

Abstract of the PhD Thesis

**THE ROLE OF PROINFLAMMATORY CYTOKINES AND MICRONUTRIENTS IN THE ASSESSMENT OF
THE CHILD WITH NUTRITIONAL DEFICIT**

PhD Student: Lidia Matei (Man)

PhD Coordinator: Prof. Dr. Maria Despina Baghiu

The health condition and the quality of life reflect on the nutritional status, its assessment being one of the most important objectives of the examination, by monitoring the patient for the early discover of individual and/or general nutritional disequilibria, with the aim of correcting them. A healthy child will be a healthy adult, with low risk of developing chronic disorders, with appropriate work and reproducing capacities.

In the general part, are presented in eight sections, general data about the epidemiology of malnutrition, nutritional status, nutritional deficit, malnutrition, studied microelements (Fe, Ca, Mg, Cu, Zn), studied proinflammatory cytokines (IL-6, IL-8, TNF-alpha), inflammatory tests (PCR, VSH) and the scores for appreciating the risk of developing malnutrition.

The personal contribution of the paper is structured in three studies: the first one, "Evaluation of the interrelation of the nutritional status with the level of micronutrients and proinflammatory cytokines"; the second one, "Evaluation of the risk of developing malnutrition at hospitalized children"; and the third one, which is an epidemiologic analysis, "The prevalence of malnutrition at the children from Mureş county".

The objectives of the first study were to evaluate the serum levels of five micronutrients and of some proinflammatory cytokines in children, by studying the relation between these and the anthropometric parameters, respectively between anthropometry and a series of aspects evaluated by questionnaire. The study was a prospective one, conducted during October 2012 – July 2014 in the Pediatric Clinic I Tîrgu-Mureş. In the study, 232 patients with the age between 0-18 years were included. The nutritional status of these children was evaluated through clinical examination, anthropometric measurements (weight, height/length, mid-upper arm circumference, tricipital skin fold, abdomen circumference, hips circumference; from these, weight for height, height for age, body mass index were calculated), laboratory tests (Fe, Ca, Mg, Cu, Zn, IL-6, IL-8, TNF-alpha, PCR, VSH, complete CBC, glycaemia, total protein, albumin, total cholesterol, transaminases, lactate-dehydrogenase, alkaline phosphatase, urea, creatinine) general and nutritional history (the aliments rich in the studied micronutrients were targeted, the parents or the tutors were asked to respond how many times a week does the child consume those aliments). Depending of the anthropometric indices values, 8 study groups were formed, one for each anthropometric criteria, each of them being divided in: patients with Z-score < -2SD for one anthropometric parameter, being considered part of the investigated group for the anthropometric parameter that presented the decreased value; the patients with Z-scores between -2DS and +2DS were considered part of the control group. The statistical analysis of the data was performed with the programs MedCalc, SPSS, respectively Graphpad Prism.

As a result of this study, we observed that: acute malnutrition predominate in the age category of under one year, while the chronic one predominate in the age group of 5–9 years; there were not any significant statistical differences between the serum concentrations of Zn and Cu at children with < -2DS in comparison with the normal ones, independently of the studied anthropometric parameter, even though Cu was (though statistically insignificant) higher in children with Z-scores < -2DS, except WCA; the Ca level was higher in children that had anthropometric indices < -2DS; the level of Fe was significantly lower in children with low TSF; IL-6, IL-8, TNF-alpha presented smaller values in the group with chronic malnutrition; IL-6 presented higher values, but statistically insignificant, in children with low HCA and MUAC; IL-8 presented higher values, but statistically insignificant in children with low WFH, WCA and MUAC, but TNF-alpha presented higher values, statistically insignificant in the group with low WFH, WFA, WCA, HCA, MUAC and TSF. The socio-economic factors influenced the nutritional status;

thus, the low degree of education in parents, inadequate life conditions, the pregnancy rank, the increased number of members in the family, smoking during pregnancy, correlated with decreased anthropometric indices; the serum level of micronutrients was not influenced by the intake of aliments known to be rich in the microelement, even though the intake frequency was high.

In the second study, "Evaluation of the risk of developing malnutrition in hospitalized children", we followed the assessment of the PYMS, STAMP and STRONGkids scores efficiency in relation with the anthropometric measurements, and also their role in appreciating the risk of malnutrition when the children are admitted into the hospital. The study is a prospective one, conducted in the Pediatric Clinic I of The Emergency Clinical County Hospital Mureş during January 1, 2014 - June 31, 2014. At the moment of admission, after clinical examination, the weight and the height of the children were measured with the appropriate instruments. For the PYMS score, BMI was calculated. For the STAMP score, the growth curves based on percentiles were used. For STRONGkids, but also for the other scores, specific questionnaires were used. The anthropometric measurements were calculated and interpreted with the program Growth Analyser 3.5, using the reference curves for Romania.

Following our results, we concluded that most of the cases with high risk of developing malnutrition were identified by the PYMS score, followed by STAMP, and at last the STRONGkids score; the medium risk was better assessed by STRONGkids score, followed by STAMP and PYMS; following these scores, most of the children admitted were not assessed with nutritional risk of developing malnutrition. The PYMS score was statistically significant associated with BMI, WFA and WFH, most of the children with low BMI, WFA, respectively WFH being also identified with increased risk of malnutrition, but without observing a significant statistical association with HFA; the STAMP score presented statistically significant association with BMI, more than one third of the children with low BMI presenting increased risk of malnutrition following this score, association that is maintained also for the other studied indices; the STRONGkids score presented significant statistical association with all the analyzed indices; thus, there was not found any increased risk, regardless the followed anthropometric measurement; instead, over one half of the children with low indices were assessed with a medium risk. The PYMS score presented the highest sensitivity for BMI and WFH, respectively the STAMP score for WFA and HFA; the highest specificity was found in PYMS score for BMI, WFA and WFH, and in STRONGkids for HFA.

The objective of the last study was to evaluate the prevalence of acute and chronic malnutrition among the children from Mureş County. Applying the sampling formula for the study group, 230 subjects were needed. The assessment of the children was performed through anthropometric measurements, the interpretation of the data being made with Growth Analyser 3.5 software, using the reference curves for Romania. As a result of this study, we observed that: chronic malnutrition is more frequent in rural area; in the studied population, every seventh child present height for age values under the limit that defines chronic malnutrition; the chronic malnutrition is more frequent among the boys; in the investigated group, the acute malnutrition was identified in 1 of 25 children; acute malnutrition had a higher frequency in girls, in 1-5 years age group.

The present paper assessed the nutritional status of the children, being the first study from Romania which evaluated the correlations between the anthropometric measurements and IL-6, IL-8, TNF-alpha in children with anthropometric values < -2DS comparatively with the children with normal values. The study is underlying the importance of complex evaluation, and it approached for the first time in Romania three different methods of screening, showing that the risk scores can be used as predictors for the risk of developing nutritional deficits; thus, the implementation of the risk scores in the pediatrics services could be for a real use. The study also underlined aspects regarding the epidemiology of several types of malnutrition in our geographic area.

Keywords: malnutrition, micronutrients, anthropometry, cytokines, prevalence, nutritional scores.