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Effect of reactive oxygen species on serum antioxidant capacity in dengue infections in Sri Lanka

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During a dengue infection, reactive oxygen species (ROS) are generated in activated phagocytic cells. A high concentration of ROS can generate oxidative stress leading to cellular damage. The main aim of this study was to determine whether ROS can be used as a prognostic indicator for severe dengue infection. Dengue suspected patients were recruited (n = 75) to this study from North Colombo Teaching Hospital. The disease was confirmed by using IgM, IgG ELISA and RT-PCR tests and patients clinically characterized as having dengue fever (DF; n = 30) and dengue hemorrhagic fever (DHF; n = 20) were selected. Patients' sera were obtained on admission (DFA, DHFA) and on discharge (DFD, DHFD). Age-gender matched healthy controls (n = 30) were also recruited. In DHF patients, pulse pressure (mmHg) and platelet count ($\times 10^3/\text{mm}^3$) were significantly lower (mean \pm SD, 25.7 ± 8.5 , $p = 0.004$; 9.2 ± 6.9 , $p < 0.001$ respectively) and liver enzyme levels were significantly higher compared to DF patients (ALT, 222.1 ± 113.0 U/L, $p = 0.001$; AST, 260.5 ± 172.9 U/L, $p = 0.003$). Serum ROS was measured indirectly, using serum antioxidant capacity (AOC). Serum ROS is inversely related to serum AOC. The ABTS decolorization assay was used to measure the AOC and values were corrected using serum protein content. Corrected AOC levels in DHF patients on admission showed a negative correlation with platelet count ($r = -0.464$, $p = 0.046$). Corrected AOC levels in DHF patients on admission ($5.02 \pm 0.95 \mu\text{M mg}^{-1}$) were significantly higher compared to DF patients on admission (4.42 ± 0.83 , $p = 0.036$) and HC ($3.53 \pm 0.72 \mu\text{M mg}^{-1}$, $p < 0.001$). All patient categories have significantly high level of AOC compared to healthy control (DFA, 4.42 ± 0.83 , $p < 0.001$; DFD, 4.31 ± 0.75 , $p = 0.002$; DHFA, $p < 0.001$; DHFD, 4.42 ± 0.85 , $p = 0.012$). This may indicate a low level of ROS (high AOC) in serum which may be partly due to plasma leakage in severe dengue patients resulting from high vascular permeability. Alternatively, in DHF patients on admission there may be high production of ROS which may trigger the production of more antioxidant in serum. Thus, high serum AOC can be suggested for use as a prognostic indicator for severe dengue infection.

Keywords: Dengue, reactive oxygen species, antioxidant capacity

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