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Original research article

A study of association of eosinophil count with severity and outcome in corona virus disease (COVID-19) in paediatric cases

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Abstract

Background:
Recently, COVID-19 has been investigated for questions pertaining to eosinophils. Eosinopenia, often known as a decrease in eosinophil levels, was identified as a characteristic feature associated with SARS-CoV-2 infection. However, in the past researchers have found conflicting evidence on the connection between eosinopenia and the severity of the disease.
It is not quite obvious if these changes occurred as a consequence of the immunomodulation that the medication provided or of the disease process itself. In addition, additional study is required to shed light on the possible connection that exists between the eosinophil count and the development and severity of COVID-19. The current analysis was to report changes in the eosinophil count in symptomatic COVID-19 patients and to link such changes with severity and prognosis. The purpose of the investigation was also to record variations in the eosinophil count.
Keywords: Association, eosinophil count, severity, outcome, COVID-19

Introduction

The disease that was later given the name COVID-19 and was found in December 2019 in Wuhan, China, was associated with an approximately 2% increase in the probability of passing away [1]. The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which has only recently been discovered, is the agent responsible for causing this illness [2]. The coronavirus illness known as SARS-CoV was discovered for the first time in China in 2002, and the coronavirus infection known as Middle East Respiratory Syndrome (MERS-CoV) was discovered for the first time in Saudi Arabia in 2012 [3, 4]. These coronaviruses are all encapsulated positive-strand RNA viruses that are infectious between people, animals and humans [5]. They were first detected in bats and were found to have been spread by bats. Recent investigations have revealed particular differences between the two, despite the fact that they share certain clinical symptoms [5]. The initial phase of the sickness is driven by viral replication, and it may be followed by a second phase that is driven by an inflammatory host response [6]. The illness is characterised by both phases.
The radiological findings that are typical of a SARS-CoV-2 infection reveal a hyperimmune response that is associated with acute respiratory distress syndrome [7]. A condition known as a "cytokine storm," which is characterised by an increase in the release of many cytokines that cause lung tissue fibrosis and long-term damage, may occur in the most seriously ill individuals [8]. This condition is characterised by an increase in the number of cytokines that are released.
Eosinophils are effector cells that are found in humans and are capable of causing inflammation as well as other types of damage. Eosinophils, which were once thought of as end-stage cells involved in host defence against parasite infection and immunopathology in hypersensitivity disease, are recruited from bone marrow and blood to the sites of the immune response during cellular inflammation. These eosinophils are found at the sites where the immune response is taking place. Eosinophils have been shown in an increasing body of research to be capable of performing a wide range of immunological regulatory functions. These functions may include the presentation of antigens, as well as the production and release of a wide range of cytokines and other immunomodulatory substances. Eosinophils can now be thought of as multifunctional leukocytes, which, depending on their location and level of activation [9, 10], contribute to a wide variety of physiological and pathological processes. As a consequence of this,

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eosinophils can now be thought of as multifunctional leukocytes.
The eosinophil count (EC) in the body is normally under tight control and only accounts for a small minority (between 1 and 3 percent) of peripheral blood leukocytes [11]. It is considered normal for the EC to range between 200x 103/L and 520x 103 /L. Peripheral blood eosinophilia (500 x 103/L) can be the outcome of a wide variety of diseases, including allergies, infectious diseases, inflammatory diseases, and even neoplastic conditions [12]. Eosinopenia is a condition that is diagnosed when the number of circulating eosinophils falls below 100 x 103/L [13].
Recently, COVID-19 has been investigated for questions pertaining to eosinophils. Eosinopenia, also known as a decrease in eosinophil levels, was a characteristic finding that was associated with SARS-CoV-2 infection [14-23]. The correlation between eosinopenia and the severity of the disease, on the other hand, has resulted in contradictory findings in the past [17-19]. [Note: It is not quite obvious if these changes occurred as a consequence of the immunomodulation that the medication provided or of the disease process itself. In addition, additional study is required to shed light on the possible connection that exists between the eosinophil count and the development and severity of COVID-19. The current analysis was to report changes in the eosinophil count in symptomatic COVID-19 patients and to link such changes with severity and prognosis. The purpose of the investigation was also to record variations in the eosinophil count.

Aim and Objectives

Aim

The association of eosinophil count with severity and outcome in corona virus disease (COVID-19) in paediatric cases.

Material and Methods

This study was done from December 2020 to October 2022.
This study was done in the Department of Paediatrics in Kanachur Institute of medical Sciences, Mangalore.

Methodology

- A written informed consent was taken from those willing to participate. After obtaining consent, relevant data was collected.
- Patients were categorized into non severe Covid-19 (Category A, B) and severe Covid-19 infections (Category C) as per Karnataka government guidelines:

Category A

Asymptomatic/Patients with mild symptoms.

Category B

Symptomatic patients with mild to moderate pneumonia with no signs of severe disease, respiratory rate 25-30 cycles per minute or SPO2-90 to 94% at room air.

Category C

- Symptomatic patients with severe pneumonia with respiratory rate >30 cycles per minute or SPO2< 90% at room air or less than 94% with oxygen, ARDS, Septic Shock, (Confusion, drowsiness, decrease in urine output, lower blood pressure, tachycardia)

Results

Table 1: Distribution of study groups as per severity of Covid-19

Severe Covid	N
No	87
Yes	47
Total	134

Table 2: Mean comparison of inflammatory markers between cases of severe and non-severe Covid-19 infection

Variables (admission)	Severe Covid	Mean	SD	p-value
Eosinophils (%)	No	1.0	1.7	<0.01
	Yes	0.2	0.2	

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Table 3: ROC Curve analysis of inflammatory markers to predict severe Covid-19 infection

Area Under the Curve (Severe Covid)					
Test Result Variable (admission)	Area	SE	p-value	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Eosinophils (%)	0.75	0.04	<0.01	0.66	0.84

Discussion

Currently, all of us are enduring a pandemic caused by the coronavirus. The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which has only recently been discovered, is the agent responsible for causing this illness [2]. The initial phase of the sickness is driven by viral replication, and it may be followed by a second phase that is driven by an inflammatory host response [6]. The illness is characterised by both phases. A condition known as a "cytokine storm", which is characterised by an increase in the release of many cytokines that cause lung tissue fibrosis and long-term damage, may occur in the most seriously ill individuals [8]. This condition is characterised by an increase in the number of cytokines that are released. There is a substantial risk of morbidity and mortality associated with instances that involve severe infections. For the purpose of prognosis prediction, one therefore requires a diagnostic marker that is straightforward to compute, readily available, and possesses an adequate level of diagnostic accuracy. In this context, recent research have concentrated on severe markers, such as neutrophils, lymphocytes, ESR, CRP, ferritin, levels of LDH, D-dimer, and IL-6, among other things.

The eosinophil count (EC) in the body is normally very tightly controlled and only accounts for a small percentage (1-3%) of the total number of leukocytes in the peripheral blood. Recently, COVID-19 has been investigated for questions pertaining to eosinophils. Eosinopenia, also known as a decrease in eosinophil levels, was a characteristic finding that was associated with SARS-CoV-2 infection [14-23]. The correlation between eosinopenia and the severity of the disease, on the other hand, has resulted in contradictory findings in the past [17-19].

It is not quite obvious if these changes occurred as a consequence of the immunomodulation that the medication provided or of the disease process itself. In addition, additional study is required to shed light on the possible connection that exists between the eosinophil count and the development and severity of COVID-19. As a result, the purpose of this study was to analyse the precision of the eosinophil count as a predictive indicator for severity in COVID-19 and compare it to other inflammatory markers. Specifically, the participants in the study were COVID-19 patients (CRP, LDH, ferritin and D-dimer).

Conclusion

Eosinopenia (count 0.35%) has the highest diagnostic adequacy for predicting mortality and severe Covid infection in paediatric cases.

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