Volume 03, Issue 05 (November-December 2020), PP 61-66 **www.ijmsdr.org**
ISSN: 2581-902X

International Journal of Medical Science and Dental Research

Correlation between Chest Pain and ECG Finding in Emergency Room

Ahmad Saeed Muhammad[1],HalgurdFathulla Ahmed[2], Rezan Hardi[3], Sadeeq Hama Aziz[4]

[1]*MBChB, Diploma in Medicine,KBMS/Emergency MedicineTrainee, Sulaimani Directory of Health, Iraqi Kurdistan Ministry of Health, Sulaimani, Kurdistan Region, Iraq, 07701531144,*
[2]*MBChB,FIBMS, Assistant prof.and MED director of training KBMS, Erbil, Kurdistan Region, Iraq.*
[3]*Specialist for General Medicine and Emergency medicine (Facharzt), Sulaimani, Kurdistan Region, Iraq.*
[4]*MBChB, Diploma in General Surgery, Emergency Medicine Specialist, Sulaimani Directory of Health,Iraqi Kurdistan Ministry of Health, Sulaimani, Kurdistan Region, Iraq.*

Abstract

Background:
Chest pain is a common symptom presented in Emergency Room (ER) patients. It can be due to various disorders, including life-threatening, to self-limiting.Therefore, it is essential to know the frequencies of cardiac problems related to chest pain.

Objective:
The study aimed to know the association of ECG findings with chest pain in patients admitted to the ER of the Coronary Care Unit (CCU) in Sulaimani.

Patients and Methods:
A cross-sectional study included 659 patients with chest pain admitted to the ER of the CCU in Sulaimani from January 1st, 2020, to February 1st, 2020. The inclusion criteria included all the patients who presented with chest pain and had an ECG. The patients' ages and gender were recorded. Also, the findings on the ECG were identified by the cardiologists on duty and the researchers themselves.

Results:
The mean ± SD (standard deviation) of patients' ages was 61.3±4.1 years, ranging from 18 to 85, and most of the patients (60%) were between 45 and 75. The males' frequency was 53.6% compared to 46.4% females with an M: F (male to female) ratio of 1.15:1. The association of ECG findings with age groups of the patients who attended ER was statistically significant (p-value = 0.043). However, the association of ECG findings with gender was statistically none significant.

Conclusions:
It is not only the clinical evaluation and ECG findings of patients that help in the diagnosis; the physician's experience and routines performed in our ER are also significant.

Keywords: Chest pain; Electrocardiography (ECG); Emergency Room (ER); Sulaimani

I. Introduction

Chest pain in patients admitted tothe Emergency Room (ER) can be produced by many disorders ranging from life-threatening conditions such as myocardial infarction (MI) to mild self-limiting problems like muscle spasm [(1)]. Further, cardiac chest pain ranges from total global acute MI to simple short-lived angina, including acute coronary syndrome (ACS) with critical ischemia to minimal damage to the myocardium [(1)]. Chest pain is a common symptom for admitting patients into the ER, and it accounts for 2-4% of all new attendances of ER[(2-3)].

The diagnosis of MI and none ST-elevation ACS, i.e., unstable angina, can be made hurriedly when typical changes are present on the electrocardiography (ECG) or increased myocardial marker levels in the plasma of the patients [(3)]. However, the absence of these abnormalities does not always exclude cardiac problems[(4)]. Thus, early diagnosis of MI or none ST-elevation ACS is difficult in the early stages [(3)]. Therefore, making an early diagnosis is crucial because patients can significantly benefit from early treatment and prevent sudden death outside the hospital due to the changing of unstable angina into MI [(3-4)].

Usually, patients are examined by junior doctors who had duty in the ER and supervised by a resident. Based on the patients' clinical history and examination, risk factors, ECG, and MI markers in plasma, the decision will be made on discharge from or admission to hospital for clinical observation to confirm or exclude the diagnosis [(3)]. Therefore, it is essential to know the frequencies and distribution of the cardiac-related problems diagnosed by ECG that correlate with chest pain.

In the current study, we wanted to know the association of ECG findings with chest pain in patients admitted to the ER in Sulaimani to plan the management of our ER efficiently.

II. Patients and Methods

An observational cross-sectional study included659patients with chest painadmitted tothe Emergency Room (ER) of Coronary Care Unit (CCU)in Sulaimani during the period from January 1st, 2020, to February 1st, 2020. The patients were randomly selected by using a simple random sampling method.

Research Ethical Committee of the Kurdistan Board of Medical Specialties (KBMS) approved the study proposal, and a formal acceptance letter was obtained from thehospital before starting the study. Also, informed consent has been taken from the patients or their accompanyingfor their inclusion in this study.

The inclusion criteria included all the patients who presented with chest pain and had an ECG. However, the exclusion criteria included patients' or their accompanying' refusal to participate in the study.

The patients' agesand gender were recorded. Also, the findings on the ECG were identified by the cardiologists on duty and the researchers themselves.

Statistical analysis was performed usingthe "IBM SPSS Statistics version 25",and both descriptive and inferential statistics were used. Furthermore, a P-value of ≤ 0.05 was considered as statistically significant associations.Besides, Pearson Chi-Square was used to determine the significance of the association between independent and dependent variable pairs.

III. Results

The mean ± SD (standard deviation) of ages of all the 659 patients was 61.3±4.1 years, ranging from 18 to 85. Further, mostof the patients (39.1%) were between 45 and 65 (Figure1).

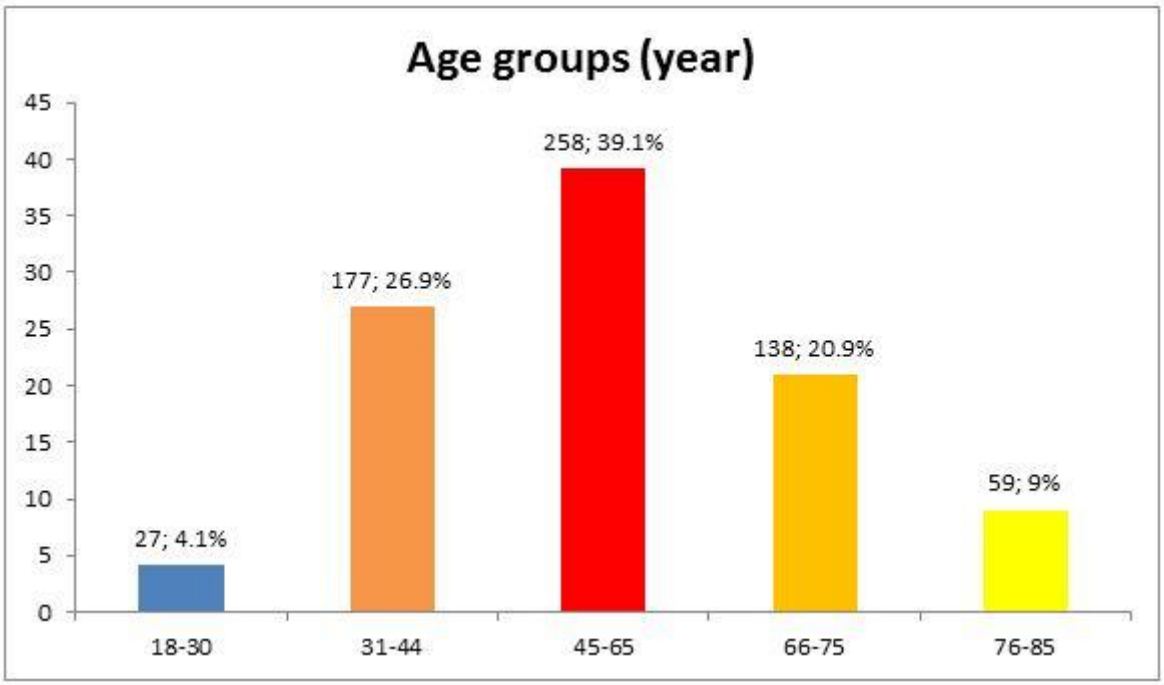

Figure (1): Age distribution of the patients

The males' frequencywas 353 (53.6%)compared to 306 (46.4%)female patients. Also, the M:F (male to female) ratio was 1.15:1 (Figure 2).

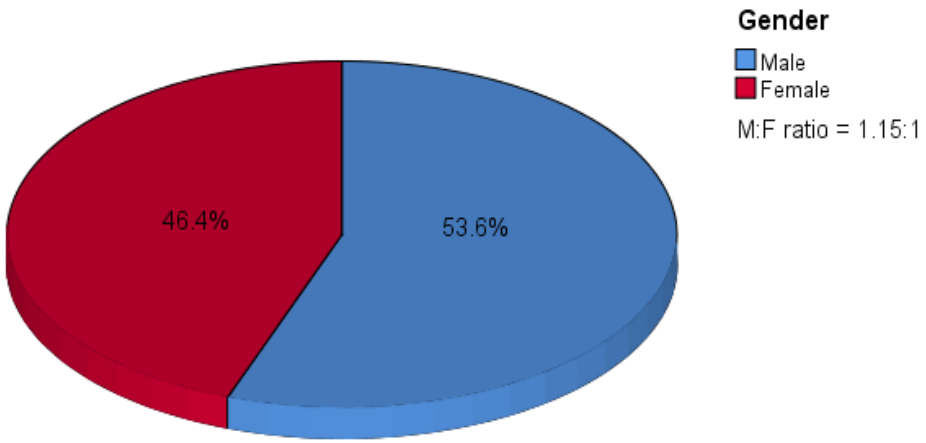

Figure (2): Gender distribution of the patients

There was a statistically significant (*p*-value = 0.043) association of ECG findings with age groups of the patients who attended ER (Table 1).

Table (1): Association of ER patients' ECG findings with age groups

ECG findings	Age groups (year)					Total (%)	*p*-value
	18-30 (%)	31-44 (%)	45-65 (%)	66-75 (%)	76-85 (%)		
Normal sinus rhythm	24 (3.6)	153 (23.2)	177 (26.9)	3 (0.6)	0 (0)	357 (54.2)	0.043
Sinus tachycardia	3 (0.6)	24 (3.6)	41 (6.2)	8 (1.2)	1 (0.2)	77 (11.7)	
Sinus bradycardia	0 (0)	0 (0)	20 (3)	9 (1.4)	6 (0.9)	35 (5.3)	
Ischemic heart disease	0 (0)	0 (0)	7 (1.1)	29 (4.4)	34 (5.2)	70 (10.6)	
Left bundle branch block	0 (0)	0 (0)	7 (1.1)	5 (0.8)	3 (0.6)	15 (2.3)	
Right bundle branch block	0 (0)	0 (0)	1 (0.2)	11 (1.7)	1 (0.2)	13 (2)	
Ventricular ectopics	0 (0)	0 (0)	1 (0.2)	19 (2.9)	2 (0.3)	22 (3.3)	
Early repolarization syndrome	0 (0)	0 (0)	2 (0.3)	20 (3)	0 (0)	22 (3.3)	
Atrial ectopics	0 (0)	0 (0)	0 (0)	3 (0.6)	1 (0.2)	4 (0.7)	
Left ventricular hypertrophy	0 (0)	0 (0)	0 (0)	14 (2.1)	2 (0.3)	16 (2.4)	
Arrhythmias	0 (0)	0 (0)	2 (0.3)	17 (2.6)	9 (1.4)	28 (4.3)	
Total	27 (4.1)	177 (26.9)	258 (39.1)	138 (20.9)	59 (9)	659 (100)	

However, the association of ECG findings was statistically not significant with the gender of the patients attending ER (Table 2).

Table (2): Association of ECG findings withthe gender of the ER patients

ECG findings	Gender		Total (%)	*p*-value
	Male (%)	Female (%)		
Normal sinus rhythm	181 (27.5)	176 (26.7)	357 (54.2)	0.446
Sinus tachycardia	39 (5.9)	38 (5.8)	77 (11.7)	
Sinus bradycardia	27 (4.1)	8 (1.2)	35 (5.3)	
Ischemic heart disease	43 (6.5)	27 (4.1)	70 (10.6)	
Left bundle branch block	9 (1.4)	6 (0.9)	15 (2.3)	
Right bundle branch block	8 (1.2)	5 (0.8)	13 (2)	
Ventricular ectopics	13 (2)	9 (1.4)	22 (3.3)	
Early repolarization syndrome	14 (2.1)	8 (1.2)	22 (3.3)	
Atrial ectopics	3 (0.5)	1 (0.2)	4 (0.7)	
Left ventricular hypertrophy	9 (1.4)	7 (1.1)	16 (2.4)	
Arrhythmias	7 (1.1)	21 (3.2)	28 (4.3)	
Total	353 (53.6)	306 (46.4)	659 (100)	

IV. Discussion

One of the symptoms that create uncertainty for all the physicians in the ER, in particular, when the diagnosis is unclear, is chest pain. Each year, around eight million people present to the ER due to chest pain, and nearly half of them need admission [(5)]. The diagnosis of none ST-elevation ACS can be easy to diagnose; however, it can be difficult to exclude [(6)].

Low-risk patients can be identified by clinical assessment and ECG findings [(7-8)]. Further, a normal ECG finding is associated with low mortality and risk of cardiac complications; it is a suitable method of diagnosing patients with chest pain presented in the ER [(5)]. However, the ECG is not always perfect due to its limited capabilities for detecting ischemia in the left circumflex coronary artery distribution and posterior left ventricular area, and in patients with a history of acute MI [(9)]. Also, the evidence of ischemia on ECG can be transient [(10)]. We collected all the 659 patients presented with chest pain in the ER of CCU in Sulaimani for one month. Further, the

physicians on duties performed ECG as a first-line tool of diagnosis for all the patients. As it is clear, chest pain can be found in various cardiac and non-cardiac problems, including musculoskeletal spasms and psychological disturbances[11]. Thence, it is not only the clinical evaluation and ECG findings of the patients that help in diagnosis; the physician's experience and specialties are also significant.

Although a patient presented with chest pain and normal ECG has a lower risk of cardiac complications, Pope et al. [12] found a contradictory finding; they found that a normal ECG was one of the four factors independently associated with missed ACS in ER. Besides, the other three factors found by Pope et al. [12] were female gender aged less than 55 years, races other than white, and shortness of breath as presenting symptoms. Due to the cross-sectional study design of the current study, we did not follow up with the patients, and we collected only their age and gender with their ECG findings. The majority of the patients in the current study (60%) aged 45 to 75 years old with an M: F ratio of 1.15:1 (Figures 1 and 2, Tables 1 and 2).

The study of Salih et al. [13] found results near to our findings and showed a significant association of the ages with tachyarrhythmias (*p*.value = 0.003). The study was performed in 2017 in the same center as the current study, although their focus was only on tachyarrhythmias[13]. In contrast, the study of Salih et al. [13] showed a significant association between gender andtachyarrhythmias (p-value = 0.009). However, the M: F ratio in their study was near our results (1.2:1 vs. 1.15:1) [13]. Although both the studies' population and demographic features were the same, the study's difference performed by Salih et al. [13] with our findings may be due to the study duration and sample size differences in both the studies. They selected 63 patients during a year; however, we collected all the 659 patients afflicted with chest pain and presented in the ER during a month.

The majority of ECG findings in the current study (54.2%) had normal sinus rhythm followed by sinus tachycardia (11.7%), ischemic heart disease (10.6%), sinus bradycardia (5.3%), arrhythmias (4.3%), and others (Tables 1 and 2). Although CCU is a tertiary center globally, it is used as a primary center in our locality. All the patients presented with chest pain, even if it was due to causes other than cardiac origins, visit the ER of CCU. Therefore, it increases physical and mental loads on healthcare professionals and uses needed resources for unnecessary procedures.

V. Conclusions

The ECG findings were significantly associated with the patients' ages; however, this association was none significant with gender. The majority of the patients presented with chest pain had a normal sinus rhythm. Therefore, it is wise to revise the routines performed in our ER of CCU.

VI. Conflict of interest

The authors declare no conflict of interest

References

[1.] Herren KR, Mackway-Jones K. Emergency management of cardiac chest pain: areview. *Emerg Med J* 2001;18:6–10.

[2.] Fothergill NJ, Hunt MT, Touquet R. Audit of patients with chest pain presenting to an accident and emergency department over a 6-month period. Arch Emerg Med. 1993;10:155–60.

[3.] Six AJ, Backus BE, Kelder JC. Chest pain in the emergency room: value of the HEART score. Neth Heart J. 2008;16(6):191-6.

[4.] Hirsch A, Windhausen F, Thijssen JGP, Verheugt FWA, Cornel JH, De Winter RJ. Long-term outcome after an early invasive versus selective invasive treatment strategy in patients with non-STelevationacute coronary syndrome and elevated cardiac troponin T (the ICTUS trial): a follow-up study. Lancet. 2007;369:827-35.

[5.] Turnipseed SD, Trythall WS, Diercks DB, Laurin EG, Kirk JD, Smith DS, et al. Frequency of acute coronary syndrome in patients with normal electrocardiogram performed during presence or absence of chest pain. AcadEmerg Med. 2009;16(6):495-9.

[6.] Hollander JE. Acute coronary syndrome in the emergency department: Diagnosis, risk stratification, and management. In: P Théroux (Ed.): Acute coronary syndromes. A companion to Braunwald's heart disease. Saunders/Elsevier, 2003.

[7.] Goldman L, Cook EF, Johnson PA, Brand DA, Rouan GW, Lee TH. Prediction of the need for intensive care in patients who come to emergency departments with acute chest pain. N Engl J Med. 1996;334:1498–504.

[8.] Amsterdam EA, Kirk JD, Diercks DB, Lewis WR, Turnipseed SD. Immediate exercise testing to evaluate low-risk patients presenting to the emergency department with chest pain. J Am CollCardiol. 2002; 40:251–6.

[9.] Wagner GS (ed). Marriott's Practical Electrocardiography, 11th ed. Philadelphia, PA: Lippincott Williams & Wilkins, 2008.

[10.] Sharkey SW, Beger CR, Brunette DD, Henry TD. Impact of the electrocardiogram on the delivery of thrombolytic therapy for acute myocardial infarction. Am J Cardiol. 1994; 73:550–3.

[11.] Wertli MM, Dangma TD, Müller SE, Gort LM, Klauser BS, Melzer L, et al. Non-cardiac chest pain patients in the emergency department: Do physicians have a plan how to diagnose and treat them? A retrospective study. PLoS One. 2019;14(2):e0211615.

[12.] Pope JH, Aufderheide TP, Ruthazer R, Woolard RH, Feldman JA, Beshansky JR, et al. Missed diagnoses of acute cardiac ischemic in the emergency department. N Engl J Med. 2000; 342(16):1163–70.

[13.] SalihSMA, Ismaeel SM, Ahmed HF. Pattern of Tachyarrhythmias in Sulaimani Teaching Hospital, Cardiac Center/Coronary Care Unit. Journal of Kurdistan Board of Medical Specialties. 2018;4(2): 21-6.