Coronary artery disease is the major cause of death and disability in developed countries. Although the prevalence accrues with age, an increasing number of young patients suffering from coronary artery disease and requiring revascularization is being observed worldwide. Nevertheless, the prevalence of coronary artery disease in young patients is difficult to establish as a majority of them show no symptoms of the disease. As studies show, acute coronary syndrome (i.e. myocardial infarction) is commonly the first clinical manifestation of coronary artery disease in young age groups. Coronary artery bypass grafting, which is an open heart cardiac surgery, is a recommended treatment option for advanced coronary artery disease. Although the complication rate after this treatment is low in this age group, the risk of major complications, including death, increases when the surgery is performed urgently in case of acute coronary syndrome.

Early onset of coronary artery disease is partially determined by genetic factors. However, most genetic effects are modest in size and still the vast majority of the heritability of coronary artery disease remains unexplained. Moreover, the biomolecular factors that increases the risk of acute coronary syndrome in young adults suffering from coronary artery disease need to be further investigated.

Platelets, which are the blood components involved in thrombus formation, are undoubtedly participating in the mechanism of acute coronary syndrome. They have the capacity of protein synthesis through translation of megakaryocyte-derived mRNAs, which may influence their functioning, including pathological hyperreactivity. This prompts the assumption that platelets in patients with acute coronary syndrome are potentially preconditioned at the transcriptional level to a higher degree of reactivity, which eventually lead to the thrombotic event, i.e. myocardial infarction. Nevertheless, it remains unknown whether differences in mRNA expression levels in platelets can be found in between young patients with premature advanced coronary artery disease and with or without acute coronary syndrome. Investigating for this knowledge is the main aim of the study.

Moreover, in patients who experienced acute coronary syndrome, antiplatelet therapy with two different antiplatelet agents is recommended based on the European Society of Cardiology Guidelines. However, the responsiveness to the treatment and its transcriptomic mechanisms in patients undergoing coronary artery bypass grafting remains unknown. Acquiring this knowledge is the additional aim of the study.

New knowledge achieved based on the study results will provide novel insights into the pathophysiology of the development of premature advanced coronary artery disease resulting in acute coronary syndrome. This knowledge will be useful in terms of developing and creating novel tools for risk assessments of the acute coronary syndrome that may allow to introduce preventive measures and aid better management of the disease treatment.