

Study of Chest Pain and its Risk Factors in Over 30 Year-Old Individuals

S. Dabiran

Abstract—Chest pain is one of the most prevalent complaints among adults that cause the people to attend to medical centers. The aim was to determine the prevalence and risk factors of chest pain among over 30 years old people in Tehran. In this cross-sectional study, 787 adults took part from Apr 2005 until Apr 2006. The sampling method was random cluster sampling and there were 25 clusters. In each cluster, interviews were performed with 32 over 30 years old, people lived in those houses. In cases with chest pain, extra questions asked. The prevalence of CP was 9% (71 cases). Of them 21 cases (6.5%) were in 41-60 year age ranges and the remainders were over 61 year old. 19 cases (26.8%) mentioned CP in resting state and all of the cases had exertion onset CP. The CP duration was 10 minutes or less in all of the cases and in most of them (84.5%), the location of pain mentioned left anterior part of chest, left anterior part of sternum and or left arm. There was positive history of myocardial infarction in 12 cases (17%). There was significant relation between CP and age, sex and between history of myocardial infarction and marital state of study people. Our results are similar to other studies' results in most parts, however it is necessary to perform supplementary tests and follow up studies to differentiate between cardiac and non-cardiac CP exactly.

Keywords—Chest pain, myocardial infarction, risk factor, prevalence

I. INTRODUCTION

CHEST PAIN (CP) is one of the most prevalent complaints in adults [1]. The pain consists of any discomfort or abnormal feeling such as pain, burn, compression, or radiation in the chest wall lasting more than one to 15 minutes. Although CP is commonly post-sternal, it may radiate to jaw, throat, shoulder, back, left arm and wrist or it may even be restricted to these sites [2]. In non-traumatic CPs, patients refer to clinics or emergency departments depend on acuteness or chronicity of pain in one hand and its severity on the other hand. Patients with acute CP are a common problem and a difficult challenge for clinicians. In the United States more than 5 million patients are examined in the emergency departments on a yearly basis, at a cost of 6 billion dollars [3],[4]. Serious lung diseases and cardiovascular diseases are reported more commonly in patients referring to emergency departments [3]. From 1.3 to 50 % of CP referees to emergency departments require admission for further evaluations, especially for acute coronary syndrome [5],[6], in 70-80 % of which various degrees of cardiac ischemia or myocardial injuries like acute myocardial infarction, unstable and stable angina are found [7-9]. A multi-center CP study showed that in patients with CP, older age and male sex are independently associated with substantially increased risk of acute myocardial infarction [8]. Myocardial ischemia is a state of decreased perfusion during which the oxygen supply to the myocardium is insufficient to meet its metabolic demands [10].

S. Dabiran is with department of Community and Preventive Medicine at Tehran University of Medical Sciences, Tehran, Iran (phone: +9821 64053369; fax: +9821 88962357; e-mail: dabirans@tums.ac.ir).

Angina is considered stable when it exists as a chronic pattern of predictable exertional discomfort, and it is considered unstable when there is a significant change in frequency, severity, or duration of the episodes, or when it occurs with decreasing level of exertion [10]. In patients admitted with CP, final diagnosis may be bacterial pneumonia and less commonly pulmonary embolism or even aortic dissection [8]. 25 to 50 percent of CP patients are not appropriately admitted to hospital and despite this conservative approach, acute myocardial infarction is misdiagnosed in up to 8% of patients with acute CP, who are released from the emergency departments without further evaluation, according to approximately 20% of emergency departments' malpractice in the United States [4]. Gastrointestinal disorders, musculoskeletal problems and psychopathology are identified more frequently in general practice [3]. Gastro-esophageal reflux is the most common gastrointestinal disorder inducing CP [1],[6],[11]. CP causes depression and anxiety. It also leads to many days absence from work. One third to 60% of emergency department and cardiologists' out-patient CP referees, even with no documented cardiac diseases, are affected with panic disorders or moderate levels of depression [5], [12], [13]; which is continues for more than one month after primary evaluations and affects patients' quality of life [12]. CP influences patients' prognosis, it is associated with higher probability of newly onset coronary diseases, heart failure or mortality risk in coming months or years [9],[14]. Considering the importance of CP and the effect of its timely and accurate diagnosis on patients' physical and mental health in long and short terms, and as there is no available data on its prevalence in Iran, we conducted the present study to evaluate the prevalence and risk factors of CP in over 30 years old population in Tehran city.

II. METHODS

This cross-sectional population-based study was conducted in 2005-2006, on people over-30 individuals of the urban communities of Tehran, Iran. A structured questionnaire was used for interviewing by two medical students for the purpose of determining prevalence or assessment of chest pain. Inclusion criteria were having more than 30 years of age, absence of hemorrhagic disease and mental retardation and Iranian nationality. The sampling method was random cluster sampling and there were 25 clusters. The delivery centers through Tehran were chosen as cluster starting point and selected randomly. In each cluster, interviews were performed with 32 over 30 years old, people lived in those houses. The study was approved by the ethics committee of Tehran University of Medical Sciences. The prevalence of CP in the population according to a primary pilot study was 16%. The calculated sample volume was 787 individuals ($P=0.05$, accuracy=20%, design effect=1.5). Cases were enrolled from 25 clusters each containing 32 individuals over 30 years old. Subjects' epidemiological data was gathered through

questionnaires. Parameters noted included age, sex, occupation, educational level, and marital status, existence of CP and history of myocardial infarction. In CP positive individuals rest or exertion pain, patients' reaction to it, reduction of pain after rest and the time needed for recovery, site of pain and existence of any accompanying pain in other sites were also noted. Descriptive statistics was used to report demographic characteristics by the means of SPSS statistic package version 13. Chi square and Fisher exact test were also used for data analysis.

III. RESULTS

Analysis was performed on the data of 787 completed questionnaires. Prevalence of CP in our study population was 9% (n=71) including 32 females (45%) and 39 males (55%). Table 1. Twenty-four (33.8%) experienced an accompanying pain in the sites other than chest. In all patients pain existed during activity but only 19(26.85%) of them mentioned a rest pain. The reaction to CP in all of them was stopping activity and resting or taking pills (mostly TNG). In almost all, these actions resulted in relief. The pain lasted less than 10 minutes for all. Site distribution of pain is shown in Table II. Twelve (1.5%) individuals (7 males) had a history of myocardial infarction, and CP existed in all of them. Table III. There were statistically significant associations between CP and age ($P<0.001$), CP and sex ($P<0.05$), CP and marital status ($P<0.001$), as well as CP and level of education ($P<0.001$). There were also significant associations between myocardial infarction and age ($P<0.01$) and myocardial infarction and marital status ($P<0.001$) (Table IV).

TABLE I
DESCRIPTIVE DATA OF CHEST PAIN POSITIVE AND CHEST PAIN NEGATIVE PATIENTS

| | Chest pain+ | Chest pain- | total | P value |
|----------------------------|-------------|-------------|-----------|---------|
| No | 9(71) | 91(716) | 100(787) | |
| Age (%) | | | | |
| ≤41 | 0(0) | 100(208) | 26.4(208) | <0.001 |
| 60-41 | 6.5(21) | 93.5(301) | 40.9(322) | |
| ≥61 | 41.1(50) | 80.6(207) | 32.7(257) | |
| Sex (%) | | | | |
| male | 11.2(39) | 88.7(307) | 44(346) | 0.05 |
| female | 25(32) | 92.7(409) | 56(441) | |
| Occupation (%) | | | | |
| employee | 7.8(14) | 92.2(164) | 22.6(178) | NS* |
| worker | 15.3(15) | 84.7(83) | 12.5(98) | |
| teacher | 8.9(7) | 91.1(71) | 9.9(78) | |
| Non governmental | 11.2(18) | 88.8(142) | 20.3(160) | |
| other | 6.2(17) | 93.8(256) | 34.7(273) | |
| Marriage status (%) | | | | |
| single | 4.4(3) | 95.6(64) | 8.5(67) | <0.001 |
| married | 7.7(49) | 92.3(580) | 9.9(629) | |
| widow/bachelor | 22.8(13) | 77.2(44) | 7.2(57) | |
| divorced | 17.6(6) | 82.4(28) | 4.3(34) | |
| Education (%) | | | | |
| uneducated | 11.1(11) | 88.9(88) | 12.6(99) | <0.001 |
| elementary | 17.6(18) | 82.4(84) | 13(102) | |
| guidance school | 12.8(21) | 78.2(142) | 0.7(163) | |
| high school | 5.6(14) | 94.4(236) | 1.8(250) | |
| above high school | 4(7) | 94(166) | 2(173) | |

*Not significant

TABLE II
DISTRIBUTION OF DIFFERENT CHEST PAIN LOCATIONS

| Location of chest pain | number | percent |
|---|--------|---------|
| Retrosternal | 6 | 8.5 |
| Left-anterior of chest wall | 16 | 22.5 |
| Retrosternal and Left-anterior of chest wall | 27 | 38 |
| Retrosternal and left arm | 1 | 1.4 |
| Left-anterior of chest wall and left arm | 17 | 24 |
| Retrosternal and Left-anterior of chest wall and left arm | 4 | 5.6 |
| Total | 71 | 100 |

TABLE III
DATA OF MI POSITIVE AND MI NEGATIVE PATIENTS

| | History of MI+ | History of MI- | total | P value |
|----------------------------|----------------|----------------|-----------|---------|
| Age (%) | | | | |
| ≤41 | 0(0) | 100(208) | 26.4(208) | 0.01 |
| 60-41 | 2.3(4) | 98.7(318) | 40.9(322) | |
| ≥61 | 3.1(8) | 96.9(249) | 32.7(257) | |
| Sex (%) | | | | |
| male | 2(7) | 98(339) | 44(346) | NS* |
| female | 1.1(5) | 98.8(436) | 56(441) | |
| Occupation (%) | | | | |
| employee | 1.1(2) | 98.9(176) | 22.6(178) | NS* |
| worker | 2(2) | 98(96) | 12.5(98) | |
| Teacher | 1.2(1) | 98.8(77) | 9.9(78) | |
| Non governmental | 1.8(3) | 98.2(157) | 20.3(160) | |
| job | 1.4(4) | 98.6(269) | 34.7(273) | |
| Marriage status (%) | | | | |
| single | 0(0) | 100(67) | 8.5(67) | <0.001 |
| married | 0.9(6) | 91.1(623) | 79.9(629) | |
| widow / bachelor | 7(4) | 93(53) | 72.2(57) | |
| divorced | 5.8(2) | 94.2(32) | 4.3(34) | |
| Education (%) | | | | |
| uneducated | 0(0) | 100(99) | 12.6(99) | NS* |
| elementary school | 3.9(4) | 96.1(98) | 13(102) | |
| guidance school | 1.8(3) | 98.2(160) | 20.7(163) | |
| high school | 1.6(4) | 98.4(246) | 31.8(250) | |
| above high school | 0.5(1) | 99.5(172) | 22(173) | |

* Not Significant

IV. DISCUSSION

The prevalence of CP in our study was 9%, which is much less than previous studies. In a cohort study in London the prevalence in over 30 year old individuals was 17.6% [15]. There are reports of 20.65% [1] in Hong Kong in a telephone based and 39% [6] in Australia in a randomized questionnaire based study. These different results can be explained by different population age distribution and different study designs.

Considering site and duration of pain, it's relationship to exertion, and patients' reaction to pain, it seems almost all of our subjects suffer from a cardiac CP. Although in one third of them pain in other sites was also present, but none of them had the characteristics of a non-cardiac pain. There may be several reasons for this finding. One may be that all CPs in our population were truly cardiac, which must be confirmed with specific diagnostic cardiac tests. Other reason may be related to peoples' concept of CP, which mainly includes cardiac pains. Finally, chronic and mild non-cardiac pains may have too little importance for patients in comparison to acute and relatively severe cardiac pains, that they did not even mention them. However, it also needs further investigations. In various populations non-cardiac CP accounts for one third to 70% of all CPs [1],[6],[8],[11]. The outstanding difference supports the importance of population based studies on characteristics of various kinds of non-cardiac CPs. In London survey [15] merely 1% of CPs in comparison to 100% in our study were exertion. The difference may be the cause of difference in the prevalence of various kinds of CP or the mean age of study populations. Prevalence of CP in our study in line with most others, such as Australia [6], New Zealand [16], Hong Kong [1], and Spain [17] surveys; where the prevalence of angina was reported 8%, less than 7%, 6.7% and 7.5%, respectively. However our results is in contrast with Toronto survey[10] which reports 1.9% CP prevalence in population above 12 years old, and with Scotland¹⁸ study with 26.5% prevalence reported. Different age distribution or difference in other characteristics such as genetic and ethnic factors, predisposing environmental factors, or cardiovascular risk factors can explain these divergent findings.

We found a significant increase in CP prevalence with age. However, most previous documents have not reported age differences in CP prevalence. In one study in England, Aberdeen[19] prevalence of CP in individuals over 65 years old was reported less than younger ones. CP in this study was also mainly of cardiac origin. The author explains this decrease by higher prevalence of other manifestations of acute coronary syndrome, like dyspnea and collapse or other atypical presentations in old age group. Consistent with our study, the prevalence of CP is demonstrated to increase with age in some other studies [18],[20].

In line with previous reports, we found that CP is significantly more prevalent in men[11],[18],[20],[21] where in a Brazilian[22] and an Australian[6] study CP was more prevalent in women. This divergence may be caused by different distribution of various kinds of CPs and their etiologies and difference in age distribution in the populations under survey, which can influence on sex distribution too. In Hong Kong, study [1] prevalence of non-cardiac CP was higher in females.

Despite no similar reports in previous documents, we could show a significant lower prevalence of CP in singles and higher-level educated individuals. There was no significant association between prevalence of CP and peoples' occupation; as it may be caused by variety of occupation in our study sample, future large-scale studies with higher sample volume is suggested. There is no report of this association in previous studies.

1.2 percent of individuals had history of myocardial infarction. This prevalence is similar to the prevalence of Toronto survey (2.1%)[20] but much less than the Australian study (7%)[6]. Difference in genetic and ethnic characteristics, age distribution, risk factors, and predisposing environmental factors for myocardial infarction in various populations can explain these divergent results.

In present study, there were no significant association between history of myocardial infarction with age and marital status. It also was not demonstrated in previous reports.

Large-scale future studies on the basis of risk factors are suggested. More complete investigations on patients presented with CP and their follow up can reveal the exact cardiac or non-cardiac nature of CPs.

Community awareness of cardiac pain and its characteristics should also be raised and the importance of urgent medical care emphasized, for Iran Ministry of Health, Treatment and Medical Education. Study limitations include absence of data on important risk factors for CHD (e.g., cholesterol) and possible concomitant respiratory disease that might be associated with exertion chest pain

ACKNOWLEDGMENT

This research project has been supported by Medical sciences/University of Tehran. The authors would like to thank DR Firooze Mehraby, Fateme Soltanpour assistance and all participants who gave up their time for the study.

REFERENCES

- [1] Wong WM, Lam KF, Cheng C, Hui WM, Xia HH, Lai KC, et al. Population based study of no cardiac chest pain in southern Chinese: prevalence, psychosocial factors, and health care utilization. *World J Gastroenterology* 2004; 10:707-712.
- [2] Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL. *Harrison's principles of Internal Medicine*. 16th Ed. New York: Mc Graw-Hill; 2005
- [3] Buntinx F, Knockaert D, Bruyninckx R, de Blaeij N, Aerts M, Knottnerus JA, et al. Chest pain in general practice or in the hospital emergency department: is it the same? *Fam Pract* 2001; 18 :586-589.
- [4] Cassin M, Badajo LP, Solinas L, Macro F, Borelli C, Antoni-Canterin F, et al. Is a more efficient operative strategy feasible for the emergency management of the patient with acute chest pain? *Ital Heart J* 2000; one (two Suppl):186-201.
- [5] Dammen T, Arnesen H, Ekeberg O, Husebye T, Friis S. Panic disorder in chest pain patients referred for cardiological outpatient investigation. *J Intern Med* 1999; 245:497-507.
- [6] Eslick GD, Jones MP, Talley NJ. Non-cardiac chest pain: prevalence, risk factors, impact, and consulting. A population-based study. *Aliment Pharmacology Ther* 2003; 17:1115-1124.
- [7] Cape well S, Murphy NF, Macintyre K, Frame S, Stewart S, Chalmers JW, et al. Short-terms and long-terms outcomes in 133,429 emergency patients admitted with angina or myocardial infarction in Scotland,1990-2000. *Heart* 2006; 92:1563-1570.
- [8] Kohn MA, Kwan E, Gupta M, Tabas JA. Prevalence of acute Myocardial infarction and other serious diagnoses in patients presenting to an urban emergency department with chest pain. *J Emerg Med* 2005; 29:383-390.

- [9] Solinas L, Raucci R, Terrazzino S, Moscariello F, Pertoldi F, Vajto S, et al. Prevalence, clinical characteristics, resource utilization and outcome of patients with acute chest pain in the emergency department. A multicenter, prospective, observational study in northeastern Italy. *Ital Heart J* 2003; 4:318-324.
- [10] Goldman L, Ausiello D. *Textbook of Medicine*. 22nd Ed. Philadelphia: W.B. Saunders; 2004.
- [11] Spalding L, Reay E, Kelly C. Cause and outcome of atypical chest pain in patients admitted to hospital. *J R Soc Med* 2003; 96:122-125.
- [12] Goodacre S, Mason S, Arnold J, Angelini K. Psychologic morbidity and health-related quality of life of patients assessed in a chest pain observation unit. *Ann Emerg Med* 2001; 38: 369-376.
- [13] Kuijpers PM, Honig A, Griez EJ, Braat SH, Wellens HJ. Panic disorder in patients with chest pain and palpitations: an often unrecognized relationship. *Ned Tijdschr Geneesk* 2000; 144:732-736.
- [14] Ruigomez A, Rodriguez LA, Wall Ander MA, Johansson S, Jones R. Chest pain in general practices: incidence, co morbidity, and mortality. *Fam Pract* 2006; 23:167-174.
- [15] Hotopf M, Mayo R, Wadsworth M, Wessely S. Psychosocial, and developmental antecedents of chest pain in young adults. *Psychosomatic Med* 1999; 61:861-867.
- [16] Wells S, Broad J, Jackson R. Estimated prevalence of cardiovascular disease and distribution of cardiovascular risk in New Zealanders: data for healthcare planners, funders and providers. *N Z Med J* 2006; 119: U 1935.
- [17] López-Bescos L, Cosin J, Elosua R, Cabades A, DeLos Reyes M, Aros F, et al. The prevalence of angina and cardiovascular risk factors in the different autonomous communities of Spain. *Rev Esp. Cardio* 1999; 52:1045-1056.
- [18] Murphy NF, Simpson CR, Macintyre K, McAlister FA, Chalmers J, McMurray JJ. Prevalence, incidence, primary care burden, and medical treatment of angina in Scotland: age, sex, and socioeconomic disparities. *Heart* 2006; 92:1047-1054.
- [19] Soiza RL, Leslie SJ, Harrild K, Penden NR, Hargreaves AD. Age-dependent differences in presentation, risk factor profile, and outcome of suspected acute coronary syndrome. *J Am Geriatric Soc* 2005; 53:1961-1965.
- [20] Chow CM, Donovan L, Manuel D, Johansen H, Tu JV. Regional variation in self-reported heart disease prevalence in Canada. *Can J Cardio* 2005; 21:1265-1271.
- [21] Richards H, McConnachie A, Morrison C, Murray K, Watt G. Social and gender variation in the prevalence, presentation and general practitioner provisional diagnosis of chest pain. *J Epidemiology Community Health* 2000; 54:714-718.
- [22] Mendozza-Sassi R, Beria IU, Fiori N, Bortolotto A. Prevalence of signs and symptoms, associated sociodemographic factors and resulting actions in an urban center in southern Brazil. *Rev Panam Salud Publican* 2006; 20:22-28.