineate data specific to India (n = 1013) [4]. To our knowledge, the current study is the largest study to date examining gender differences in CVD care in the outpatient setting in India.

We found that despite a significantly higher burden of co-morbidities in Indian women compared with men, fewer women received GDMT for CVD care compared to men. Our findings are similar to that reported by Joshi et al. from the Andhra Pradesh Rural Health Initiative, a study of CVD and its risk factors in adults from rural villages in the state of Andhra Pradesh in India [4,6], which demonstrated that men had higher prescription rates of the following medications for secondary prevention of CVD, albeit a lack of statistical significance due to small numbers: aspirin (18.4% vs. 13.0% in women); clopidogrel (4.2% vs. 3.4% in women); ACE-i (12.1% vs. 8.6% in women); and statins (8.5% vs. 3.6% in women) [6].

Similar data are available for non-atherosclerotic CVD states in India. A study on 405 congenital heart disease patients by Ramakrishnan et al. from Delhi, India showed that only 44% girls underwent corrective

Table 1
Prevalence of coronary artery disease risk factors among women and men in the PINNACLE India Quality Improvement Program (PIQIP) registry.

Coronary artery disease risk factors				
	Men (n = 11,739) (%)	Women (n = 2271) (%)	Total (n = 14,010) (%)	p value
Mean age (years)	51.5	48.9		≤0.01
Hypertension	5356/11,739 (45.6%)	1407/2271 (62.0%)	6763/14,010 (48.3%)	≤0.01
Diabetes mellitus	4107/11,739 (35%)	894/2271 (39.4%)	5001/14,010 (35.7%)	≤0.01
Hyperlipidemia	367/11,739 (3.1%)	83/2271 (3.7%)	450/14,010 (3.2%)	≤0.01

surgery at 1 year following diagnosis, compared to 70% boys [7]. Families of girl children more likely felt the need to conceal their child's illness from relatives and friends, compared to families of boys (23.1% vs. 1.5%, p < 0.0001), and a postoperative scar was perceived as a problem by 62% of girls' parents compared to 6% of boys' parents, fearing that surgery may decrease future matrimonial prospects [7]. In another survey of 9483 individuals from Pakistan, women were more likely to have rheumatic heart disease compared to men [8].

Reasons for gender disparities in CVD care in India could be multifactorial, such as variation in culture, religion, and social customs. This could also be related to greater importance of the society to men's health, such as a tendency to preferentially spend resources on men's healthcare (who are usually the sole source of household income) [4]. The survey from Pakistan also attributed gender disparity to more women being housebound and living in crowded conditions, compared to men, and healthcare-seeking patterns in women that constrain them from arranging clinic visits over men due to sociocultural norms nurturing and preferring men's well-being over women [8]. Our results also show that follow-up for CVD in the outpatient setting in India happens less frequently for women compared with men. This in itself could lead to less frequent contact with the medical system among women with CVD compared with men, limiting the number of available opportunities to improve GDMT for CVD care in women. Studies have also demonstrated direct relationship of women's education and socioeconomic status to access to healthcare [9]. A vast majority of patients in India are uninsured (2014 data show that only 0.32% patients have health insurance in India [10]), and access healthcare provided by private health systems [4], augmenting the significance of socioeconomic status contributing incrementally toward gender disparities in healthcare.

Our findings have significant implications for future health policy regulations in the Indian government's National Rural Health Mission (NHRM) program that has until recently, largely focused on prevention of communicable diseases, and maternal and child health welfare and education at primary healthcare delivery level [4]. With recognition of recent epidemic of non-communicable diseases in low- and middle-income countries [11], federal government has allocated support and additional resources within NHRM to support the National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke [4,9]. However, gender disparity remains a challenge and hurdle in the success of the program, and our findings provide contemporary data on its prevalence.

Our study has several limitations. We did not collect data on patients' health insurance coverage or contraindications of otherwise indicated medical therapy. These along with differences in medical documentation practices in India could also explain the overall lower use of GDMT — and could also affect our findings in the current study. Although low documentation of GDMT could explain the overall low numbers of patients (women and men) receiving GDMT, we do not believe that it explains gender-related disparities in CVD care, as suboptimal documentation of GDMT use should affect both genders equally.

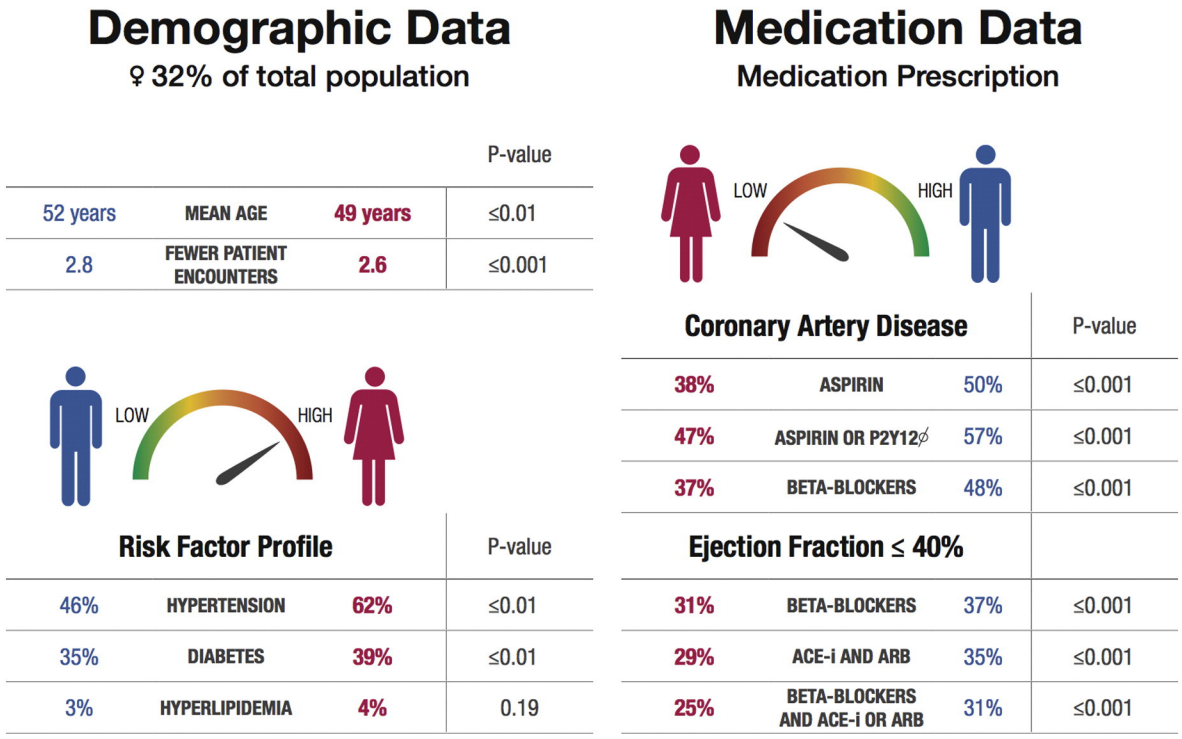

Fig. 1. Infographic depicting the risk factor profile and medication prescription among women and men in the PINNACLE India Quality Improvement Program (PIQIP) registry. ACE-i = angiotensin-converting enzyme inhibitor. ARB = angiotensin-receptor blocker. P2Y12∅ = P2Y12 antagonist.

Table 2
Guideline-directed medication prescription among women and men in the PINNACLE India Quality Improvement Program (PIQIP) registry.

Coronary artery disease				
Medication prescription				
	Men (n = 11,739)	Women (n = 2271)	Total (n = 14,010)	p value
Aspirin	5918 (50.4%)	862 (38.0%)	6780 (48.4%)	≤0.001
Aspirin ± thienopyridine	6714 (57.2%)	1066 (46.9%)	7780 (55.5%)	≤0.001
Beta-blockers	5616 (47.8%)	835 (36.8%)	6451 (46.0%)	≤0.001
Ejection fraction ≤ 40%				
Medication prescription				
	Men (n = 9149)	Women (n = 2816)	Total (n = 11,965)	p value
Beta-blockers	3389 (37.0%)	867 (30.8%)	4256 (35.6%)	≤0.001
ACE-i or ARB	3196 (34.9%)	825 (29.3%)	4021 (33.6%)	≤0.001
Beta-blockers + ACE-i or ARB	2840 (31.0%)	694 (24.6%)	3534 (29.5%)	≤0.001
Atrial fibrillation and CHADS2 ≥ 2				
Medication prescription				
	Men (n = 123)	Women (n = 92)	Total (n = 215)	p value
Warfarin or NOAC	18 (14.6%)	18 (19.6%)	36 (16.7%)	0.34

ACE-i = angiotensin-converting enzyme inhibitor. ARB = angiotensin receptor blocker. CAD = coronary artery disease. CHADS2 = congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, stroke. NOAC = non-vitamin K oral anticoagulant.

Our study is based on only a small number of participating sites and if such gender disparities are confirmed in the larger Indian population, targeted interventions (e.g. audit and feedback) will be needed to narrow this gap.

5. Conclusions

There is a lack of contemporary data on gender disparities in access to cardiovascular care in India, and other low- and middle-income countries. With the emerging epidemic of non-communicable diseases in these countries, more research is needed to identify the menace of gender bias, and develop strategies to overcome gender disparities in access to cardiovascular care. Our findings provide evidence of profound gender gap existence in India, highlighting urgent need to understand the drivers of these disparities, and to address them.

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Disclosures

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Conflict of interest

The authors report no relationships that could be construed as a conflict of interest.

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