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博士学位論文要約

【学位論文題目】
小児の栄養評価に関する研究 —評価基準作成とその臨床への応用—

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【論文要約】
The nutritional status of children affects their development and health; therefore, appropriate nutritional assessments and interventions are required for hospitalized children. However, few studies have investigated the nutritional assessment of children. The purpose of this thesis is to discuss the nutritional assessment of pediatric patients.

This thesis includes two parts: (1) fundamental research results from studies conducted in this field (Chapters 1–3) and (2) their application in a clinical setting (Chapters 4–6).

Chapter 1 contains the results of surveys regarding the procedures for nutritional assessment in the pediatric field, as well as the nutritional status of pediatric patients. These surveys revealed the following two issues: evaluating children’s nutritional status is difficult because of the lack of established reference values and information regarding pediatric nutritional states, and the risk of malnutrition varies depending on the specific disease state.

Chapter 2, we report the results of a study that evaluated the nutritional status of 7,517 healthy children (age, 3–17 years) by using their height and weight, which was measured during regular health check-ups. The data were evaluated by using the Waterlow classification, which examines weight-for-height (W/H) and height-for-age (H/A). Using W/H and H/A, the prevalence of under-nutrition was estimated to be 20.1% and 8.3%, respectively, and the peak prevalence was observed at approximately 10–12 years for both W/H and H/A. We have clearly demonstrated that the risk of malnutrition in healthy children varies according to age. These findings indicate that the reference values should be carefully considered when the nutritional status of hospitalized children is evaluated by using the Waterlow classification.

In Chapter 3, we report the results of a trial attempting to establish the reference
value for rapid turnover proteins (RTP) in children, a measure that is considered a useful index for pediatric nutritional assessment. In this study, our goal was to define the clinical reference range for transthyretin (TTR) and retinol-binding protein (RBP) by using pediatric patients' data. The results indicate that patients' TTR and RBP levels increased during school age, and reached adult levels at approximately 15 years of age. These results demonstrate the potential utility of RTP levels as an objective measure of children's nutritional status.

Regarding these techniques' application in a clinical setting (Chapters 4–6), we assessed the nutritional status of pediatric patients with acute lymphoblastic leukemia (ALL), Down's syndrome, and severe motor and intellectual disabilities (SMID).

In Chapter 4, we report the results of our investigation regarding the longitudinal changes in nutritional status, such as the anthropometric measures and serum albumin levels of patients with ALL who were undergoing chemotherapy. We used their body mass index (BMI) z-scores and Waterlow classification as nutritional assessment indices. Neither assessment detected a significant change in the prevalence of malnutrition during chemotherapy, although the absolute scores for both assessments significantly reduced in the sanctuary treatment phase. Low level of serum albumin (<3.2 g/dL) was observed in two patients at diagnosis, and the mean albumin level decreased significantly during the induction and the re-induction phases. The nutritional status, as assessed by using anthropometric measures and albumin levels, differed among patients receiving similar chemotherapeutic regimens; therefore, careful observation of their nutritional status and potential intervention may be necessary in different phases of chemotherapy.

In Chapter 5, we report the results of our survey regarding the correlation between lifestyle-related laboratory variables and nutritional intake in pediatric patients with Down's syndrome. The prevalence of hyperuricaemia was significantly higher in patients with Down's syndrome than in normal individuals, and it was also significantly higher in males. There were no significant differences between hyperuricaemia-positive and hyperuricaemia-negative patients in terms of age, BMI z-scores, and purine intake. Among patients with Down's syndrome, we observed high rates of hyperuricemia beginning at an early age. These results suggest that careful nutritional management is required for patients with Down's syndrome, as hyperuricaemia is an independent risk factor for lifestyle-related diseases during the adult years.

In Chapter 6, we discuss the results from a longitudinal study of the nutritional status of children with SMID, and specifically their anthropometric measurements and TTR levels. In all patients, TTR levels showed a marginal correlation with BMI z-score.
Change ratios of TTR and body weight were not significantly correlated. Multiple regression analysis revealed that only arm muscle circumference was significantly associated with TTR.

Based on these results, we have clarified the nutritional status for patients with each of these diseases, and discussed the advantages and limitations of each index. The systematic design of this project may contribute to the discussion regarding the nutritional assessment of pediatric patients.