Correlation of CALL Score and Cardiac Rhythm Abnormalities in COVID-19 Patients and Its Effect on Mortality and Length of Stay

Hafsa Liaqat, Malik Faisal Iftikhar, Muhammad Ali, Faraz Ali Khan, Awais Raees, and Uzma Saddique

ABSTRACT

Objective: To correlate CALL score and electro physiological abnormalities on EKG and see its effect on mortality and length of stay in patients having moderate to severe covid infection- being admitted in HDU and ICU of the Lady Reading Hospital Peshawar.

Methodology: A cross sectional (Descriptive) study was done in HDU and ICU of Lady reading hospital- LRH Peshawar from March 2021 to June 2021. This single centre analysis was conducted after approval from hospital ethical and research committee. All patients meeting the inclusion criteria were included in the study. All patients were subjected to detailed history and examination. Careful scrutiny of past medical records and detailed history were taken under the supervision of a senior physician-who is the fellow of CPSP.

Results: Out of 100 patients, 54% were male and 46% were females. The mean age was 60 years. 72% of the population of interest developed rhythm abnormalities. They affect the length of stay and influence the clinical outcome.

Conclusion: There is a positive correlation between CALL score and new onset electro cardio graphic abnormalities. They affect the length of stay and influence the clinical outcome.

Keywords: CALL score, moderate and severe covid-19 infection, mortality, rhythm abnormalities on electro cardiograph.

I. INTRODUCTION

Since December 2019 the entire world was shaken by a new pandemic situation due to the severe acute respiratory syndrome corona virus. This new virus belongs to the same family of severe acute respiratory syndrome-corona virus (SARS-CoV) and Middle East respiratory syndrome-corona virus (MERS-CoV). After emerging from Wuhan-China, the corona virus disease (COVID-19) swiftly spread throughout the world.

The new virus with its respiratory tract infection is a pandemic affecting 5,800,000 people globally and leading to 362,000 deaths at the time of this writing [1], [2]. The death toll is on rise. More than 210 countries are involved globally [1]. Inspite of the fact that COVID-19 infection primarily affects the respiratory system, extensive cardiovascular involvement has come to the front [3]-[5], especially rhythm abnormalities [6], [7]. A recent report from Wuhan, China, noted that SARS-CoV-2 infection is associated with a variety of pro-inflammatory mediators which play important role in the pathophysiology of cardiac and arrhythmic complications [8]. Although the underlying pathophysiology has remained unclear, various single-center studies and surveys around the world have reported a spectrum of electrophysiology issues associated with the disease and its therapies, specifically atrioventricular heart block, atrial fibrillation (AF), and polymorphic ventricular tachycardia (VT) [8].

People with underlying conditions such as hypertension (HTN), cardiovascular disease, diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), and malignancy have an increased probability of advancement to severity hence increasing mortality [9]. It is very important to identify moderate to severe covid-19 cases earlier and predict disease progression through the risk factors in order to
escalate treatment and combat the high death toll (61.5%). Various predictive models for COVID-19 have been designed during this pandemic, which are now accessible in academic literature to aid medical decision making [10]. A similar predictive model- Comorbidity-Age-Lymphocyte count-Lactate dehydrogenase (CALL), has been devised to anticipate disease progression [11].

Our single centre study at Lady Reading Hospital Peshawar will correlate the CALL scoring with rhythm abnormalities in patients admitted in HDU and ICU over the period of 3 months from March 2021 till June 2021, and evaluate the effects on mortality and morbidity rates after combining electrophysiological changes with CALL scores.

II. METHODOLOGY

A cross-sectional retrospective study was done. Non-probability purposive sampling done

The single centre analysis was conducted after approval from hospital ethical and research committee. All patients meeting the inclusion criteria were included in the study after taking informed consent from their relatives. Careful scrutiny of past medical records and detailed history had been taken under the supervision of a senior physician-who is the fellow of CPSP.

Patients with SARS-COV-19 infection (confirmed by positive PCR) being admitted in HDU and ICU of LRH Hospital Peshawar without preexisting cardiac arrhythmias were enrolled in the study. Duration was three months from March 2021 till June 2021. De identified demographics have been recorded for record keeping. Questionnaire was used to record comorbidities, baseline electrocardiographic findings, CALL score, length of stay, use of invasive ventilation, and preexisting arrhythmia and new onset arrhythmia during hospital stay. Patient classified as having arrhythmias if they had documented Atrial fibrillation, atrial flutter, supraventricular tachycardia (SVT) ventricular tachycardia (VT), ventricular fibrillation (VF), atrioventricular block or marked sinu bradycardia (heart rate of <40bpm) and cardiac arrest on arrival to HDU and ICU. CALL score calculated using added information; including ALC (absolute lymphocyte count) and LDH (lactate dehydrogenase) levels at the day of admission (day zero) to HDU.

A. Inclusion Criteria

Both genders were included in the study. COVID-19 diagnosed by positive polymerase chain reaction (RT-PCR) for SARS-CoV-2. Patients having moderate, severe, and critical illness, age 10 to 80 years, who were escalated to ICU and HDU from isolation units

B. Exclusion Criteria

Participants having mild disease without oxygen dependency, having pre-existing rhythm abnormalities and those taking anti-arrhythmic medications.

The above mentioned conditions might have acted as confounders and included in the study these might have produced bias in the study results.

C. Sample Size Calculation

Using openEpi software for sample size calculation and taking 50% prevalence of Arrhythmias in COVID-19 infection, a sample of 100 individuals estimated the true population proportion with a 10 percent margin of error at 95% confidence level. (Power and Sample size software). We accept a margin of error (MOE) of 10% considering our limited time frame and fewer patients in high dependency units.

D. Data Management

Data Entry, Validity, and Consistency checks done by applying restrictions and managing data entry using EpiData Software version 3.1. Double Data Entry done for cross-validation to ensure data accuracy.

E. Data Analysis

SPSS version 20 used for analysis. Means ± standard deviations or Median ± Inter-Quartile Ranges reported as summary measures for normally and non-normally distributed numeric variables respectively.

Ninety-five percent confidence intervals used for estimation of population parameters. Proportions of categorical variables reported as percentages.

Two group comparisons regarding numeric variables done using t tests for independent samples. Non-parametric alternative tests used in case of any breech of assumptions.

Chi square tests used for cross-tabulation analyses and for comparison of categorical outcomes among two or more groups.

Stratified and Multivariate Analyses used to adjust for any confounding and to detect any effect modification. All tests of significance are two-tailed at an Alpha of 0.05.

III. OPERATIONAL DEFINITIONS

A. Moderate COVID-19 Infection

Hypoxygenation (oxygen saturation <94% but >90% Chest x-ray with <50% infiltrates.

B. Severe Infection/Critical Illness

Respiratory rate >30/min. Severe respiratory distress requiring supplemental oxygen saturation< 90%.

C. Rhythm Abnormality

Presence of following events recorded on electro cardio graph (ECG):

- Supra ventricular tachycardia
- Ventricular tachycardia
- Atrial fibrillation
- Heart blocks
- Sinus Brady cardia (HR<40)
- Sinus Tachy cardia
D. Call Score

A predictive model suggested for categorizing covid-19 infected patients on the basis of disease severity and anticipates disease progression.

IV. Results

A total of 100 patients were recruited as per sample size calculated through WHO software. 54% of the participants were males and 46% females. Majority of the population of interest were young i.e less than 65 years of age (62%) mean age of our sample is 60 years. Maximum admissions and expiries were recorded in the month of may. 90% of the population of interest had worst clinical outcome i.e they expired (90%) and 62% had a hospital stay of less then and equal to 15 days.

41% of the patients with moderate to severe covid-19 infection and oxygen dependency had no previous co-morbidities. The call score was 6-11 in 80% of patients and 11 and above in 20%.

Out of the total study population, 55% required ventilator support for oxygenation and ventilation. 72% of patients with no history of any kind of arrhythmias developed rhythm abnormalities after getting corona virus infection. out of them, most frequently (32%) observed abnormality was supra ventricular tachycardia (svt). second frequently detected abnormality was tachycardia (14%). Cross tab between call scores and clinical outcomes showed that 52% of patients with call score 6-11 expired and expiry rate among 11 and above was 38%. cross tabbing between abnormalities on electrocardiogram and clinical outcome showed 77% of population with new onset arrhythmias expired. majority of the findings on ekg were reported in the month of may- the peak season of 3rd COVID-19 wave.

We compared our results for electro cardio graphic abnormalities and clinical outcome using chi-square test and our p value came out 0.00 which is statistically significant (p<0.005), the comparison of call score and clinical outcomes in the form of death also came out to be statistically significant, with p value of 0.00 (p<0.05).

| S.no | Variables | i. | ii. |
|------|-----------|----|-----|
| 1    | Call scores | 1  | -   |
| 2    | EKG abnormalities | <0.005 | 1   |

V. Discussion

The findings of this survey support the findings of [7] that in hospitalized COVID-19 patients, reported a wide variety of arrhythmic manifestations, with several reporting
potentially life-threatening ventricular arrhythmias (sustained monomorphic VT, polymorphic VT/Torsade de Pointes, VT/VF arrest) as well as pulseless electrical activity. Our research findings showed that SVT are the most common tachyarrhythmia presentation which is against the findings of [7] that showed atrial fibrillation was the most common cardiac arrhythmia and among bradycardic patients, our findings are supported by the result of [7] that severe sinus bradycardia and complete heart block were the most common Brady arrhythmias. Our study showed 10% of sample showed VT which is comparable to the findings of [12] that incidence of VT/VF was 5.9%. Moreover, our survey didn’t report PEA whereas in the findings of [12] pulse less electrical activity was reported in 5.6% respondents.

The median age (IQR) for patients who died in this study was 60 (50-70) years, which is similar to many studies where older age was linked with higher mortality as evident in the narrative review by [13] and findings of [14].

The findings of our research showed that lymphopenia was reported in 77% of covid patients which is supported by the the findings of Guan et al [12] that clinical characteristic of 1,099 patients with laboratory-confirmed COVID-19 from 552 hospitals lymphopenia was observed in 82.1% of patients.

Like in the findings of our research the lymphocyte count has been a remarkably well-validated variable employed in various studies, the lower count being an indicator of worse outcome [15]-[17]. Many studies affirm the findings of our research that elevated LDH values have been associated with a rise in mortality [18]-[20].

Our research showed that old age, low lymphocytes and other CALL scoring parameters when deranged gives poor prognosis which is consistent with the findings of [21] and findings of [22] that showed that older age, comorbidities, lymphocyte count and serum LDH at presentation help clinicians to identify patients with poor prognosis at an early stage. The findings of our research are supported by the findings of [21] that over 96% of subjects with CALL score of 4-6 points will not progress to severe disease.

VI. CONCLUSION

There is a positive correlation between CALL score and new onset electro cardio graphic abnormalities. They affect the length of stay and influence the clinical outcome.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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DOI: http://dx.doi.org/10.24018/ejmed.2022.4.5.1405 Vol 4 | Issue 5 | September 2022