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Using the height-for-age z-score (haz) to predict protein-energy malnutrition in patients with congenital epidermolysis bullosa through the application of machine learning methods

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Congenital epidermolysis bullosa (CEB) is a group of genetically and clinically heterogeneous diseases characterized by a tendency to form blisters and/or erosions on the skin and mucous membranes with minimal trauma. Nutritional deficiency stands as the most common complication observed in EB, with its development influenced by a multitude of contributing factors.

Purpose of the study: to construct a predictive model for the development of protein-energy malnutrition in patients with various forms of EB, identify the main features affecting the sensitivity of the predictive model, and evaluate the model's validity based on retrospective data on the presence of protein-energy malnutrition in this patient category.

Methods: The study involved 101 patients aged 3 to 18 years with simplex (n=25), junctional (n=10), and dystrophic (n=66) CEB. The Birmingham EB Severity Score, laboratory and anthropometric parameters, as well as data on the presence of gastrointestinal complications, were used for the analysis of disease progression and predictive model construction. The Scikit-learn library of the programming language Python was utilized for building the machine learning model.

Results: In the construction of the predictive model, the RandomForestClassifier model showed the best results. The developed machine learning model can correctly determine whether a patient has chronic protein-energy malnutrition (class 1, HAZ < -2) or not (class 0, HAZ > -2) with an accuracy of 92%, sensitivity of 85.7%, and specificity of 100%.

Conclusions: The machine learning model presented in this study predicts the values of the Height-for-Age Z-score (HAZ) and can have practical significance in medical practice and clinical research. The model can be used for early diagnosis of protein-energy malnutrition in patients with EB, which may allow healthcare professionals to timely start nutritional support and prevent possible complications of the disease, as well as develop individual nutrition and treatment plans for patients.

Key words: congenital epidermolysis bullosa, nutritional deficiency, micronutrient deficiency, machine learning, artificial intelligence, prediction