Characteristics, types and causes of chest pain in an urban family practice secondary care center in South India

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A – Study Design, B – Data Collection, C – Statistical Analysis, D – Data Interpretation, E – Manuscript Preparation, F – Literature Search, G – Funds Collection

Summary   **Background.** Chest pain is a common diagnostic problem faced by primary and emergency care physicians. We are taught to consider the cardiac cause of chest pain as the usual cause from our undergraduate textbooks. Though the cardiac cause of chest pain is one of the more serious causes, it may not be the common one. There was a paucity of data available concerning this common problem in the Indian context. We present an observational study of causes of chest pain in 254 adults presenting to an ambulatory secondary care unit.
Material and methods. All consecutive adults (over 18 years of age) presenting with chest pain to the urban family health center were administered a questionnaire documenting location, severity, characteristic and cause of chest pain as diagnosed by relevant clinical examination and appropriate investigations. This was done in the time period from September 2014 to July 2016.
Results. A total of 254 adults with chest pain were studied, among whom 73.6% (187) were female. The most common diagnosis as to the cause of chest pain made by the treating physician was of a gastro-esophageal cause (41.3%, 105). A cardiac origin of chest pain was diagnosed in 18.5% (47) of the patients.
Conclusions. The causes of chest pain in adults vary with the setting and the target population. It is mostly non-cardiac in ambulatory care practices in primary and secondary care units. However, we need to be clinically vigilant and apply a robust approach in diagnosing chest pain.
Key words: chest pain, family practice, secondary care, India.

Background

Chest pain is a common symptom in all health care settings and can be caused by a wide range of disease conditions. Some of these could be due to treatable causes, such as musculoskeletal disorders with favorable outcomes; others could be due to potentially fatal life-threatening conditions, such as acute coronary syndrome [1]. Most patients with chest pain are initially seen by a general practitioner (GP), who thus has the challenge of triaging the patients. In order to correctly triage patients, GPs need to know the common causes of chest pain and their frequency of occurrence in the population.

GPs generally follow a process of probabilistic reasoning by combing the initial likelihood for a given cause (pre-test probability) with the information gathered from the patient's history and clinical examination. This process guides the GP to reach a final differential diagnosis (post-test probability) [2].

A study of the symptoms of chest pain that looks at how patients present with it, what other underlying conditions there are and their respective frequencies and the final diagnoses made has not been done in the Indian health care setting. The knowledge derived from such a study would be of immense practical value for GPs in India by providing pre-test probability of a diagnosis for these symptoms.

Symptoms of chest pain can be broadly divided into cardiac chest pain (CCP) or non-cardiac chest pain (NCCP) based on the etiology. The concern of the emergency physician is in diagnosing and managing CCP in as short a time frame as possible. The GP is faced with the challenging task of differentiating the various causes of chest pain and make an appropriate referral. Though CCP is definitely more life threatening, there is significant morbidity in NCCP as well. The GP uses the history and clinical examination to differentiate the various causes of NCCP. CCP is usually left sided with radiation, aggravated by exertion, relieved by rest and is more likely in patients who have a past history of heart disease, hypertension or diabetes mellitus. When a patient has a cough, rapid respiratory rate or chest pain that worsens on deep inspiration, the most likely cause of chest pain is a pulmonary cause. The clinical characteristics of NCCP of musculoskeletal origin are localized pain that is reproducible by palpation and aggravated by movement. The features that are suggestive of NCCP due to gastroenterological causes are retrosternal pain accompanied by esophageal symptoms, such as dyspepsia, nausea, heartburn and regurgitation [3]. Other causes of NCCP documented in primary care are panic disorder, anxiety and skin conditions, such as herpes zoster.

The prevalence of these various causes differs in countries where the epidemiology of NCCP has been studied in primary care settings. In Belgium, for example, a cardiac diagnosis was

made in 13% of patients with chest pain in primary care. Among NCCP, a musculoskeletal cause was attributed in 21%, while 20% was due to a pulmonary cause [4]. In the U.K. and Switzerland, the proportion of consultations for chest pain in primary care varied from 1–2.7% [5–7]. The prevalence of NCCP due to a musculoskeletal cause was 21–51%, gastroenterological causes were 8–19%, and a psychogenic cause was 8–17% [5–7].

There is a paucity of studies on the prevalence of various causes of chest pain in the Indian general practice setting. In India, a medical graduate who has successfully completed the undergraduate Bachelor of Medicine and Bachelor of Surgery course (MBBS) and has been registered with the Indian Medical Council is eligible to practice as a GP. There are only a few graduates who complete specialist training in Family Medicine. During undergraduate training, being predominantly in tertiary care institutes, one is taught to consider a cardiac cause as the most probable cause for patients presenting with chest pain. Studies have shown this may not be applicable in primary care settings. To the best of our knowledge, there are no current statistics available in the rural or urban primary or secondary care settings on common causes of chest pain and its associated characteristics and frequencies. We, therefore, perceived a need to conduct such a study.

Objectives

We planned an observational cross-sectional study with the following objectives:
- To identify the common causes of chest pain in a family practice secondary care unit located in an urban area//serving an economically disadvantaged urban population.
- To describe the characteristics of patients who present with chest pain.
- To assess the association, if any, of the described characteristic with the causes of chest pain.

Material and methods

Study design

The study design was an observational cross-sectional study.

Study setting

The study setting was the urban health care unit of a medical college and hospital. The unit is located two kilometers away from the tertiary care main hospital and manned by family medicine specialists, community health specialists, medical officers and post-graduate residents. It is a secondary level unit and caters to a population of approximately 200,000. The population consists mostly of economically disadvantaged urban slum residents. The average number of ambulatory care visits per year is approximately 70,000. The unit has a 46-bed inpatient ward and

a 2-bed labor ward. As the unit specializes in family medicine, the physicians see patients of all ages. The common diseases seen are acute respiratory illnesses, acute febrile episodes, gastroenteritis, mental health disorders and chronic morbidities, such as diabetes mellitus, hypertension, ischemic heart diseases, seizure disorders, chronic obstructive pulmonary disease and musculoskeletal disorders. There are daily outreach clinics that cater to the neighboring urban residents, wherein a similar profile of morbidities is seen.

Study participants

The study participants were recruited between September 2014 and July 2016 using a questionnaire that included type, duration, severity and characteristics of chest pain. The questionnaire was filled in by the treating physician. After obtaining informed consent in their local language, all consecutive adults (over 18 years of age) presenting with chest pain to the urban health care unit were administered a questionnaire by the treating physician, wherein clinical characteristics of the pain and any underlying co-morbidity were inquired. A focused physical examination was done and relevant investigations ordered based on the differential diagnosis and on the algorithm (Figure 1). The algorithm was developed after a discussion with all the treating physicians of the unit. They also ensured that all the study participants were given the best available standard of care for their illness. The final diagnosis was made by the treating physician based on the collective clinical and investigative findings.

Variables

We documented the demographic details of the participants: the baseline characteristics, the examination findings and the investigations carried out. We recorded the characteristics of chest pain and tabulated the various factors associated with cardiac and non-cardiac chest pain.

Data sources/measurement

The data was recorded in written format in the questionnaire by the treating physicians. The severity of chest pain was documented using the Wong-Baker FACES® pain rating scale [8].

Statistical methods

The data was entered using Microsoft Access 2000 and statistics tabulated using SPSS Statistics for Windows, Version 17.0. (Chicago, U.S.A.). The chi-squared test of association or Fisher's exact probability tests were used to assess the association between the cardiac and non-cardiac cause of chest pain with associated variables such as age, sex, gender, past history of hypertension, diabetes or ischemic heart disease. An unadjusted binary logistic regression analysis was done using the step-wise method.
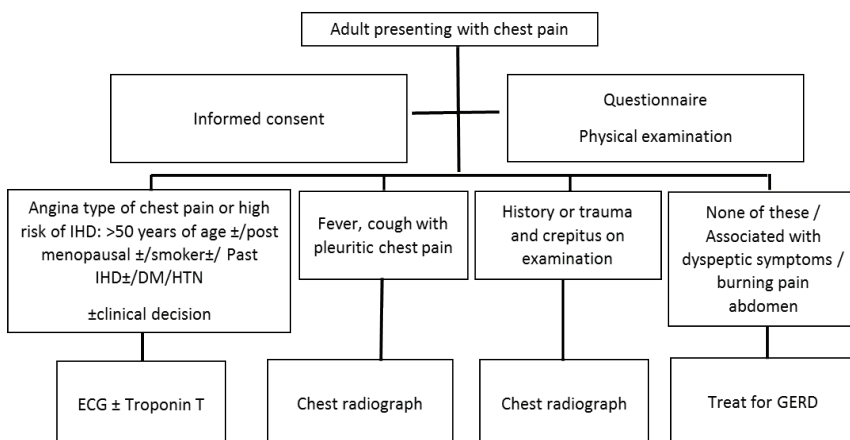

Figure 1. Detailed diagrammatic algorithm of the study

Ethical approval

The Institutional Review Board and Ethics Committee (IRB) of the Institution approved the conduct of the study (vide IRB minutes of the meeting (8696) held on 26 February 2014; approval dated 7 April 2014).

Results

Participants

The characteristics of chest pain were recorded in 254 patients. The percentage of females was 73.6%, as reflected from our outpatient visit timings, which are in the morning, preventing access to working male members (Table 1).

Table 1. Distribution of baseline characteristics, examination and investigations

Variable (n = 254)	Number (%)	Variable (n = 254)	Number (%)
Age in years		**Family history**	
≤ 20	3 (1.2)	diabetes mellitus	51 (20.1)
21–40	90 (35.4)	hypertension	44 (17.3)
41–60	126 (49.6)	cardiac problems	13 (5.1)
> 60	35 (13.8)	respiratory problems	4 (1.6)
Gender		**Examination**	
Male	67 (26.6)	pallor	22 (8.7)
Female	187 (73.6)	pedal edema	2 (0.8)
Personal history		normal heart sounds	250 (97.2)
Smoking	39 (15.4)	normal breath sounds	248 (95.6)
Alcohol consumption	23 (9.1)	chest wall tenderness	74 (29.1)
Past medical history		**Investigations**	
Diabetes mellitus	67 (26.4)	electro cardiograph	133 (52.4)
Hypertension	83 (32.7)	chest X-ray	43 (16.9)
Tuberculosis	17 (6.7)	cardiac enzymes	31 (12.2)
Respiratory conditions	16 (6.3)		
Cardiac conditions	14 (5.5)		

Descriptive data

Nearly half of the patients (126/254, 49.6%) were from the age group of 41 to 60 years. The proportion of patients consuming alcohol (23/254, 9.1%) and smoking (39/254, 15.4%) was relatively low, as it was predominantly female patients. More than half had a significant medical history of diabetes (67/254, 26.4%) and hypertension (83/254, 32.7%) (Table 1).

Main results

The onset of chest pain was equally distributed between less than three days and a longer duration. The most common location of chest pain described was central by 134 patients (52.8%). Nearly two-thirds of the patients experienced chest pain greater than 5 on the pain scale (Table 2). Some of the aggravating factors described by patients included exercise (66 (26%)) and food (48 (18.9%)). Patients had chest pain along with associated symptoms of dyspepsia (51 (20.1%)), breathlessness (46 (18.1%)) and nausea or vomiting (31 (12.2%)). Common relieving factors for chest pain described were rest (85 (33.5%)) and food (25 (9.8%)), and many had unspecified relieving factors (121 (47.6%)).

The most often ordered investigation was an ECG in 133 patients (52.4%) (Table 1). Biomarkers for myocardial injury, serum Troponin T was ordered in 31 patients, among whom 8 had elevated Troponin T levels.

After eliciting a history, appropriate physical examination and investigations, the most common diagnosis as a cause of chest pain made by the physicians was gastro-esophageal reflux disease (GERD) (105 (41.3%)). The next common cause was musculoskeletal (65 (25.6%)). A cardiac cause of chest pain was diagnosed in 47 patients (18.5%). In patients more than 70 years of age, the cause of chest pain was attributed more to cardiovascular cause, whereas in those younger than 20 years, the cause was attributed more as a musculoskeletal cause (Figure 2). Male patients and those older than 40 years of age showed a significantly higher proportion of cardiac causes of chest pain ($p < 0.015$ and $p < 0.001$) (Table 3). Moreover, patients with a positive history of diabetes and hypertension were more significantly diagnosed to have a cardiac cause of chest pain ($p < 0.0001$).

Table 2. Characteristics of chest pain

Characteristics	Number (%)	Characteristics	Number (%)
Onset (n = 253)		**Progression (n = 254)**	
< 3 days	92 (36.4)	constant	124 (48.8)
3 days to 2 weeks	80 (31.6)	worsened	104 (40.9)
> 2 weeks	81 (32.0)	decreased	26 (10.2)
Location (n = 254)		**Radiation of pain (n = 254)**	
Central	134 (52.8)	yes	79 (31.1)
Left lateral	91 (35.8)	no	175 (68.9)
Right lateral	29 (11.4)	**Diurnal variation (n = 254)**	
Type of pain (n = 253)		yes	32 (12.6)
Pricking	95 (37.5)	no	222 (87.4)
Crushing	87 (34.4)	**Severity of pain – Wong-Baker FACES® pain rating scale (n = 254)**	
Burning	45 (17.8)	≤ 5	97 (38.2)
Others	26 (10.3)	> 5	157 (61.8)

Table 3. Association of various factors with the cause of chest pain

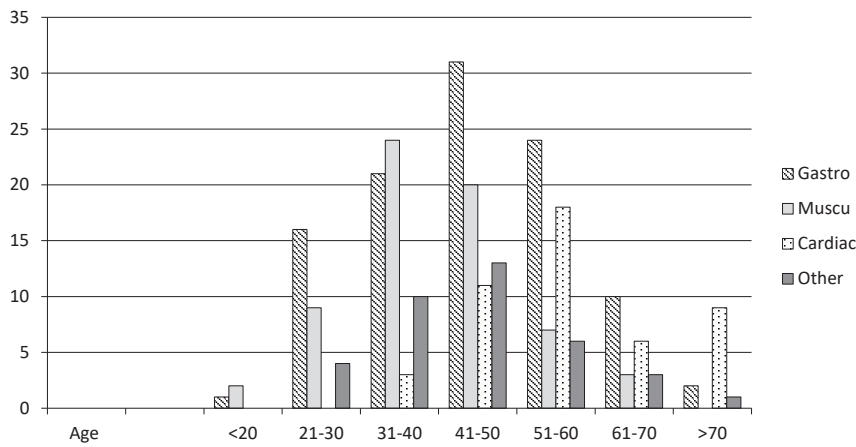| Factors	Non-cardiac cause n = 207	Cardiac cause n = 47	p
Age			< 0.001
< 40	87	3	
> 40	120	44	
Gender			< 0.015
Male	48	19	
Female	159	28	

Figure 2. Distribution of the most probable cause of chest pain compared with the age of the patient

Table 3. Association of various factors with the cause of chest pain

Factors	Non-cardiac cause n = 207	Cardiac cause n = 47	p
Past history diabetes mellitus			< 0.0001
Present	41	26	
Absent	166	21	
Past history of hypertension			< 0.0001
Present	53	30	
Absent	154	17	
Past history of cardiac disease			< 0.001
Present	6	8	
Absent	201	39	
History of smoking			0.14
Present	28	11	
Absent	179	36	
History of alcohol use			0.57
Present	19	4	
Absent	188	43	

Discussion

Key results

Our study reports that the most common cause of chest pain in adults presenting to an urban family practice center in South India is gastrointestinal in origin. Most of the patients had central chest pain associated with dyspepsia or nausea. A cardiac cause was diagnosed more in patients with a previous history of diabetes mellitus, hypertension and cardiac disease. To our knowledge, this is the first of such studies done in the Indian population.

Limitations of the study

Our study had some limitations. The study population was small in comparison to the expected prevalence of chest pain as seen in published literature in other countries. We were not able to follow up on patients diagnosed as having various types of chest pain to see the long-term outcomes. Our ambulatory

care clinic was accessed mainly by females, as working hours were in the morning. As a result, the proportion of females was markedly higher than males.

Interpretation

Chest pain is the hallmark symptom of acute coronary artery disease to the clinician, as well as to the general public. However, it has been reported that one-third of those who do complain of chest pain do not have acute coronary artery disease [9]. Moreover, the causes of chest pain as diagnosed in primary care differ markedly from emergency or acute care. The prevalence of chest pain of cardiac or non-cardiac etiology has not been studied in India. In India, 70% of the population visit private practitioners who are general practitioners for common ailments [10]. However, the prevalence of chest pain or the causes of chest pain have not been studied among these visits. In the United States, the cause of chest pain is often non-cardiac in an outpatient visit [11]. Serious cardiovascular conditions account for 50% of patients presenting with chest pain in the emergency context [12]. Our study had a larger proportion of females due to the outpatient timings which restricted the access to working males; however, in general, females would see their general practitioner more often than males for chest pain [13].

In Switzerland, a study done among all patients presenting in primary care reported that 2.7% of patients presented with chest pain. Among those who had chest pain, 12% was of cardiac origin [14]. Our study reports that in 18.5% of patients, the probable cause of chest pain was of cardiac origin. Non-cardiac chest pain due to gastrointestinal problems, musculoskeletal disorders and psychopathology are found more frequently in general practice [4]. A meta-analysis of the most common causes of chest pain in primary care reported that in 24.5% to 49.8% of patient, the cause of chest pain was attributed to chest wall syndrome or musculoskeletal causes, 13.8% to 16.1% to cardiovascular causes and 5.6% to 9.7% to gastrointestinal disorders [15]. Most of the studies included in this analysis were from developed countries.

In our study, the most common cause of chest pain diagnosed in our practice was gastrointestinal. This is similar to studies in the Asian population, wherein the prevalence of gastroesophageal reflux in patients with non-cardiac chest pain was 66.7% [16]. Karlaftisa et al. have shown that clinical features such as heartburn, regurgitation, postprandial chest pain and pain relief with anti-reflux drugs are typical of non-cardiac chest pain related NCCP [17]. In an emergency department in South Africa, the most common cause of chest pain was found to be due to respiratory causes, followed by musculoskeletal causes [18]. Diagnosis of the cause of chest pain varies according to the setting, whether ambulatory or emergency, and population. A working knowledge of the common causes of chest pain in

the target population provides a better "pre-test" probability of one diagnosis from a list of differential diagnoses. This is supplemented by a thorough history and physical examination. It is also useful to define practice populations as rural, remote or isolated to determine referral criteria and standards of care for various symptoms, including chest pain, that present in such practices [19]. Our study helped, in a small context, in demonstrating that the common causes of chest pain in our target ambulatory care patients were related to gastrointestinal causes, characterized by central pain and associated with symptoms of dyspepsia, nausea and vomiting.

Conclusions

In summary, documenting causes of chest pain in family practice is useful. The most common cause of chest pain was one with non-cardiac, gastrointestinal origin. A cardiac origin of chest pain needs to be suspected when the patient has underlying co-morbidities of diabetes mellitus, hypertension and cardiac disease. There is a need for more studies on the prevalence and causes of all common symptoms that present in general practices across India. This information would be of practical value for the family practitioner, as it would provide pre-test probabilities of common diseases in primary care and guide the diagnostic process. The goal of the family practitioner when evaluating a patient with chest pain is to exclude life-threatening conditions that would need a referral to tertiary centers. Prior awareness of the most prevalent causes in his/her area of practice would assist towards this goal.

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