

Seroprevalence and clinical-epidemiological study of SARS-CoV-2 infection

ABSTRACT

PhD student: Bodea Réka

PhD supervisor: Prof. Dr. Ábrám Zoltán Samoil

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, represented an unprecedented global health crisis. Beyond human losses, it profoundly affected the functioning of health systems, generated economic disruptions, and modified social behaviors on a global scale. Romania has felt these consequences intensely, with over 3.3 million confirmed cases and more than 67,000 deaths by the beginning of 2022, the peak periods being among the most severe in the European Union.

In this context, this thesis aimed to characterize the evolution of the disease through two complementary approaches: a retrospective analysis of hospitalized patients in the central region of the country and an assessment of seroprevalence at the national level. This integrated approach allowed capturing the impact of the pandemic from the perspective of both symptomatic cases and the degree of acquired immunity among the general population.

The first study, of observational and analytical type, was based on data from the national Corona Forms platform and included 24,633 patients hospitalized between February 2020 and February 2022 in Mureș, Harghita, and Covasna counties. Demographic, clinical, therapeutic, and evolutionary variables were analyzed, with a focus on the influence of age, sex, and comorbidities on the prognosis. The results highlighted a high frequency of cases in the elderly and a proportional increase in clinical severity with the number of associated chronic conditions. Cardiovascular diseases (43.6%), diabetes mellitus (22.8%), and obesity (17.4%) were the most common concomitant pathologies. Statistical analysis showed that the presence of comorbidities significantly increased the risk of death (OR = 59.35; 95% CI: 50.05–70.40; $p < 0.001$). The average length of hospital stay was 9.2 days, and the overall hospital mortality rate was 16.88%.

The second study aimed to calculate the seroprevalence of SARS-CoV-2 infection at the national level, based on 51,533 blood samples from 42,482 unique individuals, collected between May 2020 and April 2022 from all regions of the country. Serological analyses were performed on the Abbott Alinity platform, using a chemiluminescent microparticle immunoassay for the detection of anti-Nucleocapsid IgG antibodies. The cumulative seroprevalence was approximately 40%, more than three times higher than the prevalence estimated based on officially confirmed cases, indicating extensive underdiagnosis and widespread circulation of the virus.

The general conclusions emphasize that advanced age and the presence of chronic comorbidities are the main risk factors for severe evolution and mortality in patients with COVID-19. In parallel, the seroprevalence analysis confirmed that the real level of exposure in the population far exceeded the official data, demonstrating the value of serological surveillance in assessing epidemic dynamics.

The originality of the thesis lies in the correlation of these two research perspectives, which allowed the identification of major risk factors, the description of regional clinical particularities, and the estimation of real population immunity, thus constituting a solid scientific basis for assessing the impact of COVID-19 and for preparing the healthcare system for similar future crises.