Gut microbiota in hospitalized children and the risk prediction for nosocomial diarrhea – a nested case-control study.

Aim of the project

The main aim of the project is to explore whether and how gut microbiota of pediatric patients at the moment of admission to the hospital is associated with the risk of diarrhea during hospital stay. We also plan to compare gut microbiota changes which occur during hospital stay between the patients who at some point develop and do not develop diarrhea.

Study description

In this study, we plan to obtain stool samples for microbiota analysis from the patients aged 15-36 months, admitted to the Department of Paediatrics of the Medical University of Warsaw. The first sample will be taken at the day of admission. The next sample will be taken only from two chosen groups of patients. The first group (the 'case group') will include children who develop diarrhea during the hospitalization. The second group (the 'control group'), will be comprised of children without diarrhea, matched to children from the case group based on their age, date of admission and type of treatment. Finally, we will perform laboratory tests to characterize microbiota in the samples taken from both groups and compare them between each other using statistical methods.

Why is this project important?

Nosocomial diarrhea is a common complication of hospital treatment in children, both in high- and low-income countries. It may be caused by pathogens (either viral or bacterial) as well as medications (most notably, antibiotics). Regardless of the cause, nosocomial diarrhea may lead to a prolonged hospital stay or treatment failure, exposing patient to an unnecessary stress and increasing the costs of medical care.

Gut microbiota may be defined as "the assemblage of microorganisms (all the bacteria, archaea, eukaryotes, and viruses) present in the gastrointestinal tract". Its disturbances are one of the possible, yet not extensively explored factors responsible for nosocomial diarrhea.

Associations between human gut microbiota and disease are one of the main subjects in modern biomedical research. Microbiota disturbances may contribute to a large number of childhood diseases, including but not limited to: allergies, autoimmune diseases, obesity and autism spectrum disorders. Much of the evidence is derived from studies of microbiota status after the occurrence of symptoms, which poses a question: 'what was first?' – microbiota disturbance, or the disease? To date, no studies have assessed microbiota composition in children before the occurrence of diarrhea.

In the future, the results of this study may find a significant practical application. When the techniques of microbiota analysis become more accessible, it may be possible to use microbiota characterization to identify patients at a higher risk of certain diseases or complications (including nosocomial diarrhea), and open up an opportunity for targeted, preventive interventions tailored for individual microbiota patterns.

Expected results

We expect to identify differences between microbiota diversity and composition in patients who develop and do not develop nosocomial diarrhea. This study will significantly improve the knowledge on the role of microbiota in health and disease of children.