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Low vitamin D status predicts ICU admission and increased mortality in unvaccinated hospitalised Covid-19 patients in Dublin

M. Sanecka[1], M. Youssef[2], M. Abdulsalam[2], A. Qadeer[1], S.I. Shah[2], A. Al Lawati[2], D.M.A. McCartney[1] and J.L. Faul[2,3,4]

[1]*School of Biological, Health & Sports Science, Technological University Dublin, Dublin, Ireland,*
[2]*Department of Respiratory and Sleep Medicine, Connolly Hospital Dublin, Dublin, Ireland,*
[3]*Department of Medicine, University College Dublin, Dublin, Ireland and*
[4]*Department of Medicine, Royal College of Surgeons in Ireland, Dublin, Ireland.*

Vitamin D is thought to play an important role in the immune response to respiratory infection. A low vitamin D status, is very common and is particularly associated with poor diet and a lack of sun exposure (staying indoors)[(1)]. Since 2020, a low vitamin D state has been identified as a risk for mortality due to Covid-19[(2,3)]. The aims of this study were: (i) to estimate the prevalence of a low vitamin D state in hospitalised Covid-19 patients, and (ii) to explore if outcomes are dependent on vitamin D and/or vaccination status after adjustment for potential confounders.

Adult subjects (n = 171) with a diagnosis of Covid pneumonia and who were admitted to Connolly Hospital Blanchardstown between June and December 2021 were enrolled in the study. Serum 25(OH)D levels were collected on admission and categorised as follows: deficient (<30nmol/L), insufficient (30–49.99nmol/L), and sufficient (≥50nmol/L). The clinical outcomes investigated were requirement for extended supplemental oxygen (>24 hours), mechanical ventilation, intensive care unit (ICU) admission and mortality. Potential confounding factors were age, gender, BMI, smoking status, and underlying disease (e.g. diabetes mellitus, hypertension). Statistical analyses were undertaken using SPSS v 28.0 (IBM Inc., Armonk, New York), with univariate analyses (Cross-tabulation with Chisquare, independent samples *t*-tests, two-way ANOVA) augmented by multivariate analyses (binary logistic regression analyses) to adjust for confounding. The study was approved by Connolly Hospital's Research Ethics Committee.

Unvaccinated subjects (average 46 years) were significantly younger than vaccinated subjects (average = 69 years) ($p < 0.001$). Vitamin D deficiency (VDD) was prevalent in both vaccinated (17.5%) and unvaccinated (19.8%) subjects, with a further 22.5% of vaccinated subjects and 37.4% of unvaccinated patients considered to have vitamin D insufficiency. For unvaccinated subjects, serum 25(OH)D was significantly lower in patients who died (36.9 +/- 15.1 nmol/L) than survivors (52.6+/-23.1 nmol/L) ($p = 0.049$).

Multivariate binary logistic regression confirmed that compared to vitamin D sufficiency (25(OH)D > 50nmol/L), VDD was independently associated with both ICU admission (OR: 6.87 (95% CI: 1.13–41.85) ($p = 0.036$) and mortality (OR: 24.81 (95% CI: 1.57–392.1) ($p = 0.023$) in unvaccinated patients, even after adjustment for major confounders (age, sex, BMI, smoking status, pre-existing disease).

This study confirms that unvaccinated subjects who die from Covid-19 have significantly lower serum 25(OH)D measures on the day of admission to hospital. These data also confirm that vitamin D deficiency (serum 25(OH)D <30nmol/L) is a potent independent risk factor for both ICU admission and mortality amongst unvaccinated Covid-19 inpatients, even after adjustment for major confounders. Previous intervention studies have shown improved outcomes in Covid-19 patients receiving vitamin D supplementation[(3)]. These findings suggest that prevention and correction of low vitamin D status should be prioritised in addressing the Covid-19 pandemic in Ireland and internationally.

References

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