Association of arterial carbon dioxide and pH with hospital mortality after cardiac arrest

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PURPOSE OF THE STUDY: Arterial carbon dioxide tension ($p\text{CO}_2$) is a possible modifiable parameter that could contribute to survival after cardiac arrest. The purpose of our study was to determine $p\text{CO}_2$ and pH in our patient population.

MATERIALS AND METHODS: We performed a retrospective study in adult patients after non-asphyxial out-of-hospital or in-hospital cardiac arrest, who were admitted in 2015 and 2016. We collected data on the highest $p\text{CO}_2$, the lowest pH and the highest lactate in the first 24 hours after admission.

RESULTS: We included 153 patients. 109 (71.2%) were males, mean age was 64 ± 13 years, and 62 (40.5%) patients survived to hospital discharge. We observed no significant differences in $p\text{CO}_2$ between survivors and non-survivors (7.1 ± 2.2 kPa vs. 7.3 ± 2 kPa, $p = 0.62$), and a significantly lower pH (7.2 ± 0.1 vs. 7.1 ± 0.1 , $p < 0.0001$) and higher lactate (4.9 ± 3.1 mmol/l vs. 8.5 ± 5.5 mmol/l, $p < 0.0001$) in non-survivors. We observed hypocapnia ($p\text{CO}_2 < 4$ kPa) in 1.6% of survivors and 1.1% of non-survivors, normocapnia ($p\text{CO}_2$ 4.5–6 kPa) in 19.4% vs. 14.3%, mild hypercapnia ($p\text{CO}_2$ 6.5–8 kPa) in 38.7% vs. 16.5% and severe hypercapnia ($p\text{CO}_2 > 8$ kPa) in 19.4% vs. 25.3%. We observed a trend towards lower mortality in patients with mild hypercapnia (OR 0.3 [95% CI 0.13–0.67, $p = 0.003$]). Severe acidosis (pH < 7.1) and hyperlactatemia (lactate > 4 mmol/l) were observed in 12.9% and 47.5% of survivors, and 30.8% and 69% of non-survivors, and were associated with a trend towards greater mortality (OR 3.0 [95% CI 1.26–7.13, $p = 0.01$], and OR 1.9 [95% CI 0.86–4.49, $p = 0.11$], respectively).

CONCLUSIONS: Derangements in arterial $p\text{CO}_2$ and pH are common in survivors after cardiac arrest, however, it seems that metabolic acidosis associated with hyperlactatemia, and not elevated $p\text{CO}_2$ contributed to mortality in our patient population.