

Cardiology

UPDATE

Volume 1| Issue 1| 2022

IN THIS ISSUE

Assessment of diagnostic accuracy of prehospital ECG interpretation through systematic review and meta-analyses.

Correlation between Estimated Pulse Wave Velocity with all-cause mortality and Myocardial Infraction

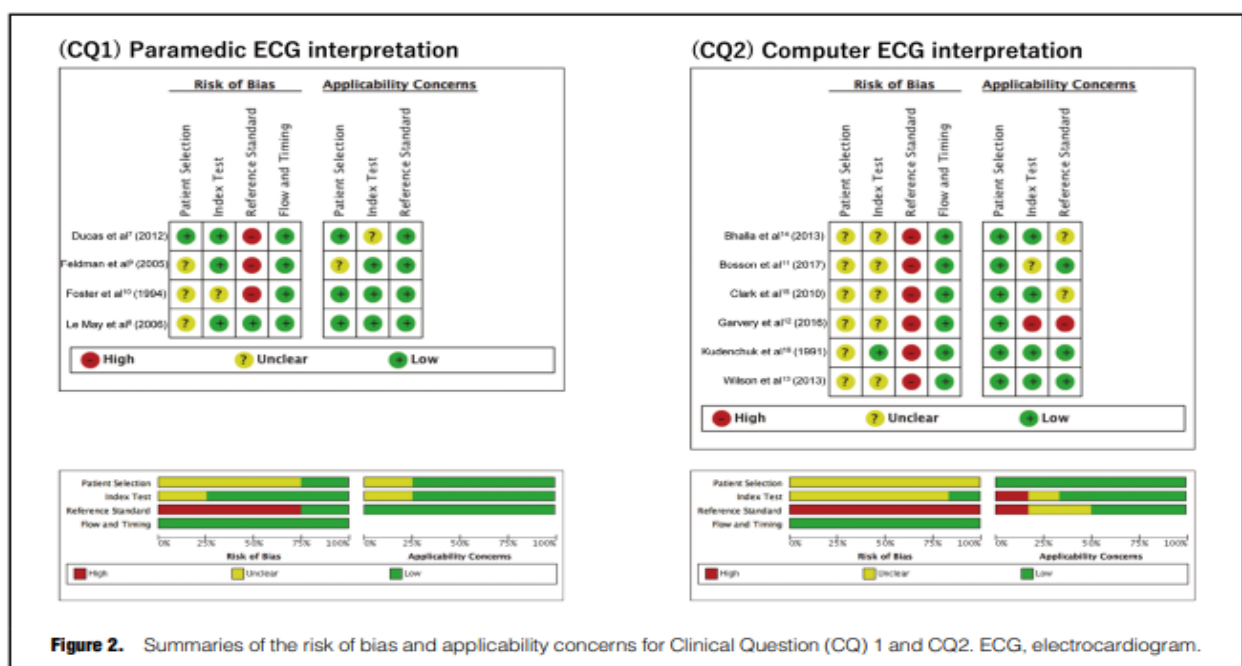
Acute Myocardial Infarction related complication during Pre COVID period and COVID 19 pandemic: A Systematic Review and Meta-Analysis



Assessment of diagnostic accuracy of prehospital ECG interpretation through systematic review and meta-analyses.

In patients with ST elevated MI, early diagnosis and reperfusion therapy are the important steps for the better prognosis of the disease. Various prehospital attempts to identify STEMI are important and critical in lowering the time until reperfusion. To adopt such prehospital procedures in clinical practice, diagnostic accuracy is a crucial factor because accurate early diagnosis leads to prompt cardiac catheterization laboratory activation, reducing mortality and/or morbidity.¹ Early revascularization has proved to be most effective and has led to strategies to improve timely detection in the setting of a STEMI. Healthcare professionals should identify a STEMI and take quick and appropriate measures to ensure therapy is initiated rapidly.² High rates of false-positive results and low diagnostic accuracy, can lead to over identifications of STEMI and can have significant adverse effects on resource utilization. At the same time, high rates of false-negative results can cause problem as they can interrupt early diagnosis and a delay in STEMI notification.¹

Fig1: Summaries of the risk of bias and applicability concerns for Clinical Question (CQ) 1 and CQ2. ECG, Electrocardiogram.



This study aimed to assess and discuss the diagnostic accuracy of prehospital ECG interpretation through systematic review and meta-analyses. Literature published up to July 2020 was searched using PubMed and data were collected. Almost all studies of prehospital adult patients suspected of ST-segment elevation myocardial infarction in which prehospital ECG interpretation was evaluated and reporting all 4 : true-positive, false-positive, false-negative, and true-negative values were included. For the diagnostic accuracy of prehospital ECG interpretation by paramedics, meta analysis were conducted separately. 4 studies for clinical questions (CQ1) and 6 studies for computer questions(CQ2) were enrolled. The pooled sensitivity and specificity were 95.5% and 95.8% in CQ1, while in CQ2, the pooled sensitivity and specificity were 85.4% and 95.4% respectively

CONCLUSION: This study concluded that the accuracy during diagnosis through paramedic prehospital ECG interpretations could be favourable, with high pooled sensitivity, specificity and with an acceptable estimation number of false positives and false negatives results.

References:

1. Tanaka A,et al. Systematic Review and Meta-Analysis of Diagnostic Accuracy to Identify ST-Segment Elevation Myocardial Infarction on Interpretations of Prehospital Electrocardiograms. Circulation Reports. 2022 May 25:CR-22.
2. Degheim G, Berry A, Zughaib M. False activation of the cardiac catheterization laboratory: The price to pay for shorter treatment delay. JRSM Cardiovasc Dis. 2019 Apr 8;8:2048004019836365.

Correlation between Estimated Pulse Wave Velocity with all-cause mortality and Myocardial Infraction

One of the strongest marker of cardiovascular disease is the arterial stiffness assessed by carotid-femoral pulse wave velocity. For the identification of organ damage related to hypertension, current hypertension guidelines have listed carotid-femoral pulse wave velocity as a major marker.¹ Carotid-femoral pulse wave velocity is an incremental predictive marker for future cardiovascular events and all-cause mortality beyond classical risk scores and BP.² However there are limited evidences suggesting that elevated carotid-femoral pulse wave velocity is associated with the poor response of BP to BP-lowering drugs and that carotid-femoral pulse wave velocity regression is related to improved survival.² Measurement of carotid-femoral pulse wave velocity not only requires specialized equipment but also trained staff. Hence, it has not been widely implemented in clinical practice.¹ However in patients with symptomatic stable angina, the prognostic potential of estimated pulse wave velocity during long-term follow-up is unclear.

Association between estimated pulse wave velocity with all-cause mortality and MI was observed in patients with stable angina pectoris beyond traditional risk factors.

Laugesen E et al. aimed to assess the association between estimated pulse wave velocity and all-cause mortality, myocardial infarction and stroke in patients with stable angina undergoing elective coronary angiography. Researchers enrolled 25,066 patients with a known case of myocardial infarction, stroke, heart failure, or valvular with stable angina pectoris undergoing elective coronary angiography. Patients having diabetes were excluded from the study. The association between incident all-cause mortality, MI, and stroke were calculated with the help of multivariable Cox models shown in Kaplan-Meier plot (fig 2,3 ,4). A median follow-up period of 8.5 years reported 779 strokes, 1233 MIs, and 4112 deaths.

Result of this study highlighted the association between estimated pulse wave velocity with all-cause mortality and MI after adjusting for age, SBP, BMI, smoking, eGFR, Charlson Comorbidity Index score, antihypertensive therapy, statins, aspirin etc. The adjusted model with estimated pulse wave velocity was associated with a minor increase in discrimination for mortality

Fig2: Kaplan-Meier plots
A: Estimated pulse wave velocity and death

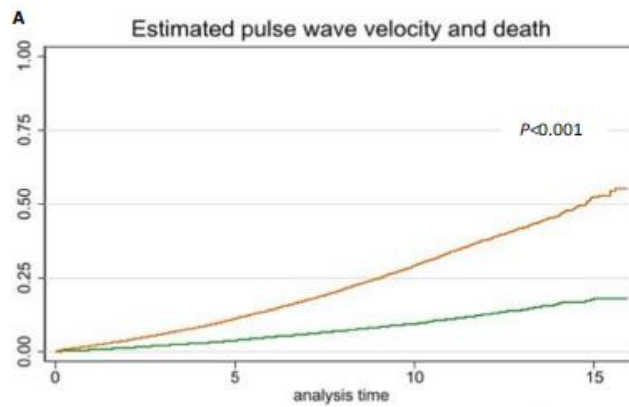


Fig3: Kaplan-Meier plots
B. Estimated pulse wave velocity and myocardial infarction.

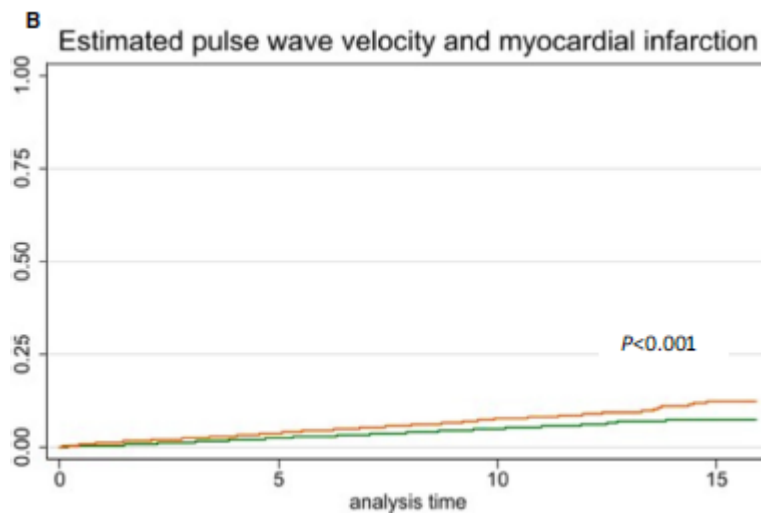
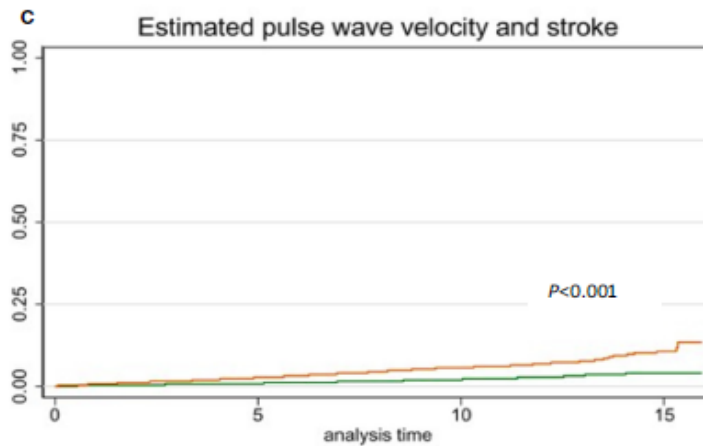


Fig4: Kaplan-Meier plots
C: Estimated pulse wave velocity and stroke



Conclusion: This study demonstrated an association between all-cause mortality and MI beyond traditional risk factors in patients with stable angina. However, there was no improvement observed in the added prediction of mortality to a clinically relevant extent

References

1. Laugesen E, et al. Estimated Pulse Wave Velocity Is Associated With All-Cause Mortality During 8.5 Years Follow-up in Patients Undergoing Elective Coronary Angiography. *J Am Heart Assoc.* 2022 May 17;11(10):e025173.
2. Vlachopoulos C, Terentes-Printzios D, Laurent S, et al. Association of Estimated Pulse Wave Velocity With Survival: A Secondary Analysis of SPRINT. *JAMA Netw Open.* 2019;2(10):e1912831.

Acute Myocardial Infarction related complication during Pre COVID period and COVID 19 pandemic: A Systematic Review and Meta Analysis

Globally, COVID-19 pandemic created an overwhelming pressure on the healthcare systems requiring reorganization and realignment to deal with the demanding workload associated with the rise of COVID-19 infection. During the pandemic, not only SARS-COV-2 related mortality has been documented, a substantial excess mortality rate related to non-COVID-19

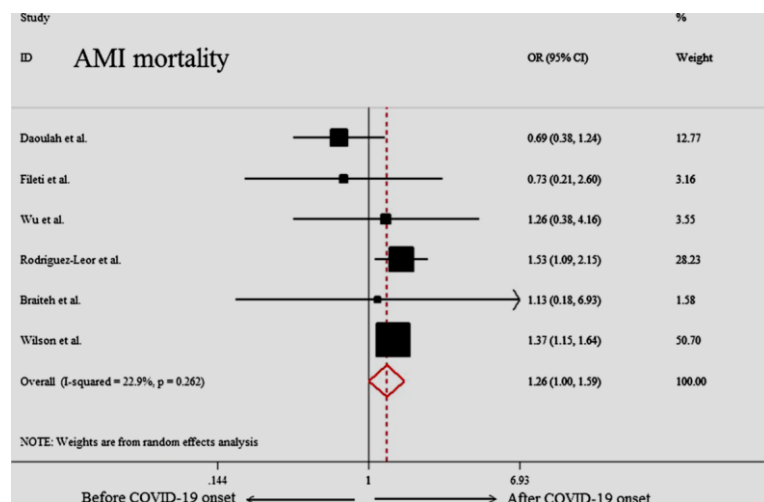
During the COVID-19 pandemic, AMI related hospital admissions significantly decreased compared to pre-COVID period

diseases was observed. This raises concern about the public health consequences of the pandemic related to non COVID.¹

During the COVID-19 pandemic, numerous data suggests decline in the acute myocardial infarction related hospital admissions. Hospitals were perceived as dangerous places, for which patients did not activate emergency medical systems regarding the infection risk. Moreover, patients with AMI had a significantly higher in-hospital mortality during the COVID-19 pandemic when compared to those admitted before COVID-19, which can be due to late arrival to the hospital.²

COVID-19 led to cardiovascular complication included ST elevation myocardial infarction and non-STEMI. ¹Reduction in the AMI related hospital admissions could either because of a lower incidence of AMI at the time of the outbreak, or patients were seeking medical care when they become symptomatic. If the latter explanation is correct, this can lead to catastrophic effects on the prognosis of the patient, as early management of AMI is crucial and life-saving

Fig:5 In-hospital mortality Rate Forest Plot in AMI patients



Pourasghari H et al. aimed to compare the rate of AMI admissions and major complication before and during the COVID pandemic. Patients data were collected through PubMed, Scopus, and Web of Science Core Collection and enrolled 41 studies into it. Original COVID-19 related studies with outcomes such as AMI admissions (STEMI or NSTEMI), AMI mortality rate (including in-hospital mortality), and major complications in patients with MI were included and compared with pre pandemic periods.

During COVID-19, AMI hospitalized patients were 35% less compared with pre-pandemic periods, which was statistically significantly. During COVID-19 periods, patients hospitalized for STEMI and NSTEMI were 29% and 34% respectively less compared with pre COVID periods, which was statistically significantly.

In-hospital mortality in AMI patients increased overall by 26% during COVID- 19 period, which was not statistically significant (Fig:5). At the same time, in-hospital mortality related to STEMI and NSTEMI patients increased by 15% and 26% respectively in the COVID-19 period, which was not statistically significant.

Conclusion: This study explains the challenges in the health-care systems with the impact of the COVID-19 pandemic. During the COVID-19 pandemic, AMI related hospital admissions significantly decreased. However, there were no significant differences in-hospital mortality rate between the pre and post-COVID- 19 periods. To avoid and prevent collateral damage in AMI patients during pandemic, or in future outbreaks, strategies should be improved.

References:

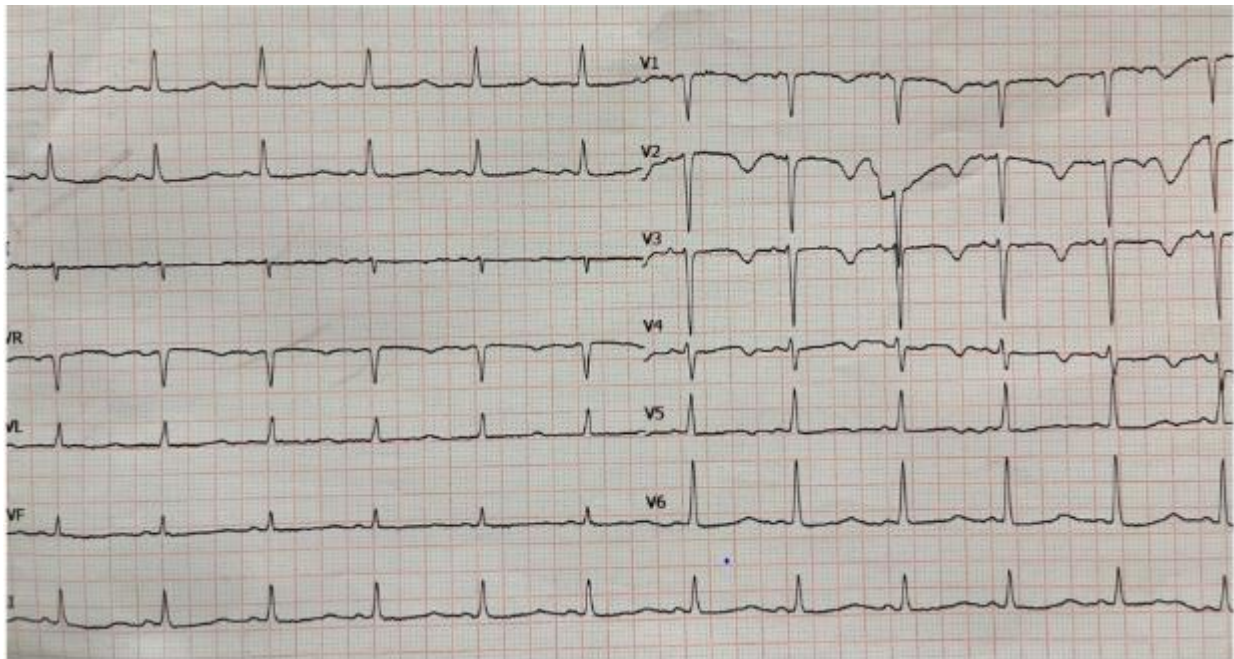
1. Pourasghari H,et al. Hospitalization, major complications and mortality in acute myocardial infarction patients during the COVID-19 era: A systematic review and meta-analysis. *Int J Cardiol Heart Vasc.* 2022 May 23;41:101058.
2. Toscano O, et al. Acute Myocardial Infarction During the COVID-19 Pandemic: An Update on Clinical Characteristics and Outcomes. *Front Cardiovasc Med.* 2021 Dec 23;8:648290

Hypocalcemia-induced heart failure; A Case Report

Heart failure is one of the common clinical condition caused by an anatomical or functional heart abnormality that prevents the ventricle's capacity to fill or eject blood. Moreover, it is considered as the most common cause of Heart failure over the age of 60 years.

Heart failure causes significant morbidity and mortality and creates a major burden on patients and their caregivers. Globally it has become a common cardiac disease owing to an increase in incidence due to population aging, an increase in the poorly controlled risk factors (hypertension, diabetes, and obesity). Calcium is essential for cardiac contraction and relaxation. However, hypocalcemia-induced heart failure in both pediatric and adult Populations is rarely observed.

Fig:6 The electrocardiogram (ECG) showing prolongation of the QT interval and T inversion in leads V1 to V4



A 29-year-old female was presented with orthopnea, dyspnea on mild exertion, and bilateral swelling of lower limb. Patient had a history of epilepsy and hypocalcemia, and was given anticonvulsant therapy (levetiracetam) without calcium. No history of previous surgeries, and history of medication allergies were found. Negative family history was recorded. Patients showed a positive Trousseau's sign. Vital signs were stable except for tachycardia. Bilateral basal fine inspiratory crackles were observed during chest auscultation. Result of ECG revealed QT interval prolongation and T inversion in leads V1 to V4 (Fig. 6). Global hypokinesia with

severe left ventricular dysfunction with ejection fraction 20%) was recorded. Patient was diagnosed as pulmonary edema and immediate treatment with intravenous furosemide and oxygen therapy was started. Along with it, treatment for correcting the hypocalcemia was also initiated (990 mg per 24 hours) along with alfacalcidol tablet (1 mcg, three times daily) and magnesium sulfate infusion. At 1 month follow up, improvement in the left ventricular function with an ejection fraction of 40% and a normal serum calcium level (8.5 mg/dL) was observed.

CONCLUSION: This study concluded that Hypocalcemia may be a possible factor causing heart failure and should be considered in the differential diagnosis with congestive heart failure

References

1. Baqi DH, Ahmed SF, Baba HO, Fattah FH, Salih AM, Ali RM, Saed DHAH, Kakamad FH. Hypocalcemia as a cause of reversible heart failure: A case report and review of the literature. Ann Med Surg (Lond). 2022 Apr 5;77:103572.



This scientific input is prepared from the Department of Medical Services, an initiative of M/s Micro Labs Limited under the aegis of Micro Knowledge Academy. The information contained herein is for education purpose only. The content is developed by compiling information from various authentic and published literatures. Although great care has been taken to assure the accuracy of the publication, M/s Micro Labs Limited shall not be responsible or in any way liable for any inaccuracy, errors, or omissions resulting from negligence or otherwise howsoever or any consequences arising there from. In spite of best efforts the information in this publication may become outdated over time. M/s Micro Labs Limited shall not be responsible in any manner whatsoever, for any action taken, opinions expressed, advice rendered or accepted, any direct, incidental, special or consequential loss and damage caused on the basis of any material or information presented in this publication / update.