Addition of vitamin D status to prognostic scores improves the prediction of outcome in community-acquired pneumonia

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Vitamin D deficiency is very common worldwide. Vitamin D plays a role in host defense against infection. The prognostic value of vitamin D status in pneumonia is unknown.

In this study, we aimed to assess the impact of vitamin D deficiency on clinical outcome in community-acquired pneumonia (CAP). Next, we investigated the contribution of 25-hydroxyvitamin D to the prognostic accuracy of other biomarkers and prognostic scores in CAP.

**Background**

Vitamin D deficiency is highly prevalent in patients hospitalized with CAP in the Netherlands. (Severe) vitamin D deficiency is associated with adverse clinical outcome in CAP. 25-hydroxyvitamin D status is an independent predictor of 30-day mortality, and adds prognostic value to the commonly used PSI score.

**Materials and Methods**

This prospective cohort study included 272 patients hospitalized with CAP. Serum 25-hydroxyvitamin D, C-reactive protein, total cortisol, leukocyte count, Pneumonia Severity Index (PSI) score and CURB-65 score were determined on admission.

Based on the 25-hydroxyvitamin D level, patients were categorized as severely deficient (<30 nmol/L), deficient (30-49 nmol/L), and sufficient (≥50 nmol/L).

Major outcome measures were intensive care unit (ICU) admission and 30-day mortality.

The association between vitamin D status and both outcomes was examined by univariate analysis. For 30-day mortality, a prediction model was constructed applying logistic regression techniques.

**Results**

In this cohort, median 25-hydroxyvitamin D level was 47 nmol/L (IQR 30-68). 78 patients (29%) were vitamin D deficient, and 65 patients (24%) were severely deficient.

15 patients (5.5%) were admitted to the ICU during hospital stay. At day 30, 256 patients (94%) had survived and 16 patients (5.9%) had died. (Severe) vitamin D deficiency was associated with an increased risk of ICU admission and 30-day mortality (Figure 1).

In multivariate regression analysis, 25-hydroxyvitamin D status appeared an independent predictor of 30-day mortality, and adds predictive value to the PSI score (Figure 2).

Additional bootstrap analysis of the final model at 1000 iterations revealed a mean bootstrap area under the curve (AUC) of 0.87 (confidence interval 0.76-0.96), confirming that our model is robust.

**Conclusions**

Vitamin D deficiency is highly prevalent in patients hospitalized with CAP in the Netherlands. (Severe) vitamin D deficiency is associated with adverse clinical outcome in CAP. 25-hydroxyvitamin D status is an independent predictor of 30-day mortality, and adds prognostic value to the commonly used PSI score.