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## Mathematical model for determination of colloid osmotic pressure: The role of albumin-globulin ratio

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## Abstract

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Background: Colloid Osmotic Pressure (COP) is an important factor in the fluid balance of body compartments. COP is related to Total Protein (TP) concentration and Albumin: Globulin Ratio (A/G). The A/G was not included in previous empirical models, and therefore the main objective of this study was to develop a mathematical model to determine the COP in terms of TP concentration and A/G. Methods: Sera with different A/G were prepared in-vitro, and COP was measured directly using colloid osmometer. The relationship between COP, TP concentration and A/G were determined mathematically. The validity of developed empirical models was confirmed by statistical comparison between measured and calculated COP in 122 serum samples obtained from hospitalized patients and healthy individuals. Results: By non-linear regression, the following relationships were found between COP, TP concentration and A/G. All coefficients were statistically significant ( $p < 0.05$ ):  $COP (4.0814 A/G TP)/(A/G + 0.0153 TP)$ ;  $r^2 = 0.91272$ .  $COP = [5.3192 A/G - 2.2252 (A/G)^2 + 0.2939 (A/G)^3]$  TP;  $r^2 = 0.94737$ . No significant differences were indicated between measured COP and calculated one in clinical data. Conclusions: The variation of A/G may be the most effective factor for the differences between calculated and measured COP. This parameter must be considered when the direct measurement of COP is unavailable.

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## Author keywords

Albumin-globulin ratio; Colloid osmotic pressure; Mathematical model; Oncotic pressure

## Indexed Keywords

EMTREE drug terms: albumin; globulin; plasma protein

EMTREE medical terms: analytical parameters; article; blood sampling; colloid; controlled study; empirical research; hospitalization; human; in vitro study; mathematical computing; mathematical model; nonlinear system; osmotic pressure; protein analysis; protein content; regression analysis; serology; statistical significance; validity

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