METHODS OF BIOMEDICAL INFORMATICS IN THE STUDY OF INFLAMMATORY BOWEL DISEASE IN CHILDREN

Abstract

Inflammatory bowel diseases (IBD) are a group of chronic, polygenic diseases primarily affecting the gastrointestinal tract, with an increasing incidence in both adult and paediatric populations globally. These diseases include Crohn's disease (CD), ulcerative colitis (UC) and so-called IBD unclassified (IBD-U). Faecal calprotectin (FC) is a marker of inflammation in IBD and its levels correlate with disease activity as defined by clinical parameters, endoscopic findings and histology. Current medical practice is associated with the availability of a large amount of clinical data and the desire to apply it effectively in the medical decision-making process in such a way as to achieve the maximum possible reduction in the risk of adverse disease course and the occurrence of disease- and/or treatment-associated complications.

The primary goal of this dissertation is to apply biomedical informatics methods to paediatric IBD in the process of validating FC in predicting disease activity and response to treatment, searching for additional potential predictive factors, and developing prediction models for specific clinical situations.

We found that the development of FC levels in the early phase of induction therapy with exclusive enteral nutrition cannot be used as a basis for further management. By validating a home test for the determination of FC concentration in stool, we pointed out its potential benefits for speeding up the decision-making process, however, with the need to confirm the result by conventional laboratory methods. By defining a balanced cut-off of azathioprine metabolites to predict the achievement of effective infliximab levels, we obtained a suitable tool for optimizing combination therapy in CD patients. By comparing two first-line biologic therapy agents, we highlighted the need to consider the identified risk factors in the choice of therapy. We found that induction therapy does not play a major role in the duration of disease remission in patients with uncomplicated CD concomitantly taking azathioprine. We justified the appropriateness of vitamin D supplementation in paediatric patients with IBD and highlighted the possibility of reducing previously indicated testing in asymptomatic individuals.

The new findings from the conducted studies bring with them the possibility of a more exact and individualized approach in the clinical decision-making process.

Key words: faecal calprotectin, prediction, inflammatory bowel diseases