Original Article

Comparison of Non Cardiac Chest Pain (NCCP) and Acute Coronary Syndrome (ACS) patients presenting to a tertiary care center

Om Parkash, Aysha Almas, Aamir Hameed, Muhammad Islam
Department of Medicine, Aga Khan University, Karachi.

Abstract

Objective: To compare clinical characteristics of patients admitted with chest pain with those who had Acute Coronary Syndrome (ACS) and Non Cardiac Chest Pain (NCCP) presenting at a tertiary care center.

Methods: An analytical crossectional study was done. All patients presenting to the emergency with acute chest pain of age more than 18 years who had electrocardiography done and had an initial serum Troponin I (Trop I) measured were included. Patients were assigned to ACS groups or NCCP group after cardiac workup. Those who did not have cardiac workup were excluded from the study.

Results: We enrolled a total of 202 patients. After workup 45.94% were placed in the ACS group and 34.5% in NCCP group. On comparison of the baseline characteristics of the ACS and NCCP group, there was significant difference in age ($p < 0.001$) and Diabetes Mellitus ($p < 0.002$). Comparison of clinical characteristics, showed a significant difference in the character of chest pain ($p < 0.001$), electrocardiogram ($p < 0.001$), -ve Troponin (Trop I) value ($p < 0.001$), pulse ($p < 0.02$) and presence of Pulmonary edema ($p < 0.006$). Non ST elevation myocardial infarction (NSTEMI) (46.5%)was the most common diagnosis in the ACS group and Muscular pain (27.60%) was the most common diagnosis in the NCCP group.

Conclusion: Patients with NCCP were younger, majority were non- diabetics, had slower pulse, more atypical/non-cardiac chest pain, had more normal ECG at base line as compared to patients with ACS. Muscular chest pain was the most common diagnosis in NCCP and NSTEMI in ACS group (JPMA 59:667; 2009).

Introduction

Despite many insights and innovations over the past two decades, the evaluation of acute chest pain remains challenging.[1] Over the years a number of modalities have evolved for rapid diagnosis and better risk stratification of patients, still evaluation of acute chest pain should begin with a clinical history taking that focuses on character of chest pain, the time of onset and duration of symptoms, examination that emphasizes vital signs and cardiovascular status.[1] This has to be followed by electrocardiogram within 5 minutes and troponin I if necessary.

Risk stratification is an important and foremost step required to be taken by the emergency physician. Modalities like Exercise Tolerance test and Thallium scans are not available for risk stratification in the emergency room setting in our country. As a result, the stratification of patients with acute chest pain is mainly done based on the clinical assessment of the emergency physician. Patients are usually stratified into Acute Coronary Syndrome (ACS) and Non Cardiac Chest pain (NCCP) by the emergency room physician. ACS refers to presence of ischaemic cardiac chest pain resulting from a critical reduction in myocardial perfusion due to intra coronary thrombus. It encompasses unstable angina pectoris (USAP), ST Elevation Myocardial Infarction (STEMI) and Non ST Elevation Myocardial Infarction (NSTEMI).[2] Non-cardiac chest pain is the chest pain that is not angina and has not been diagnosed as being due to ischaemic heart disease by a physician.[3] Chest pain of possible cardiac origin accounts for a large proportion of emergency admissions. However, only minority of such patients turn out to have definite ACS and most of them ultimately turnout to have NCCP.[4] The mean annual prevalence of NCCP in the general population is approximately 25%, making NCCP the most common atypical/extra-esophageal manifestation of gastro-esophageal

reflux disease (GERD).[5]

The clinical characteristics of patients with ACS and NCCP ought to be different. There tends to be a difference in terms of presentation of chest pain and clinical findings and certain electrocardiographic changes. ST depression, ST elevation and T wave inversion which are classically considered to be ischaemic are present more in patients with ACS. On the other hand patients with NCCP have atypical chest pain, they tend not to have ischaemic ECG changes and have negative cardiac markers. The most perplexing clinical aspect while evaluating these patients presenting with acute chest pain is to label the chest pain as typical and atypical which helps in stratifying these patients into ACS or NCCP group. Also a large number of patients who are mistakenly labeled to have ACS and later are found not to have NCCP usually remain without a firm diagnosis. They are labeled to have atypical chest pain and account for 49-60% of all admissions with chest pain.[6] The lack of a firm diagnosis can result in depression, anxiety and decrease in daily activity.[7] Some patients do get investigations done and get diagnosed later on, but a substantial number still remain undiagnosed. Such patients with NCCP need to have workup done for their atypical chest pain. We, therefore, sought to compare clinical characteristics of patients admitted with acute coronary syndrome (ACS) and NCCP presenting to Emergency room (ER) in a tertiary care center.

Methods

It was an analytical crossectional study. We included all patients presenting to the Emergency room (ER) with acute chest pain during the study period. All these patients had a cardiac workup and they were then finally assigned into ACS and NCCP groups. Those who were not admitted were excluded from the study. It was conducted at the Emergency and Medicine department of the Aga Khan University for 8 months. Patients presenting to the emergency room with acute chest pain of age more than 18 who had electrocardiograph done and had an initial serum Troponin I measured were included in the study. Patients with chest pain who had other serious medical illnesses besides suspected cardiac event; those with no chest pain but positive Troponin or ischaemic evidence of ECG alone, were excluded from the study. A convenient sample size of 59 patients in ACS group and 59 patients in NCCP group were taken with difference in character of chestpain, of 18% between ACS and NCCP groups with a significance level of 5%.[6] However we expected that 30% of patients may not have workup so we enrolled an additional 35 patients. ACS/NCCP (final diagnosis) was taken as dependent variable and typical chest pain, atypical chest pain, demographics, Comorbids, Electrocardiogram, troponin I, cardiac workup were taken as independent variable.

Data collection tool was a self devised Performa comprising 4 parts. a) Demographics and comorbids b) Initial assessment of the cardiology resident (based on character of chest pain, electrocardiograph, troponin I) cardiovascular Clinical exam c) Final assessment of ACS and NCCP based on the cardiac workup. All patients fulfilling the inclusion criteria were included during the study period. Informed consent was taken. As it was an observational study research carried out was in accordance with the Helsinki Declaration and ethical guidelines laid down by Ethical committee of the Aga Khan University. Clinical characteristics included character of chest pain, electrocardiogram, troponin I, pulse, blood pressure, comorbids, and presence of pulmonary oedema.

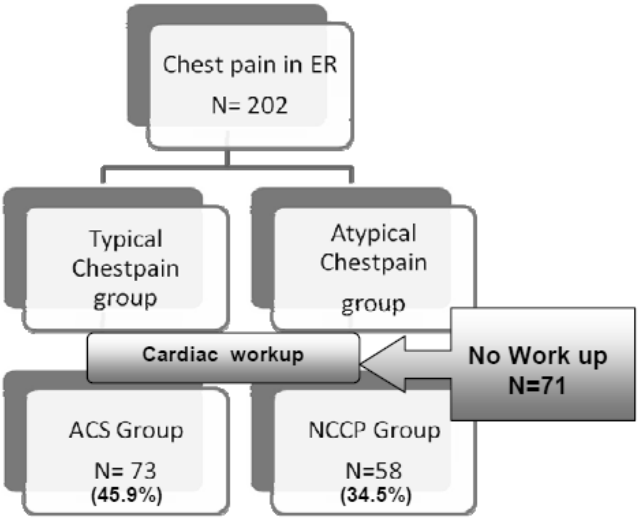
Typical chest pain: Included chest pain or discomfort (pressure, heaviness, tightness squeezing sensation in center or left sided chest pain) neck/jaw pain, arm or shoulder pain ± diaphoresis, ± dyspnea.[8] Atypical chest pain: discomfort (chest fullness, stabbing, right sided chest pain) indigestion, upper extremity numbness, tingling, pain with cough or deep breath, palpitation, mid back pain, dizziness/faint, fatigue.[9] ECG indicating ischaemia was defined as having in atleast 2 leads; new Q waves >1mm in depth or more, ST segment elevation at the j point of 2 mm in leads V1, V2, V3 and >1mm in other leads or, ST depression of 1mm or more or inverted T wave (these changes will not be significant in presence of LVH, LBBB, early depolarization or pacer). Nondiagnostic or normal ECG was defined as < 1mm ST elevation/depression, no T wave changes, and no Q wave changes.[10] Troponin I of >1 was taken as positive.

Patients were assigned to ACS groups or NCCP group after cardiac workup. Clinical characteristics of all patients were noted at this point in time. Cardiac workup was done either in form of coronary angiography, or myocardial perfusion scan or Dobutamine stress Echo or Exercise Tolerance test.

Data was analyzed on SPSS (Statistical package of social sciences version 15). Results are presented as mean and standard deviation for quantitative variables and percentages for qualitative variables. In Univariate analysis the chi square test was used for qualitative variable and Fischer exact test was used wherever applicable. Student t test was used for quantitative variables.

Results

We enrolled a total of 202 patients during the study period. Out of the 202 patients, 32 (15.9%) were excluded from further assessment as they did not get admitted (Figure-1). After workup 73 (45.94%) were placed in the ACS group, 58 (34.5%) in NCCP group and 39 (19.9%) were undecided because of lack of workup. These patients with lack of workup are those who could not have workup done due to reluctance or financial constraints. At baseline, mean age was 54.05 ± 13.5



ACS: Acute Coronary Syndrome. NCCP: Non-Cardiac Chest Pain.

Figure-1: The in-hospital course of study patients.

years, sixty one percent were males, Risk factors for Coronary Artery Disease (CAD) were present in 86%; 52% were hypertensive, 72% had Diabetes, 22.3% had prior ischaemic heart disease, 22.3 % were smokers and 13.4% had family history of premature CAD.

On comparison of the baseline characteristics of the ACS and NCCP group, there was a statistically significant difference in age and presence of Diabetes Mellitus between the 2 groups (Table-1). On comparison of clinical characteristics of the ACS and NCCP groups, there was significant difference in the character of chest pain, electrocardiogram, troponin I value, pulse and presence of Pulmonary oedema. (Table-2).Character of chest pain was typical in 94.5 % of patients in ACS group while it was atypical in 5.5%. Electrocardiogram was ischaemic in 69.8% patients in ACS group while Troponin I was positive in 63% patients. Mean pulse was 85.74 beats/minutes in the ACS group and it was 79.55 in the NCCP group (p value 0.02).

Table-1: Comparison of Base line Characteristics.

Characteristics	ACS Group n = 73 N (%)	NCCP Group n = 58 N (%)	P value
Mean Age (years)	59.34 ± 12	50.66 ± 12	<0.001
Gender			
Male	52 (71.23)	37 (63)	
Female	21 (28.76)	21 (36.20)	0.36
Risk factors	68 (93)	53 (91.3)	0.75
Diabetes Mellitus	36 (49.3)	13 (22)	0.002
Hypertension	44 (60.27)	31 (53.44)	0.43
Ischaemic Heart Disease			
Confirmed	22 (30.1)	10 (17.24)	
Not Confirmed	14 (19.1)	20 (34.4)	0.07
Smoking	23 (31.50)	15 (25.89)	0.47
Family History	11 (15)	5.5 (9)	0.94
Dyslipidiaemia	24 (32.8)	21 (36.2)	0.69
H/o CABG°	4 (5.4)	2 (3.44)	0.45

°CABG: Coronary artery Bypass Graft

Table-2: Comparison of Clinical Characteristics of Patients with ACS and Non ACS.

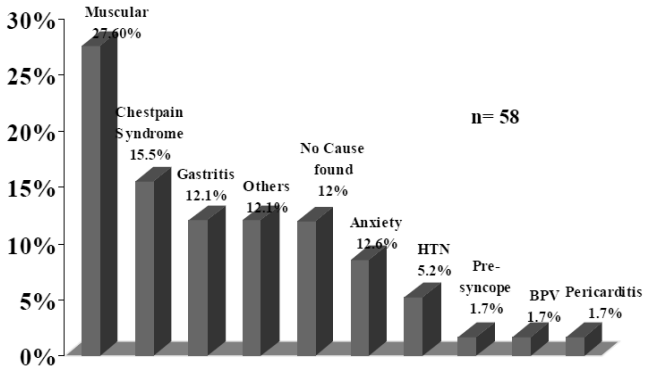
	ACS Group n = 73 N (%)	NCCP Group n = 58 N (%)	P value
Character of chest pain			
Typical	69 (94.5)	33 (56.8)	<0.001
Atypical	4 (5.4)	25 (43.1)	
Electrocardiogram			
Ischaemic	51 (69.8)	14 (24.1)	<0.001
Normal/Non diagnostic	32 (30.1)	64 (75)	
Troponin I			
>0.1(+ve)	46 (63)	0	
<0.1(-ve)	27 (37)	58 (100)	<0.001
Systolic blood pressure (mmHg)	131.81 ± 32.45	136.28 ± 25.04	0.389
Diastolic blood pressure (mmHg)	75.70 ± 16.91	80.67 ± 12.83	0.066
Pulse (beats per min)	85.74 ± 19.04	79.55 ± 10.02	0.027
Pulmonary oedema			
Present	12 (16.4)	1 (1.7)	0.006
absent	61 (83)	57 (98.2)	

Central chest pain was seen as the most common character of chest pain in the ACS group (31.5%), followed by central chest heaviness (13.7%), epigastric pain (13.7%), left sided chest pain (8.2%), chest pain with dyspnea (8.2%), chest pain with left arm pain (4.1%), shoulder pain/heaviness (4.1%), left arm pain (2.5%), dizziness (2.5%), chest pain/heaviness with ghabrahat (2.5%), left sided chest heaviness (2.5%) and neck jaw pain (2.5%).Central chest pain was also the most common character of chest pain in the NCCP (15.5%) followed by; Localized chest pain (13.8%); left sided chest pain (12.1%); chest pain/heaviness with ghabrahat (8.6%); Central chest heaviness (6.9%) and palpitations (6.9%); dizziness (5.2%) epigastric pain (5.2%); right sided chest pain(3.4%), chest burning (3.4%); left arm pain (1.7%), stabbing chest pain(1.7%) , continuous chest pain for > 12 hrs (1.7%), upper extremity numbness (1.7%), chest and left arm pain (1.7%), left sided chest heaviness (1.7%), shoulder pain (1.7%) amd chest heaviness with dyspnoea (1.7%). P value for the difference of character of chest pain between ACS and NCCP group was 0.004.

ST segment depression was seen as the most common ECG finding in the ACS group(32.9%), followed by ST elevation (20.5%), T wave inversion (15.1%), normal ECG (9.6%), changes in 1 lead only (8.2%), old changes (5.5%), early repolarization (1.4%), and ST depression with T wave inversion (1.4%). Normal ECG was the most common ECG finding in NCCP (37.9%), followed by T

wave inversion (13.8%), changes in 1 lead only (13.8%), old changes (12.1%), ST depression <1 mm (6.9%), ST depression > 1 mm (5.2%), early repolarization (5.2%), q waves with ST changes (3.4%), and ST elevation > 1mm (1.7%). P value for the difference in ECG between the ACS and NCCP group was <0.001.

NSTEMI was the most common diagnosis in the ACS group (46.5%); followed by USAP (32.87%) and STEMI (21.9%). Muscular pain was the most common diagnosis in the NCCP group (27.60%) (Figure-2).



Others: Cholycystitis, Hypoglycaemia, Chronic Obstructive Pulmonary Disease Exacerbation, Ileus, Supra ventricular tachycardia, Gastroenteritis, Anaemia, Cervical problems, Pleuritic pain. HTN: Hypertension BPV: Benign positional vertigo

Figure-2: Spectrum of Disease in NCCP Group.

Discussion

It is known that Diabetes Mellitus (DM) has a strong association with Ischaemic Heart Disease (IHD).[11] It was also observed that DM was more prevalent in patients with ACS as compared to patients in the NCCP group, and the difference was statistically significant. Diabetes increases the risk of death by 80%.[11] Diabetes, therefore, is one of the major risk factors and has to be taken care of not only for prevention of ACS but also for reducing mortality from ACS by secondary prevention. Patients with Diabetes Mellitus who present with acute typical chest pain have a higher risk of adverse outcomes than patients without DM, and appear to derive greater benefit from evidence based therapies.[12] Also, diabetic patients need to be seen in ER by the physician more carefully, as they have atypical symptoms at presentation which may result in a worse outcome if they are not carefully examined. This has also been demonstrated in a local study conducted in Military Hospital, Rawalpindi which showed that 25 % of the diabetics present without chest pain.[13]

In the presented study, the age of patients with ACS was higher than those in the NCCP group. In a local study, conducted on 150 patients, elderly individuals presented more with atypical symptoms.[14] Similar trend has been observed in a study conducted on 213 patients where atypical presentations were more likely to be encountered in the elderly with shortness of breath being most common. Age group of NCCP was also around 50 years.[15]

Musculoskeletal chest pain constituted around 27% of the Non ACS patients presenting to ER in our study. Spalding etal conducted a study on 250 patients with acute chest pain, and musculoskeletal cause was found for atypical chest pain in 23% of patients.[6] However, this diagnosis of chest pain was purely based on clinical grounds with a history of heavy lifting or injury confirmed by presence of tenderness. Even in studies in which special investigations for musculoskeletal pain were considered, this diagnostic category had more patients at followup.[6]

Chest pain syndrome was found as the 2nd most common cause of NCCP group constituting 15.5%. These patients had normal coronaries on coronary angiogram but still presented with typical chest pain.[15] However, patients with chest pain syndrome, suffering from angina like chest pain with normal coronaries on angiogram, have a long term prognosis which does not differ from general population of same age.[16]

The third most common cause of NCCP was due to Gastrointestinal cause, mainly Peptic Ulcer Disease (PUD), and Gastrointestinal Esophageal Reflux Disease (GERD). Although in some studies Gastrointestinal causes of atypical chest pain has been second on the list.[6] The usual description of PUD and GERD include epigastric discomfort and retrosternal burning, but often it is difficult to distinguish clearly between classic heart burn and classic chest pain.[17] Diagnosis of PUD/GERD in patients in the NCCP group is also important as they are potentially treatable causes of chest pain. Once cardiac Ischaemia has been excluded, it is important to consider GERD because it may be established as the cause of chest pain in 10% to 50% of such patients. If GERD is suspected vigorous anti reflux treatment, preferably a proton pump inhibiter is indicated.[18]

It is interesting to note that a good 12% of patients with NCCP did not have any cause found for their chest pain. They were unable to have a firm diagnosis based on clinical grounds. But diagnosis of patients with NCCP is also important as they lead a compromised quality of life, if they remain undiagnosed. Eslick etal conducted a study on NCCP on 1000 residents of Penrith and demonstrated that severe NCCP is a highly debilitating condition.[4] Tew

et al., in a small hospital-based prospective study, observed that patients with non-specific chest pain reported more frequent visits for medical care than ischaemic heart disease patients.[19] This emphasizes the fact that patients with NCCP need workup to alleviate their anxiety as this significantly hampers their quality of life. Workup of NCCP is not very simple and can range from minimal non-invasive clinical evaluation to complex invasive procedures like Upper gastrointestinal Endoscopy, Ph monitoring and manometry.

The limitations of the study included limited external validity due to it being a single hospital study and catering only to highly selective population in the city. All patients with NCCP did not have the complete workup to find out the cause of the NCCP.

Conclusion

It is concluded, that Patients with NCCP were younger, majority were non- diabetics, had slower pulse, more atypical/noncardiac chest pain, and had more normal ECG at base line as compared to patients with ACS. Muscular chest pain was the most common diagnosis in NCCP and NSTEMI in ACS group.

Since majority of the patients with NCCP go without workup it is recommended that this population needs proper evaluation (Upper GI Endoscopy, 24 hours PH monitoring or Manometry) for the etiology of NCCP and to relieve anxiety associated with chest pain in these patients.

References

1. Lee TH, Goldman L. Evaluation of the patient with acute chest pain. N Engl J Med 2000; 342: 1187-95.
2. Grubb NR, Newby DE. Cardiology. 2nd ed. Edinburgh: Elsevier Churchill Livingstone 2006.
3. Davie AP, Caesar D, Caruana L, Clegg G, Spiller J, Capewell S, et al. Outcome from a rapid-assessment chest pain clinic. QJM 1998; 91: 339-43.
4. Eslick GD, Jones MP, Talley NJ. Non-cardiac chest pain: prevalence, risk factors, impact and consulting -- a population-based study. Aliment Pharmacol Ther 2003; 17: 1115-24.
5. Fass R, Dickman R. Non-cardiac chest pain: an update. Neurogastroenterol Motil 2006; 18: 408-17.
6. Spalding L, Reay E, Kelly C. Cause and outcome of atypical chest pain in patients admitted to hospital. J R Soc Med 2003; 96:122-5.
7. Chambers J, Bass C. Atypical chest pain: looking beyond the heart. QJM 1998; 91: 239-44.
8. Milner KA, Funk M, Arnold A, Vaccarino V. Typical symptoms are predictive of acute coronary syndromes in women. Am Heart J 2002; 143: 283-8.
9. Goldman L, Kirtane AJ. Triage of patients with acute chest pain and possible cardiac ischemia: the elusive search for diagnostic perfection. Ann Intern Med 2003; 139: 987-95.
10. Pope JH, Aufderheide TP, Ruthazer R, Woolard RH, Feldman JA, Beshansky JR, et al. Missed diagnoses of acute cardiac ischemia in the emergency department. N Eng J Med 2000; 342: 1163-70.
11. Cannon RO 3rd, Quyyumi AA, Mincemoyer R, Stine AM, Gracely RH, Smith WB, et al. Imipramine in patients with chest pain despite normal coronary angiograms. N Engl J Med 1994; 330: 1411-7.
12. Gandhi MM, Lampe FC, Wood DA. Incidence, clinical characteristics, and short-term prognosis of angina pectoris. Br Heart J 1995; 73: 193-8.
13. Trichon BH, Roe MT. Acute coronary syndromes and diabetes mellitus. Diab Vasc Dis Res 2004; 1: 23-32.
14. Naseem A, Moin S. Comparison of Diabetics and Non-Diabetics presenting with acute Myocardial Infarction. J Coll Physicians Surg Pak 2002; 12: 356-60.
15. Ali A, Khan ISU, Khan MF, Zaheer HA. Acute myocardial infarction in elderly; differences compared with young patients. Ann Pak Inst Med Sci 2005; 1: 191-3.
16. Scholz M, Wegener K, Unverdorben M, Klepzig H. [Long-term outcome in patients with angina-like chest pain and normal coronary angiograms]. Herz 2003; 28: 413-20.
17. Cayley WE, Jr. Diagnosing the cause of chest pain. Am Fam Physician 2005; 72: 2012-21.
18. Boivin M, Paterson WG. Management of complicated gastroesophageal reflux disease: atypical chest pain. Can J Gastroenterol 1997; 11 Suppl B:91B-3B.
19. Tew R, Guthrie EA, Creed FH, Cotter L, Kisely S, Tomenson B. A long-term follow-up study of patients with ischaemic heart disease versus patients with nonspecific chest pain. J Psychosom Res 1995; 39: 977-85.