SIGNIFICANCE OF ECG IN ACUTE MYOCARDIALINFARCTION DIAGNOSIS IN ABSENCE OF CHEST PAIN AT EMERGENCY DEPARTMENT

Abstract

Epigastric discomfort with/without chest pain is a common scenario in emergency/outdoor patient department. Patients having mild to moderate epigastric discomfort without retrosternal chest pain showing maiden ECG abnormalities like ST segment elevation/ depression. That's why importance of ECG have been proven undoubtedly as life saving emergency investigation. 35 male and 28 female patient with age group of 32-67 years of old participated in this cross sectional study. Average age of male patients was 43+_ 2 and 49+_2 in female years.23 male and 19 female had history of repeated epigastric discomfort which was subsided by injectable Esomeprazole, anti emetics. Rest of patients have minor discomfort which was subsided by oral anti ulcerants. 10 male and 11 female patients who came in emergency & OPD department for relieving epigastric discomfort without having chest pain. 7 male patients having ST segment elevation /depression and followed by Troponin- I (according to post ECG advice for confirmed heart attack) in 2 male patients.5 females diagnosed as MI after getting ECG followed by Troponin-I result. Emergency and OPD should have ECG facility for it's specificity in early MI diagnosis. This early diagnosis can reduce cardiac mortality in middle ages to elderly patients in grass root level.

Key words: MI, co-morbidities, ECG, OPD, dexlansoprazole

1. Introduction

Chest discomfort mostly epigastric region is a common event in various types of hospital across the urban & rural area of Bangladesh. Here people are very much habituated in spicy foods becomes traditional food culture. Changing of time period junk foods are very much attractive to this generation. Lack of physical movement people specially in corporate sector prefer shortcut food with delicious taste. This refers to obesity followed by different co-morbidities. Chronic Spicy food intake causes dyspepsia, heartburn nausea associated gastrointestinal tract ulceration in severe cases[29,30,31]. The most terrific incidents that various patients sometimes fall moderate to severe chest discomfort which typically subsided by intravenous anti ulcerants, found ECG abnormalities in several occasions. This events are followed by ST segment abnormalities with elevated Troponin I in some cases. Typically patients with cardiac abnormalities mainly acute myocardial infarction come with retro-sternal chest pain with nausea .But absence of chest pain with mild chest discomfort misguided acute coronary syndrome (ACS) with heartburn. Mandatory ECG must be ensured in patients who come in minimal chest discomfort in emergency department for avoiding cardiac hazards.

2. Patterns of epigastric/ chest discomfort

Epigastric/ chest discomfort typically felt at epigastric region (mentioned by name).Throbbing, sharp (like cutting by knife as patients described) sensation added with it turns into pain. In tertiary level hospital like medical colleges or specialized institutions ECG is practiced as primary diagnostic investigation for myocardial infarction or any other cardiac abnormalities. But when patients come with minimal discomfort or previously subsided history by taking oral medications physicians are little bit convinced by thinking it typical gastritis or peptic ulcer

disease. Patients habitual food intake history like streets food or spicy foods also effect this thinking. In rural area lack of awareness and logistic supports this kind of complaints are overlooked in some cases. Associated vomiting or cold periphery convinced the physicians for proper referral or prescribing primary anti platelet drugs.[1-4]Site of the pain mentioned in figure 1

Figure 1: Site of Chest discomfort patient typically felt

3. Role of co-morbidities

As peoples in Bangladesh depends mostly on carbohydrates on their regular meal, spicy and junk foods, lack of physical exercise leads them obese and other common co-morbidities like hypertension, diabetes mellitus ,dyslipidemia. During treating chest discomfort history of these co-morbidities should be emphasized. Asymptomatic myocardial infarction or other coronary disturbance may be silent or advanced progressively without notifying due to these co-morbidities. [5-7]

4. Methodology & Contents

- Cross sectional study
- Male participants : 35
- Female participants: 28
- Age group: 32-67 years old
- Average age (for male): 43+-2 yrs old
- Average age (for female): 49+-2 yrs old
- Study place: Emergency department, Chattogram Medical College Hospital
- Study time: June ,2023- November 2023

Graphical relationship among the participants are shown in figure 2

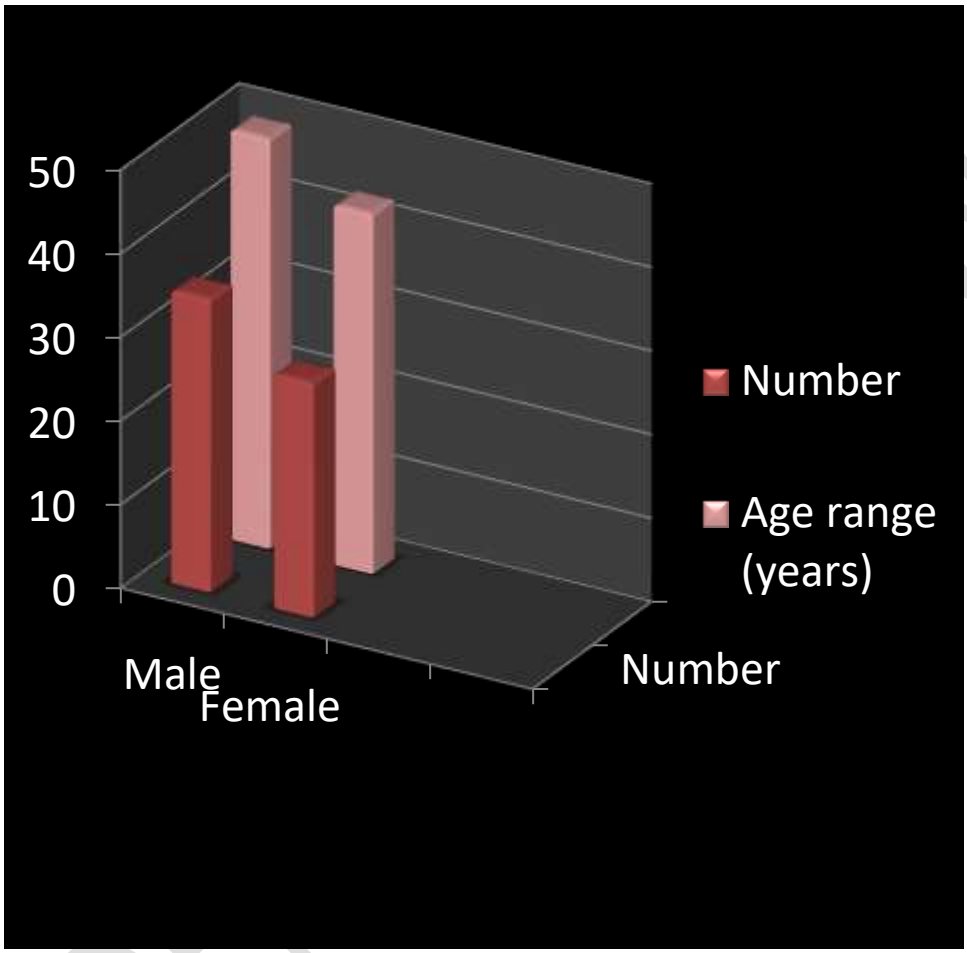

Figure 2: Graphical presentation of participants's age & sex

During history and data collection patients are fully described about this study and its future impact. Their identity and personal info have been kept confidentially.[8-11]

5. Results

Sex of patients having recurrency of epigastric discomfort	**Number Of participants**	**Number of conventional oral medication dependant person(Esomeprazole,Rabeprazole,Dexlansoprazole)**	**Number of patients needed hospital treatment (Intravenous management in Emergency/OPD department)**
Male	23	17	10
Female	19	13	11

Table 1: Tabulated relation of the participants

5.1Patients needed emergency management for subsiding discomfort

Total male participants: 10

Diabetic : 3

Diabetic and hypertensive: 5

Dyslipidemic,diabetic and hypertensive: 2

Total female participants: 11

Diabetic: 5

Diabetic and Hypertensive: 3

Dyslipidemic: 3

Above mentioned data are graphically arranged on figure 3 [12-16]

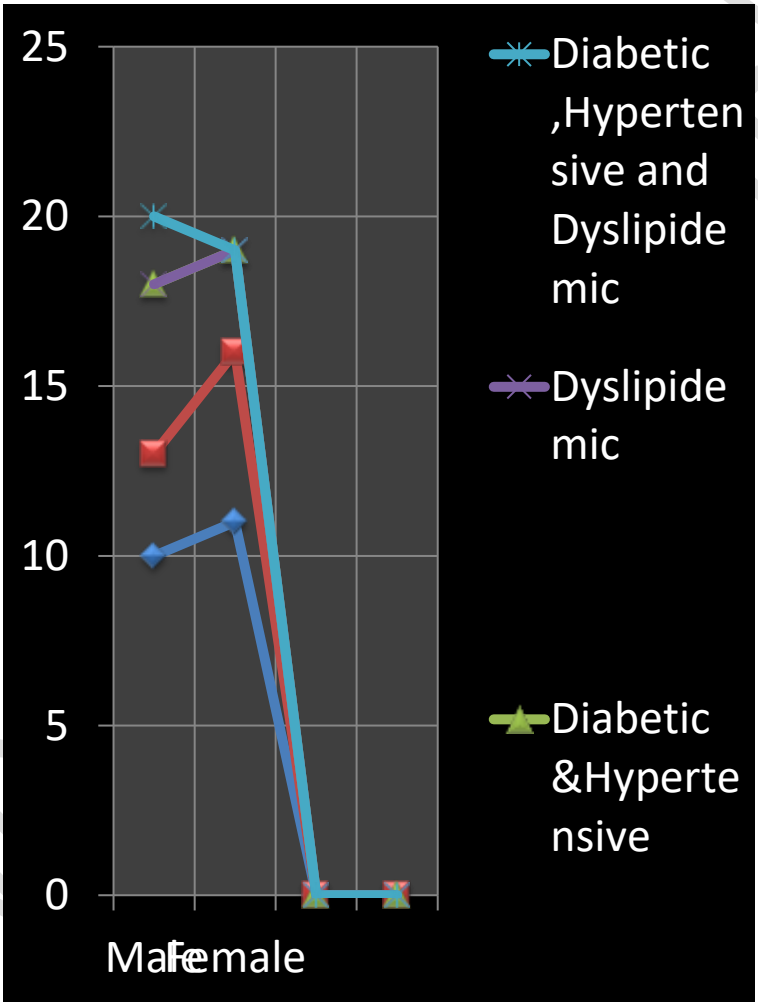

Figure 3: Graphical relation with co-morbidities

5.2 ECG abnormalities of the previous mentioned patients

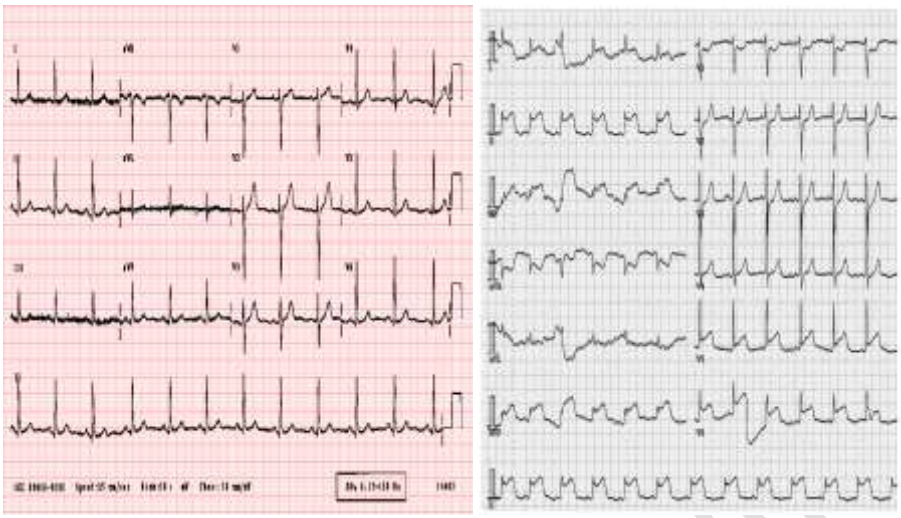

Figure 4: Comparison between normal and cardiac abnormality based ECG

Male: 10 patients

ECG abnormalities: 7

ST elevation : 3

Non ST elevation: 2

Troponin I> 0.04 ng/mL: 2

Female: 11

ECG abnormalities: 5

ST elevation: 2

Non ST elevation: 1

Troponin I > 0.04 ng/mL : 1 [17-18]

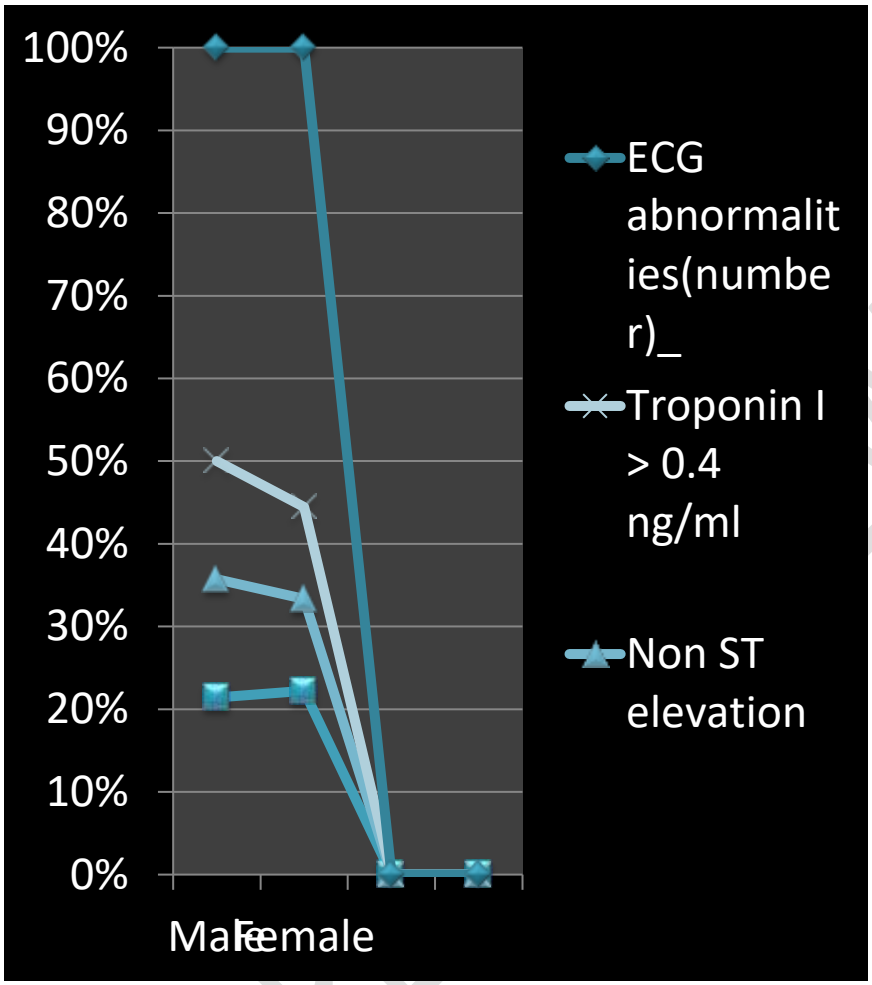

Figure 5: Graphical relationship with ECG abnormalities

6. Findings & Discussions

Patients needed emergency treatment for subsiding epigastric discomfort.

Male- 43%

Female-58%

At least 2 co-morbidities(diseases under well controlled.)

Male-70%

Female-30%

In moderate to severe epigastric discomfort , ECG abnormalities found

Male -70%

Female-50% .

- ST Segment abnormalities- approximately 50% (in both sex) ,20 % and 10 % of male and female respectively having troponin I >0.04 ng/ml

From the above findings , it is shown that female are ahead of male in epigastric discomfort due to traditional spicy, pungent food fascination, lack of punctuality in food intake, irregularity in medications intake etc. But the ECG abnormalities and co-morbidities ahead of males in consequences like acute coronary syndrome specially acute myocardial infarction. Though these non communicable disease were found well controlled in participating patients, chronic affects of these diseases on asymptomatic myocardial infarction are never been overlooked. [19-22]

Table 2. Comparison of ECG facilities between Urban and Rural area of Bangladesh

Pattern of Medical Colleges	Number
Government	37

Private	69

Medical Colleges are mostly well equipped like ECG facilities. Besides there are private clinic and other health service providers who have ECG facilities and people having epigastric discomfort easily being diagnosed if there is any cardiac issues. But in rural area government health service providers like community clinic Upazila(sub-district) Health Complex are not always well equipped in emergency service like ECG. People then need to be shifted hospitals in district levels or shifted to capital Dhaka. More patients are died on the way to hospitals when they arrive in emergency department of tertiary medical college hospitals or other health service providing institutions. In many rural areas where communication status are not up to the mark; transportation of patients to nearest well equipped hospitals are usually a challenge for the local people. This leads to death increase regarding cardiac issues. In some cases availability of skilled ECG technician become tough. In urban areas people need to give 1000-2000 taka in private hospitals for ECG. Per capita income in Bangladesh has been increased in recent years but this doesn't reflect the low range income community status. In some extent daily bread and butter is the prime task to them where spending 2000 taka for ECG is so luxurious to them. [23]

7. Recommendations

- Patients might have cardiac abnormalities(Myocardial Infarction) in absence of chest pain so any kind of chest discomfort shouldn't be overlooked as gastritis or confined in gastrointestinal tract.

- Patients of chronic epigastric discomfort or if evidence of taking medication like Omeprazole/Esomeprazole/Rabeprazole/Dexlansoprazole should be advised for ECG in emergency situation.
- ECG must be available in hospitals (government/private)ofrural area as part of primary health care management.
- Adults around 30 years of age should be advised for ECG,Echocardiography 3-4 months interval(the lower limit of ages of this study is 32 years of age).
- Emergency transportation (like cardiac ambulance) should allocate in district/sub-district level of patient referral (if needed).
- Enhancing monitoring and research in government and private level.
- Awareness raising programmes through print and electronic media should be enhanced.[24-28]

9. Conclusion

Universal health coverage; one of the prime goal of Sustainable Development Goal (SDG).Bangladesh is trying to achieve this goal in global standard pathway. But daily irregularity and lack of awareness of health rules people emphasis in economy than health issue. Co-morbidities become advanced leads to cardiac health become worsen. Insufficient cardiac investigations facilities and high purchase rate make limited it to moderate/high paid people. In the field of public health availability to cardiac investigative tools should be more available

towards all that helps us to reduce premature death rate. Formal plan and steps are government task but private organization in collaboration with government officials can make our dream universal health coverage become real.

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12.References

1. Amsterdam EA, Kirk JD, Bluemke DA, Diercks D, Farkouh ME, Garvey JL, Kontos MC, McCord J, Miller TD, Morise A, Newby LK, Ruberg FL, Scordo KA, Thompson PD. Testing of low-risk patients presenting to the emergency department with chest pain: a scientific statement

from the american heart association. *Circulation.* 2010;122(17):1756–1776. doi: 10.1161/CIR.0b013e3181ec61df. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

2. Bell MH, Flewelling D, Flynn CA. A systematic review of troponin t and i for diagnosing acute myocardial infarction. *J Fam Pract.* 2000;49(6):550–556. [PubMed] [Google Scholar]

3. Ekelund U, Nilsson HJ, Frigyesi A, Torffvit O. Patients with suspected acute coronary syndrome in a university hospital emergency department: an observational study. *BMC Emerg Med.* 2002;2(1):1. doi: 10.1186/1471-227X-2-1. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

4. Fesmire FM, Percy RF, Wears RL, MacMath TL. Initial ecg in q wave and non-q wave myocardial infarction. *Ann Emerg Med.* 1989;18(7):741–746. doi: 10.1016/S0196-0644(89)80007-1. [PubMed] [CrossRef] [Google Scholar]

5. Fesmire FM, Martin EJ, Cao Y, Heath GW. Improving risk stratification in patients with chest pain: the Erlanger HEARTS3 score. *Am J Emerg Med.* 2012;30(9):1829–1837. doi: 10.1016/j.ajem.2012.03.017. [PubMed] [CrossRef] [Google Scholar]

6. Goodacre S, Cross E, Arnold J, Angelini K, Capewell S, Nicholl J. The health care burden of acute chest pain. *Heart.* 2005;91(2):229–230. doi: 10.1136/hrt.2003.027599. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

7. Han JH, Lindsell CJ, Storrow AB, Luber S, Hoekstra JW, Hollander JE, Peacock WF, Pollack CV, Gibler WB. The role of cardiac risk factor burden in diagnosing acute coronary syndromes in the emergency department setting. *Ann Emerg Med.* 2007;49(2):145–152. doi: 10.1016/j.annemergmed.2006.09.027. [PubMed] [CrossRef] [Google Scholar]

8. Hess EP, Thiruganasambandamoorthy V, Wells GA, Erwin P, Jaffe AS, Hollander JE, Montori VM, Stiell IG. Diagnostic accuracy of clinical prediction rules to exclude acute coronary syndrome in the emergency department setting: a systematic review. *CJEM.* 2008;10(4):373–382. [PubMed] [Google Scholar]

9. Erhardt L, Herlitz J, Bossaert L, et al. Task force on the management of chest pain. *Eur Heart J* 2002; 23: 1153–1176.

10.Konstantinides SV, Torbicki A, Agnelli G, et al. 2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism: the Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC). Endorsed by the European Respiratory Society (ERS). *Eur Heart J* 2014; 35: 3033–3073.

11. Kabrhel C, Camargo CA, Jr, Goldhaber SZ. Clinical gestalt and the diagnosis of pulmonary embolism: does experience matter? *Chest.* 2005;127(5):1627–1630. doi: 10.1378/chest.127.5.1627. [PubMed] [CrossRef] [Google Scholar]

12. Karlson BW, Herlitz J, Wiklund O, Richter A, Hjalmarson A. Early prediction of acute myocardial infarction from clinical history, examination and electrocardiogram in the emergency room. *Am J Cardiol.* 1991;68(2):171–175. doi: 10.1016/0002-9149(91)90739-8. [PubMed] [CrossRef] [Google Scholar]

13. Kline JA, Stubblefield WB. Clinician Gestalt Estimate of Pretest Probability for Acute Coronary Syndrome and Pulmonary Embolism in Patients With Chest Pain and Dyspnea. *Ann Emerg Med.* 2014;63(3):275–280. doi: 10.1016/j.annemergmed.2013.08.023. [PubMed] [CrossRef] [Google Scholar]

14. Manini AF, Dannemann N, Brown DF, Butler J, Bamberg F, Nagurney JT, Nichols JH, Hoffmann U. Limitations of risk score models in patients with acute chest pain. *Am J Emerg Med.* 2009;27(1):43–48. doi: 10.1016/j.ajem.2008.01.022. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

15. Marsan RJ, Jr, Shaver KJ, Sease KL, Shofer FS, Sites FD, Hollander JE. Evaluation of a clinical decision rule for young adult patients with chest pain. *Acad Emerg Med.* 2005;12(1):26–31. doi: 10.1111/j.1553-2712.2005.tb01473.x. [PubMed] [CrossRef] [Google Scholar]

16. Miller CD, Lindsell CJ, Khandelwal S, Chandra A, Pollack CV, Tiffany BR, Hollander JE, Gibler WB, Hoekstra JW. Is the initial diagnostic impression of "noncardiac chest pain" adequate to exclude cardiac disease? *Ann Emerg Med.* 2004;44(6):565–574. doi: 10.1016/j.annemergmed.2004.03.021. [PubMed] [CrossRef] [Google Scholar]

17. Panju AA, Hemmelgarn BR, Guyatt GH, Simel DL. The rational clinical examination. is this patient having a myocardial infarction? *JAMA.* 1998;280(14):1256–1263. doi: 10.1001/jama.280.14.1256. [PubMed] [CrossRef] [Google Scholar]

18. Penaloza A, Verschuren F, Meyer G, Quentin-Georget S, Soulie C, Thys F, Roy PM. Comparison of the unstructured clinician gestalt, the wells score, and the revised geneva score to estimate pretest probability for suspected pulmonary embolism. *Ann Emerg Med.* 2013;62(2):117–124. doi: 10.1016/j.annemergmed.2012.11.002. [PubMed] [CrossRef] [Google Scholar]

19.Penumetsa SC, Mallidi J, Friderici JL, Hiser W, Rothberg MB. Outcomes of patients admitted for observation of chest pain. *Arch Intern Med.* 2012;172(11):873–877. doi: 10.1001/archinternmed.2012.940. [PubMed] [CrossRef] [Google Scholar]

20.Pope JH, Aufderheide TP, Ruthazer R, Woolard RH, Feldman JA, Beshansky JR, Griffith JL, Selker HP. Missed diagnoses of acute cardiac ischemia in the emergency department. *N Engl J Med.* 2000;342(16):1163–1170. doi: 10.1056/NEJM200004203421603. [PubMed] [CrossRef] [Google Scholar]

21. Swap CJ, Nagurney JT. Value and limitations of chest pain history in the evaluation of patients with suspected acute coronary syndromes. *JAMA.* 2005;294(20):2623–2629. doi: 10.1001/jama.294.20.2623. [PubMed] [CrossRef] [Google Scholar]

22. Tierney WM, Fitzgerald J, McHenry R, Roth BJ, Psaty B, Stump DL, Anderson FK. Physicians' estimates of the probability of myocardial infarction in emergency room patients with chest pain. *Med Decis Making.* 1986;6(1):12–17. doi: 10.1177/0272989X8600600103. [PubMed] [CrossRef] [Google Scholar]

23. Trowbridge RL, Rutkowski NK, Shojania KG. Does this patient have acute cholecystitis? *JAMA.* 2003;289(1):80–86. doi: 10.1001/jama.289.1.80. [PubMed] [CrossRef] [Google Scholar]

24. Regitz-Zagrosek V, Oertelt-Prigione S, Prescott E, et al. Gender in cardiovascular diseases: impact on clinical manifestations, management, and outcomes. *Eur Heart J* 2016; 37: 24–34.

25.Goodacre S, Cross E, Arnold J, et al. The health care burden of acute chest pain. *Heart* 2005; 91: 229–230.

26. Lee BT, Kwon JM, Cho J, Bae W, Park H, Seo WW, Cho I, Lee Y, Park J, Oh BH, Jeon KH. Usefulness of Deep-Learning Algorithm for Detecting Acute Myocardial Infarction Using Electrocardiogram Alone in Patients With Chest Pain at Emergency Department: DAMI-ECG Study. J Cardiovasc Interv. 2023 Apr;2(2):100-112. https://doi.org/10.54912/jci.2022.0028

27. Kontos, M, de Lemos, J. et al. 2022 ACC Expert Consensus Decision Pathway on the Evaluation and Disposition of Acute Chest Pain in the Emergency Department: A Report of the American College of Cardiology Solution Set Oversight Committee. *J Am Coll Cardiol.* 2022 Nov, 80 (20) 1925–1960.**https://doi.org/10.1016/j.jacc.2022.08.750**

28. Casarin, C., Pirot, AS., Gregoire, C. *et al.* Improving the performance of a triage scale for chest pain patients admitted to emergency departments: combining cardiovascular risk factors and electrocardiogram. *BMC Emerg Med* **22**, 118 (2022). https://doi.org/10.1186/s12873-022-00680-y

29 Faheem M, Shah MJ, Younas B. A Cross Sectional Study on Hypokalemia in Patients with Acute Myocardial Infarction. J. Pharm. Res. Int. [Internet]. 2021 Dec. 28 [cited 2024 May 16];33(60B):3693-6. Available from: https://journaljpri.com/index.php/JPRI/article/view/7070

30 Osafo R, Olatunji SH, Nduka CL. Acute Myocardial Infarction (AMI) Diagnosis; Impact of Technology in Developing Highly Sensitive Biomarkers and Assays. Cardiol. Angiol. Int. J. [Internet]. 2022 Jun. 13 [cited 2024 May 16];11(4):124-3. Available from: https://journalca.com/index.php/CA/article/view/261

31 Califfi RM, Ohman EM. The diagnosis of acute myocardial infarction. Chest. 1992 Apr 1;101(4):106S-15S.