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Are child and youth population at lower risk of COVID-19 fatalities? Evidences from South-East Asian and European countries

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ABSTRACT

Background: The coronavirus disease (COVID-19) pandemic has revealed many lacunas of public health preparedness, especially in lower and middle-income countries and fatality differentials between European and South-East Asian countries. The case fatality rate (CFR) in most of the South-East Asian countries is much lower than the European countries. The percentages of child and youth population are more in South-East countries.

Objective: The study aims to show the impacts of age composition on fatality differentials in European and South-East Asian countries by age-structure, especially the percentage share of child and youth population.

Data and methods: This study has been done based on data provided by UNDP, WHO and worldometers. The case fatality rate (CFR) has been calculated to find out the mortality differentials of countries, and the higher fatality risk countries have been identified by the composite Z score technique.

Results: It is revealed that the COVID-19 case fatality rates are substantially high in highly developed countries of the European countries compared to the South-East Asian countries. Our study shows that there is an issue of child and youth population which affects the lower CFR in SE Asian countries. In France, the CFR was 16.72% which was nearly 7 times more than India (2.31%). The COVID-19 fatality risk ratio was highest in Germany (0.77) while the lowest risk ratio was observed in Bangladesh (−0.71).

Conclusion: Despite of having a very high level of human development and preparedness, the current pandemic COVID-19 has revealed that there exist significant differentials among fatality status of European and South-East Asian countries. The CFR is lower in the SE Asian countries where the child and youth population are more than the older population.

1. Introduction

The World Health Organization (WHO) of China country office was reported Pneumonia of unknown etiology, which was first detected in Wuhan, the capital city of Hubei province of China on December 31, 2019. The outbreak of the unknown Pneumonia was a public health emergency of international concern and names as new coronavirus disease, COVID-19. Tyrell and Bynoe in 1966, first described the Coronavirus while treating the patients suffering from cold (Tyrell & Bynoe, 1966) and being spherical in shape with a core-shell and surface projections resembling a solar corona Tyrell and Bynoe called them Coronavirus (Velavan & Meyer, 2020). The WHO has reported the total affected cases were 44 as on January 3 of 2020, among them, 11 were severely affected in China. The COVID-19 outbreak started in Italy from January 31, 2020, as two Chinese visitors from Wuhan arrived at Malpensa airport of Milan on January 23. Despite of having better preparedness and favourable conditions, hunt for “patient zero” a national priority was unsuccessful (Carinci, 2020). The outbreak of the COVID-19 has vastly affected the world rapidly taking only 30 days to expand from Hubei to the rest of Mainland China (Surveillances, 2020; Guo et al., 2020). Considering the alarming levels of spreading, infection and fatality, on March 11, 2020, the Director-General of WHO declared the COVID-19 situation as a pandemic. Total number of the COVID-19 cases of the outside province of China had increased drastically, and 143 countries were affected by the March 16, 2020 (Bedford et al., 2020). The outbreak hit Europe on March 20, 2020 and Italy ranked second after China in terms of confirmed cases, and gradually all European countries appear to be in the same situation (Saglietto et al., 2020). The COVID-19 has affected the learning status of the students (Kapasia et al., 2020) and community mobility due to the lockdown (Saha et al., 2020). As per the situation report 1 of WHO India, as of January 13, 2020 first case of the COVID-19 was reported in Kerala, the patient was a student who travelled from China (WHO, Situation Report, India 1, 2020). SARS-CoV-2 (Severe Acute Respiratory
Syndrome Coronavirus 2) is the result of the COVID-19 (Coronavirus disease 2019) and is the matter of global health concern (Tu et al., 2020). As per the WHO’s Situation Report-191 as of July 29, 2020 the global COVID-19 cases had already crossed 165.58 lakh. In the European region, the total cases were around 32.83 lakh, and death cases were above 2.11 lakh whereas in South East Asian (SE Asia) region the COVID-19 cases were around 18.92 lakh with 0.42 lakh fatalities. High level of preparedness is required for rapid response to cope up with new coronavirus infections and therefore an indispensable surge is in immediate demand across the world for the better health and social care sector (Watkins, 2020). Due to low preparedness in health services, lower-income and middle-income countries of South East Asia require technical and financial support to cope with the COVID-19 (Bedford et al., 2020). Although European countries have made considerable achievements in their health infrastructure, the COVID-19 fatality rates are substantially higher in most of the European countries than SE Asian countries. A possible explanation lies in the fact that the higher percentage share of the child and the youth in SE Asian countries has an impact on lower fatality rates.

Many studies have revealed that the age composition of the COVID-19 patients has a direct impact on fatality rates as a considerable portion of dead persons were of 65 and above age groups. Compared to the child and younger age groups, the most diseased persons are older people (65 and above age groups). The COVID-19 fatality cases are mainly associated with the comorbidities such as diabetes, hypertension, and chronic obstructive pulmonary disease etc. (Dowd et al., 2020). Pre-existing morbidities may affect the mortalities of under-five children along with the elderly (Saha & Chouhan, 2020). All the COVID-19 affected countries of the world are trying to reduce the transmission of coronavirus disease. These countries have adopted short term plans like travel restrictions and social distancing and to execute these plans, countrywide lockdowns were implemented strictly. It has been established from many studies that the transmission rate of the pandemic is mostly affected by the demographic composition like age structure, mainly by population ageing in developed European countries. In China, the higher case fatality rate (CFR) was recorded for those who were 80+ years of age (Novel, C. P. E. R. E. 2020). As of July 26, 2020, the CFRs of Italy and the U.K. were 14.28% and 15.31% where the percentages of 65+ populations were 21.7% and 18.1% respectively, whereas the CFR of India was only 2.31%. In the present study, we have comprehensively assessed the fatality differentials in association with the age structure among European and SE Asian regions, especially with the child and youth people to cope up with the COVID-19 pandemic using the most recent data.

2. Data and methods

2.1. Data sources

The study is done based on secondary data. The data related to the HDI, number of physicians, nurses, midwives and hospital beds etc. have been compiled from the report by Kovacevic and Jahics (2020) on the Covid-19 and Human Development Exploring global preparedness and vulnerability, UNDP. The total numbers of the COVID-19 cases and death cases per million population as of July 27, 2020, at 07:42 GMT accessed from Worldometers. info/ coronavirus. The country-wise total cases, total deaths, confirmed cases were compiles based on World Health Organization’s Situation Reports on 2019-nCoV. The countrywise population by age group has been accessed from Worldometers.info/world-population on June 30, 2020, at 19.05 GMT.

2.2. Variables used

The Demographic, developmental and COVID-19 related variables have been used to depict the result of the study. Developmental indicators included in this study are HDI, Current health expenditure (GDP%), physicians, nurses and midwives and hospital beds per 10,000 population. Demographic factors (age structure) like percentage of the population of 0–14 and 15–24 years of ages to show the association between the COVID-19 fatality and age structure and the COVID-19 factors (Total tests/1 M population and case fatality rate) were considered for the estimation of mean composite Z-scores for different countries (Fig. 1).

2.3. Methods

In this research, we have used the most recent data of the COVID-19 cases, age structure related demographic data and UNDP’s data on Human Development and preparedness to analyse the COVID-19 fatality differentials. In this analytical study, the comparative situations in HDI and preparedness to cope with the current the COVID-19 pandemic have been displayed by changing colour gradient for better comparison. To find out the fatality differentials between European and South-East Asian countries, the case fatality rate (CFR) has been calculated by using the following formula-

$$
CFR = \frac{\text{Total COVID Deaths}}{\text{Total Confirmed COVID Cases}} \times 100
$$

The countries with higher fatality risks have been identified by the mean composite Z score technique. All the factors used for the study are negatively associated with fatality rate, except case fatality rate (CFR). So for compositing, the CFR is converted into unidirectional manner. For the determination of the risk score of the COVID-19 fatalities, the Z score or Risk Score has been calculated by using the formula-

$$
Z \text{Score (Fatality Risk Score)} = \frac{\text{Individual Score}(x) - \text{Mean Score}(\mu)}{\text{Standard Deviation}(\sigma)}
$$

The risk score or average Z score value has been estimated by the calculating mean of all Z scores of all selected variables. The lower value of the Z score represents the lower risk of the COVID-19 fatality and vice-versa.

3. Results

3.1. Level of human development and preparedness to COVID-19: Comparative scenario between European and South-East Asian countries

Societies, groups and individuals of highly developed countries compared to least developed countries are vulnerable to the COVID-19 pandemic, and it has been established that our preparedness in response to the pandemic is significantly lower (Kovacevic & Jahics, 2020). Table 1 reflects that the selected ten countries of Europe have very high Human Development Index and have developed healthcare facilities compared to selected ten SE Asian countries having high level of human development (Sri Lanka, Thailand, Maldives and Indonesia) and
medium human development (India, Timor-Leste, Bhutan, Bangladesh, Myanmar and Nepal). In the selected European countries the highest number of physicians per 10,000 population found in Sweden (54) and nurses/ midwives and hospital beds per 10,000 population are found Germany (132 and 83 respectively) while the lowest number of physicians, nurses and midwives and beds per 10,000 population in selected SE Asian countries are found in Bhutan (3.7), Bangladesh (3) and Nepal (3). India is the second-largest populated country of the world after China and its rank based on HDI is 129 with HDI 0.647 (2018). The total population size of India has crossed 1.38 billion. The number of physicians, nurses and midwives and hospital beds per 10,000 population in India are only 7.8, 21 and 7, respectively. To cope up with the situation like the COVID-19 pandemic, it is very difficult with such poor health infrastructure. The health expenditure of India is only 3.7% of GDP, which is even less than Myanmar (5.1%) and Nepal (6.3%). So, health expenditure in India must be increased to have a better health system for coping with pandemic like the COVID-19.

In this study we have considered the level of human development and essential health infrastructures like the number of physicians, nurses and midwives and hospital beds per 10,000 populations, to portray the prevailing inequalities in preparedness level among selected European and South-East Asian countries. Fig. 2 represents the inter-relationship between CFR and health infrastructure of selected European and SE Asian countries by their level of human developments and ranks. It is observed that in the European region of very high human development the current health expenditure is high and apparently the number of physicians, nurses and midwives and hospital beds per 10,000 populations are also high compared to the high and medium human development countries of SE Asian region. To develop the healthcare system of SE Asian countries, the concerned authorities should increase the percentage share of GDP to the health sector, which definitely will help to cope up with pandemic like the COVID-19.

Table 1

| WHO's region       | Countries     | Human development index (HDI) | Physicians (per 10,000 people) | Nurses and midwives (per 10,000 people) | Hospital beds (per 10,000 people) | Current health expenditure (% of GDP) |
|--------------------|---------------|------------------------------|--------------------------------|----------------------------------------|-----------------------------------|--------------------------------------|
|                    |               | 2018                         | 2010-2018                      | 2010-2018                              | 2010-2018                         | 2016                                 |
| European Region    | Germany       | 0.939                        | 42.1                           | 132                                    | 83                                | 11.1                                 |
|                    | Sweden        | 0.937                        | 54                             | 115                                    | 26                                | 10.9                                 |
|                    | United Kingdom| 0.92                         | 28.1                           | 83                                     | 28                                | 9.8                                  |
|                    | Spain         | 0.893                        | 40.7                           | 55                                     | 30                                | 9                                    |
|                    | France        | 0.891                        | 32.3                           | 97                                     | 65                                | 11.5                                 |
|                    | Italy         | 0.883                        | 40.9                           | 59                                     | 34                                | 8.9                                  |
|                    | Russian Federation | 0.824                  | 40.1                           | 86                                     | 82                                | 5.3                                  |
|                    | Belarus       | 0.817                        | 40.8                           | 114                                    | 110                               | 6.3                                  |
|                    | Kazakhstan    | 0.817                        | 33                             | 85                                     | 67                                | 3.5                                  |
|                    | Turkey        | 0.806                        | 17.6                           | 26                                     | 27                                | 4.3                                  |
|                    | Sri Lanka     | 0.78                         | 9.6                            | 21                                     | 36                                | 3.9                                  |
|                    | Thailand      | 0.765                        | 8.1                            | 30                                     | 21                                | 3.7                                  |
|                    | Maldives      | 0.719                        | 10.4                           | 40                                     | 43                                | 10.6                                 |
| South-East Asian Region | Indonesia | 0.707                        | 3.8                            | 21                                     | 12                                | 3.1                                  |
|                    | India         | 0.647                        | 7.8                            | 21                                     | 7                                 | 3.7                                  |
|                    | Timor-Leste   | 0.626                        | 7.2                            | 17                                     | 59                                | 4.0                                  |
|                    | Bhutan        | 0.617                        | 3.7                            | 15                                     | 17                                | 3.5                                  |
|                    | Bangladesh    | 0.614                        | 5.3                            | 3                                      | 8                                 | 2.4                                  |
|                    | Myanmar       | 0.584                        | 8.6                            | 10                                     | 9                                 | 5.1                                  |
|                    | Nepal         | 0.579                        | 6.5                            | 27                                     | 3                                 | 6.3                                  |

Preparedness Level

| Low | Medium-low | Medium | Medium-high | High |

Source: Kovacevic and Jahics (2020), Covid-19 and Human Development Exploring global preparedness and vulnerability, UNDP.
The Case Fatality Rates are estimated from the data provided by https://www.worldometers.info/coronavirus/ as of June 26, 2020, at 07:42 GMT. Considerable variations in the COVID-19 CFRs were observed between European and SE Asian countries. In European countries, the COVID-19 Case Fatality Rates (CFRs) are substantially high in France (16.72%), U.K. (15.31%), Italy (14.28%) and in Spain (8.90%). In SE Asian region the COVID-19 CFRs are exceptionally low (< 3%) except Indonesia (4.85%). So, it is observed that the European countries have prevailed high CFR, despite of having a very high level of human development and preparedness. Though the preparedness is very low in the SE Asian countries, the CFRs were lower in Nepal (0.24%), Sri Lanka (0.40%), Maldives (0.46%), and in India (2.31%). There are colossal variations in European and SE Asian regions regarding testing rate of the COVID-19 (persons tested/ million population) in accordance with their respective level of human developments and HDI ranks. Our study supports the notion that the very highly developed countries of Europe have modern and developed health system and they have conducted more COVID-19 tests per million population compared to the SE Asian countries of high and medium human development (Table 2).

Table 2
Age-Structure and COVID-19 cases of selected European and South-East Asian countries.

| WHO's region          | Countries       | Age Groups | Total tests/1 M case | Total cases (n) | Total death (n) | Case Fatality Rate (%) |
|-----------------------|-----------------|------------|----------------------|-----------------|-----------------|------------------------|
|                       |                 | 0–14 (%)   | 15–24 (%)            | 65+ (%)         |                 |                        |
| European Region       | Russian Federation | 16.5      | 11                   | 13.2            | 182,341         | 812,485                | 13,269 | 1.63 |
|                       | United Kingdom  | 17.6      | 12                   | 18.1            | 214,529         | 298,681                | 45,738 | 15.31 |
|                       | Spain           | 15.5      | 9.3                  | 18.3            | 113,188         | 289,500                | 28,432 | 8.9 |
|                       | Italy           | 14        | 9.8                  | 21.7            | 107,849         | 245,864                | 35,102 | 14.28 |
|                       | Turkey          | 24.9      | 16.6                 | 7.7             | 53,706          | 225,173                | 45,738 | 2.49 |
|                       | Germany         | 12.9      | 10.3                 | 21.4            | 88,527          | 208,332                | 37,193 | 14.28 |
|                       | France          | 18.1      | 12.2                 | 18.7            | 45,642          | 180,528                | 30,193 | 16.72 |
|                       | Kazakhstan      | 26.4      | 15                   | 6.8             | 100,835         | 81,720                 | 5867   | 0.72 |
|                       | Sweden          | 17.3      | 12.2                 | 20              | 74,352          | 78,997                 | 5697   | 7.21 |
|                       | Belarus         | 15.8      | 11.4                 | 13.8            | 131,401         | 131,401                | 67,002 | 0.5 |
|                       | India           | 28.4      | 18.3                 | 5.5             | 11,798          | 1,389,097              | 32,127 | 2.31 |
| South-East Asian Region | Bangladesh    | 29        | 19.7                 | 4.9             | 6884            | 221,178                | 2874   | 1.3 |
|                       | Indonesia       | 28.1      | 16.8                 | 5.4             | 4973            | 97,286                 | 4714   | 4.85 |
|                       | Nepal           | 33        | 20.6                 | 5.3             | 22,197          | 18,483                 | 45     | 0.24 |
|                       | Thailand        | 17.5      | 13.3                 | 10.4            | 9817            | 130,919                | 3291   | 0.76 |
|                       | Maldives        | 28.2      | 19.7                 | 4.9             | 130,919         | 3252                   | 15     | 0.46 |
|                       | Sri Lanka       | 25.1      | 14.6                 | 9               | 6708            | 2770                   | 11     | 0.4 |
|                       | Myanmar         | 24.2      | 17.3                 | 5.4             | 1983            | 348                    | 6      | 1.72 |
|                       | Bhutan          | 27.1      | 19.4                 | 5               | 53,652          | 93                     | 0      | 0 |
|                       | Timor-Leste     | 44.8      | 24.3                 | 3.4             | 1188            | 24                     | 0      | 0 |

Sources 1. Age Structure Data: www.worldometers.info/world-population/world-population-gender-age.php as of 30th June 2020 at 07.05 GMT.
2. COVID-19 Data: https://www.worldometers.info/coronavirus/as of 26th July, 07:42 GMT.
3.2. Comparative scenario of age composition and COVID-19 fatality rates between European and South-East Asian countries

One of the very important observations from the European Region is that the older adults (aged 65+) are at a higher risk of the severe COVID-19 disease and over 95% of COVID-19 deaths occurred in those who were older than 60 years. It has also been established that 8 out of 10 deaths are happening in persons who have at least one comorbidity like cardiovascular diseases/hypertension and diabetes (Kluge, 2020; Jalil, 2020). Age composition of the population is one of the important demographic characteristics as it reflects the proportion of working-age people and life expectancy of a country. The population ageing is a crucial issue in highly developed countries due to more life expectancy than developing countries of the world. We used data of the current population by age group as of June 30, 2020 to show the population composition of countries by age groups. Table 2 reflects that the percentage share of the elderly population (65 and above age groups) is more in highly developed countries of European countries whereas, in the South-East Asian countries the percentage share of the child and youth population are more. Among the selected ten European countries higher share of the elderly population is found in Italy (21.7%), Germany (21.4%), Sweden (20%) and in France (18.7%). In European countries, the COVID-19 fatality rates are more among the elderly (65 and above ages) (Altringer et al., 2020). In Germany out of the total COVID-19 cases, less than 5 per cent deaths occurred in case of the population who were below 60 years of age while 95 per cent deaths were found among the elderly population (age 65 and above). This finding was consistent with the fatalities of Italy.

Moreover, The European countries having a lower percentage of child and youth population had more COVID-19 deaths/million population and case fatality rates (CFRs). The highest deaths per million (674) and CFR (15.31%) were recorded in the U.K. where the percentage of the child (17.6%) and youth (12%) population are less than the elderly population (18.1%). The same situation can be observed in Spain, Italy, Germany, France and Sweden where child and youth population are less compared to the elderly population and all these countries had very high CFRs compared to the South-East Asian countries. The South-East Asian countries have more proportion of child and youth population than European countries. In India, the percentage of child and youth population are nearly 28% and 18% and population aged 65 and above population constitutes only 5.5%. Among the selected ten SE Asian countries, no death cases found in Bhutan and Timor-Leste, where the percentage of the population aged 65 and above are only 5 and 3. In Nepal, the COVID-19 case fatality rate was also very low (0.24%). In the selected SE Asian countries, the Case Fatality Rates are below 5%. Highest CFR was found in Indonesia (4.85%) followed by India (2.31%), Thailand (1.76%) and Myanmar (1.72%) while no fatalities caused in Bhutan and Timor-Leste (Fig. 3).

Based on the calculated risk scores of selected development status, health system, demographic characteristics and the COVID-19 cases, the selected European and South-East Asian Countries are classified into three fatality risk zones, i.e. low, moderate and high-risk zones. In high-risk zones, the CFRs (Case Fatality Rates) are very high (0.35–0.55) and most of the European countries are under this zone. Table 3 highlights that the countries having a higher concentration of population aged 65+ years population have higher CFRs. Belarus (0.55), Germany (0.54), Sweden (0.43), Russian Federation (0.36), and U.K. (0.35) of European region and Maldives (0.45) of SE Asian region are under high-risk zones of COVID-19 fatalities. The countries with risk scores −0.19 to 0.31, are moderate-risk zones. The countries under this zone are France (0.31), Spain (0.08), Nepal (0.07), Italy (0.04), Sri Lanka (−0.17) etc. The lower fatality risk countries (Risk Score −0.59 to −0.48) have more child and youth population compared to European countries of higher risks. The countries of lower risk of the COVID-19 fatalities are Myanmar (−0.59), Thailand (−0.57), Bangladesh (−0.55), Indonesia (−0.53), India (−0.48) and Bhutan (−0.48). All these countries have a higher percentage of child and youth population. It is also observed that the fatality rates of COVID-19 are more in the countries having more 65+ years of age population. The CFR of most of the European countries is considerably higher than the SE Asian countries. Moreover, the wide range of variations in the age composition of the population are also observed among the European and SE Asian countries. The European countries have inevitably the biggest share of the elderly (aged 65+ years); however, SE Asian countries retain a predominant share in favour of child and youth population. The observed CFR of countries revealed the fact that European countries had substantially higher CFR because of the dominance of elderly population other than SE Asian countries wherein the predominant share of child and youth population had curbed fatality rates. So, it may be pointed out that the likelihood of the COVID-19 fatality rates is more in European countries despite of having a higher level of human development and preparedness to cope with the COVID-19 pandemic (see Fig. 4).
Results discussed above reflect that there are significant variations in fatality rates in highly developed European countries and lower-middle-income SE Asian countries. The United Nations Human Development report supports the notion that the developed countries have better health infrastructures. In the European countries of a very high level of human development, the number of physicians, nurse and midwives and hospital beds per 10,000 population are more compared to SE Asian countries. The numbers of physicians in high, medium and low human development groups are 16.5, 7.3 and 2.1 per 10,000 population. So the numbers of doctors are nearly eight and two times more among very high human development groups in comparison to low and medium human development groups. The comparative figures of nurses and midwives reflect that the number of nurses and midwives are nearly ten and five times more in highly developed countries than the countries of low and medium human development (Kovacevic & Jahics, 2020). The role of nurses to cope with the pandemic is invaluable. Their hard work and tremendous support to recover the illness of affected have declined the fatality rate in many countries (Buheji & Buhaid, 2020). The numbers of beds in hospitals in highly human developed regions per 10,000 populations are nine and six times more compared to the low and medium development groups. Significant differences are observed in current health expenditures among different human development groups. In 2016, the health expenditure of very high human development groups was 12% of GDP whereas it was 5.7%, 3.9% and 4.5% respectively in high, medium and low human development groups. It is observed that the level of human development and its inequality has affected the health care system of the world. Low level of preparedness to respond and cope with the current COVID-19 pandemic may cause massive fatalities in the world during the period of a global health emergency (Kovacevic & Jahics, 2020). Policies should be adopted to reduce the health vulnerabilities caused by the COVID-19 and future pandemics. Individuals and societies must be aware of the guidelines provided by national and international health organisations. The government must pay attention to the importance of modern health infrastructures. The study reveals that European countries have more COVID-19 fatalities despite of having developed health infrastructure due to the lower share of child and youth population. The SE Asian countries with high and medium human development indices must be aware of the fact that they have much lower GDP share in the health sector and very poor preparedness to tackle the crisis like COVID-19 pandemic. The risk of COVID-19 disease transmission is more at mass gatherings (MGs). So the appropriate surveillance of public health and risk reduction interventions are essential in densely populated countries of SE Asia (McCloskey et al., 2020). In many countries of the world, the lockdown orders were implemented to prevent the rapid infection, although it affected the economy of the countries at large scale (Xuefei Ren, 2020). The COVID-19 pandemic has exposed a lack of preparedness, especially in lower- and middle-income countries of SE Asia.

### Table 3
Mean composite risk-score of different indicators affecting COVID-19 fatalities in selected European and South-East Asian countries.

| Countries                  | X1  | X2  | X3   | X4   | X5   | X6   | X7   | X8   | X9   | Mean composite risk score |
|---------------------------|-----|-----|------|------|------|------|------|------|------|----------------------------|
| Russian Federation        | −0.85 | −0.99 | 1.07  | 0.82  | 1.46  | −0.33 | 0.45  | 1.74  | −0.16 | 0.36                       |
| United Kingdom            | −0.71 | −0.75 | 0.35  | 0.74  | −0.35 | 1.1   | 1.23  | 2.24  | −0.68 | 0.35                       |
| Spain                     | −0.98 | −1.39 | 1.13  | 0.05  | −0.28 | 0.84  | 1.01  | 1.02  | −0.64 | 0.08                       |
| Italy                     | −1.17 | −1.27 | 1.13  | 0.15  | −0.15 | 0.81  | 0.93  | 0.6   | −0.68 | 0.04                       |
| Turkey                    | 0.21  | 0.33  | −0.24 | 0.66  | −0.38 | −0.65 | 0.3   | −0.24 | 0.36 | −0.19                      |
| Germany                   | −1.31 | −1.15 | 1.19  | 1.95  | 1.49  | 1.51  | 1.38  | 0.3   | −0.53 | 0.54                       |
| France                    | −0.65 | −0.71 | 0.59  | 1.09  | 0.89  | 1.64  | 0.99  | −0.36 | −0.69 | 0.31                       |
| Kazakhstan                | 0.40  | −0.04 | 0.62  | 0.79  | 0.96  | −0.9  | 0.39  | 0.49  | 0.58  | 0.37                       |
| Sweden                    | −0.75 | −0.71 | 1.91  | 1.54  | −0.41 | 1.46  | 1.36  | 0.08  | −0.61 | 0.43                       |
| Belarus                   | −0.94 | −0.89 | 1.12  | 1.52  | 2.4   | −0.01 | 0.39  | 0.96  | 0.45  | 0.55                       |
| India                     | 0.66  | 0.73  | −0.84 | −0.79 | −1.05 | −0.84 | −0.98 | −0.88 | −0.33 | −0.48                      |
| Bangladesh                | 0.73  | 1.06  | −1.02 | −1.23 | −1.02 | −1.25 | −1.25 | −0.96 | −0.01 | −0.55                      |
| Indonesia                 | 0.62  | 0.38  | −1.08 | −0.79 | −0.88 | −1.03 | −0.49 | −0.99 | −0.55 | −0.53                      |
| Nepal                     | 1.24  | 1.28  | −0.9  | −0.64 | −1.18 | −0.02 | −1.53 | −0.72 | 3.14  | 0.07                       |
| Thailand                  | −0.73 | −0.45 | −0.84 | −0.57 | −0.58 | −0.84 | −0.03 | −0.92 | −0.21 | −0.57                      |
| Maldives                  | 0.63  | 1.06  | −0.72 | −0.32 | 0.16  | 1.35  | −0.04 | 0.95  | 1.31  | 0.45                       |
| Sri Lanka                 | 0.24  | −0.14 | −0.72 | −0.79 | −0.08 | −0.78 | 0.09  | −0.96 | 1.64  | −0.17                      |
| Myanmar                   | 0.12  | 0.50  | −0.78 | −1.06 | −0.98 | −0.4  | −1.49 | −1.04 | −0.19 | −0.59                      |
| Bhutan                    | 0.49  | 0.99  | −1.08 | −0.94 | −0.71 | −0.9  | −1.22 | −0.24 | −0.74 | −0.48                      |
| Timor-Leste               | 2.74  | 2.15  | −0.9  | −0.89 | 0.69  | −0.75 | −1.15 | −1.05 | −0.74 | 0.01                       |

X1 = Age group (0–14), X2 = Age group (15–24), X3 = Physicians, X4 = Nurses and midwives, X5 = Hospital beds, X6 = Current health expenditure (GDP), X7 = HDI, X8 = Total test/1 M population, X9 = Case Fatality Rate.

### Fig 4
Risk factors of COVID-19 fatalities in European and South-East Asian countries.

### 4. Discussion

Results discussed above reflect that there are significant variations in fatality rates in highly developed European countries and lower-middle-income SE Asian countries. The United Nations Human Development report supports the notion that the developed countries have better health infrastructures. In the European countries of a very high level of human development, the number of physicians, nurse and midwives and hospital beds per 10,000 population are more compared to SE Asian countries. The numbers of physicians in high, medium and low human development groups are 16.5, 7.3 and 2.1 per 10,000 population. So the numbers of doctors are nearly eight and two times more among very high human development groups in comparison to low and medium human development groups. The comparative figures of nurses and midwives reflect that the number of nurses and midwives are nearly ten and five times more in highly developed countries than the countries of low and medium human development (Kovacevic & Jahics, 2020). The role of nurses to cope with the pandemic is invaluable. Their hard work and tremendous support to recover the illness of affected have declined the fatality rate in many countries (Buheji & Buhaid, 2020). The numbers of beds in hospitals in highly human developed regions per 10,000 populations are nine and six times more compared to the low and medium development groups. Significant differences are observed in current health expenditures among different human development groups. In 2016, the health expenditure of very highly developed groups was 12% of GDP whereas it was 5.7%, 3.9% and 4.5% respectively in high, medium and low human development groups. It is observed that the level of human development and its inequality has affected the health care system of the world. Low level of preparedness to respond and cope with the current COVID-19 pandemic may cause massive fatalities in the world during the period of a global health emergency (Kovacevic & Jahics, 2020). Policies should be adopted to reduce the health vulnerabilities caused by the COVID-19 and future pandemics. Individuals and societies must be aware of the guidelines provided by national and international health organisations. The government must pay attention to the importance of modern health infrastructures. The study reveals that European countries have more COVID-19 fatalities despite of having developed health infrastructure due to the lower share of child and youth population. The SE Asian countries with high and medium human development indices must be aware of the fact that they have much lower GDP share in the health sector and very poor preparedness to tackle the crisis like COVID-19 pandemic. The risk of COVID-19 disease transmission is more at mass gatherings (MGs). So the appropriate surveillance of public health and risk reduction interventions are essential in densely populated countries of SE Asia (McCloskey et al., 2020). In many countries of the world, the lockdown orders were implemented to prevent the rapid infection, although it affected the economy of the countries at large scale (Xuefei Ren, 2020). The COVID-19 pandemic has exposed a lack of preparedness, especially in lower- and middle-income countries of SE Asia.
compared to highly developed countries of Europe (Mahmood et al., 2020). After assessing the imbalances in the health system, the question appears in mind that will the COVID-19 pandemic create global preparedness to detect, prevent and respond to an outbreak in future? The recent findings of Kandel and colleagues revealed out that of 182 countries 104 (75%) had well enough preparedness to perform at a national and sub-national level. In contrast, 32 (18%) had low preparedness, and they need external assistance to cope with the situation of emerging infectious diseases (Jacobsen, 2020). For rapid response to the COVID-19 pandemic, importance should be given on trust, trade-offs, and preparedness (Balog-Way & McComas 2020).

A noteworthy finding of this study is that the age composition of the population (Proportion of child, youth and elderly) affected the variation in fatalities in selected European and South-East Asian countries. Italy is a country where 21.7% of its population is over 65 years, compared to 5.5% in India and only 3.4% in Timor-Leste. Age composition of the population is crucial for understanding the highest risk of the fatality caused by the COVID-19, and the countries should formulate the strict measure like ‘social distancing’ for “flattening the curve” (Verhagen et al., 2020). Extensive intergenerational contacts and residential proximity between adult children and parents are frequent in Italy (Kalmin & Saraceno, 2008). As a result, the CFR of Italy is 14.28% compared to 2.31 in India (Table 3). The COVID-19 fatalities had revealed that there is an issue of population ageing, which is related to the current pandemic. The effect of population ageing is prominent in highly developed countries of Europe like the U.K., Italy, France, and Spain. Contrary, in lower-income countries like India, Bangladesh, Nepal and Timor-Leste, the CFRs are very low despite of having poor health infrastructure and lower preparedness because of the younger age structure. Though Africa has extensive travel and trade links with China, it has a smaller number of COVID cases, and that is specifically attributed to protective shield in the form of young age structure and associated strong immunity other than elderly population. Apart from the age structure, the sex composition and co-morbidities like hypertension, diabetes, and COPD (Chronic Obstructive Pulmonary Disease) act as triggering factors of COVID-19 fatalities (Dowd et al., 2020). The current COVID-19 pandemic has revealed that the percentage of child and youth deaths were very low to total deaths in both European and SE Asian regions. The percentage of children (Below 14 years) and youth (15–29) were only 1 and 3 per cent whereas the fatality rate of persons aged 60 and above was 53% in India (Hindustantimes, July 10, 2020). In Italy, the fatality rate of children aged below 9 years was only 0.01% and 0.05% among the child and youth of 10–29 years. The fatality rate among persons aged 60 and above was near 95%. So, it can be said that the fatality rate was below 5% for persons below 60 years as of July 14, 2020 (COVID-19 deaths in Italy, 2020). These figures were similar to another developed European country, Germany, where as of July 10, 2020, more than 95% deaths found among people aged 65 and above (COVID-19 deaths in Germany, 2020). In France, the fatality rate among children below 15 years was nil, whereas the fatality rate among people aged 65 and above was nearly 92% as of March 24, 2020 (COVID-19 deaths in France, 2020).

5. Limitations

For not following the COVID-19 safety guidelines, the child and young people may be infected and eventually may die, which may affect the current findings of the study. We also lacked information on important determinants of nCOV2019 infection and fatalities that might confound associations between the age structure and COVID-19 fatality risks. Lacking information on the mutation of the coronavirus, deceased persons with the type of comorbidities by age group, proper identification and isolation of the affected persons, nature and extent of community mobility and community spreading of the COVID-19 pandemic etc., may affect the current estimates.

6. Conclusion

Our findings suggest that countries with population ageing must take protective measures and particular attention should be given to the elderly population (especially for those who are suffering from co-morbidities like hypertension, diabetes, and Chronic Obstructive Pulmonary Disease) to dip the CFR. The countries may prepare cluster mapping for vulnerable age groups (65 and above age groups) for special attention and health care. Early detection of COVID infection, isolation of an affected person, reduction in intergenerational contacts and proper treatment may flatten the curve of the COVID-19 cases and fatality rates. The CFR is much lower in most of the SE Asian countries where the proportions of child and youth people are more than the older population. So, this finding supports the notion that the child and youths are at lower risk of the COVID-19 fatalities. Though, recent COVID-19 cases are indicating that the child and young people are not invincible to COVID-19 infection and progression, and they can be infected, may spread the disease and eventually may die. Hence, the healthy child and youth people must take similar precautions as elderly.

Availability of data

The data are collected from the data repository of UNDP, WHO (situation reports: Available from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports), www.worldometers. Info/coronavirus and www.worldometers.info/world-population/world-country-population-age-gender.php, which are publicly available and could be accessed easily.

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CRediT authorship contribution statement

Ankita Zaveri: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing - original draft, Writing - review & editing. Pradip Chouhan: Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing - review & editing.

Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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