The Prevalence and Severity Comparison of COVID-19 Disease in SAARC Affiliated Countries: Pattern Analysis during the First Wave in 2020

Prevalência e gravidade da COVID-19 em países afiliados à SAARC: análise de padrões durante a primeira onda em 2020

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Abstract

Objectives: This study aimed to explore the prevalence and severity of COVID-19 disease in SAARC affiliated countries and show the comparison by analyzing the patterns of infections, recoveries, and deaths among the countries. **Methods:** The data related to COVID-19 of SAARC affiliated countries were collected from Worldometer in which the dataset consists of daily confirmed, recovery, and death cases. To compare the prevalence and severity of COVID-19 among these countries, we consider three parameters such as case fatality rate (CFR), recovery-to-death ratio (RDR), and percent active case (PAC). **Results**: The highest daily CFR among the SAARC affiliated countries was in Bangladesh followed by Afghanistan, India, Sri Lanka, Pakistan, Nepal and the Maldives according to the maximum CFR of the countries until 24 October 2020. The highest RDR among the SAARC affiliated countries was in Nepal followed by the Maldives, Sri Lanka, India, Bangladesh, Pakistan, Afghanistan until 24 October. The most prevalent country according to infection per million people by COVID-19 among the SAARC affiliated countries is the Maldives followed by India, Nepal, Bangladesh, Pakistan, Afghanistan, Bhutan, and Sri Lanka as of October 24. The most death prevalent country per million people is India followed by the Maldives, Afghanistan, Bangladesh, Pakistan, Nepal, Sri Lanka, and no people died in Bhutan until October 24, 2020. **Conclusion**: This study shows that the severity of COVID-19 is high in the Maldives in terms of infections and India in terms of deaths per million in SAARC, so India is at high risk among the countries.

Keywords: SAARC. COVID-19; Pandemic; Fatality; Infection.

Resumo

Objetivos: Este estudo teve como objetivo explorar a prevalência e gravidade da doença COVID-19 em países afiliados à SAARC e mostrar a comparação por meio da análise dos padrões de infecções, recuperações e mortes entre os países. **Métodos**: Os dados relacionados ao COVID-19 dos países afiliados à SAARC foram coletados do worldometer no qual o conjunto de dados consiste em casos diários confirmados, de recuperação e de óbito. Para comparar a prevalência e gravidade de COVID-19 entre esses países, consideramos três parâmetros, como taxa de letalidade (CFR), razão de recuperação para óbito (RDR) e porcentagem de casos ativos (PAC). **Resultados**: O CFR diário mais alto entre os países afiliados da SAARC foi em Bangladesh, seguido pelo Afeganistão, Índia, Sri Lanka, Paquistão, Nepal, Maldivas, de acordo com o CFR máximo dos países até 24 de outubro de 2020. O RDR mais alto entre os países afiliados da SAARC foi no Nepal, seguido por Maldivas, Sri Lanka, Índia, Bangladesh, Paquistão, Afeganistão até 24 de outubro. O país mais prevalente, de acordo com a infecção por milhão de pessoas por COVID-19 entre os países afiliados à SAARC, é as Maldivas, seguido pela Índia, Nepal, Bangladesh, Paquistão, Afeganistão, Butão e Sri Lanka em 24 de outubro. País com maior prevalência de morte em por milhão de pessoas é a Índia, seguida por Maldivas, Afeganistão, Bangladesh, Paquistão, Nepal, Sri Lanka, e nenhuma pessoa morreu no Butão até 24 de outubro de 2020. **Conclusão**: Este estudo mostra que a gravidade do COVID-19 é alta nas Maldivas em termos de infecções e na Índia, em termos de mortes por milhão na SAARC. Portanto, a Índia está em alto risco entre os países.

Palavras-chave: SAARC; COVID-19; Pandemia; Fatalidade; Infecção.

INTRODUCTION

Since December 2019, starting from Wuhan, People's Republic of China, the World Health Organization (WHO) reported Coronavirus disease (COVID-19) has spread across most of the countries of the world[1]. Coronavirus, also known as SARS-CoV-2 has already shown its frightening and deadly nature not only in developing countries but also in developed countries. Many people are dying across the world every day. According to Worldometer[2], there exist 43004754 Coronavirus cases all over the world until 24 October 2020. Among them 1156954 people died, 31741280 affected people are recovered from the deadly disease and therefore 10106520 active cases were under treatment. Moreover, a record 740,042 new cases are found around the world on December 17, 2020[2]. COVID-19 is an RNA virus that affects raspatory and spreads between people through direct or indirect contact with infected people[3]. When an infected person coughs, sneezes, talks or sings, droplets or saliva comes out from his mouth or nose. These droplets or saliva can infect another person who is in close contact with the

infected person[4]. If an infected person leaves saliva or droplets over fomites such as clothes, utensils, and furniture then other people touching the fomites can be infected. If a person gets infected, the most common symptoms of COVID-19 are fever (>38°C), dry cough, and fatigue[4]. There are some other less common symptoms affecting patients which include loss of taste or smell, nasal congestion, sore throat, headache, muscle or joint pain, skin rash, nausea or vomiting, diarrhea, and dizziness[4]. In addition, some people become infected but only have very mild symptoms.

To limit the infections, doctors and health professionals are suggesting people wear fabric masks if they get infected. Uninfected people should also wear a mask to protect themselves from this unwanted virus. Several countries are following locked down to protect their people from COVID-19. For example, the Indian Government announced four phases of nationwide lockdown between 25 March 2020 and 31 May 2020[5]. Moreover, educational institutions are still closed in most countries to protect students from the virus infection. Every person should keep at least a 1-meter distance from another person while they are in the same place such as market, shopping mall, bank, office, and many other similar places. In these circumstances, the severity of this virus is understandable from its transmission nature and precaution measures[6]. Therefore, scientists, doctors, researchers, health organizations, and others have come forward to limit its deadly nature and save the lives of people of the world. Furthermore, the USA, UK, China, Russia, India, Bangladesh and many other countries are trying to invent a vaccine to prevent the coronavirus. Recently, UK approved a vaccine produced by Pfizer and BioNTech for emergency use[7].

According to world population review[8], the South Asian Association for Regional Cooperation (SAARC) in Asia includes eight countries such as India, Bangladesh, Pakistan, Sri Lanka, Nepal, Bhutan, the Maldives, and Afghanistan. Furthermore, more than 1.7 billion people live in SAARC affiliated countries. Moreover, SAARC countries are also affected by SARS-CoV-2 as like rest of the world. Due to high population density and climate change, many people live under the poverty line in SAARC affiliated countries[9]. In addition, the coronavirus causes many people jobless[10]. The income of many small businessmen becomes low due to a lack of customers. Recently, Sultana and Reza noticed that whether SAARC countries are ready to combat COVID-19 while they analyze data from 1 March to 20 June, 2020[11]. They only showed the total number of infected cases, the number of tests, and tests per million people in SAARC countries until June 20, 2020.

Earlier studies[12] show that the number of infected is rising quickly in India. They also show a comparative analysis of India with other SAARC countries to assess the level of spreading COVID-19 in the south Asian region. Dey et al.[13] showed that India has reported the highest number of confirmed cases until May 30, 2020. Though the other SAARC countries show an increasing trend for infection, their recovery rate is also rising over time.

Siam et al.[14] showed that cumulative incidence in South Asia was very slow compared to the USA and EU. South Asia also has a lower mortality rate than the EU and the USA. The case fatality rate (CFR) of India due to SARS-CoV-2 had an upward trend from March 15 to April 12, 2020, then slightly reduced until 20 April, 2020[15]. The CFR of Bangladesh due to SARS-CoV-2 had a downward trend from April 08 to May 09, 2020 and the recovery to death ratio (RDR) had an upward trend from April 26 to May 09, 2020[16]. Saima et al.[17] compared the trends of the CFR in the Eastern Mediterranean Region (EMR) taking data from February 14 to April 26, 2020 and the CFR of Pakistan was found 2.1% which was moderate compared to other countries. The CFR in Afghanistan was found 1.63% taking data from February 24 to June 4, 2020[18]. Overall CFR in Nepal was found 0.28% until June 2020[19]. Daily active cases which are the daily patients who are under treatment showed a downward pattern from May 03 to August 29, 2020 in Bangladesh[20].

To our knowledge, no author analyzes the pattern of prevalence and severity of COVID-19 of SAARC countries and showed its impact on their population using the data until 24 October 2020. Therefore, we analyze the pattern of prevalence and severity of COVID-19 in SAARC affiliated countries.

METHODOLOGY

Data source

In this study, we have collected the data of all SAARC countries from [worldometerinfo] daily basis by observing daily data. We choose the starting date of our collected data depending on the first date when every country in SAARC has at least one active case. The starting date is 8 March 2020. We took the dataset for 232 days until 24 October 2020. The collected data of every country are cross-checked with the data published by the health service authority of the respective country.

Statistical Methods

The case fatality rate (CFR) is the most used method to measure the risk of dying. To reveal the severity of deaths compared to infection, the case fatality rate (CFR) is used. The CFR is defined by dividing the number of deaths from a specified disease over a defined period by the number of individuals diagnosed with the disease during that time and the resulting ratio is then expressed as a percentage multiplying by 100[21]. The Recovery-to-death ratio (RDR) is the ratio of the cumulative number of patients recovering from a disease divided by the cumulative number of deaths over the same time by that disease. The RDR states the proportion of patients recovering compared to dying by a disease. An upward trend may indicate more recovery than deaths. A downward trending suggests a slow growth of the event over time. Active cases are determined by subtracting cumulative recovery and deaths from cumulative infections and are those who are under treatment. The percent active cases (PAC) to infections have been computed by dividing daily active cases by cumulative infections at the same time and multiplied

by 100. Graphical presentations were used to see the trend of incidences. Statistical analysis was done using the R 4.0.2 version of statistical software. We performed the data entry and conversion using Microsoft Excel (version 13).

RESULTS

The current situation of COVID-19 in SAARC affiliated countries until October 24, 2020 is shown in Figure 1. Total infections, recovery, and deaths in India were 7863892, 7075719, and 118567 respectively whereas they were 327063, 310101, and 6727 respectively in Pakistan. Moreover, total infections, recovery, and deaths in Bangladesh were 397507, 313563, and 5780 respectively. In Afghanistan, total infections, recovery, and deaths were 40768, 34023, and 1511 respectively. In Bhutan, total infections, recovery, and deaths were 336, 306, and no deaths respectively. Total infections, recovery, and deaths in the Maldives were 11421, 10472, and 37, 155233, 108334, and 842 in Nepal, 7521, 3714, and 15 in Sri Lanka respectively until October 24, 2020. At the beginning of the outbreak, COVID-19 infections increased very slowly in India and started rapidly increased from June, 2020. In India, Infections were exponentially high in July and showed slow growth in August. The COVID-19 patients increased very slowly in Pakistan at the starting and started rapidly increasing from June and showed slow growth until October, 2020. The COVID-19 infections increased slowly in Bangladesh at the starting of the outbreak and started rapidly increasing from June and decreased outbreak from August, 2020. The total COVID-19 infections increased slowly at the beginning and rapidly increased from June in the Maldives and Sri Lanka until October, 2020. The COVID-19 patients increased very slowly in Afghanistan at the starting of the outbreak and started rapidly increasing from May and showed slow growth until October, 2020. The COVID-19 patients increased very slowly in Nepal and Bhutan at the starting and started rapidly increasing from June, 2020 (Figure-1(A)). At the beginning of the outbreak, recovery increased very slowly and started rapidly increasing from May in India, Pakistan and Sri Lanka, and was exponentially high from July to October, 2020 in India. Recovery increased very slowly at the beginning and started rapidly increasing from June, 2020 in Bangladesh, Afghanistan, Bhutan, the Maldives, Nepal over time until October, 2020 (Figure-1(B)). At the beginning of the outbreak, deaths increased very slowly in India and started rapidly increasing from June, 2020. Deaths increased very slowly at the beginning and started rapidly increasing from May, 2020 and showed a slow growth from July to October, 2020 in Pakistan. Deaths increased very slowly at the beginning and started rapidly increasing from June and get slowed in October, 2020 in Bangladesh. Deaths increased very slowly at the beginning and started rapidly increasing from May, 2020 and showed slow growth in October in Afghanistan. There were no deaths in Bhutan until October, 2020. Deaths in Nepal had a very slow increase until August and then had an increasing pattern. Deaths in the Maldives and Sri Lanka had no specific patterns which were fluctuated randomly (Figure-1(C)).

Figure 1. COVID-19 in SAARC affiliated countries. A) Daily cumulative infections in SAARC affiliated countries; B) Daily cumulative recovery in SAARC affiliated countries; C) Daily cumulative deaths in SAARC affiliated countries as of October 24, 2020.
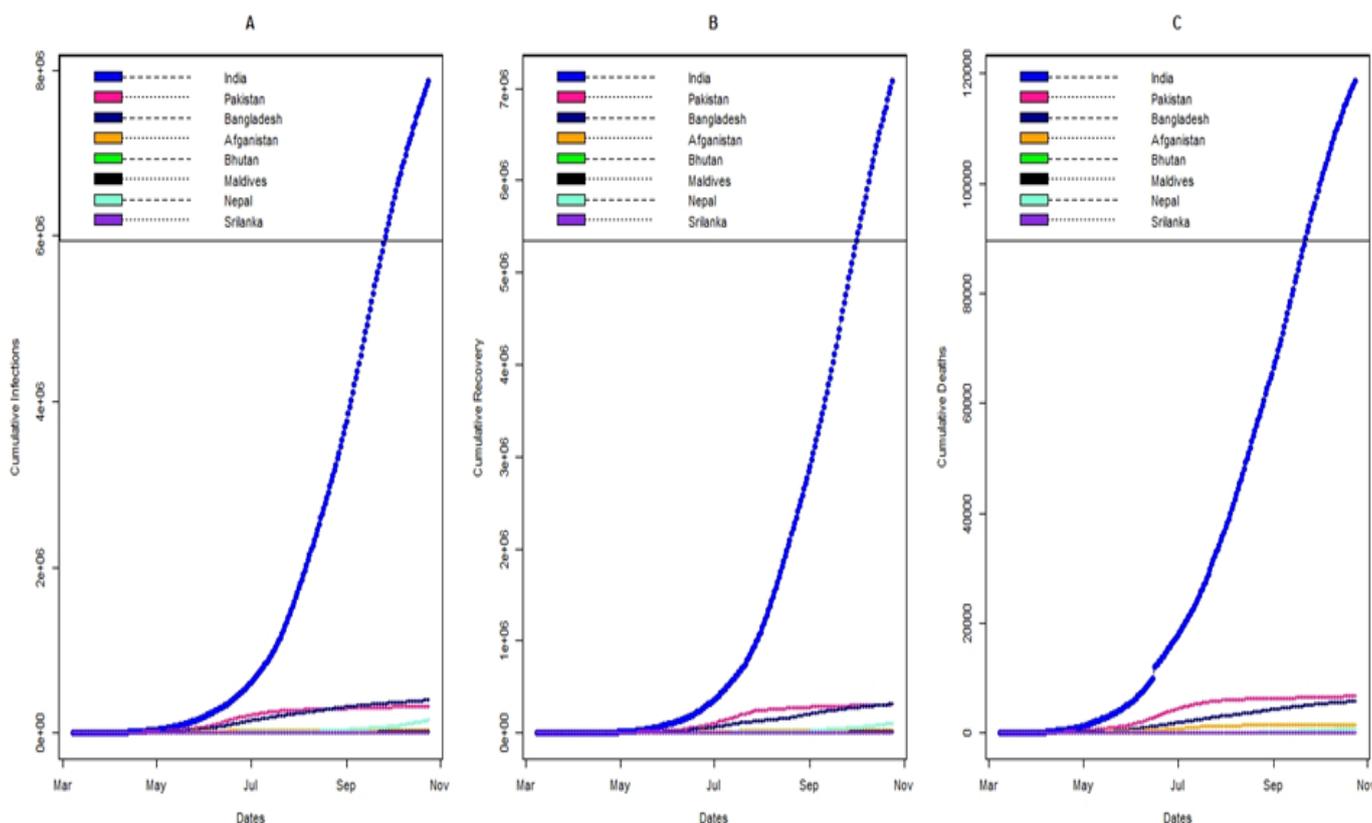
Percent active cases (PAC) of India decreased over time until October 24, 2020. In Pakistan, PAC increased at the beginning of the outbreak and then decreased with little fluctuation, remained almost constant in October, 2020. PAC in Bangladesh heavily fluctuated at the beginning and then decreased from June, 2020. In Afghanistan, PAC had slight fluctuations over time and started decreasing from June and remained constant in October, 2020. PAC increased in Nepal at the beginning and then fluctuated over time till October, 2020. In Bhutan, PAC fluctuated at the starting of the outbreak and then had a decreasing pattern from June and fluctuation in October, 2020. Furthermore, PAC in the Maldives fluctuated over time and showed a decreasing pattern from the last of August to October, 2020. In Sri Lanka, the PAC increased at the beginning, then fluctuated over time and showed an increasing pattern in October, 2020 (Figure 2).

Table 1: Percent active cases (PAC), case fatality rate (CFR) and recovery to death ratio (RDR) of SAARC affiliated countries as of October 24, 2020

Dates	India (PAC, CFR, RDR)	Pakistan (PAC, CFR, RDR)	Bangladesh (PAC, CFR, RDR)	Afghanistan (PAC, CFR, RDR)	Bhutan (PAC, CFR, RDR)	Nepal (PAC, CFR, RDR)	The Maldives (PAC, CFR, RDR)	Sri Lanka (PAC, CFR, RDR)
08 March	(100, 0, -)	(85.71, 0, -)	(100, 0, -)	(100, 0, -)	(100, 0, -)	(0, 0, -)	(100, 0, -)	(0, 0, -)
09 March	(97.87, 0, -)	(93.75, 0, -)	(100, 0, -)	(100, 0, -)	(100, 0, -)	(0, 0, -)	(100, 0, -)	(0, 0, -)
10 March	(98.38, 0, -)	(89.47, 0, -)	(100, 0, -)	(100, 0, -)	(100, 0, -)	(0, 0, -)	(100, 0, -)	(0, 0, -)
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
22 October	(8.96. 1.51, 59.20)	(2.96, 2.05, 46.12)	(19.90, 1.45, 54.02)	(13.02, 3.70, 22.47)	(7.83, 0, -)	(30.21, 0.54, 126.62)	(8.25, 0.32, 280.62)	(43.13, 0.22, 254.35)
23 October	(8.73, 1.51, 59.44)	(3.02, 2.05, 46.11)	(19.82, 1.45, 54.16)	(12.70, 3.70, 22.56)	(8.92, 0, -)	(30.51, 0.54, 127.24)	(8.12, 0.32, 281.83)	(48.86, 0.19, 260.28)
24 October	(8.51, 1.50, 59.67)	(3.12, 2.05, 46.09)	(19.66, 1.45, 54.24)	(12.83, 3.70, 22.51)	(8.92, 0, -)	(29.66, 0.54, 128.66)	(7.98, 0.32, 283.02)	(50.41, 0.19, 247.60)

Figure 2. Percent active cases (PAC) in SAARC affiliated countries as of October 24, 2020.
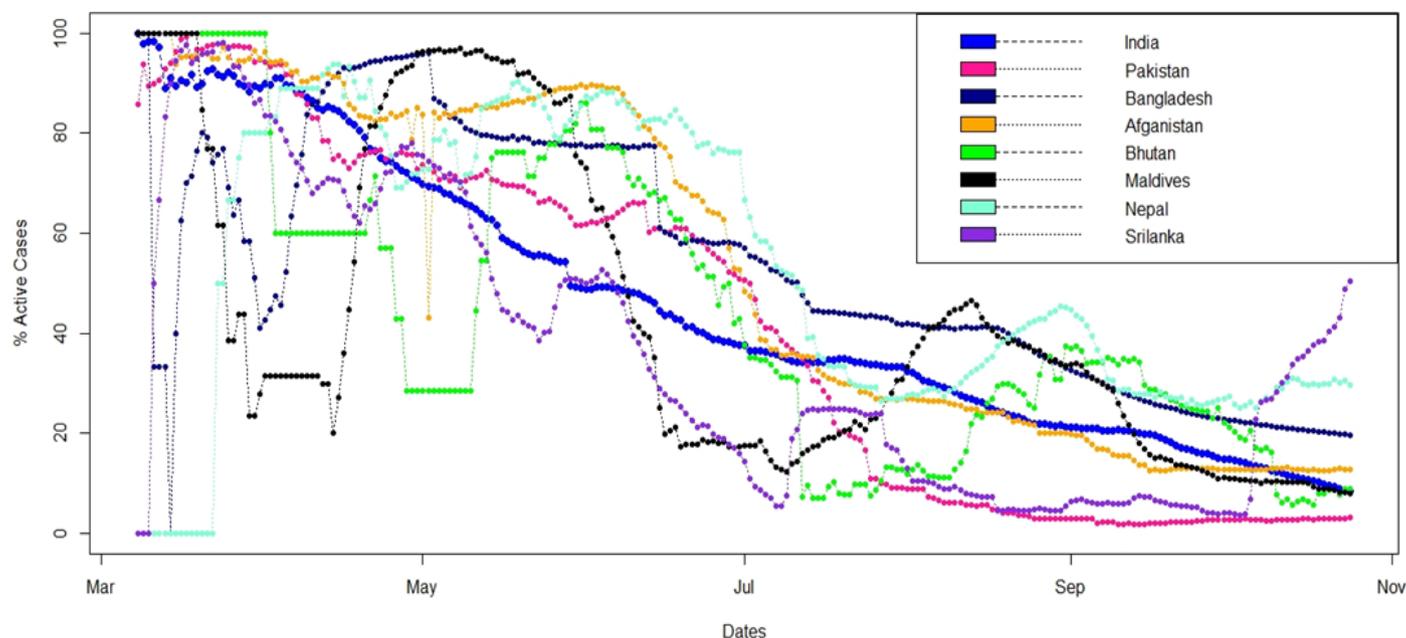

The CFR of India fluctuated till the middle of May and then showed a decreasing pattern. The CFR was 1.51% on October 24, 2020 in India which indicates 1.51% of the infected patients died due to COVID-19 out of total diagnosed patients till that day. The downward trending of daily CFR indicates the percent of dying is decreasing over time compare to infected cases due to COVID-19 disease. The CFR of Pakistan increased till May and decreased till June then showed an almost constant pattern from July 2020. In Bangladesh, the CFR fluctuated till April and then had an almost constant trend over time until October, 2020. The CFR in Afghanistan fluctuated till April and then decreased until June 2020 and showed an almost constant trend

from August to October, 2020. Since there were no deaths in Bhutan due to COVID-19 until October, so it showed a constant trend at zero. As there were no deaths in Nepal till the middle of May, it showed a constant pattern up to the middle of May at zero then it fluctuated till June and had a decreasing pattern on October 2020. Since there were no deaths in the Maldives till the last of May, so the CFR showed a constant trend at zero then it fluctuated over time and showed a decreasing trend at the last week of October, 2020. In Sri Lanka, the CFR increased at the beginning and then started decreasing from the middle of April, 2020 (Figure 3 (A)). The RDR in India increased over time till August, 2020 which indicates recovery was rapidly increasing compared to deaths. The RDR on October 24, in India, was 59.67 which indicates recovery cases from COVID-19 were

about 60 times more compare to deaths. In Pakistan, the RDR fluctuated at the beginning and then increased over time until October, 2020. The RDR slightly fluctuated in Bangladesh at the beginning and showed an increasing trend in October, 2020. In Afghanistan, the RDR showed an upward trend till July, then started decreasing and showed an upward trend until October, 2020. Since there were no deaths in Bhutan, so the RDR could not be computed. In the Maldives, the RDR showed a rising trend till July, then started decreasing with little fluctuation and showed an upward trend until October. The RDR in Nepal increased with little fluctuation till July and then showed a downward trend and started increasing from September until October, 2020. The RDR in Sri Lanka had an upward trend with little fluctuation over time until October, 2020 (Figure 3 (B)).

Figure 3. Comparison of case fatality rate (CFR) and recovery to death ratio (RDR) in SAARC affiliated countries; (A) CFR (%) of SAARC affiliated countries; (B) RDR of SAARC affiliated countries as of October 24, 2020.
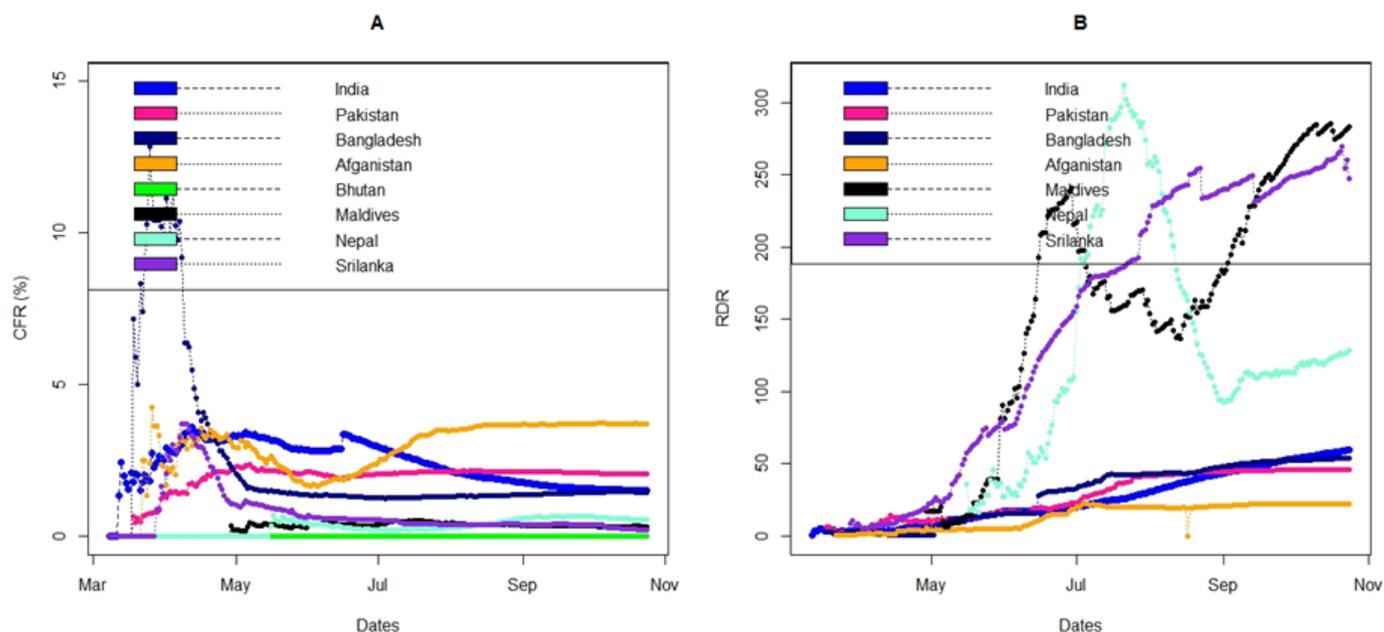
To compare infected and death cases among SAARC affiliated countries per million population, the mid-year population of 2020 for SAARC countries taken from world population data sheet. About 5617, 1481, 2341, 1048, 480, 22842, 5174, 341 and 85, 30, 34, 39, 0, 74, 28, 1 people were infected and died per million population in India, Pakistan, Bangladesh, Afganistan, Bhutan, the Maldives, Nepal, Sri Lanka respectively by SARS-CoV-2 as of October 24, 2020. Infection per million is very high in the Maldives and very low in Sri Lanka by SARS-CoV-2 until October 24, 2020. Deaths per million are very high in India and no deaths in Bhutan.

DISCUSSION

The SAARC consists of 21% of the world population with 3% of the world area[22]. Therefore, it is especially important to understand the severity of COVID 19 in the SAARC affiliated countries. No specific study was conducted to compare the

severity of COVID-19 disease among SAARC affiliated countries. In this study, we estimated CRF, RDR, and PAC of SAARC affiliated countries as of October 24, 2020 to compare the severity of COVID-19 disease. Then the policymakers will understand the impact of COVID 19 which will help them to take the necessary action for disease control.

An early study[23] showed that Afghanistan had the highest CFR, then Pakistan, India, Bangladesh, Nepal, the Maldives, and Sri Lanka are in a sequence. They used the daily records up to 9th October where we use daily data until 24th October, 2020. In our study, we find that Afghanistan had the highest CFR until 24th October, 2020 and Pakistan in the second position whereas India and Bangladesh are in almost the same condition followed by Nepal, the Maldives, and Sri Lanka.

Muyeed et al.[16] demonstrate the RDR and CFR trend only for Bangladesh where they showed that CFR was in a fluctuated

pattern at the early stage, it had a downward pattern after 8th April. They also showed the RDR had an upward pattern from 26 April to 09 May, 2020. Muyeed et al.[20] demonstrated daily PAC had a downward pattern in Bangladesh from May to August, 2020. They presented their results only for Bangladesh where this study shows patterns of CFR and RDR for all SAARC affiliated countries. According to the daily RDR, the Maldives had the highest RDR followed by Sri Lanka, Nepal, India, Bangladesh, Pakistan, and Afghanistan until 24th October, 2020. Since, Bhutan has no death until 24th October therefore, daily RDR could not be computed for Bhutan.

This study shows the pattern of COVID-19 spreading in terms of infections, deaths, and recoveries for SAARC affiliated countries. In India, we observe a slow growth of infections at the beginning of the outbreak but started to increase rapidly from June, 2020 and infections were very high in July, 2020 and again showed slow growth in August, 2020. This study shows a similar pattern for recovery and death rate in India, where shows a slow rate at the beginning and started rapidly from May-June. In Pakistan, the number of infected patients increased very slowly at the beginning of the outbreak. The recovery rate was very low at the starting and increased remarkably from May 2020. We find a similar pattern for the death rate from the beginning to May and after July, the death rate was decreasing in Pakistan. For Bangladesh, we find an increasing pattern for cumulative infections from starting to June and decreased from August, 2020. Although the recovery rate was very slow at starting, it started to increase rapidly from June, 2020 and the death rate increased with time in Bangladesh. Though the increasing rate of infections was slow from the beginning of the outbreak in the Maldives and Sri Lanka, infections began to increase rapidly from June 2020. At the starting of the outbreak, the recovery rate was very slow in the Maldives and Sri Lanka. Recovery started to increase rapidly from June in the Maldives and from May, 2020 in Sri Lanka. The deaths of the Maldives and Sri Lanka are in a scattered pattern. Afghanistan shows a slow increasing pattern for infections at the starting of COVID-19 and started rapidly decreasing from May and showed a slow growth until

October. Afghanistan shows slow recovery at the beginning and recovery increased rapidly from June. Death in Afghanistan shows a similar trend as recovery. In Nepal and Bhutan, the rate of infections and recovery were slow at the beginning but started to increase from June, 2020. Bhutan has no death due to COVID-19 until October, 2020 but Nepal showed a slow increase until August but now in an increasing pattern. Initially, the overall growth rate of infection, death, and recovery was slower until May in the SAARC region, however from June, 2020 infection, death, and recovery increased rapidly.

The daily PAC of India was high at the beginning and decreased over time till October 24, 2020. CFR of India showed fluctuating pattern until the middle of May but after this period it showed a downward pattern which indicates that the death percentage is decreasing over time compared to infected cases. RDR of India shows an increasing pattern which means that recovery was rapidly increasing in contrast to deaths. The daily PAC and CFR of Pakistan have a constant pattern with a little fluctuation at the start. Daily RDR in Pakistan fluctuated at starting and shows an upward pattern until October 24.

India ranks the highest in terms of deaths per million people, followed by the Maldives, Afghanistan, Bangladesh, Pakistan, Nepal, and Sri Lanka. As Bhutan had no death until this study that's why we ignore Bhutan in this rank. In accordance with our study, India is at high risk. Ranking the countries in accordance with infected per million population is very high in the Maldives followed by India, Nepal, Bangladesh, Pakistan, Bhutan, Sri Lanka, and Afghanistan as mentioned in the result section.

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