

## FUZZY SET IN VECTORIAL ANALYSIS OF BODY IMPEDANCE

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**Background and aims:** Vectorial analysis of body bioimpedance suggests patterns of body composition (Piccoli et al. 2002). However, limits defining these patterns are uncertain and Fuzzy Logic Theory (Zadeh, 1965) has shown to be adequate for dealing with uncertainty inherent to this complex phenomena. The aim is to create hypothetical linguistic model based on fuzzy rules for studying human body composition.

**Methods:** Fuzzy rules were defined by experts on body composition using Nhanes III dataset as a guide for checking the biological plausibility. Input variables were resistance/height and reactance/height. Output variables were edema, dehydration, caquexia, athletics, thinness, obesity, eutrophic and each of them presented five categories of intensity (from 0.10 – definitely not - until 1.00 – definitely yes). Fuzzy rule base was composed by fuzzy propositions as “if reactance high and resistance high, then dehydration is definitely yes, athletics uncertain, thinness uncertain and so on. Takagi-Sugeno was the inference method. An individual presenting 207  $\Omega/m$  resistance/height and 39 $\Omega/m$  reactance/height was selected for applying the linguistic model.

**Results:** Fuzzy model produced seven superficial graphics, which corresponded to each pattern of body composition. Membership degrees of individual selected for dehydration, athletics, thinness, eutrophic, obesity, caquexia and edema were, respectively, 0,27; 0,53; 0,16; 0,59; 0,88; 0,30 e 0,61. The highest category of intensity was obesity, which bests represented his current body composition. As an additional contribution provided by a fuzzy model, information about intensity of edema was also important for choosing a better therapeutic strategic, for example. In addition, fuzzy model allows quantifying the intensity of each patter for individuals, which were made, until now, by visual inspection of vectorial graphic.

**Conclusions:** Potential of fuzzy approach in expanding knowledge of body composition of individuals was presented. Overcoming binary classifications as yes/no pertain to a group may be reviewed in health science as strategy for expanding scientific knowledge.

### References:

Piccoli A, Nescolarde L, Rosell J. Análisis convencional y vectorial de bioimpedancia en la práctica clínica. *Nefrología* 2002; 22.

Zadeh LA. Fuzzy Sets. *Information and Control* 1965; 8:338-353.