A left shift in oxyhaemoglobin dissociation curve in patients with severe COVID-19

Supplementary information

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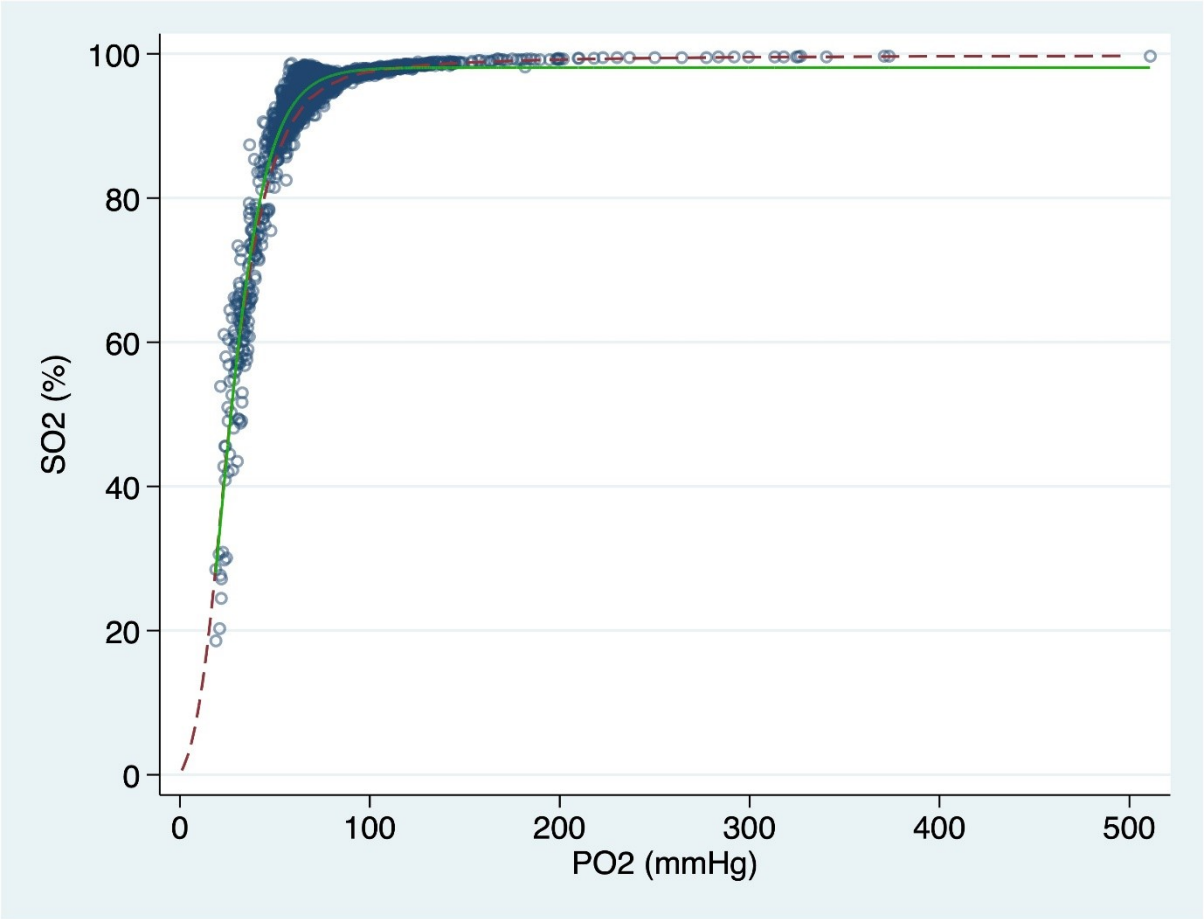
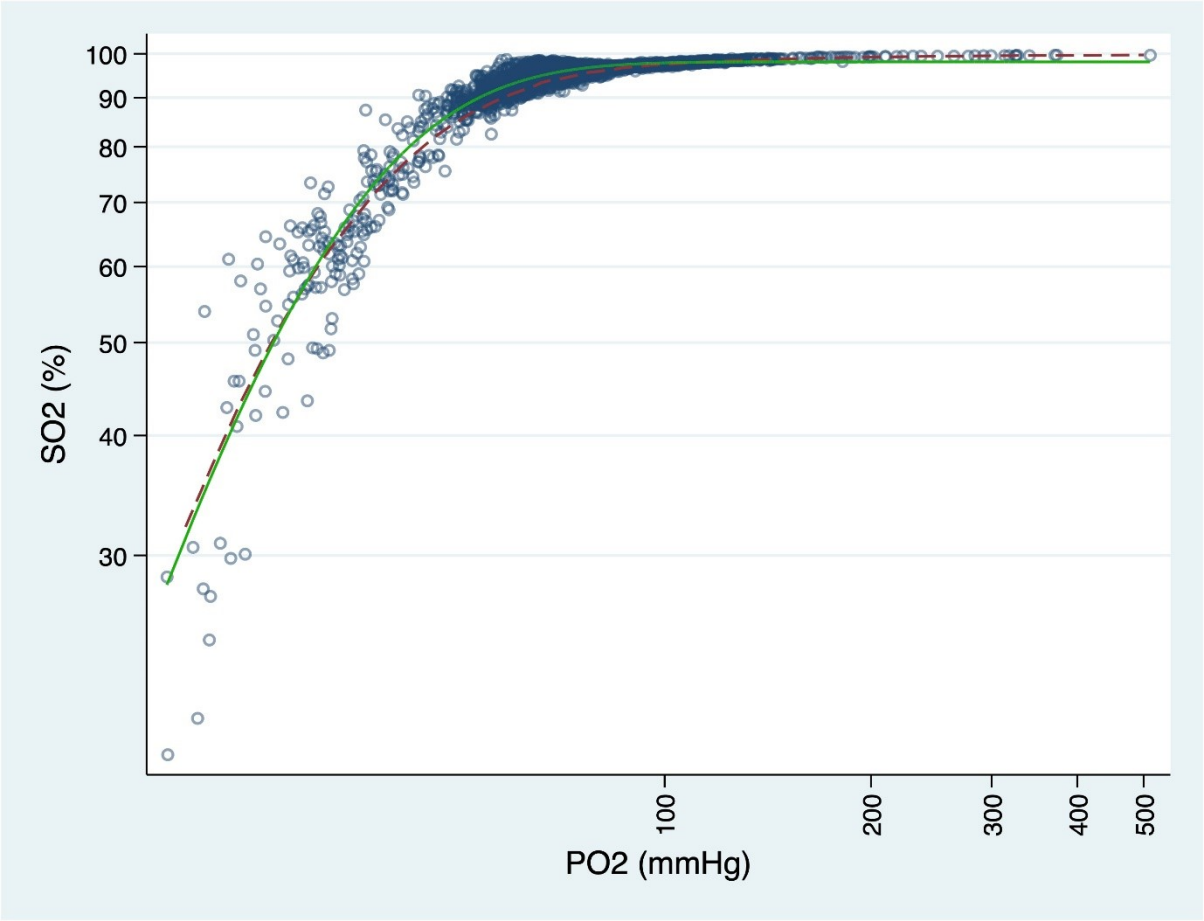
Supplemental results

Oxyhaemoglobin dissociation curve

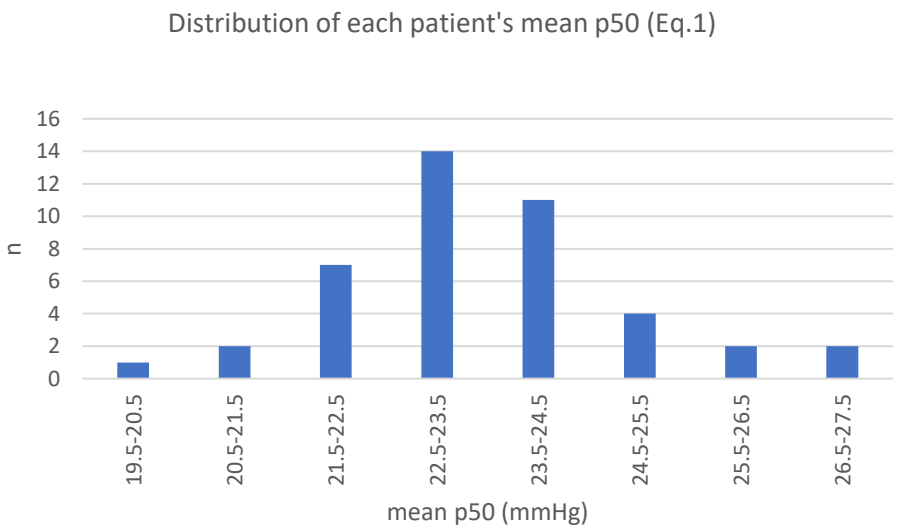


eFigure 1. SO_2 with respective pO_2 for 3,518 blood gas analyses (circles) and the sigmoid fitting line (green line). For comparison standard oxyhaemoglobin dissociation curve is shown (dashed red line). (1)



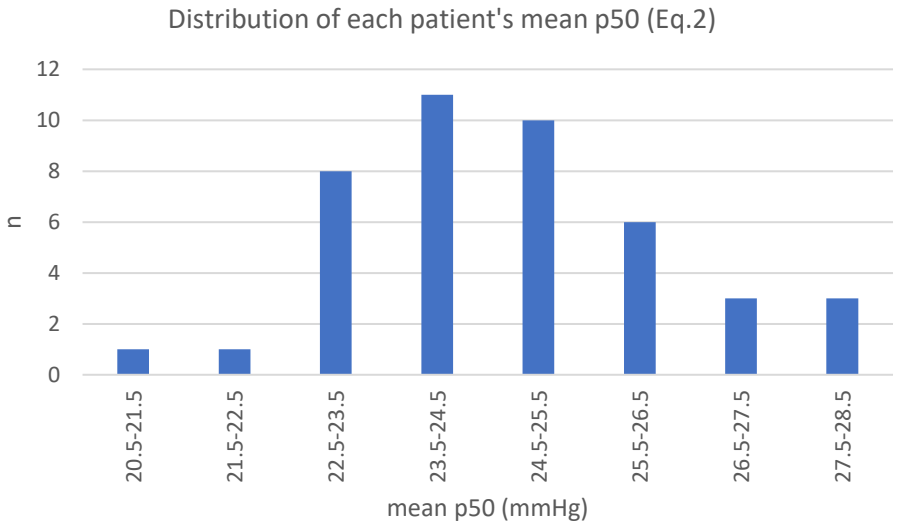
eFigure 2. Hill plot showing SO_2 with respective pO_2 for 3,518 blood gas analyses (circles) and the sigmoid fitting line (green line). For comparison standard oxyhaemoglobin dissociation curve is shown (dashed red line). (1)

Inter subject variability



eFigure 2 Distribution of the mean p_{50} calculated for each subject according to the following equation (see Eq. 1 in the main text): $p_{50} = pO_{2(corr)} \times \left(\frac{1-SO_2}{SO_2}\right)^{\frac{1}{2.711}}$,

where $pO_{2(corr)} = pO_2 \times 10^{[0.48(pH-7.4)-0.024(T-37)-0.0013\times Base\ Excess]}$



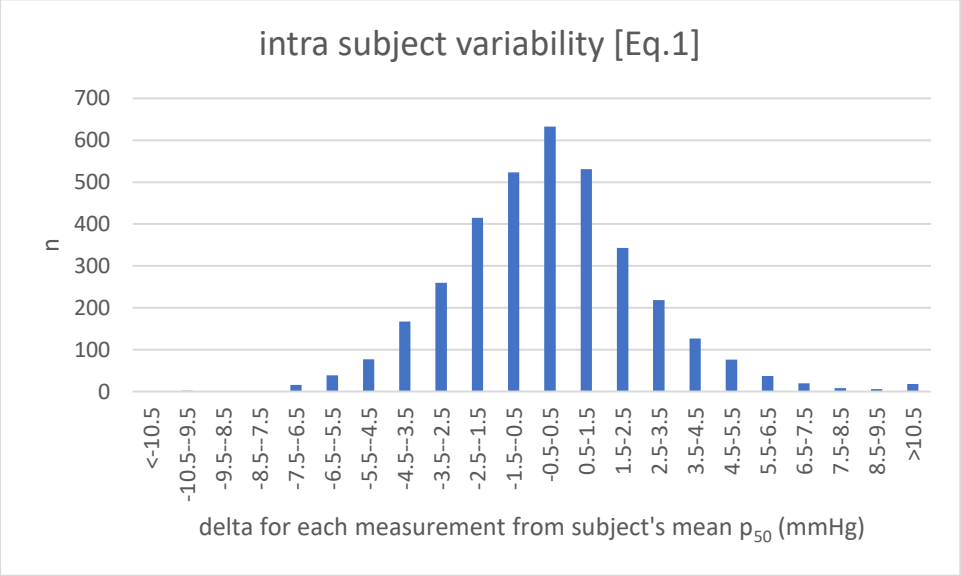
eFigure 3 Distribution of the mean p_{50} calculated for each subject according to the following equation (see Eq. 2 in the main text): $p_{50} = 26.7 \times 10^{(lg\ pO_2 - lg\ {pO_2}^k)}$,

where $lg\ {pO_2}^k = \frac{\lg\ Q+4.172}{2.9}$ and $Q = \frac{SO_2}{100\%-SO_2}$.

Individual's mean p50

The mean (SD) of each individual's mean p_{50} for Eq.1 was 23.46 mmHg (1.39) and Eq. 2 was 24.74 mmHg (1.58). Thus, the left shift is still present when only using one value per patient (n=43). Comparing this to normal p_{50} (26.7 mmHg) with one sample t test showed a statistically significant difference ($p<0.0001$ with df=42 respectively; $t = 15.2850$ for Eq.1 and $t = 9.673$ for Eq.2)

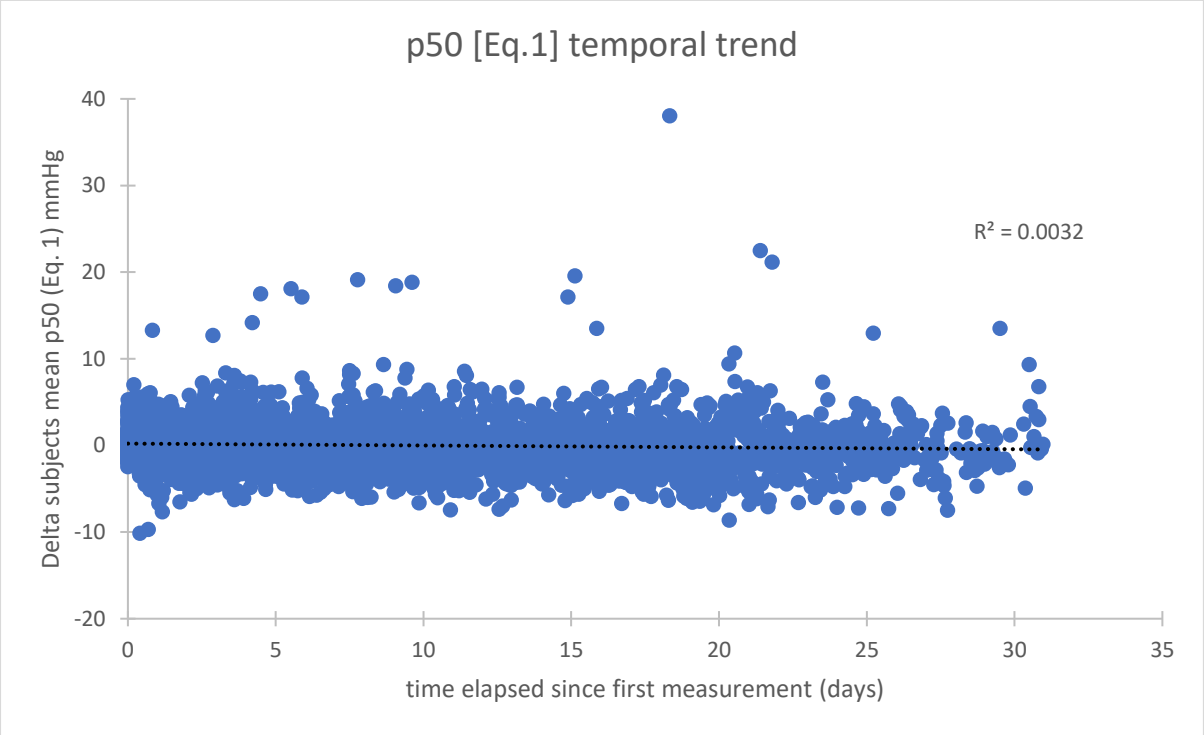
Intra subject variability



eFigure 4 Distribution of absolute difference between each measurement and the respective individual's mean p_{50} calculated with the Eq.1.

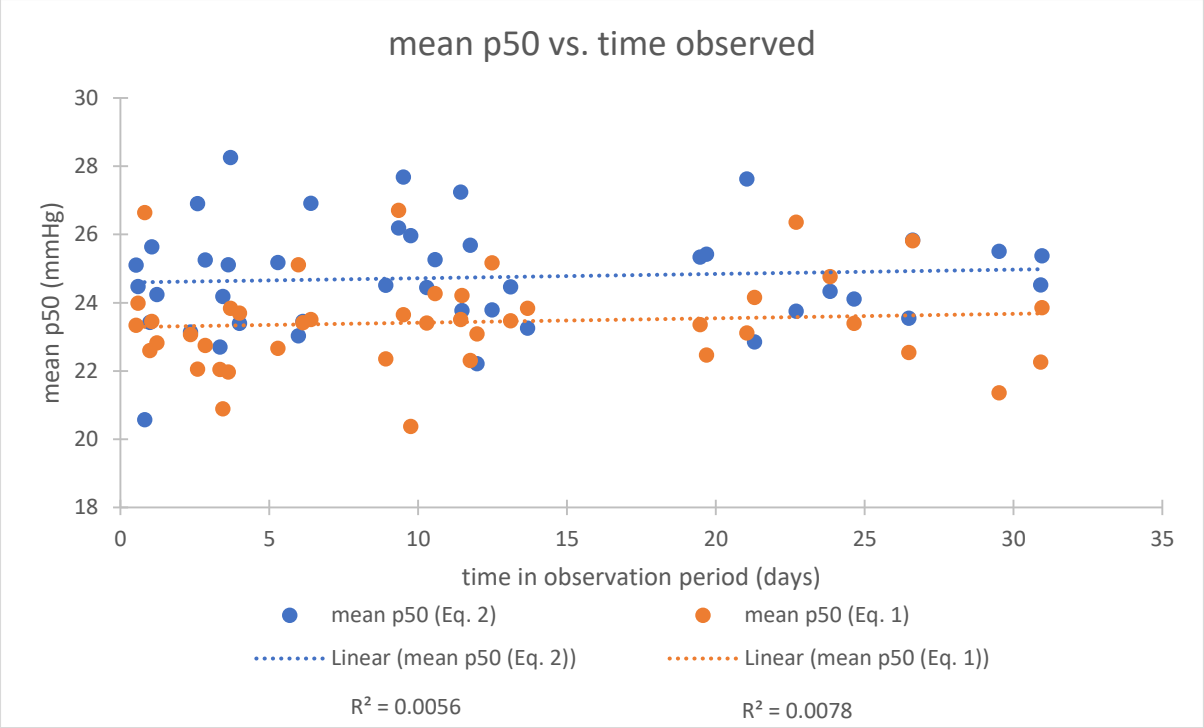
Time

Patients spent a mean of 11.5 days in ICU during the observation period. Each individual's p_{50} varied during their time in ICU. However, plotting each measurement's deviation from the individual's mean p_{50} against elapsed time from first measurement did not show a relevant unidirectional change (eFig. 5).



eFigure 5 Delta between each individual measurement from the mean p_{50} of that subject plotted over time starting from the first measurement.

Furthermore, individuals who spent a longer period in ICU during the observation period, did not show a different mean p_{50} and there was no specific correlation between mean p_{50} and time spent in ICU during the observation period (eFig. 6).



eFigure 6 Distribution of the individual patients' mean p50 calculated with Eq.1 and Eq.2 plotted according to their length of stay during the observation period.

1. Severinghaus JW. Simple, accurate equations for human blood O2 dissociation computations. J Appl Physiol Respir Environ Exerc Physiol. 1979;46(3):599-602.