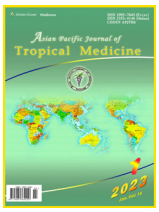

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Sociodemographic and clinical characteristics of SARS−CoV−2 infected population during the second and third epidemiological waves in Sri Lanka

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ABSTRACT

Objective: To analyze data on socio-demographic and clinical characteristics of SARS-CoV-2 infected population whose samples were received from Medical Research Institute, Sri Lanka.

Methods: Laboratory based retrospective study was done on patient samples which were tested positive for SARS-CoV-2 by National Reference Virology Laboratory at the Medical Research Institute, Sri Lanka, from November, 2020 to November, 2021. Data on socio-demographic characteristics and clinical presentation of 13 126 patients were examined.

Results: The mean age of the study population was (36.0±7.2) years and the majority were men (64.0%). The highest number of positive cases were found in the 21-30 years-of-age group. Two distinct peaks were noted in the incidence of SARS-CoV-2 positive individuals. In addition, 42.5% of the positive samples tested positive (42.5%) were from Medical Officer of Health collection centres. Furthermore, 60.6% (7951) of the infected subjects were asymptomatic whereas the remaining were symptomatic. The highest percentage of symptomatic patients were observed in the 91-100 years-of-age group while the highest asymptomatic subjects were found in the 31-40 years-of-age group. The percentage of asymptomatic children (65.3%) was significantly (P<0.05) higher than that of adults (43.4%).

Conclusions: The findings of this study aid decision makers to focus on the vulnerable groups, and geographic and temporal distribution of patients in the public health strategies that aim at preventing the spread of the disease and reducinig its mortalities.

KEYWORDS: COVID-19; SARS-CoV-2; Socio-demographic; Clinical

1. Introduction

A novel coronavirus known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has been rapidly spreading throughout the globe since early 2020. Coronavirus disease 2019 was the term given to the illness it produced (COVID-19). The first case of COVID-19 was officially confirmed in Sri Lanka on 27th January, 2020 and the first confirmed local case was reported on 11th March, 2020. Since then, the number of cases has fluctuated over time[1]. According to the World Health Organization (WHO), Sri Lanka has reported 671 334 COVID-19 cases and 16 782 coronavirus deaths up to now[2]. The reporting of epidemiological data regarding the COVID-19 pandemic was based on three distinct waves. The first, second, and third waves were observed, respectively, from January 2020 to October 2020, from October 2020 to April 2021, and from April 2021 to June 2021.

Patients with COVID-19 might present clinical characteristics ranging from asymptomatic infection to severe pneumonia. Additionally, multiorgan failure and acute respiratory distress syndrome were listed as the clinical characteristics of severe cases[3]. As a result, research on the clinical traits of the affected patients is crucial for COVID-19 screening and diagnosis. Clinical

Significance

In Sri Lanka, sociodemographic and clinical characteristics of SARS-CoV-2 infected individuals were less evaluated so far for a large size of sample. The findings of this study indicate that SARS-CoV-2 infection is influenced by age and sex-related sociodemographic factors. Asymptomatic infections play a significant role since they were more common in society. In public health strategies aimed at preventing the spread of the disease and its deaths, our findings assist decision-makers in highlighting vulnerable groups and their temporal and geographical distribution.

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characteristics may be influenced by a number of variables such as virus strain which is currently in circulation, ethnicity, mean population age, sex, geographic location, humidity, climate and other country-specific variables including overcrowding[4].

The management of the SARS-CoV-2 infection in the community and the early detection of acute infection in both symptomatic and asymptomatic patients are crucial. The primary method of preventing widespread community infection with the SARS-CoV-2 virus is early diagnosis along with contact tracing, quarantining of exposed contacts, and other preventative measures[1]. COVID-19 predominantly affects adults, whereas children are mostly asymptomatic or affected by less severe clinical pictures (fever, cough, runny nose, nasal congestion, fatigue)[5].

It is essential to describe the clinical characteristics and related outcomes of patients diagnosed with coronavirus disease for a better understand of the disease, allocate resources to individuals who are most likely to have a severe outcome and manage the pandemic.

The features and outcomes of various cohorts of COVID-19 patients have been outlined in numerous researches undertaken internationally[6–9]. However, the majority of studies were single-center and concentrate on patients who are hospitalized. There are limited publications on COVID-19 patients from multi-centered group of patients in local contexts. This study, which included both symptomatic and asymptomatic patients with different age groups who had been diagnosed with COVID-19, was done to give a broader view of the disease. The objective of the study was to examine the sociodemographic (age, sex) and clinical traits (symptomatic/asymptomatic) of 13 126 SARS-CoV-2 positive patients whose samples were sent to National Reference Virology Center, Sri Lanka.

2. Subjects and methods

2.1. Study design

This laboratory based retrospective study was done over a period of one-year (November, 2020-November, 2021) during the second and third waves of the COVID-19 pandemic. Nasopharyngeal swabs/aspirates from different hospitals and collection centers received from National Reference Virology Laboratory, Medical Research Institute (MRI), Sri Lanka, were used for this study. Results were obtained from the real-time PCR assays which were performed by using commercial kits [Altona Real Star SARS-CoV-2 RT-PCR kit, Altona Diagnostics; Novel coronavirus (2019-nCoV) nucleic acid diagnostic kit, Sansure Biotech; Detection kit for 2019 novel coronavirus (2019-nCoV) RNA (PCR-fluorescence probing), DaANGene Co. Ltd; COVID-19 real-time PCR kit (fluorescent PCR method), Hybribio Biotech] SARS-CoV-2 positive, clinical and sociodemographic records available, 13 126 patients were included in this study. Request forms were reviewed to assess demographic and clinical factors, including age, sex and clinical presentation of symptoms.

2.2. Statistical analysis

Descriptive statistics (absolute number and percentage) were used to show the characteristics of the study population. Demographic and clinical characteristics evaluated using two-sample t-test. Significance level was set at $\alpha<0.05$. All analyses were conducted using statistical software SPSS 26.

2.3. Ethical approval

Ethics approval were waived for this study because no individual patients' data were reported. We declare that our research thoroughly adheres to all the ethical guidelines in concern.

3. Results

Laboratory-confirmed 13 126 SARS-CoV-2 positive samples were used for this study. These samples were received from centers including hospitals, Medical Officer of Health (MOH) areas, prisons, and other collection centers in Sri Lanka. Most of the SARS-CoV-2 positive samples were received from Western Province (Figure 1). The mean age is (36.0±17.2) years (ranging from 1 day to 96 years old) with 68% of cases aged between 18 and 53 years. Among positive cases, 8 400 (64.0%) were male, 4 726 (36.0%) were female. In this study, less than 18-year-old patients were considered as children and others were considered as adults.

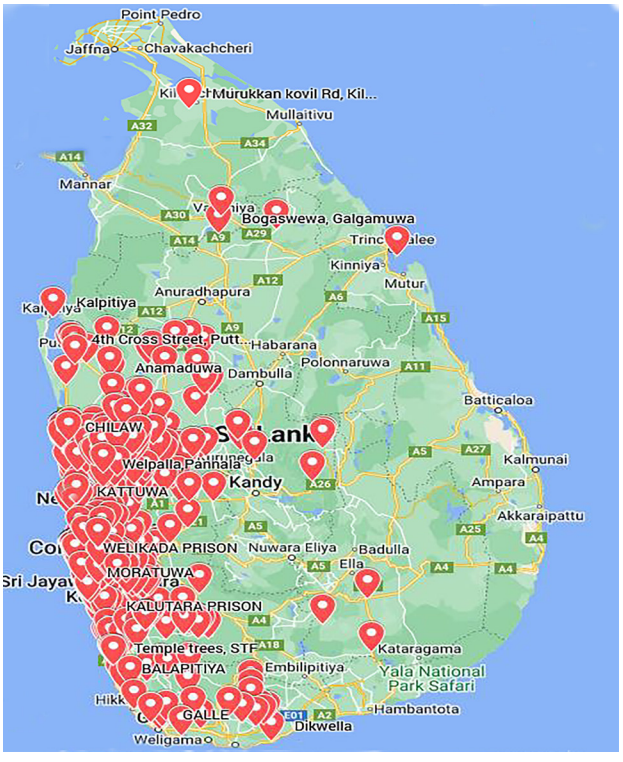

Figure 1. Geographical distribution of SARS-CoV-2 infected individuals whose samples were tested positive by Virology Laboratory, MRI, Sri Lanka from November 2020 to November 2021.

The highest number of SARS-CoV-2 positive individuals was observed in (21-30) age group while the lowest was in (90-100) age group. The number of male patients were higher than that of female patients in most of the age groups (Figure 2).

The results of the study showed that the most COVID-19 cases were recorded in the periods of November, 2020 to February, 2021 and March, 2021 to October, 2021. However, the highest incidence of COVID-19 cases was recorded during the months of January and May 2021 (Figure 3A and 3B). The incidence of male COVID-19 cases was higher than that of female patients throughout the period of study (Figure 3B).

From the SARS-CoV-2 positive samples, 42.5% of the samples were received from MOH collection centers, followed by hospitals (36.0%), prisons (16.8%) and other collection centers (0.42%). Samples from Base hospitals and District General hospitals were mainly included in hospital samples.

Percentage of asymptomatic SARS-CoV-2 positive individuals (60.6%, 7951) were significantly higher than that of symptomatic (39.4%, 5175) (P<0.05). In both asymptomatic and symptomatic individuals, percentage of male individuals (68.1%, 57.6%) were higher than that of the female patients (31.8%, 42.4%).

The highest percentage of symptomatic individuals were observed in (91-100) age group while the highest asymptomatic individuals were found in (31-40) age group (Figure 4). Number of total adults were 11973 and number of total children were 1153. Percentage of asymptomatic SARS-CoV-2 positive children (65.3%) were significantly (P<0.05) higher than that of adults (43.4%).

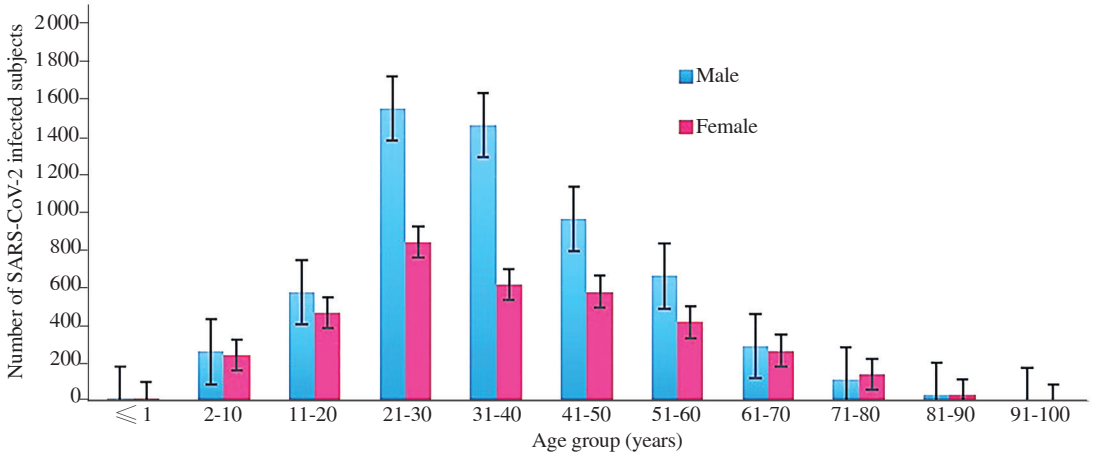

Figure 2. Age and sex distribution of SARS-CoV-2 infected subjects.

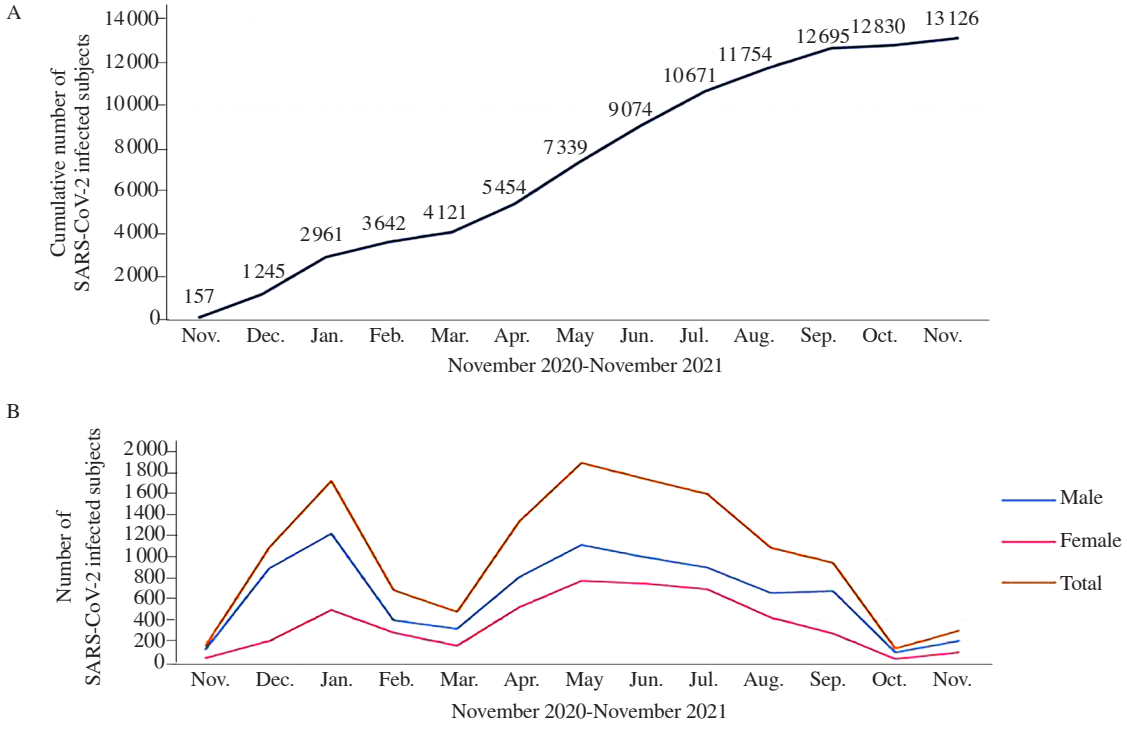

Figure 3. Temporal distribution of SARS-CoV-2 infected subjects from November 2020 to November 2021. (A) Cumulative total of SARS-CoV-2 infected subjects; (B) Monthly confirmed SARS-CoV-2 infected subjects.

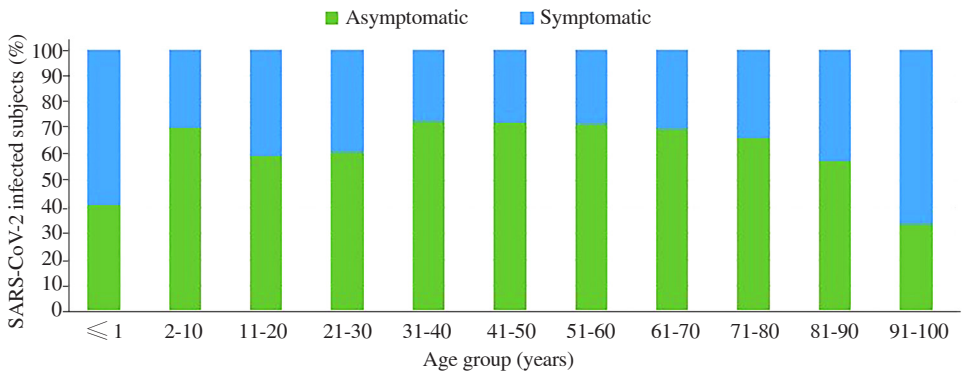

Figure 4. Age distribution and clinical presentation of SARS-CoV-2 infected subjects.

4. Discussion

Study on sociodemographic and clinical characteristics of COVID-19 patients is very important in epidemiological management. According to a study done by Herath *et al*, epidemiological prognostic risk factors were considered to be males, older age (over 65 years), smokers, and suffering from obesity, diabetes, chronic lung disease, hypertension, cardiovascular disease, and chronic kidney disease[4].

The current study revealed that the percentage of male SARS-CoV-2 infected individuals were significantly (P<0.05) higher (64.0%) than that of female SARS-CoV-2 infected individuals (36.0%). These results were compatible with the report issued by Worldwide Extreme Intense Respiratory and Developing Contaminations Consortium[10] based on the cases from 240 locales over 25 nations and the status report issued by the Sri Lanka Epidemiology Unit. The reasons behind this as elaborated in the study done by Bwire were biological differences in the immune systems between men and women, life style differences such as higher levels of smoking and drinking among men, responsibility and the attitude toward the COVID-19 pandemic[11].

One of the most significant clinical characteristics of COVID-19 appears to be asymptomatic transmission. Even those who are asymptomatic can spread the virus, but it can be difficult to predict their impact on epidemics[12]. It is debatable whether asymptomatic infections serve as "silent triggers" of COVID-19 dissemination. The most significant data come from epidemiological investigations that concentrate on contact tracing and which explicitly ascertain if and to what extent illnesses developed in the close contacts of asymptomatic or pre-symptomatic individuals. In our investigation, the majority of the asymptomatic SARS-CoV-2 infected individuals were identified from the COVID-19 contact tracing and screening by MOH areas. Parallel to our study results, a meta-analysis done by Qiuyue Ma *et al*. also showed a significant fraction (40.50%) of individuals had asymptomatic infections among the confirmed population[13]. Furthermore, since diseased individuals would isolate, asymptomatic persons may have more contacts than those who have symptoms. This fact is important to consider the role that asymptomatic cases play in the spread of COVID-19 in the community. Thus, to control the pandemic, identifying asymptomatic infections is critical. The absence of symptoms might not necessarily imply an absence of harm in COVID-19 patients. Therefore, further studies are needed to determine the significance of subclinical lung changes visible on computed scans[14].

According to present study results, almost all hospitalized patients showed one or more symptoms such as fever, runny nose, cough, nasal congestion and fatigue. A study done by Guan *et al*. observed fever in 88.7% of patients among 1 099 hospitalized patients in China at the beginning of the COVID-19 epidemic[15]. Similar to this, a study carried out in a tertiary care hospital in Pune, India, revealed that a higher percentage (75%) of hospitalized cases were symptomatic[4]. However, due to difficulty in gathering precise data on clinical symptoms for a large number of patients in this study, it was taken into account whether a patient was symptomatic or not.

Comparable to the results of this study, earlier studies indicated that the majority of children appeared to have asymptomatic or mildly symptomatic illnesses[16–18]. A review of the electronic health records of 82 798 US children under the age of 18 with laboratory-confirmed SARS-CoV-2 infection revealed that 66% of them had no symptoms and 27% had mild ones and children of all ages can be affected by SARS-CoV-2. In 2020, a systematic review investigating the symptoms and signs in children under 20 years of age with established SARS-CoV-2 infection stated that the incidence of asymptomatic infections ranged from 15% to 42%[3]. Another study found that the clinical manifestation of symptomatic SARS-CoV-2 infection in children varies and frequently coexists with other clinical syndromes, including gastroenteritis, pneumonia, bronchiolitis, croup, and lung injury related to the use of e-cigarettes or vaping products[19].

Although they may seem evident, geographic aspects of recent COVID-19 instances have not been thoroughly investigated in relation to the range of patient-level clinical characteristics. However,

in this study, most of the positive patients were concentrated to Western province due to high population density and the most of the samples received from nearby hospitals and collection centers to MRI.

According to former study done by Phuong *et al*, overall, geographic, demographic, and socioeconomic features were more explosively associated with original SARS-CoV-2 test positivity than clinical characteristics across all visit types examined, indeed though a combination of sociodemographic and clinical features produced the more expressive predictive performance[20].

Study on temporal distribution of SARS-CoV-2 infected individuals is another important aspect in its management. There were two distinguishable phases where the incidence rate of SARS-CoV-2 infected individuals was high. These phases were observed in November 2020 to February 2021 (peak-January) and March 2021 to October 2021 (peak-May). These findings were consistent with the epidemiological data collected in Sri Lanka during the COVID-19 second and third waves. The Northeast monsoon season (December-February) and the Southwest monsoon season (May-September) are the two climatic seasons in Sri Lanka based on rainfall patterns. Our results suggest that the occurrence of SARS-CoV-2 infected individuals and the rainfall pattern may be related. However, this should be substantiated by further studies.

Due to the ease of gathering information from large number of patients' request forms, we simply considered age and sex as the key sociodemographic characteristics in this investigation. However, there is a great deal of other significant sociodemographic factors that need to be researched.

The findings of the study indicate that SARS-CoV-2 infection is influenced by age and sex-related sociodemographic factors. Asymptomatic SARS-CoV-2 infected individuals were more common in society. In public health strategies aimed at preventing the spread of the disease and its deaths, our findings assist decision-makers in highlighting the vulnerable groups and their temporal and geographical distribution.

Conflict of interest statement

All authors declare there is no conflict of interest.

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Authors' contributions

HBCH and JIA developed the theoretical formalism. HBCH performed the analytic calculations and performed the numerical simulations. HBCH, JIA, RTW, GW and CJSJ contributed to the final version of the manuscript. JIA and CJSJ supervised the project.

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