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Impact of COVID-19 Pandemic on Refugees, Migrants and Asylum Seekers Living in Camps and Reception and Identification Centers in Greece in the Pre-Vaccination Period, February 2020 to May 2021: Summary of Epidemiological Findings

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Abstract

Background: Protection of refugees, migrants, and asylum seekers living in open hosting camps (HCs) and reception and identification centers (RICs) has been a priority since the beginning of the COVID-19 pandemic. We present the epidemiological data of COVID-19 infection in HCs/RICs in Greece from February 2020 to May 2021, before the initiation of the onsite vaccinations.

Aim: To summarize the epidemiological data in the population and assess the implemented practices in order the appropriate adjustments to be made.

Methods: Case confirmation was performed by rapid antigenic test and/or RT-PCR. Data were retrieved from the National COVID-19 registry. The notification rate by type of accommodation facility, by sex and ethnicity and the mean age of cases, were calculated for HCs, RICs and general population. Data on clinical manifestations, and disease severity (admissions to intensive care unit (ICU)/case fatality rate) were analyzed.

Results: Of the 397,497 recorded domestic COVID-19 infection cases, 2,609 (0.7%) regarded HCs/RICs; of them 1,566 (60%) were identified in 27 HCs and 1,043 (40%) in six RICs. The notification rate was 542 and 380 cases per 10,000 population in HCs/RICs and the general population, respectively (p-value<0.001).

Up to February 2021 the occurrence of cases in HCs/RICs did not follow the occurrence of cases in the general population. After March 2021 the course of the outbreak in HCs/RICs and the general population was similar.

The median age of cases in HCs/RICs and the general population was 27 (range: 0-81) and 44 (range: 0-106), respectively (p<0.001). Twenty-four different ethnicities were reported among migrant cases; 51% were from Afghanistan, 13% from Syria, 6% from Kongo and 5% from Somalia.

Overall, 48% and 80% of cases, respectively in HCs/RICs and the general population were symptomatic (p<0.001). Five (0.2%) cases in HCs/RICs were admitted to the ICU compared to 10,426 cases (3.0%) in the general population (p-value <0.001). Case fatality rate was 3% in the general population and 0.08% in HCs/RICs (p-value <0.001).

Conclusion: Recorded COVID-19 infections were less severe in migrants living at HCs/RICs than the general population, however, the number of identified cases was high and measures for the prevention of transmission should be strengthened.

Keywords: COVID-19; Pandemic; Migrants; Refugees; Identification centers; Global health

Abbreviations: HCs : Hosting Camps; ICU: Intensive Care Unit; UnHCR: United Nations High Commissioner for Refugees; ECHO: European Civil Protection and Humanitarian Aid Operations; NUTS: Nomenclature of Territorial Units for Statistics.

Introduction

Within weeks after the novel coronavirus (severe acute respiratory syndrome coronavirus 2, SARS-CoV-2) was first detected in China in December 2019, it spread rapidly worldwide [1,2].

On 26/02 the first case of the disease was recorded in Greece [3]. Public health authorities introduced measures to reduce person-to-person transmission of COVID-19. At the time, the country was hosting over 186,000 newly arrived migrants, refugees, and asylum-seekers [4]. The early detection of cases and the prevention of transmission in the susceptible population living in hosting camps (HCs), and reception and identification centers (RICs) were set as one of the main priorities of the response system.

The main concern of public health authorities was that due to overcrowding, poor sanitation, and frequent close contact among residents (e.g., food lines, shared toilets, and shared washing facilities) COVID-19 could rapidly spread in such facilities [5-7].

In the last years, Greece turned from a previously mainly transit country for migrant populations, into a medium-term stay country.

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Newly arrived refugees and migrants entering Greece through the North-eastern Aegean Islands (Lesvos, Kos, Chios, Samos, Leros) and the Greek-Turkish land border in Evros in Northern Greece are placed at RICs and those assessed as vulnerable or eligible for asylum are transferred to HCs on the mainland until they are finally hosted at hostels, hotels, apartments or other community facilities under the initiatives of the United Nations High Commissioner for Refugees (UNHCR) and other European Civil Protection and Humanitarian Aid Operations (ECHO) partners [4,8].

The Greek Ministry of Migration and Asylum activated in April 2020 a plan for the management of COVID-19 infection cases in HCs and RICs, named "Agnodiki" [9]. A member of the personnel in each one of the accommodation facilities was designated as the COVID-19 contact person that had to organize the necessary interventions onsite for the identification of cases/outbreaks and the implementation of control and preventive measures.

At RICs all newly arrived refugees and migrants were tested upon arrival and put in 14-days quarantine in a separate facility [3].

On 3rd of June 2021 voluntary massive vaccinations against COVID-19 started in HCs/RICs. In this paper, we present the available epidemiological data of COVID-19 infection in the population of HCs and RICs in Greece since the beginning of the pandemic and up to the initiation of vaccinations and compare them with the respective data in the general population of the country. Our aim is to summarize the epidemiological data in the population and assess the implemented practices in order the appropriate adjustments to be made.

In this manuscript, we refer to refugees, asylum seekers and newly arrived migrants as migrants.

Methodology

Study population

The study population consisted of migrants residing in two types of open accommodation facilities in Greece: RICs and HCs. Migrants living in other facilities, hotels or apartments were not included in the analysis. Overall, there were 28 HCs and six RICs in place during the study period (February 2020 to May 2021). Data regarding Moria and Kara Tepe RICs on Lesvos were analysed together as the outburst of a fire on 09/09/2020 led to the destruction of Moria RIC and the transfer of the population to the new RIC of Kara Tepe a few days later, on 14/09/2020.

Surveillance data

The Greek National Public Health Organization (EODY) is by law the responsible entity in the country for the epidemiological surveillance and response for communicable and non-communicable diseases. In the context of the program "Emergency health response to refugee crisis", EODY coordinates surveillance of syndromic nature inside HCs and RICs *via* the "System for Epidemiological Surveillance at Points of Care for Refugees and Migrants" and provides medical services to the population inside the accommodation facilities [10].

All COVID-19 cases (symptomatic and asymptomatic) diagnosed at medical services or onsite at HCs and RICs are recorded to the National COVID-19 registry which was specifically designed for the management of the pandemic. Data for the general population and the population in HCs and RICs for the period February 2020 to May 2021 (date of sample collection) were retrieved from the registry.

During the first weeks of the pandemic in Greece, the laboratory capacity for the diagnosis of COVID-19 infection was limited. Only cases with a RT-PCR positive test were recorded at the National Registry. Respiratory specimens, either nasopharyngeal swabs or endotracheal aspirates, were collected mainly from symptomatic cases in medical services and few laboratories were designated by NPHO at that time for the performance of COVID-19 molecular testing. Migrants with respiratory symptoms in HCs/RICs were sent to the closest medical facility for PCR testing or their specimens were transferred to the designated laboratories in the main metropolitan cities. Diagnosed cases were recorded and notified through laboratory surveillance system collecting data from laboratories involved in COVID-19 diagnostics and were followed up. All migrants had access to the health care system free of charge. Close contacts were tested and isolated.

After the mitigation phase described above there was a substantial scale-up of the country's testing capacity over time. The testing strategy of the country changed and medical offices in HCs/RICs were provided with rapid tests to assure early identification of cases. After the 28th of November 2020 (date of sample collection) cases with a positive rapid test started to be recorded at the National COVID-19 registry without a PCR confirmation to be a prerequisite. However, all positive with rapid test specimens from HCs/RICs from Attica and North-eastern Aegean islands were sent to the Central Public Health laboratory of EODY for molecular testing.

From 25 January 2021 onwards, EODY organised voluntary mass screening of the population on a weekly basis in HCs and RICs as the COVID-19 situation in the country escalated. Total number of performed tests and number of positive cases were recorded on a weekly basis, and the positivity rate inside HCs/RICs was monitored.

Statistical analysis

The number of recorded cases for the first year of the pandemic in Greece by type of accommodation facility, demographic data (age, sex, ethnicity) and data on clinical manifestations and disease severity (Intensive Care Units (ICUs)/deaths) were analysed.

Cases diagnosed with COVID-19 infection upon arrival in the country or during the following quarantine of 14 days were excluded from the analysis. Workers/volunteers at RICs and HCs that were diagnosed with COVID-19 were reported separately as in most cases there was a parallel community transmission of the virus that made it difficult to epidemiologically link cases to the facilities. The , temporal distribution of cases, demographic characteristics, and severity of disease among migrants living at RICs were compared to the respective characteristics of the population at HCs. Comparison was also made between the migrant population of RICs/HCs and the general population. Imported cases were excluded from the number of cases in the general population. The temporal distribution of cases was depicted, also, by region and regional unit of the country (Nomenclature of Territorial Units for Statistics, NUTS 2 and NUTS 3). In each regional, regional units with HCs/RICs are presented. Regions with no HCs/RICs (Ionian Islands and Crete) or with only sporadic cases throughout the study period in the migrant population were not included in the analysis.

Due to substantial differences of the values in the two populations, semi-logarithmic scale was used to present the number of recorded cases in HC/RICs and the general population in the same figures. Population estimates were retrieved from the Hellenic Statistical Authority (census 2011). The monthly number of hosted populations at each HC and RIC as well as the demographic characteristics of the population (age and sex) were retrieved from the registries of the

Reception and Identification Service in Greece. The overall notification rate in HCs and RICs was calculated as the total number of recorded cases divided with the average monthly hosted population. P-values <0.05 were considered statistically significant. Data were analysed using Stata v16.1.

Results

Population hosted in HCs and RICs and testing on site

From February 2020 to May 2021, the population in RICs decreased by 75% (from 37,798 to 9,324) and in HCs by 20% (from 28,758 to 22,983). From the 25th of January 2021, when EODY started to broadly conduct voluntary screening inside HCs and RICs with the use of rapid tests, and up to 30 of May 2021, overall, 75,422 tests were performed in migrants. Of them, 1,920 (2.6%) tests were positive.

The weekly number of tests and positivity rate after the 24th of January 2021 among migrants is given in Figure 1.

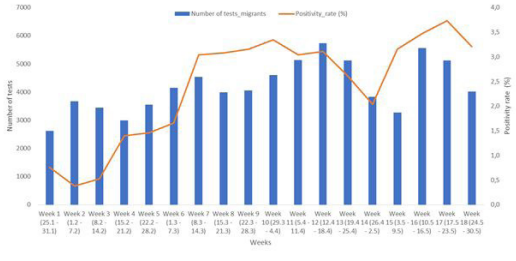

Figure 1: Weekly number of tests and positivity rate among migrants in hosting camps (HCs) and reception and identification centers (RICs), 25 January 2021-30 May 2021, Greece.**Note:** (▬) Number of tests_migrants, (▬) Positivity_rate(%).

COVID-19 infections in HCs and RICs

Out of the 403,774 recorded COVID-19 infection cases from February 2020 to May 2021 in the country, 397,497 were domestic. Of them, 1,566 cases were recorded among migrants in 27 different HCs, 1,043 in the six RICs of the North-Eastern Aegean and Evros and 160 cases in hotels and other community facilities. Cases in HCs/RICs accounted for 0.7% of the total number of recorded cases in the country.

The first case in the study population was identified at 30/3/2020 in one of the HCs of the mainland, in the region of Central Greece. Until the end of August 2020 very few cases were reported in the HCs/RICs population. In April 2020, two clusters were identified in two HCs in Attica and Central Greece, accounting for 3.4% of the total number of reported cases in the country at the time.

The epidemiological picture changed in September 2020 with the notification rate reaching a peak. In the following month's notification rate gradually decreased. The course of the outbreak in HCs and RICs was similar.

In March-May 2021 the number of recorded cases increased again in HCs and RICs. The highest notification rate was recorded in RICs in May 2021 whereas at whereas at the same time the notification rate in HCs started declining. The monthly notification rate for the two types of accommodation is presented in Figure 2. In HCs, 89% of recorded cases were diagnosed onsite during screening or contact tracing and the rest at local health care services. Respectively, for RICs 80% of cases were recorded onsite. The overall notification rate in the 16 months study period was 490 and 583 cases per 10,000 populations in RICs and HCs, respectively.

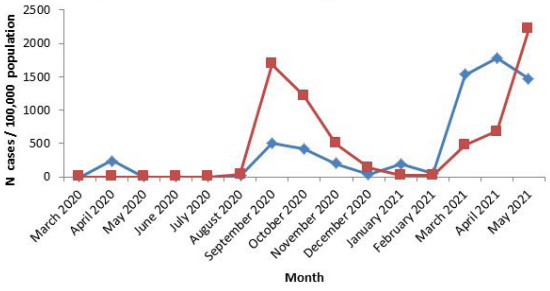

Figure 2: Monthly notification rate of COVID-19 infection in hosting camps (HCs) and reception and identification centers (RICs), February 2020-May 2021, Greece.**Note:** (▬) Cases per 100,000 population_HCs, (▬) Cases per 100,000 population_RICs.

Overall, 64% and 68% of the recorded cases were males at HCs and RICs; the median age of cases was 27 at HCs and 26 years at RICs, ranging between 0-81 and 0-69 years, respectively. Most cases in HCs/RICs (98%) aged less than 60 years of age.

Twenty-four different ethnicities were reported among cases. Most cases were from Afghanistan (51%), Syria (13%), Kongo (6%), and Somalia (5%). Symptoms were reported for 52% of the cases at HCs and 42% of the cases at RICs. Five cases from 4 different HCs and 1 RIC were admitted to the ICU and two died (case fatality rate: 0.08%). Cases in HCs/RICs were reported in 10 of the 13 regions of the country, in 19 regional units (Table 1). In Western Greece, Peloponnese, and Western Macedonia only sporadic cases were recorded. In each of these regions less than 10 cases were identified throughout the study period. Most cases were reported in the North Aegean region and more specifically in Lesvos. The first cases in Lesvos were identified in the RIC of Moria on 02/09/2020, however cases continued to be recorded when population was transferred to the new accommodation facilities in Kara Tepe. Transmission of the disease in Lesvos lasted for two months and 482 cases were overall recorded from 02/09/2020 to 15/02/2021. From 16/02/2021 to 9/4/2021 only six sporadic cases were recorded, followed by a new increase of the cases. Overall, 698 cases were recorded in Lesvos accounting for 67% of all cases in RICs, followed by 195 cases in Samos, 102 cases in Chios, 9 in Leros and 4 in Kos.COVID-19 infection in HCs and RICs compared to the general population. The notification rate was 542 cases per 10,000 population among migrants in HCs/RICs and 380 cases per 10,000 population in the general population (p-value<0.001).

The median age of cases in HCs/RICs and the general population was 27 (range: 0-81) and 44 (range: 0-106), respectively (p<0.001) and 66% of the cases were male in HCs/RICs compared to 51% in the general population (p<0.001).

The number of recorded COVID-19 cases and the notification rate in HCs/RICs and the general population by geographical region/regional unit are given in Table 1. The temporal distribution of cases differed among the geographical regions of the country. The course of the outbreak by region of the country is given in the following (Figure 3).

	Region	Regional Units*	No of cases migrant population**	Cases/10,000 population- migrant population***	No of cases- general population	Cases/10,000 population- general population
HCS	Attica	All region	479	529	26653	71
	Epirus	Ioanninon, Prevezas	345	1776	898	40
	Thessaly	Magnisias, Larisas	145	953	2783	59
	Central Macedonia	Thessalonis, Kilkis, Serron, Pierias, Imathias	209	277	7042	43
	Central Greece	Fthiotidas, Viotias, Evoias	221	487	2039	42
	Eastern Macedonia and Thrace	Dramas, Kavalas	156	1204	727	33
RICs	North-eastern Aegean	Lesvou, Samou, Chiou, Kalymnou (Leros), Kos	1008	232	559	67

Note: *Regions with no HCs/RICs (Ionian Islands and Crete) or with less than 10 cases throughout the study period in the migrant population (Western Greece, Peloponnese, and Western Macedonia) and the RIC in Evros with overall 29 cases are not included in the Table.
** Information on the regional unit (hosting facility) was missing for 11 cases in HCs and 6 cases in RICs.
*** Population estimates for the general population and the HC/RICs were retrieved from the Hellenic Statistical Authority (census 2011) and the registries of the Reception and Identification Service in Greece, respectively. For HCs/RICs the average monthly hosted population was used as a denominator.

Table 1: Number of recorded COVID-19 cases and notification rate in hosting camps (HCs), reception and identification centres (RICs) and the general population by geographical region, Greece, February 2020-May 2021, Greece.

Figure 3: Monthly distribution of cases in hosting camps (HCs) and reception and identification centres (RICs) and the general population by region, February 2020-May 2021, Greece.

During the first year of the pandemic (February 2020 to February 2021) the occurrence of cases in HCs/RICs did not follow the occurrence of cases in the general population. In November 2020 that the number of cases peaked in most regions of the country, the occurrence of cases in the migrants' facilities was quite stable. However, after March the course of the outbreak in HCs/RICs and the general population was similar.

In September-October 2020 the number of recorded cases in RICs exceeded the number of cases in the community due to the large outbreak in the RIC on Lesvos Island. The peak in the recorded cases in the RIC followed an increased number of cases in August in the general population in Lesvos. The proportion of symptomatic cases was 48% in HCs/RICs and 80% in the general population ($p<0.001$). Five (0.2%) cases in HCs/RICs were admitted to the ICU compared to 10,426 cases (3.0%) in the general population (p-value <0.001). Case fatality rate was 3% in the general population and 0.08% in HCs/RICs (p-value <0.001).

Discussion

The risk of COVID-19 infection in reception centers, and other accommodation facilities for refugees, migrants and asylum seekers has been documented in the literature, as living conditions in such facilities a priori hinder satisfactory implementation of social distancing and hygiene practices [5].

There are reports in the literature regarding large outbreaks of infectious diseases in such facilities [11]. Since the beginning of the pandemic, outbreaks of COVID-19 infection have been reported from several countries [12-14].

Studies analyzing the potential effects of COVID-19 on high-density refugee populations have also shown that large-scale outbreaks are likely to have substantial effects [15].

In Greece, the COVID-19 pandemic placed an enormous stress on the health care system affecting all sectors of life. From the beginning of the COVID-19 crisis, refugees and migrants were included in the preparedness plans for the outbreak response following the international guidelines [16,17]. As soon as rapid tests became available, medical services on site were provided with tests and voluntary mass testing was organized.

The number of identified cases in HCs and RICs accounted for less than 1% of the total number of recorded cases in the country. However, the notification rate in HCs/RICs was significantly higher than that of the general population.

The decreased number of arrivals in 2020 [7] and efforts for moving migrants from RICs to other facilities resulted in a decrease of the hosted population in RICs by 75% during the study period. Still, refugee resettlement plans were suspended because of the pandemic [7]. Further improvement of living conditions inside RICs, against factors that favor the transmission of COVID-19 infection, are needed [18].

Even though during the first year of the pandemic the temporal distribution of cases in HCs/RICs and the general population differed, after March 2021 the course of the outbreak in HCs/RICs and the general population was similar. Further studies on the SARS-CoV-2 circulating strains and variants in both the HCs/RICs and the general population, throughout the study period would provide useful data and might explain, at least to a certain degree, this finding.

Data showed that most recorded cases were diagnosed onsite during voluntary screening or contact tracing. Onsite testing led to the early identification of cases (mostly asymptomatic) and the reduced burden of the local medical facilities.

Even though the actual number of hospitalizations due to COVID-19 infection was not available, data on the proportion of symptomatic infections, on ICU admissions and deaths depicted that the disease was less severe among migrants in HCs/RICs compared to the general population. There might be other explanations for this finding; however there is evidence that young age has a protective effect against severe disease and mortality among those infected [19-21]. Age was significantly lower in migrants compared to the general population and a small proportion of the migrants' population was more than 60 years old. We can also assume that chronic diseases are less prevalent in the population of HCs and RICs either because of self-selective migration of the healthier people (healthy migration effect) or because vulnerable people are prioritized for transfer to other hosting facilities in the community [4,22,23]. Still, data on the health status of the hosted population in HCs/RICs were not available.

As shown by the long list of different nationalities of recorded cases, populations of hosted migrants are heterogeneous coming from different countries and backgrounds. Thus, the management of COVID-19 cases in HCs/RICs was burdened by linguistic, cultural, and social differences in the population. Cultural differences may also explain the lower burden of the disease among Syrians. They account for 7% of the cases while more than 20% of sea arrivals are from Syrian Arab Republic [7].

A main limitation of this study is the estimation of notification rates with the use of population estimates from the Hellenic Statistical Authority for the general population and the registries of the Reception and Identification Service in Greece for HCs and RICs. The "general population" contains other closed populations, people living in health care facilities and institutions. On the other hand, the population of the HCs/RICs was not stable through the study period and mobility of the population could not be assessed.

Conclusion

Overall, during the 16 first months of COVID-19 pandemic in Greece the risk of infection was higher in HCs/RICs compared to the general population, however the impact of the disease as far as ICU admissions and fatalities is concerned was low.

Voluntary massive vaccinations against COVID-19 in HCs/RICs will hopefully prevent the occurrence of new clusters among the hosted population is such settings in the future.

Declarations

Ethics approval and consent to participate

The current study was approved by the National Public Health Organization Research Ethics Committee. The study was conducted according to the guidelines of the Declaration of Helsinki. No personal data were used for the preparation of this manuscript. All data were anonymised and retrieved from the Mandatory Notification System (COVID-19 registry) in Greece. The informed consent was waived for the study by the National Public Health Organization Research Ethics Committee.

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Availability of Data Materials

The datasets used and/or analyzed during the current study are freely available from the corresponding author on reasonable request.

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