

## Clinical and Angiographic Characteristics of Female Patients Undergoing Coronary Angiography in a Tertiary Hospital in Bangladesh

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### ABSTRACT

**Background & objective:** Coronary artery disease (CAD) is increasingly prevalent among female population, particularly in South Asia, and a large number of female patients currently undergo coronary angiography for a variety of indications. The objective of this study was to investigate the clinical and angiographic characteristics of female patients undergoing coronary angiogram, in a tertiary cardiac center in Bangladesh.

**Methods:** This retrospective observational study was conducted at Ibrahim Cardiac Hospital & Research Institute, Dhaka, Bangladesh during the period from 1<sup>st</sup> September 2005 to 31<sup>st</sup> August 2016. A total of 7,627 female patients who underwent coronary angiography were included. Obstructive coronary artery disease (CAD) was defined as a stenosis  $\geq 70\%$  in at least one of the three major coronary arteries or a stenosis  $\geq 50\%$  in left main stem.

**Result:** Nearly two-thirds (64.4%) of patients comprised of age group of 41-60 years with mean age of the patients being  $55.4 \pm 10.2$  years. Unstable angina (38.2%) was the commonest indication for coronary angiography followed by stable ischemic heart disease (25.1%), non-ST segment elevation myocardial infarction (12.8%), ST segment elevation myocardial infarction (9.3%), left ventricular failure (7.5%), post-myocardial infarction angina (6%) and atypical chest pain (1.3%). Over three quarters were hypertensive 68.3% were diabetic and 29% and dyslipidemic. Over 40% of the patients were overweight and 20% were obese. On trans-thoracic echocardiography, 65.2% had normal left ventricular (LV) systolic function; 17.6% and 9.9% had mild and moderate LV systolic dysfunction respectively. Nearly 30% had normal epicardial coronary arteries on angiography, while 17.4%, 16.5% and 37.2% had triple vessel disease (TVD), double vessel disease (DVD) and single vessel disease (SVD) respectively. Following angiography, 33.4% were advised PCI, 30.2% optimal medical management and 15.3% CABG. A few (3.2%) were advised for revascularization either by CABG or PCI.

**Conclusion:** Unstable angina is the most common indication for coronary angiography among Bangladeshi females. A clustering of risk factors for CAD such as hypertension, diabetes and overweight or obesity are observed in them. Of the obstructive CADs, SVD is the most frequent finding, indicating that females undergoing CAG are likely to have diffuse CAD, although left main disease is not uncommon in this population. Further comparative studies with matched male population are recommended to find the differences in clinical and angiographic findings with respect to sex.

**Key words:** Coronary artery disease, Women etc.

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## INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of mortality among women<sup>1</sup> and contributes 38% of cardiovascular death globally.<sup>2</sup> The lifetime risk of a woman dying from heart disease is more than eight times higher than from breast cancer.<sup>3</sup> But unfortunately their cardiovascular diseases still remain largely ignored.<sup>4</sup> The importance & severity of coronary artery disease (CAD) are underestimated in women.<sup>5</sup> CAD is not a rare entity in women, however the process is delayed by approximately 10-20 years in comparison to men.<sup>6,7</sup> The mortality & morbidity associated with CAD is significantly on the rise among women of Asian countries as supported by data from India and China.<sup>8-13</sup>

During post-menopausal years there is an increased overall risk of CAD in women. Arterial hypertension is detected more often at age 65 years and older and increases with age. The most widespread form is isolated systolic hypertension.<sup>8</sup> Lipid profile alteration like low HDL and high triglycerides is a frequent cause of CAD in women than high concentration of LDL alone.<sup>14</sup> Lori and associates showed women presented more frequently with unstable angina than NSTEMI; STEMI and sudden cardiac death, that are more common presentations in men.<sup>9</sup> Multiple studies have shown that women with acute coronary syndromes (ACS) are less likely to be treated with guideline-directed medical therapies,<sup>15-19</sup> less likely to undergo cardiac catheterization,<sup>15-20</sup> and less likely to receive timely reperfusion.<sup>16,19,21-24</sup>

The basic cause of acute myocardial infarction (AMI) in both sexes is the obstructive atherosclerotic disease of the epicardial coronary arteries, but the plaque characteristics differ between sexes. Recent data suggest a greater role of microvascular disease in the pathophysiology of coronary events among women.<sup>25</sup> The present study is, therefore, intended to describe the clinical and angiographic characteristics of female patients who underwent CAG for different indications.

## METHODS:

### Study population:

This retrospective observational study was conducted at Ibrahim Cardiac Hospital & Research Institute, Dhaka, Bangladesh during the period from 1<sup>st</sup> September 2005 to 31<sup>st</sup> August 2016. All female patients who underwent coronary angiography during the period were included. They were identified from our dedicated Cathlab database. The study was conducted with the permission of Hospital Ethical Review Committee. Prior consent had been taken from the patients' near relatives before the procedure. The study was done complying with the Declaration of Helsinki for research involving human subject, 2013.

### Echocardiographic evaluation of left ventricular systolic function:

Left ventricular (LV) systolic function was considered normal, when left ventricular ejection fraction (LVEF) was  $\geq 55\%$ . Mild LV systolic dysfunction was considered when LVEF was 45-54%, moderate LV systolic dysfunction was considered when LVEF was 30-44% & severe LV dysfunction was considered, when LVEF was  $< 30\%$ .

### Image Acquisition & interpretation:

Coronary angiography was done by right femoral or radial route at operators discretion. Routine pre-medication was given comprising of oral sedative, antihistamine and steroid injection in those with prior history of allergy. Iodinated contrast media was used. If the patient had chronic kidney disease (CKD), iso-osmolar non-ionic media (Visipaque) was used. Image interpretation was performed by two independent readers. Disagreement between readers was solved by Heart Team discussion. Coronary arteries were segmented according to a modified version of the American Heart Association 15-segment model (which includes the ramus intermedius, if present, as segment 16). Each coronary segment was visually analyzed with regard to the presence of stenosis and its severity as follows: no lesion, eccentric plaque ( $< 30\%$  diameter), mild lesion (30-49% stenosis),

moderate lesion (50–69% diameter stenosis), severe stenosis (70–98% of diameter), subtotal stenosis (99%), or total occlusion (100%). Obstructive coronary artery disease (CAD) was defined as stenosis ≥ 70% in at least one of the three major coronary arteries (LAD, RCA and LCx) and/or stenosis ≥ 50% in left main stem.

**RESULTS:**

Nearly two-thirds (64.4%) of patients comprised of age group of 41-60 years with mean age of the patients being 55.4 ± 10.2 years (Table I). Unstable angina (38.2%) was the commonest indication for coronary angiography followed by stable ischemic heart disease (25.1%), non-ST segment elevation myocardial infarction (12.8%), ST segment elevation myocardial infarction (9.3%), left ventricular failure (7.5%), post-myocardial infarction angina (6%) and atypical chest pain (1.3%) (Fig. 2). Over three-quarters (77.3%) were hypertensive and two-thirds (68.3%) were diabetic and 29% dyslipidaemic (Fig. 3). Over 40% of the patients were overweight and 20% were obese (Fig. 4). On trans-thoracic echocardiography, 65.2% had normal left ventricular systolic function; 17.6% and 9.9% had mild and moderate LV systolic dysfunction respectively (Fig. 5). Approximately 30% had angiographically normal coronary arteries, while 17.4%, 16.5% and 37.2% had triple vessel disease (TVD), double vessel disease (DVD) and single vessel disease (SVD) respectively (Fig.6). Following angiography, 33.4% were advised PCI, 30.2% optimal medical management and 15.3% CABG. A few (3.2%) were, however, advised for revascularization either by CABG or PCI (Fig: 7).

TABLE I : Distribution of patients by their age		
Age (Years)	Frequency	Percentage
21-40	572	7.5
41-60	4912	64.4
>60	2143	28.1

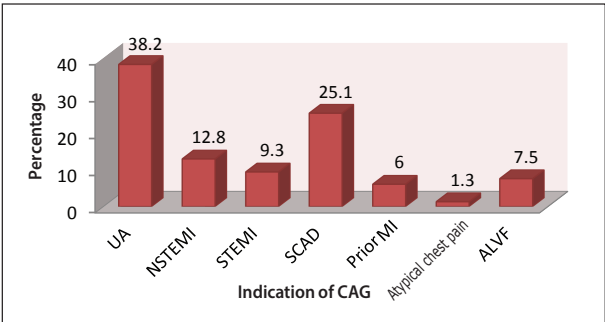


Fig: 2. Distribution of patients by Indications of CAG

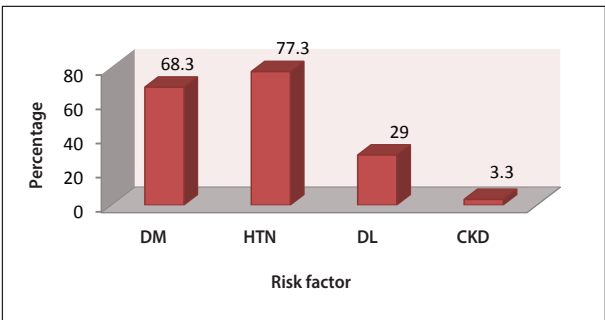


Fig: 3. Risk factors distribution in female patients

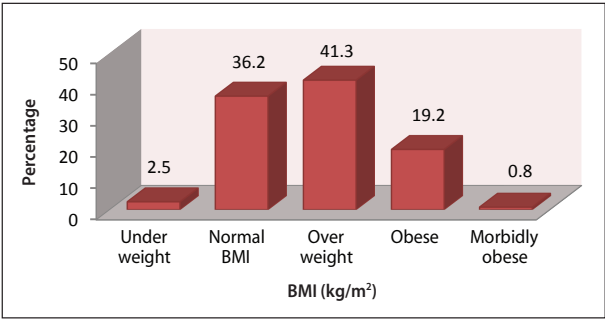


Fig: 4. Distribution of patients by their BMI

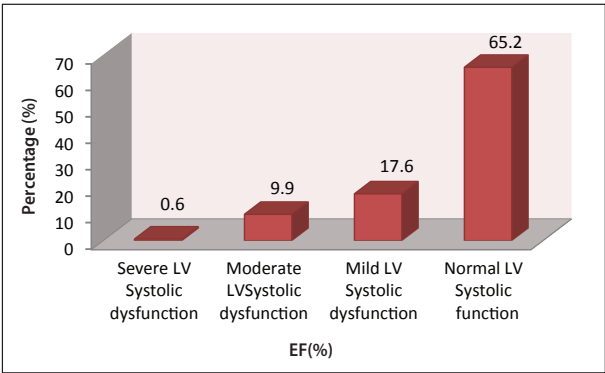


Fig: 5. Distribution of EF in the study subjects

ORIGINAL ARTICLE

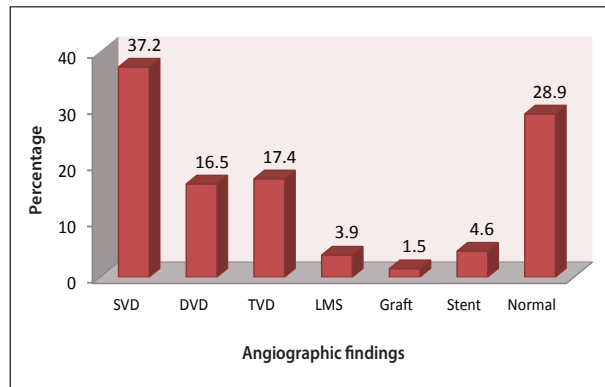


Fig. 6. Distribution of patients by angiographic findings

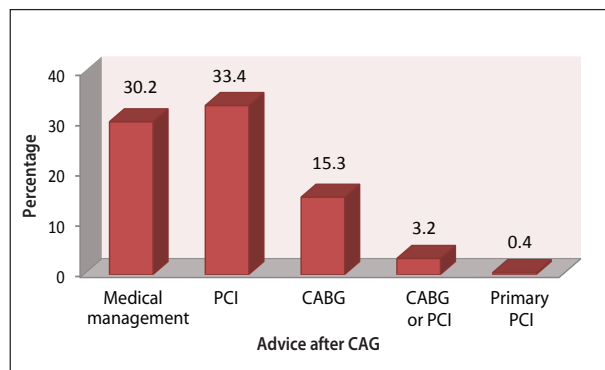


Fig. 7. Recommendation for management after CAG

## DISCUSSION:

This retrospective study sheds light on a number of aspects of female CAD. The study demonstrated that approximately 65% of the patients were in their 4<sup>th</sup> and 5<sup>th</sup> decades of life.<sup>26</sup> The National Health and Nutrition Examination Surveys (NHANES) of USA has shown that over the past several decades the prevalence of myocardial infarctions has increased in middle-aged (35 to 54 years) women, while declining in the same age-cohort of men.<sup>27</sup> Lori and associates (2014) showed that women's presentation of CAD was different from that of men. Women usually present more with unstable angina than NSTEMI, STEMI and sudden cardiac death, which are more common presentations in men.<sup>9</sup> Consistent with this finding, 38.2% of our population presented with UA, while only 12.8% and 9.3% of population presented with NSTEMI & STEMI. Data from India and China also support this observation.<sup>8-13</sup>

Women have similar magnitude of atherosclerosis like that of men, but it looks and functions differently possibly due to estrogen or genetical reasons.<sup>28</sup> Furthermore, females' plaque characteristics are known to differ in comparison to males. These different mechanisms in women result in different clinical presentations of CAD in women. In the present study over three-quarters (77.3%) of our sampled population were hypertensive, 68.3% were diabetic and 29% dyslipidaemic and over 60% were overweight or obese. Consistent with these findings Manson, et al<sup>14</sup> showed that women had a clustering of multiple risk factors for CAD, which matches well with our study findings. A large-scale study (n = 16,736) on patients of acute coronary syndrome (registered between 1991 to the end of 2010) from Hamad Medical Corporation (HMC) in Qatar also demonstrated high prevalence rates of DM (65.7%) and hypertension (68.1%).<sup>29</sup>

Multiple studies have shown that women with acute coronary syndromes (ACS) are less likely to be treated with guideline-directed medical therapies,<sup>15-19</sup> to undergo cardiac catheterization,<sup>15-20</sup> & to receive timely reperfusion.<sup>16,19,21-24</sup> This is also true for our female population, where only 0.4% of our total female patients underwent Primary PCI, although the STEMI population was nearly 10%. In female population, endothelial dysfunction, small vessel-size and diffuse atherosclerosis are usually the causes of ischemia, rather than obstruction in the coronary arteries.<sup>30</sup> Recent data also suggest a greater role of microvascular disease & endothelial dysfunction in the pathophysiology of coronary events among women.<sup>25</sup> These findings concur with our study wherein 29% of females were found to have normal epicardial coronary arteries, although they presented with signs and symptoms ischemic heart disease. Further comparative studies with matched male population are needed to validate these findings. Intravascular ultrasound (IVUS) or Optical coherence tomography (OCT)- directed identification of plaque morphology may shed further light into the aetiopathogenesis of CAD among females.

**CONCLUSION:**

Unstable angina is the most common indication for coronary angiography among Bangladeshi females. A clustering of risk factors for CAD such as hypertension, diabetes and obesity are observed among them. In terms of obstructive CAD, SVD is the most frequent finding, indicating that females undergoing CAG has less diffuse coronary artery disease, although left main disease is not uncommon. So careful advice should be given regarding life-style modification, diet and antihypertensive medication to reduce these events. Further comparative studies with matched male population are suggested.

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