

Triglyceride levels in COVID-19 patients during admission in intensive care correlate with disease severity and mortality



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Background

- Plasma triglyceride levels are raised during infection and inflammation, due to increased adipose tissue lipolysis, fatty acid synthesis and suppressed fatty acid oxidation (1).
- **Increased triglycerides** have also been linked to the 'cytokine storm' underlying the **pathophysiology of coronavirus disease 2019 (COVID-19)** (2).
- **Severe outcomes in COVID-19 patients** have been found to be associated with **higher triglyceride levels** before the infection (3).
- Another study found triglycerides to be significantly higher *after* recovery than during the acute phase of infection (4).
- There is limited data on the trajectory of triglyceride levels in COVID-19 patients during admission in intensive care. This study was able to examine this in a cohort of patients based at University Hospital Southampton in the United Kingdom.
- Investigating whether triglyceride levels are a useful **predictor** of disease severity and mortality would enable **earlier detection** of high-risk patients.
- While triglyceride levels in COVID-19 patients with mild or severe infections were found to be **elevated**, this was *not* the case in those with critical illness which included respiratory or multiple organ failure and septic shock (5).
- The differences in lipid metabolism between COVID-19 patients and patients with critical illness are yet to be elucidated.

Methods and Materials

- Data was obtained from medical records of 93 patients with COVID-19 admitted to GICU at University Hospital Southampton, between March 2020 and May 2020
- Triglyceride levels were recorded for each day of hospitalisation.
- Data was also obtained from medical records of 8 critically ill patients, 10 patients with ARDS and 10 healthy volunteers.

Results

- The trajectory of triglyceride levels in this cohort of COVID-19 patients started low, then **increased** over the course of admission (Figure 1).
- Risk for severe disease outcome was measured by calculating the Sequential Organ Failure Assessment (SOFA) score at the beginning of GICU admission.
- Increased average triglyceride levels was found to correlate with increase in SOFA score (Figure 2).
- Increased triglyceride levels in the first week of GICU admission also correlated with mortality.
- When compared with **healthy controls** and patients admitted to GICU with **ARDS**, patients with COVID-19 and critical illness had raised triglycerides (Figure 3).

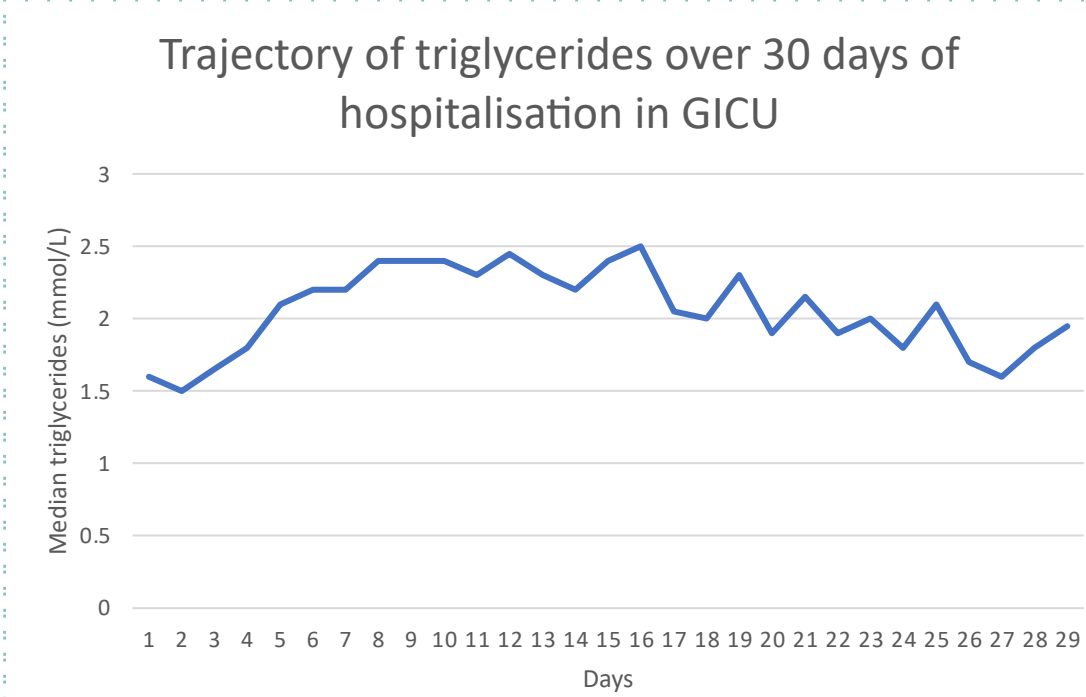


Figure 1. Median triglyceride levels of 93 patients with COVID-19 admitted to GICU.

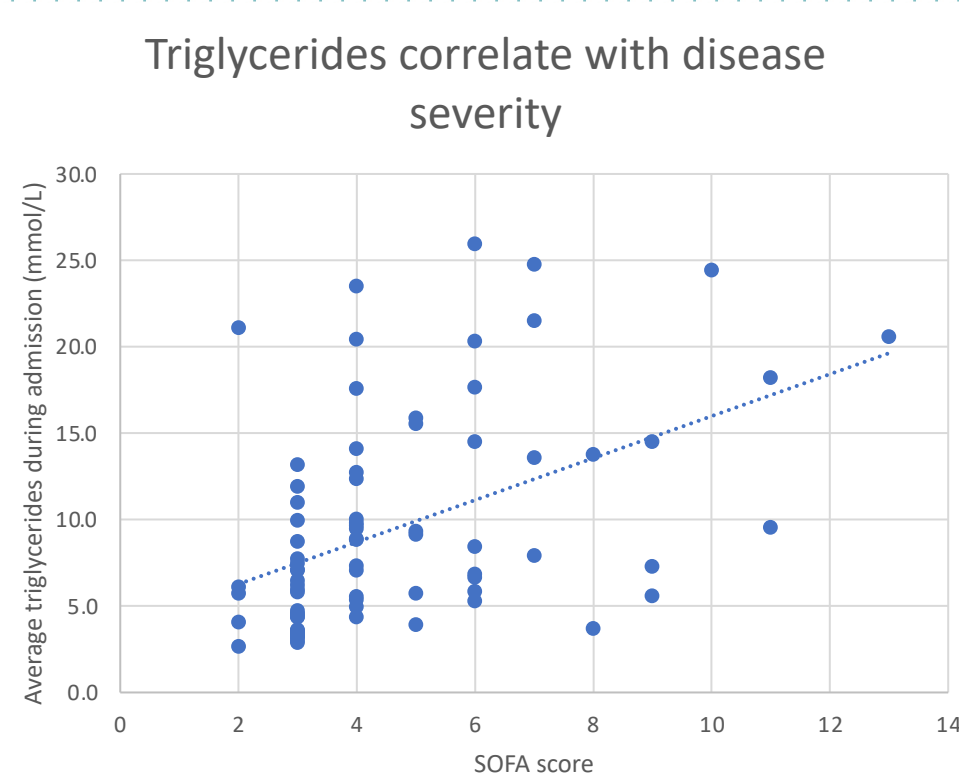


Figure 2. There is a positive correlation between average triglyceride levels over the course of GICU admission and calculated SOFA score.

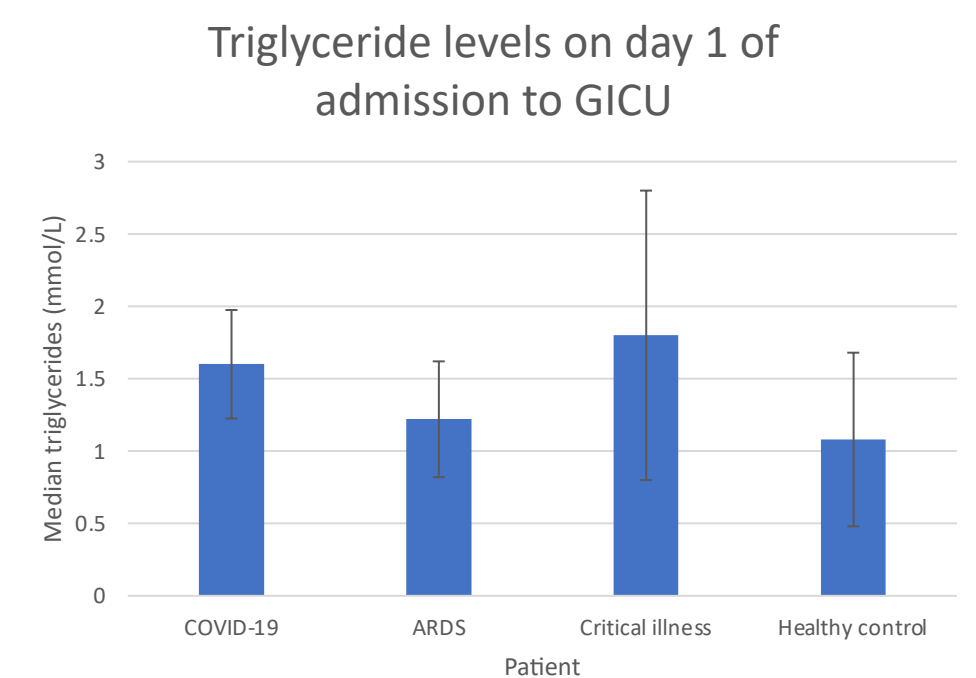


Figure 3. Comparison of median triglyceride levels on admission to GICU between patients with COVID-19, ARDS and critical illness, and healthy controls.

Conclusions

- **Increased triglyceride levels** in COVID-19 patients over the duration of GICU admission are associated with **worse disease outcomes** and **increased mortality**.
- This provides further evidence for the role of dyslipidaemia in the progression of COVID-19.



References

1. Khovidhunkit W, Kim M, Memon R, Shigenaga J, Moser A, Feingold K et al. Thematic review series: The Pathogenesis of Atherosclerosis. Effects of infection and inflammation on lipid and lipoprotein metabolism mechanisms and consequences to the host. *Journal of Lipid Research*. 2004;45(7):1169-1196.
2. Sorokin A, Karathanasis S, Yang Z, Freeman L, Kotani K, Remaley A. COVID-19—Associated dyslipidemia: Implications for mechanism of impaired resolution and novel therapeutic approaches. *The FASEB Journal*. 2020;34(8):9843-9853.
3. Masana L, Correig E, Ibarretxe D, Anoro E, Arroyo J, Jericó C et al. Low HDL and high triglycerides predict COVID-19 severity. *Scientific Reports*. 2021;11(1).
4. Roccaforte V, Daves M, Lippi G, Spreafico M, Bonato C. Altered lipid profile in patients with COVID-19 infection. *Journal of Laboratory and Precision Medicine*. 2021;6:2-2.
5. Wei X, Zeng W, Su J, Wan H, Yu X, Cao X et al. Hypolipidemia is associated with the severity of COVID-19. *Journal of Clinical Lipidology*. 2020;14(3):297-304.