Eosinophil count in severe coronavirus disease 2019 (COVID-19)

Giuseppe Lippi[1], Brandon M. Henry[2]

1. Section of Clinical Biochemistry, University of Verona, Verona, Italy
2. Cardiac Intensive Care Unit, The Heart Institute, Cincinnati Children's Hospital Medical Center, Ohio, USA

Short title: Eosinopenia and COVID-19

Type of article: Letter to the Editor

Word count: 493 + 1 Figure

Keywords: coronavirus; COVID-19, eosinopenia; eosinophils

Corresponding Author:
Prof. Giuseppe Lippi
Section of Clinical Biochemistry
University Hospital of Verona
Piazzale LA Scuro
37134 Verona, Italy
Tel. +39-045-8124308
Fax. +39-045-8122970
Email: giuseppe.lippi@univr.it

We read with interest the article of Qian et al,[1] who showed a trend, though non-significant, towards eosinopenia in patients with coronavirus disease 2019 (COVID-19). Therefore, we carried out a systematic literature search to identify additional studies which addressed this clinically and biologically important aspect.

We conducted an electronic search in Medline, Scopus and Web of Science, with the keywords "Leukocytes" OR "White Blood Cells" OR "Eosinophils" AND "coronavirus disease 2019" OR "COVID-19" without date (i.e., up to March 18, 2020) and language limits. All articles were accurately screened by the two authors, and those reporting data on the eosinophil count in patients with or without severe form of COVID-19 were included in a pooled analysis. The reference list of each document that could be identified with our search criteria was also hand-searched for detecting other eligible studies. A pooled analysis was then carried out, with calculation of the weighted mean difference (WMD) and 95% confidence interval (95% CI) of eosinophil count in patients with or without the severe form of COVID-19. Mean and standard deviation used for calculating the WMD were extrapolated from sample size, median and interquartile range (IQR), as suggested by Hozo et al.[2] The statistical analysis was performed with MetaXL software Version 5.3 (EpiGear International Pty Ltd., Sunrise Beach, Australia). This study was carried out in accordance with the declaration of Helsinki and with the term of local legislation.

Overall, 26 articles were originally identified using our search criteria. Following elimination of duplicates, 24 were excluded after title, abstract or full text screening, since they were not pertinent to COVID-19 disease (n=18), were literature reviews (n=2), editorial material (n=1), or did not reported the eosinophil count in COVID-19 patients with or without severe disease (n=3). Two additional studies were found from the reference list of the previously identified documents, such that a final

total of 4 articles were included.[1,3-5] However, one of these studies was excluded as it failed to provide necessary values for calculating the WMD (i.e., the eosinophil count was below the limit of measurement in both cohort of patients with and without severe COVID-19).[5]

Overall, the three remaining studies included 294 patients, 75 of whom (25.5%) with severe COVID-19.[1,3,4] All studies were based in China, severe disease was defined as onset of respiratory distress in two studies[1,4] and need of mechanical ventilation in the remaining.[3] The results of the pooled analysis is shown in figure 1, attesting that the eosinophil count was not found to be significantly different between patients with or without severe COVID-19 (WMD, -0.01×10^9; 95% CI, -0.07 to 0.04×10^9; I2, 0%; p=0.99).

Despite the still limited volume of data on eosinophil count in patients with COVID-19,[1,3,4] the results of our systematic literature review and pooled analysis suggest that eosinopenia may not be associated with unfavorable progression of COVID-19.

References

1. Qian GQ, Yang NB, Ding F, Ma AHY, Wang ZY, Shen YF, et al. Epidemiologic and Clinical Characteristics of 91 Hospitalized Patients with COVID-19 in Zhejiang, China: A retrospective, multi-centre case series. *QJM* 2020 Mar 17. pii: hcaa089. doi: 10.1093/qjmed/hcaa089. [Epub ahead of print].

2. Hozo SP, Djulbegovic B, Hozo I. Estimating the mean and variance from the median, range, and the size of a sample. *BMC Med Res Methodol* 2005;5:13.

3. Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, et al. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. *Allergy* 2020 Feb 19. doi: 10.1111/all.14238. [Epub ahead of print].

4. Wang Z, Yang B, Li Q, Wen L, Zhang R. Clinical Features of 69 Cases with Coronavirus Disease 2019 in Wuhan, China. *Clin Infect Dis* 2020 Mar 16. pii: ciaa272. doi: 10.1093/cid/ciaa272. [Epub ahead of print].

5. Qin C, Zhou L, Hu Z, Zhang S, Yang S, Tao Y, et al. Dysregulation of immune response in patients with COVID-19 in Wuhan, China. *Clin Infect Dis* 2020 Mar 12. pii: ciaa248. doi: 10.1093/cid/ciaa248. [Epub ahead of print].

Figure 1.

Weighted mean difference (WMD) and 95% confidence interval (95% CI) of eosinophil count in patients with or without severe coronavirus disease 2019 (COVID-19).[1,3,4]
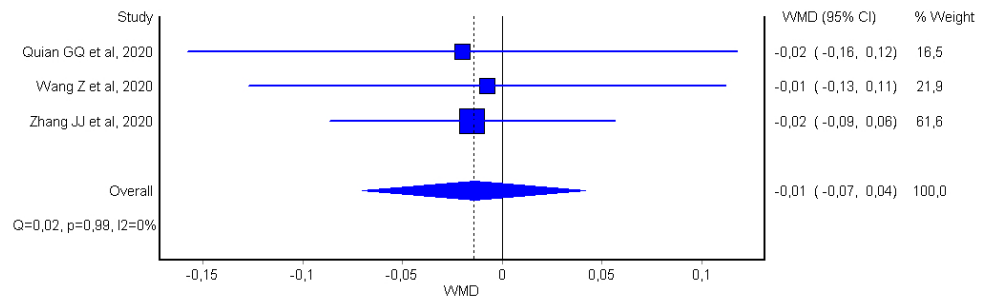
Figure 1