ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

Gender Disparity among Patients with Ischemic Heart Disease in a Tertiary Care Hospital in Mangalore

Dr Sudharani M, Dr Vijayalaxmi M, Dr BhagyaLaxmi S, Dr Amrutha A.M

Corresponding Author Dr Amrutha A.M

ABSTRACT:

Background: In women coronary artery disease is not only lethal but a contributor to morbidity and disability. It is assumed that exposure to endogenous oestrogens during the reproductive period delays the manifestation of atherosclerosis. This study was done to assess the gender disparities in established risk factors of Ischemic Heart Disease (IHD).

Methodology: A cross sectional study was conducted in Cardiac Intensive Care Unit, General Medicine wards and Cardiology wards of tertiary care hospital, K S Hegde Charitable Hospital Mangalore. Total 700 cases were collected in a period of one year who were admitted for management of coronary artery disease. Patients undergoing and those who have already undergone the interventional procedures either elective or emergency were considered. Data thus collected by interview, clinical examination and laboratory investigations were entered in structured pretested proforma. Data entry and management was done in excel. The data sets were transferred into SPSS after data cleaning and recoding with data definitions. Prevalence and proportions were be used for all quantitative data.

Results: Salient sex based differences were found in some coronary artery disease risk factors. Significant number of female subjects affected by coronary artery disease had positive family history ($p=0.0032$). Majority of affected women were Sedentary at work ($p<0.01$). Women had more abdominal obesity ($p<0.01$), Diabetes Mellitus ($p=0.0016$) and hypertension ($p=0.0018$) compared to men. Males were at risk who were sedentary at leisure time. Even history of alcohol consumption and smoking contributed to ischemic heart disease.

Conclusion: Positive genetic history, physical activity, waist circumference, history of smoking and alcohol consumption, diabetes and hypertension were found to be of higher risk in females.

Key words: Disparity, Gender, Ischemic Heart Disease, Risk factors

BACKGROUND:

Evolving knowledge of sex-specific presentations, improved recognition of conventional and novel risk factors, and expanded understanding of the sex-specific pathophysiology of ischemic heart disease have resulted in improved clinical outcomes in women. Yet, ischemic heart disease continues to be the leading cause of morbidity and mortality in women.[1]

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

Coronary heart diseases are gaining important attention in developing countries around the world, especially in India.[2] WHO has emphasized that coronary heart disease will be the leading cause of disability and death in India by the year 2025 as Indians are comparatively more susceptible for myocardial infarction (ICD 121).[3,4]

In the feminine version of CAD, it is vital to note that since 1984 annual cardiovascular deaths for women have exceeded that for men. One factor contributing to this disparity could be low socioeconomic status, which hinders women from seeking medical attention. The risk of heart disease in women is always underestimated because of the misconception that females are protected against CAD. However this disparity can also be due to the basic differences in normal physiology and pathophysiology between the two genders that are not well understood and remain understudied. It is assumed that exposure to endogenous oestrogens during the reproductive period delays the manifestation of atherosclerosis. However before menopause the CAD rate in women is lower and predominantly attributed to smoking. In women, CAD is not only lethal but a contributor to morbidity and disability.[5]

Pre-menopausal women are protected from IHD due to combination of hormonal and lifestyle influences but following this period, IHD occurs at same rate in women and men and the risk is greater among women at older age. Cardiovascular diseases (CVD), especially IHD, are endemic in India. Data from the Registrar General of India has shown that mortality from cardiovascular diseases, including IHD, has increased rapidly in the last 2 decades. World Health Organization (WHO) and Global Burden of Disease (GBD) Studies have also reported increase in mortality and disability-adjusted life years (DALYs) from IHD in India in the last few decades. This is in contrast to most high- and middle-income countries where they are declining. In India, epidemiological studies performed in 1960's to 1990's reported greater prevalence of IHD in women. However, this higher prevalence of IHD in women could be due to inclusion of non-specific electrocardiographic (ECG) criteria such as non-specific T-wave changes, based on earlier WHO guidelines that recommended ECG ST-T changes as suggestive of CHD. However, when diagnosis was based on either a clinical diagnosis or presence of pathological Q-waves, IHD prevalence was observed to be greater in men as compared to women. Million Death Study in India reported that in year 2015 age-standardized death rate from IHD in men was 173/100,000 and in women 96/100,000 but did not report secular trends.[6] This study was done to assess the gender disparities in established risk factors of Ischemic Heart Disease (IHD).

METHODOLOGY:

A cross sectional study was conducted in Cardiac Intensive Care Unit, General Medicine wards and Cardiology wards of tertiary care hospital, K S Hegde Charitable Hospital Mangalore. Total 700 cases were collected in a period of one year who were admitted for management of coronary artery disease. Patients undergoing and those who have already undergone the interventional procedures either elective or emergency were considered.

Inclusion Criteria:

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

1. All patients above 45 years of age documented to have IHD admitted in General Medicine and Cardiology wards of K S Hegde Hospital.
2. All patients fulfilling the case definition criteria.

Exclusion Criteria:

1. All patients with persisting cardiac symptoms.
2. Patients who were not willing to participate in the study.
3. Patients with history of Coronary Artery Bypass Graft.
4. Old cases of CAD with significant Q wave

Data Collection: Detailed history taking, assessment of risk factors, physical activities and presenting symptoms were done with the help of pretested Questionnaire. CICU of the hospital was visited daily to look for new admissions. For convenience, the history was taken in the recovery phase of the patient. All new patients were assessed to be recruited as study subjects. Eligible patients were informed about the purpose of the study and co-operation was requested. From all willing patients written informed consent was obtained. General physical examination and anthropometry were done for all study subjects. Review of investigations and outcome were done. Data thus collected by interview, clinical examination and laboratory investigations were entered in structured pretested proforma. Data entry and management was done in excel. The data sets were transferred into SPSS after data cleaning and recoding with data definitions. Prevalence and proportions were be used for all quantitative data.

Qualitative data of gaps were transformed into pictorial design. Chi square was applied for categorical variables, Independent t test for continuous variables, measures of dispersion wherever appropriate.

RESULTS:

In our study there were total 700 participants. Among them 434 (62%) were males and 266 (38%) were females. A major group of patients 421(60%) were aged more than 76 years i.e 216 (30.85%) and the least number of cases 134 (19.1%) were in the age group of 56years and 65years. Youngest patient in the study was 47years and oldest was patient aged 92 years. Education Status of majority of subjects was less than SSLC. A major number of Female patients 104 (39.09%) had primary level education, whereas majority of Males 108 (24.88%) had education up to PUC. Overall, considerable number of male patients 126 (29.03%) were unemployed. Majority of females were homemakers 210 (78.95%), followed by skilled workers 21 (7.89%). Among males, unskilled workers were 121(27.88%) and skilled workers were 96 (22.13%). There were no professionals among females as compared to 17 (2.43%) males. Majority of study population 236 (33.71%) belonged to Class III of modified B G Prasad Classification of which 161 (37.09%) were males and 75 (28.19%) were females. It was found that females in Class V, 104(39.09%) were more affected as compared to males in Class V, 117(26.97%). Contrary to this, 52(11.98%) males in Class I and 161(37.09%) in Class III were

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

more affected than females with corresponding income Class. But the overall difference in risk of developing CHD by gender as per Socioeconomic class was statistically not significant (p=0.24). Religion wise occurrence of CHD was similar in both sexes. In Hindus it was 92 (21.19%) in males and 51(19.17%) in females, Muslims it was 308(70.97%) in males and 181(68.05%) in females. Though Christian women had more occurrence 34(12.78%) it was not statistically significant (p=0.12). The difference found in the occurrence of CHD by habitation in this study was found to be statistically insignificant (p=0.13) However occurrence was higher in rural females 250 (93.98%), than rural men 78 (17.97%). Reverse was true in Urban Community. (males 82.03% and females 6.02%). [Table 1]

Table 1: Socio-demographic characteristics of study participants

Characteristics		**Males**	**Females**	**Total**	**p value**
Age	45-55 yr	121 (27.88%)	48 (18.05%)	169 (23%)	**0.027**
	56-65 yr	102 (23.51%)	32 (12.03%)	134 (19.1%)	
	66-75 yr	104 (23.96%)	77 (28.95%)	181 (25.85%)	
	>76 yr	107 (24.65%)	109 (40.97%)	216 (30.85%)	
Education	Illiterate	70 (16.13%)	72 (27.07%)	142 (20.28%)	0.183
	Primary	92 (21.19%)	104 (39.09%)	196 (28%)	
	SSLC	56 (12.91%)	56 (21.05%)	112 (16%)	
	PUC	108 (24.88%)	24 (9.02%)	132 (18.86%)	
	Graduation	86 (19.82%)	10 (3.77%)	96 (13.72%)	
	Post graduation	22 (05.07%)	0	22 (3.14%)	
Occupation	Unemployed	126 (29.03%)	19 (7.14%)	145 (20.71%)	**<0.01**
	Retired	35 (8.06%)	0	35 (5%)	
	Home maker	0	210 (78.95%)	210 (30%)	
	Unskilled	121 (27.88%)	8 (3.01%)	129 (18.43%)	
	Skilled	96 (22.13%)	21 (7.89%)	117 (16.71%)	
	Semi professional	39 (8.98%)	8 (3.01%)	47 (6.72%)	
	Professional	17 (3.92%)	0	17 (2.43%)	
Socio-economic status	Class I	52 (11.98%)	05 (1.87%)	57 (8.14%)	0.24
	Class II	22 (05.07%)	22 (8.28%)	44 (6.29%)	

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

	Class III	161 (37.09%)	75 (28.19%)	236 (33.71%)	
	Class IV	82 (18.89%)	60 (22.57%)	142 (20.29%)	
	Class V	117 (26.97%)	104 (39.09%)	221 (31.57%)	
Religion	Hindu	92 (21.19%)	51 (19.17%)	143 (20.44%)	0.12
	Muslim	308 (70.97%)	181 (68.05%)	489 (69.85%)	
	Christian	34 (7.84%)	34 (12.78%)	68 (9.71%)	
Habitation	Rural	78 (17.97%)	250 (93.98%)	328 (46.86%)	0.13
	Urban	356 (82.03%)	16 (6.02%)	372 (53.14%)	

Table 2: Genetic history of study participants

Genetic history	**Male**	**Female**	**Total**	**p value**
Positive	60 (13.82%)	95 (35.71%)	155 (22.14%)	OR=2.46, p= **0.0032**
Negative	374 (86.18%)	171 (64.29%)	545 (77.86%)	
Total	434 (62%)	266 (38%)	700 (100%)	

Women had a positive family history of CHD, 95 (35.71%) which was more than in men 60(13.82%). This finding was significant statistically with OR 2.46, 95% CI (1.32-4.69) and p=0.0032. This finding depicts that family history in females was an outstanding risk factor than males, which was 2.46 times higher. [Table 2]

Table 3: Modifiable risk factors of study participants

Modifiable risk factors		**Male (434)**	**Female (266)**	**p value**
Diet	Veg	12 (2.76%)	15 (5.64%)	0.59
	Non-veg	422 (97.24%)	251 (94.36%)	
Physical activity	Sedentary	203 (46.77%)	192 (72.18%)	**<0.01**
	Moderate	182 (41.94%)	66 (24.81%)	
	Vigorous	49 (11.29%)	8 (3.01%)	
Leisure time	Sedentary	314 (72.35%)	250 (93.98%)	**0.0016**

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

Physical Activity	Moderate	103 (23.73%)	16 (6.02%)	
	Vigorous	17 (3.92%)	0	
BMI	18.5-22.9	40 (9.22%)	62 (23.31%)	0.61
	23-24.9	256 (58.99%)	187 (70.30%)	
	≥25	138 (31.79%)	17(6.39%)	
Waist circumference	Normal	257 (59.22%)	69 (25.94%)	**<0.01**
	High	177 (40.78%)	197 (74.06%)	
smoking	Present	126 (29.03%)	0	**<0.01**
	Absent	308 (70.97%)	266(100%)	
Alcohol	Present	401(92.39%)	263(98.87%)	**<0.01**
	Absent	33(7.61%)	3(1.13%)	
Diabetes	Present	348(80.16%)	242(91%)	**0.0016**
	Absent	86(19.84%)	24(9%)	
Hypertension	Present	243 (56.01%)	175 (65.87%)	**0.0018**
	Absent	191 (43.99%)	91 (34.13%)	
Life events	Stressful	134 (29.89%)	96 (36.31%)	0.71
	Non-Stressful	300 (70.11%)	170 (63.69%)	

When modifiable risks were compared with the gender, following were the findings noted. Majority of the patients were non vegetarians. Only 15 (5.64%) females and 12 (2.76%) males were following vegetarian diet. Among non-vegetarians, males outnumbered females. But this difference was not statistically significant. (X^2=0.87, p=0.59). This results denotes diet did not play a significant role as a risk factor in both men and women with OR (95% CI) = 1.22 (0.79-1.88) Sedentary males were 203 (46.77%) whereas females were 192 (72.18%) indicating

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

sedentary work is more of a risk factor in females(p=<0.0001). Number affected by CHD was only 8(3.01%) in females and 49 (11.29%) in males, belonged to vigorous activity group. Large number of females 250(93.98%) belonged to sedentary group as compared to males 314(72.35%). This difference was found to be statistically significant (X2=4.82, p=0.0016). Difference was observed in moderate activity, males 103 (23.73%) against females 16 (6.02%). A minority of patients 102 (14.5%) had a normal BMI less than 23. Gender wise distribution showed that 138 males (31.6%) were obese in comparison to females which was 17(6.46%). Contrarily 62 females (23.18%) who had normal BMI developed CHD as against 40 males (9.2%) suggesting that CHD occurs more in non-obese females than in non-obese males. However the value was statistically insignificant. Mean BMI was 21.76±4.41 kg/m2. More number of Women, 197 (74.06%) had higher waist circumference as compared to men, 177 (40.78%), indicating women had higher risk of CHD as compared to men. p<0.0001; OR(95% CI) 5.95(3.67 – 9.65). Out of 700 patients, smoking was prevalent in males which accounts to 126 (29.03%). All the females in this series were non-smokers thus limited the comparison the risk of smoking between Males and Females. Among 434 male patients affected by Coronary Artery Disease, 401(92.39%) had the habit of Alcohol use. Non-alcoholics were 33(7.61%) denoting Alcohol acts as noticeable risk factor for CAD in Males. Mainstream of subjects 590(84.28%) had diabetes mellitus, which is one of the risk factor for Coronary Artery Disease. Diabetes risk was analyzed by Gender, it was found that 242 (91%) of Females versus 348 (80.16%) Males had diabetes. Which was statistically significant (X2=2.88, p=0.0037), indicating that Diabetes is of more risk in females than males in developing CHD. A good number 418(59.71%) of subjects were Hypertensive which upholds the risk Coronary Artery Disease in Hypertension. p=0.0018; OR (95% CI) = 1.47(0.95 – 2.26). When the risk was compared by sex, hypertensive Women 175 (65.87%) were more than Men 243(56.01%) which denotes Hypertension risk has more impact among Women than Men (X2=1.73, p=0.018). When the risk was compared by sex, hypertensive women 175 (65.87%) were more than Men 243(56.01%) which denotes. By using Stressful Life Events and Depression Scale, 134 (29.89%) of Men and 96 (36.31%) of Women had stress score ≥5. Stress as a risk factor for Coronary Artery Disease did not differ significantly between Males and Females, p=0.71, OR (95% CI) =0.98 (0.59 – 1.64). These observations showed that stress was not an important influencing risk factor in both sexes in the study. The Stress risk did not differ between males and females. [Table 3]

DISCUSSION:

Coronary artery disease is proving to be a most important threat to human race affecting both males and females. It is considered unique as it is considered to be predominant only in males until the recent studies which have proven females are equally affected as males. Few studies have found that there are gender disparities in risk factors (Non modifiable, Modifiable), social and demographic influence. Recently, a very few studies have concentrated on the differential impact of these risk factors on males and females.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

In our study considerable number of male patients 126 (29.03%) were unemployed. Majority of females were homemakers 210 (78.95%), followed by skilled workers 21 (7.89%). Among males, unskilled workers were 121(27.88%) and skilled workers were 96 (22.13%). There were no professionals among females as compared to 17 (2.43%) males.

The present study shows similar results as WHO MONICA project[7] regarding socio demographic characteristics, with Males being more Unemployed and Females doing more Housework . In WHO MONICA project,[7] retired females were more (15.2%) than males (14.9%) which is in disagreement with present study, may be because women are generally not employed in rural areas in our set up and majority of women in study were from rural background.

During the study it was found that females were older than males in the development of CHD, this observation is supported by a number of researchers like Gabriel Tatu-Chitoiu, et al.,[7] Kazemy T et al.[8] Hochman et. al.[9] Sonia S. Anand, et al[10]., which confirms higher age as a risk factor of Coronary Artery Disease in females as compared to males.

Women had a positive family history of CHD, 95 (35.71%) which was more than in men 60(13.82%) supporting the fact that the family history in females is a major risk factor than males which was 2.46 times higher.

Similarly Kazemy T et.al[8] have shown Family history of Coronary Artery Disease was more affecting the Females than Males. In their study, affected Females had higher positive family history than Males (4.3% vs. 4.2%) which is similar to our study.

Large number of females 250(93.98%) belonged to sedentary group as compared to males 314(72.35%). Similar finding of higher sedentary activity risk for Coronary Artery Disease in Females than Males was reported by J Kaur,[11] who pointed out sedentary activity risk was 7 folds higher to females as compared to males (84% Female vs. 11.7% Males), Prescott E et.al.[12] also reported females 23.7% were inactive vs. 18.6% Males.

Gender wise distribution showed that 138 males (31.6%) were obese in comparison to females which were 17(6.46%). Contrarily 62 females (23.18%) who had normal BMI developed CHD as against 40 males (9.2%) suggesting that CHD occurs more in non-obese females than in non-obese males. Mean BMI was 21.76±4.41 kg/m2. Prescott E et.al.[12] Shirashi J et.al[13] Akhter N et.al.[14] Contrarily, Shaw LJ et.al.[15] reported in their studies that higher Body Mass Index is more risk among Females than Males (24.3 ± 16 vs. 20.5 ± 12 kg/m2). This is probably because these studies were conducted in different geographical areas with a different socioeconomic background.

Among 434 male patients affected by Coronary Artery Disease, 401(92.39%) had the habit of Alcohol use. Non-alcoholics were 33(7.61%) denoting Alcohol acts as noticeable risk factor for CAD in Males. Our study results is almost similar to study by Prescott E et.al.[12] where only a few females were alcoholic(8.6%) as compared to males(46.1%).

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

Mainstream of subjects 590(84.28%) had diabetes mellitus, which is one of the risk factor for Coronary Artery Disease. Diabetes risk was analyzed by Gender, it was found that 242 (91%) of Females versus 348 (80.16%) Males had diabetes. Barbara Hanratty et. al.[16], Teruo Shiraki et.al.,[17] Nausheen Akhter et.al,[14] Lesle J Shaw et.al,[15] Hochman et.al.[9] also found in their studies that diabetes mellitus was carrying more risk in females than males which was also noticed in our study.

A good number 418 (59.71%) of subjects were hypertensive which upholds the risk Coronary Artery Disease in Hypertension. Similar observations were shared by various investigators such as Moser DK et.al,[18] Hochman et.al,[9] Hanratty B et. al[16], Shikari T et.al,[17] Akhter N et.al,[14] Shaw LJ et.al[15] in their study.

By using Stressful Life Events and Depression Scale, 134 (29.89%) of men and 96 (36.31%) of women had stress score ≥5. Stress as a risk factor for Coronary Artery Disease did not differ significantly between males and females (p=0.71). These observations showed that stress was not an important influencing risk factor in both sexes in the study. The Stress risk did not differ between males and females. Similarly in INTERHEART Study,[19] risk of Coronary Artery Disease in South East Asia region did not differ by sex (males:26.9% vs. females:27%).

CONCLUSION:

Warning signs of Coronary Artery Disease in females were found to be milder and different from those of males, because of this, many cases of CHD in women remained undiagnosed/neglected/delayed in treatment. Positive genetic history, physical activity, waist circumference, history of smoking and alcohol consumption, diabetes and hypertension were found to be of higher risk in females.

REFERENCES:

1. Aggarwal NR, Patel HN, Mehta LS, Sanghani RM, Lundberg GP, Lewis SJ et al. Sex differences in ischemic heart disease: advances, obstacles and next steps. Circ Cardiovasc Qual Outcomes 2018;11(2):e004437.
2. Gaziano TA, Bitton A, Anand S, Gessel SA, Murphy A. Growing epidemic of coronary heart disease in low and middle income countries. Curr Probl Cardiol 2010;35(2):72-115.
3. WHO (2020), Burden of Disease. Available from URL http://www.who.int/healthinfo/bod/en/index. html. [Accessed on 20 April 2022]
4. Beverly RK, Siscovick D. Schwartz S. Koepsell T, Psaty B. Longstreth W. Family history and risk of myocardial infarction in young women. Circulation 1996; 93: 635
5. Kannel WB, Dannenburg AL, Abott RD. Unrecognized myocardial infarction and hypertension. The Framingham Study. Am Heart J 1985; 109:581-5

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

6. Gaur K, Mohan I, Kaur M, Ahuja S, Gupta S, Gupta R et al. Escalating ischemic heart disease burden among women in India: insights from GBD, NCDRisC and NFHS reports. Am J Prev Card 2020;5(2):100-54.
7. Chitoiu GT, Cinteza M, Dorobantu M, Udeanu M, Manfrini O, Pizzi C et al. In-hospital case fatality rates for acute myocardial infarction in Romania. CMAJ 2009;180(12):1207-13.
8. Kazemy T, Sharifzadeh GR. Acute myocardial infarction in women. Iranian Heart J 2009; 10(1):31-4.
9. Hochman JS, Tamis JE, Thompson TD. Sex, clinical presentation and outcome in patients with acute coronary syndromes. N Engl J Med 1999; 341:226-32.
10. Anand SS, Islam S, Rosengren A, Franzosi MG, Steyn K, YusufAli AH et al. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. European Heart J 2008; 29(1):932–40.
11. Kaur J, Bains K. A study of risk factor profile of cardiovascular diseases in rural panjabi patients. Ind J Public Health 2006;2(1):97-100.
12. Prescott E, Hippe M, Schnohr P, Hein HO, Vestbo J. Smoking and risk of myocardial infarction in women and men: longitudinal population study. BMJ 1998;31(6):1043–7.
13. Shiraishi J, Kohno Y, Sawada T, Nishizawa S, Arihara M, Hadase M et.al. Relation of obesity to acute myocardial infarction in Japanese patients differences in gender and age. Circ J 2006; 70: 1525–30.
14. Akhter N, Beland SM, Roe MT, Piana RN, Kao J, Shroff A. Gender differences among patients with acute coronary syndromes undergoing percutaneous coronary intervention in the American College of Cardiology-National Cardiovascular Data Registry (ACC-NCDR). Am Heart J 2009;157:141-8.
15. Blomkalns AL, Chen AY, Hochman JS, Peterson ED, Trynosky K, Diercks DB et al. Gender disparities in the diagnosis and treatment of non-ST-segment elevation acute coronary syndromes: large scale observations from the CRUSADE (Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes with Early implementation of the American College of Cardiology/American Heart Association Guidelines) National Quality Improvement Initiative. J Am Coll Cardiol. 2005;45:832-7.
16. Hanratty B, Lawlor DA, Robinson MB, Sapsford RJ, Greenwood D, Hall A. Sex differences in risk factors, treatment and mortality after acute myocardial infarction: an observational study. J Epidemiol Community Health 2000;54:912–6.
17. Shiraki T, Saito D. Sex difference of in-hospital mortality in patients with acute myocardial infarction. Acta Med Okayama 2011; 65(5): 307-14.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

18. Moser DK, McKinley S, Dracup K, Chung ML. Gender differences in reasons patients delay in seeking treatment for acute myocardial infarction symptoms. Patient Education and Counseling 2005; 56(5):45–54.

19. Yusuf S, Hawken S, Ôunpuu S, Dans T, Avezum A, Lanas F et.al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 2004; 364: 937–52.