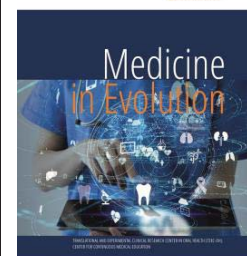# Access to health assessment services for confirmed COVID-19 patients in Bihor County, Romania

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Abstract

Aim and objective: This study presents the usefulness of a geographical information system to identify issues related to geographical access of COVID-19 confirmed individuals to established assessment services, in Bihor County, Romania. Material and method: Using the QGIS application, a geographic information system (GIS) was created with the following layers: the centroid of county localities, the assessment centres of confirmed cases, the corresponding 30-minute and 60-minute intervals for vehicle travel time from the localities to the assessment centre. Results: Determination of travel time (personal car or ambulance) from localities to an assessment centre was performed using isochrones for 30 minutes and 60 minutes. The ORS Tools plugin was used to plot the isochrones as a map. Conclusions: These analyses performed may provide key information for the development of health policies that promote safety and well-being in relation to the risks associated with COVID-19. Data are provided on areas with reduced access to healthcare resources.

Keywords: COVID-19, healthcare accessibility, isochrones

INTRODUCTION

Coronaviruses are a group of RNA viruses, named after the appearance of the outer surface, resembling a crown [1]. These viruses are a group that predominantly affect vertebrates. The novel SARS-CoV-2 coronavirus was first isolated in Wuhan from the lower respiratory tract of patients with unexplained pneumonia in 2019 [2]. There have been two new coronavirus outbreaks in the past. In 2002-2003, there was an outbreak of severe acute respiratory syndrome (SARS) caused by SARS-CoV. Another SARS outbreak occurred between 2012, which was named Middle East Respiratory Syndrome (MERS). MERS was caused by MERS-CoV. The current SARS very similar to SARS-CoV (in structure and pathogenicity) is called SARS-CoV-2 [3, 4]. Clinical manifestations are variable; clinical signs of influenza are present in about half of cases and lower respiratory tract infections occur in only 10-15%. Complications occurring in severe cases of SARS-CoV-2 infection are acute respiratory distress syndrome, disseminated intravascular coagulation and even death.

Since the beginning of the COVID-19 pandemic (March 11, 2020), all countries have been registered a large numbers of cases and they have faced problems related to the accessibility of the population to health services. A decisive factor in disease treatment is the distance to the healthcare provider.

Bihor County is located in the north-western part of Romania and has a population of 612,756 inhabitants. From the beginning of the pandemic until 31.01.2022, 67,272 cases of COVID-19 infection have been confirmed [5]. National health legislation has led to the establishment in January 2022 of nine health assessment centres for patients confirmed with SARS-CoV-2 [5].

Aim and objectives

Two objectives of this study were established. The first one is to present the usefullness of a geographical information system and to identify issues related to geographical access of COVID-19 confirmed individuals to established assessment services. The second purpose is to identify accessibility to health services assessment for COVID-19 by identifying the travel distance from the county localities to the nearest assessment center by setting time limits (30 minutes, 60 minutes) to count the number of localities in each category.

MATERIAL AND METHODS

Isochrones are timelines that are equally distant from a given geographical location [6]. Distance refers to travel time and not to physical distance [7]. Using the QGIS application (https://www.qgis.org/), a geographic information system (GIS) was created with the following layers: the Bihor County boundary, the centroid for the 454 county localities and georeferenced county addresses, 9 assessment centres. The determination of travel time by vehicle (personal, car, or ambulance) from localities to an assessment center was performed using isochrones for 30 minutes and 60 minutes. The ORS Tools plugin (https://openrouteservice.org/) was used to plot the isochrones. By performing vector operations to dissolve each isochron into a single layer (30 minutes and 60 minutes respectively) and using the tool to count points in a polygon, the number of localities for which the travel distance to an assessment center is less than 30 minutes, was obtained between 30 and 60 minutes and more than 60 minutes. In Bihor County, there are 101 administrative-territorial units with 454 localities (4 municipalities, 7 towns, and 91 communes with their villages).

RESULTS

From the determinations made it results that the population of 362 localities (79.74%) in Bihor County have access to specialized medical services for the evaluation of patients with COVID-19 in less than 30 minutes. A trip within the 30-60 minutes time interval is necessary for the population in 20% of the localities of the county. The time of more than 60 minutes is characteristic for the population in one locality (Table I).

Table I. Accessibility to health services according to travel time

Travel time	Locality Nr.	Percentage (%)
t < 30 min.	362	79,74
30<t<60 min	91	20,04
t >60 min	1	0,22

The isochrons corresponding to the travel time (30 minutes and 60 minutes) from Bihor County localities to an evaluation center are shown in Figure 1.
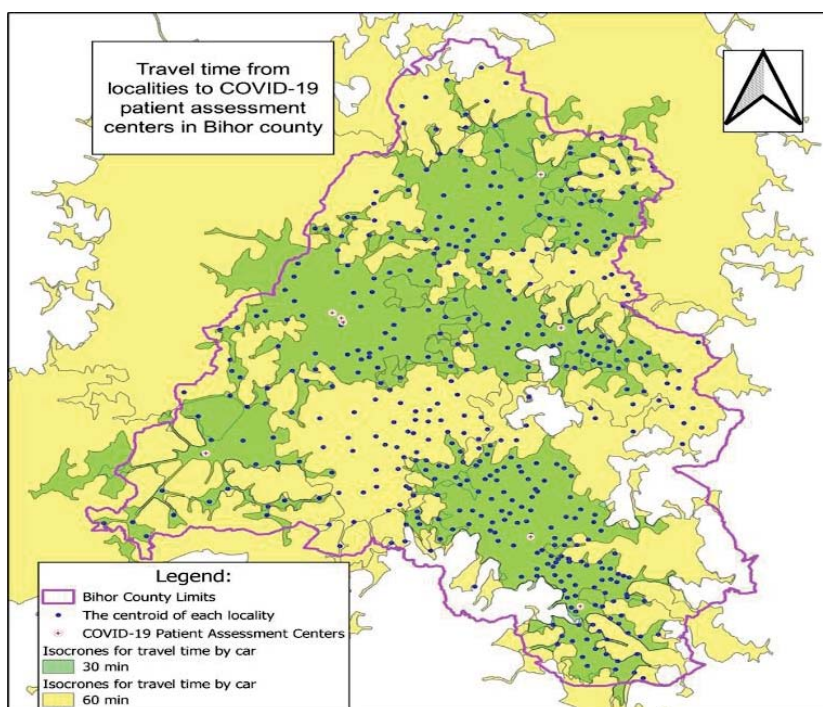

Figure 1. Isochrones corresponding to travel time to an assessment centre in Bihor County

Regarding the fatality rate, it has been found that there are 18 administrative-territorial units with a high fatality rate ranging between 9.98-16.1% (Figure 2).
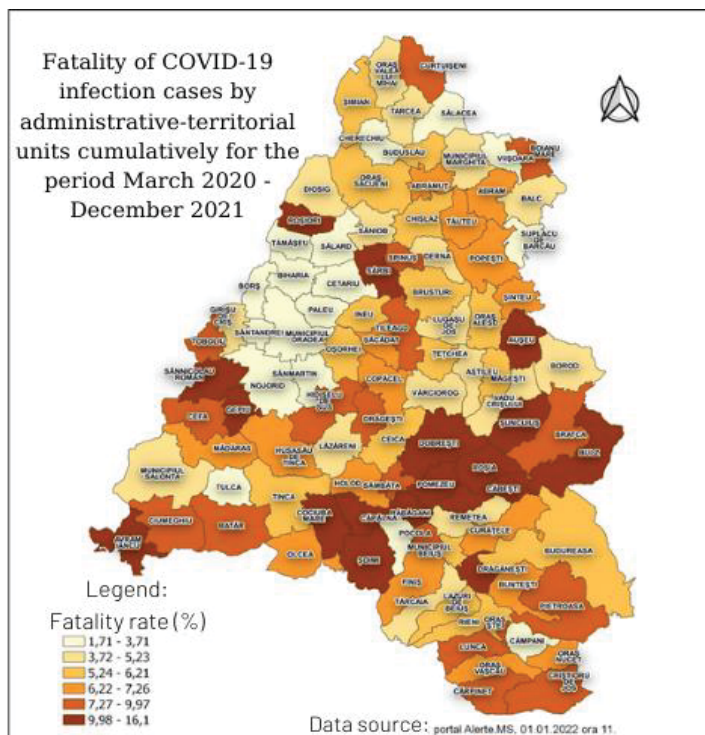
Figure 2. Fatality of COVID-19 cases by administrative-territorial units of Bihor County

DISCUSSIONS

In 10 of March 2020, 105 countries reported 114,253 cases of COVID-19 and 4,000 deaths. Since the start of the pandemic, declared on 11 March 2020 [8,9], all countries with a high number of cases have faced problems related to population access to healthcare. A decisive factor in the treatment of diseases is the distance to the healthcare provider. With the rapid increase in the number of the infections, COVID-19 has become considerably stressful for all healthcare institutions. According to a World Health Organization report (July 2020), globally there were 4534731 confirmed cases of COVID-19 along with 307537 deaths [8,9]. COVID-19 has now been reported from 216 countries [8,9]. Variations between countries and continents in the number of SARS CoV 2 cases are due to several factors: the timing of virus entry into the region and the length of time the virus circulated in the community until measures to stop the spread were applied, the demographic structure and health status of the population, and access to health care and the quality of the health system. Globally, the number of total cases remains on the rise. However, countries that experienced an explosion in the number of cases in the spring now seem to be experiencing a good, downward trend, while countries in the Americas and other countries with large populations are experiencing an alarming, rising rate of illness (Brazil, Peru, Chile, Mexico, India, Pakistan). Currently, the highest incidence is in the USA, India and Brazil with about 20,000, 17,000 and 11,000 new cases per 24 hours respectively [8,9]. The actual number of cases is not known, as many asymptomatic or minimally symptomatic infections go undiagnosed.

Bihor County, with a population of 612,754 inhabitants (by residence on 1 July 2021) is one of the 42 administrative-territorial units of Romania, located in the north-western part of the country [10]. From the beginning of the pandemic until 31 January 2022 (inclusive), 67,374 cases of COVID-19 infection have been diagnosed in Bihor county, of which 16,574 cases in January 2022 [5].

Both, national and county registration of COVID-19 cases are based on the population of county administrative units (communes, towns, municipalities). In Bihor county there are 101 administrative-territorial units. The population of each administrative-territorial unit, automatically updated in the Alerte.MS portal, is taken as a reference when calculating the cumulative incidence of cases per 1000 inhabitants per administrative-territorial unit. Cumulative data at the end of 2020 and 2021 were published in the annual activity report of the Bihor Public Health Department [5]. According to the data recorded in the database of Bihor Public Health Department the number of newly confirmed cases per month from March 2020 to January 2022 increased in the last trimester of 2021.

The extent of a public health problem is also evidenced by the fatality of illness. Fatality is expressed as the proportion of deaths in cases of disease from a given cause. For COVID-19 cases, based on data on illness cases and deaths registered in the Coronaforms and Alerte.MS portal by administrative-territorial units, it was possible to calculate the case fatality of COVID-19 cases by administrative-territorial units cumulatively for the period March 2020 - December 2021. Therefore, we observed that in some regions of Bihor County like Şuncuiuş, Bulz, Roşia, Căpâlna, and others the fatality rate of COVID-19 was up to 16%. According to national legislation [5], nine health assessment centers for newly confirmed COVID-19 cases have been operating in Bihor county since January. The assessment centers provide consultations for confirmed cases with associated diseases based on patient scheduling at these centers. Following the consultation in these centers it can be decided whether the patient has "indications/contraindications for antiviral medication and whether they require day or continuous hospitalization" [5]. For confirmed asymptomatic cases, monitoring during home isolation is carried out by the GP. Patients with moderate/severe COVID-19 benefit from continuous hospitalization in COVID-19 wards. Patient transport to the assessment center can be done by medical transport service (ambulance) or by individual transport without using public transport. A table with the locations of the nine assessment centers, the telephone number and the activity programme of each centre is posted on the website of the Bihor Public Health Directorate [10]. Access to health services refers to the extent to which a person can benefit from the services they need [6]. If health services are available, they can be obtained by those who need them, even so, sometimes there are limitations in the use of appropriate services due to geographical, organizational, financial barriers etc.

Current legislation does not provide recommendations for COVID-19 patients regarding geographic accessibility (e.g., optimal distance to a collection/assessment or treatment center). During the COVID-19 pandemic, public and some private health care facilities were fully or partially dedicated to the diagnosis and treatment of COVID-19 patients, with variations in the number of COVID-19 beds depending on the number of cases detected [11-13]. The study demonstrates the travel time required for referral to evaluation services of confirmed SARS-CoV-2 cases (mild and medium forms with associated pathology) for Bihor county localities. Subsequent studies, after a period of activity of the centres, will be able to assess the extent to which the population has benefited from these services, the territorial distribution of the cases evaluated per center and their origin from the localities of Bihor county. The uptake of telemedicine has accelerated rapidly since the onset of the COVID-19 pandemic. Telemedicine provides easy access to medical care, decreases the risk of disease transmission through physical distance, but allows professional assistance to mild and moderate forms [14, 15].

CONCLUSIONS

The study that we conducted may provide key information for the development of health policies that promote safety and well-being in relation to the risks associated with COVID-19. Data are provided on areas with reduced access to healthcare resources. Accessibility to health services is essential; even one neglected location can have adverse consequences. The paper is a starting point for future studies (after a period of operation of the centres) on addressability and accessibility to services for the assessment of patients confirmed with COVID-19.

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