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Original Article

Why pandemic coronavirus (SARS-CoV-2) hit different age groups of people in Southeast Asia? a case study in Bangladesh

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Abstract

The new catastrophe of a novel coronavirus (COVID-19s) with unstable symptoms has rapidly pulled danger to all age groups worldwide. We investigate possible causes of the different nature and demography of COVID-19. We collected and used secondary data from the IEDCR website and "Worldometer" from 1st April to 24th June for the statistical analyses, including multi-criteria decision-making method (MCDM), topsis, advanced topsis, simple additive weighting (SAW) and weighting product method (WPM) and PCA. The total number of known COVID-19 patients in Bangladesh was 122,709 as of 24th June. Radical growth will be found with 4912 cases in one day on 16th July as per the time-series forecasting. The infection rate among the young (<30) was highest, i.e., 37.8%, while the elderly (>60) had the maximum death rate (≈39%). Both of India and Bangladesh, approximately one-third of total COVID-19 cases belong to the under 30 age group. Preliminary observation finds India and Bangladesh have a high risk for young people and the working class. PCA indicates the highest positive association among the youths and the highest negative association among the older. In this study, older age (>60) individuals are in danger with the fifth rank, and the young and working-age people are at comparatively lower risk with a third to the fourth rank in terms of infection rate as indicated by MCDM. 41-50 age group remains at lower risk with the first rank in all cases. The nature of activities of younger people and the poor immunity system of older people are the reason for the non-homogenous attitude toward the coronavirus among different age groups. In Bangladesh, drug addiction, gambling habits, uncontrolled lifestyle, and social obliquity have led the youth through danger, threatening the older age of family and society.

Keywords: COVID-19, Age-group, Transmission, Youngsters, Older-age, Immunity, Risk analysis, Bangladesh

Background

The present-day coronavirus pandemic of 2019 (COVID-19) has become a global concern. Since December 2019, in Wuhan, Hubei Province, China, coronavirus ailment (COVID-19), a recently developing irresistible pneumonia with unknown causes, was reported [1,2]. The COVID-19 pandemic has created a terrible crisis that led the world's health system and medical science to question [3, 4, 5, 6, 7]. The new coronavirus termed SARS-CoV-2 is the germ to spread this disease [8, 9, 10, 11, 12] and has extended its claw up to 213 Countries and Territories [13]. As of June 24, 2020, statistics from Johns Hopkins University showed that nearly 9.07 million people had been affected by this virus, while nearly half a million lives were taken [14]. After its earliest exposure in China at the end of 2019 [11], COVID-19 patients started being detected in other parts of the world. Thailand, Japan, the USA, and South Korea reported their respective first COVID-19 patient was mid-January [15, 16]. In Europe, France was the first country to report the emergence of Coronavirus on January 24, 2020. After that, it took only six weeks to spread its claw to the whole continent [17, 18]. The earlier transmission of Coronavirus in South Asian countries started from late January to early March 2020. Within the Indian sub-continent, the first reported case of COVID-19 was found in Nepal on January 23, 2020 [19]. In India, COVID-19 was first revealed on January 30, 2020 [20], while the number of patients did not see any lift up to February 2020. Despite having fewer patients, India could not manage to limit the spread. As a result, the transmission pace got momentum from the start of April [21]. The most delayed coronavirus transmission among South Asian countries occurred in Bangladesh, its first appearance on 7th March 2020

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[22]. Nonetheless, this country also failed to have the situation under control. As of August 16, 2021, the number of infected persons in India and Bangladesh is 1,418,902 and 32,225,513, respectively [13]. Outside of South Asia, maximum patients (>2.4 M) and deaths (nearly 0.13 M) have been reported in the USA. The European countries, Italy, Spain, the United Kingdom, Germany, and France have seen large death tolls and a huge number of growing patients. Except for Germany, each country has experienced 28-43 thousand deaths. The number of affected patients diverges from approximately 0.16-0.28M in most affected European countries. Recently, Brazil has been devastated by an intensified attack of COVID-19, having more than 50 thousand death and approximately half a million affected [13]. Demographic science is always important in conceptualizing the dynamics of a pandemic [23]. Several studies have been published where the role of age structure in death rates and transmission of the different viral diseases like Hepatitis B [24], Influenza [23], La Crosse Virus [25], etc., have been investigated. Similar age-dependent studies are also available for COVID-19 [26,27]. Unlike Europe and the USA, the subcontinent holds a relatively younger population.

In European countries and also in the USA, people with age more than 65 hold a large share of the total population, for example, Italy (23.1%), Spain (19.38%), France (20.5%), United Kingdom (18.4%), Germany (17.88%), USA (15.81%). In India (6.18%) and Bangladesh (5.16%), the portion of 65+ aged people is much lower in comparison with the developed countries [28]. As of 18th June 2020, the number of affected patients and the death toll are still comparatively higher in the western countries (although transmission has been heavy recently) and the USA, where the major portion of death and transmission belong to the elderly people. In countries like China, Italy, France, the United Kingdom, and Spain, less than 30% of patients are below 40 [21]. In the USA, 42% of patients have an age limit of ≤45 [29], while in Germany, it is presumably less than 50% [21]. However, it becomes a great concern for the subcontinent since young people are highly affected. The latest report from IEDCR shows that 65% of COVID-19 patients in Bangladesh are from the 0-39 years group [30], while in India, the share becomes 58.25%, as of a Statistical report [21]. Newspapers and mass media have reported this crisis where the working group 21-50 has been identified as the most vulnerable class in India [31] and Bangladesh [32]. Owing to the mobility and unwillingness to maintain a disciplined life, young people may have played a vital role in spreading the coronavirus worldwide [33]. Since all age groups should be equally susceptible to the pandemic in the ideal case [34], studying the reason and mode of infection among young individuals in South Asian countries is necessary. Studies show that young ones can be asymptomatic and transmit the disease to children and the most vulnerable elderly people with greater ease [35-37]. In countries like Bangladesh and India, youngster infections have shown a dimension in the international community [36]. Statistical methods are always important to find out the risk groups of the society when any threat is posed to them. Several research studies have successfully demonstrated the risk groups and the associated factors in the recent and historical pandemics, including the recent COVID-19 [38-43].

Very little research on COVID-19 in Bangladesh has been published, and those works mostly focused on medical, biomedical, and mental health issues. The demography is mostly absent in those researches except in Hossain et al. [44] and Paul et al. [20]. Most of the work failed to address any notable research explaining the nature and reason for the high infection rate among young groups. The authors aim to present the scenario of youngsters' infection by the coronavirus and provide statistical analysis to find the associated factors with the aid of statistical and demographic analysis. Studying the age distribution will help understand the transmission mode of this viral disease among the youths and help policymakers save the whole community from being affected.

Methods

Data Collection

A retrospective study recruiting secondary data was conducted from 1st April to 24th June of 2020. The source of data was the Institute of Epidemiology, Disease Control and Research (IEDCR, *https://dghs-dashboard.com/pages/covid19.php*, 24th June 2020), Worldometer (*https://www.worldometers.info/coronavirus/*, 24th June 2020), and Statista (*https://www.statista.com/topics/5994/the-coronavirus-disease-covid-19-outbreak/#dossierContents__outerWrapper*, 25th June 2020). Some ideas on young people's psychological and behavioral issues were taken from a short pilot survey on different blogs on the social networking site (Facebook) among young aged people. These were observed before June 2020.

Data analysis

Statistical Analysis

Time Series forecasting models were calculated using the Built-in program named "Forecast sheet" in Excel 19. Principle Component Analysis (PCA) was carried out with Excel 19 using the XLSTAT statistical Software as Add-in.

Multi-criteria Decision-Making Method (MCDM)

COVID-19 infection prevalence in various countries has differed according to different age groups. The multi-criteria decision-making method provided a ranking solution for assessing overall risk analysis among five countries in different age groups. This method makes detecting specific findings simple and allows one to make more accurate decisions.

Entropy weight:

$$C=\begin{bmatrix} C_{11} & C_{12} & \cdots & C_{1n} \\ C_{21} & C_{22} & \cdots & C_{2n} \\ C_{31} & C_{32} & \cdots & C_{3n} \\ \vdots & \vdots & \vdots & \vdots \\ C_{m1} & C_{m2} & \cdots & C_{mn} \end{bmatrix}$$

Here, C_{ij} is the matrix component.

Step-1: The normalize matrix of C is,

$$R=\begin{bmatrix} R_{11} & R_{12} & \cdots & R_{1n} \\ R_{21} & R_{22} & \cdots & R_{2n} \\ R_{31} & R_{32} & \cdots & R_{3n} \\ \vdots & \vdots & \vdots & \vdots \\ R_{m1} & R_{m2} & \cdots & R_{mn} \end{bmatrix}, \text{ Where, } R_{ij}=\frac{C_{ij}}{\sum_{i=1}^{m} C_{ij}}$$

Step-2: The output entropy of the j[th] factor is calculated as,

$$e_j = -k \sum_{i=1}^{m} R_{ij}\, lnR_{ij}, \text{ where k= 1/ln(m)}$$

Step-3: Then the entropy weight can be calculated as follows,

$$w_j = \frac{1-e_j}{\sum_{j-1}^{n} 1-e_j} \quad [45, 46]$$

Topsis Method:

It's a compensatory aggregation method that compares a set of alternatives by determining weights for each criterion, normalizing scores for each criterion, and calculating the geometric distance between each alternative and the ideal alternative, which is the one with the best score in each criterion.

Step-1: Here, the standard normalized matrix is,

$$R=\begin{bmatrix} R_{11} & R_{12} & \cdots & R_{1n} \\ R_{21} & R_{22} & \cdots & R_{2n} \\ R_{31} & R_{32} & \cdots & R_{3n} \\ \vdots & \vdots & \vdots & \vdots \\ R_{m1} & R_{m2} & \cdots & R_{mn} \end{bmatrix} \quad [47]$$

Where, $R_{ij} = C_{ij} / \left[\sum_{i=1}^{m} {C_{ij}}^2\right]$

Step-2: Weighted normalized decision matrix can be calculated as $V_{ij} = R_{ij} * w_j$

Where w_j is the entropy weight.

Step-3: Positive and Negative Ideal solution can be determined as follows,

$$\begin{cases} v^+ = max\{v_{1j}, v_{2j} \cdots v_{mj}\} \\ v^- = min\{v_{1j}, v_{2j} \cdots v_{mj}\} \end{cases} (j = 1,2, \ldots . n)$$

Step-4: Euclidian distance between the positive-ideal and the negative-ideal reference points can be calculated as

$$\begin{cases} d^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v^+)^2} \\ d^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v^-)^2} \end{cases}$$

Step-5: The final step of the Topsis Method is to determine the Closeness Coefficient, and the formula is $CC = \frac{d^-}{d^+ + d^-}$

The higher value of CC is considered the better alternative [45-47].

Advance Topsis Method:

TOPSIS is a valuable strategy for dealing with multi-attribute or multi-criteria decision-making situations in the real world. It aids decision-makers in organizing issues to be addressed and conducting analyses, comparisons, and rankings of options.

In the Advance Topsis method, the Euclidian distances are calculated as follows.

$$\begin{cases} d^+ = \sqrt{\sum_{j=1}^{n} w_j (v_{ij} - v^+)^2} \\ d^- = \sqrt{\sum_{j=1}^{n} w_j (v_{ij} - v^-)^2} \end{cases}$$

Then, the relative Closeness coefficient of a particular alternative can be calculated by the following formula, $CC = \frac{d^-}{d^+ + d^-}$ [30].

Simple additive weighting (SAW) and weighting product method (WPM):

One of the strategies for solving multi-attribute choice issues is simple additive weighting (SAW). The SAW method's core principle of determining the number of weighted performance ratings for each option on all qualities is quite valuable. A weighted product model (WPM) is a straightforward and widely used method for resolving multi-criteria decision analysis (MCDA) issues. To achieve a score, just multiply all of the characteristics' values. The greater the number, the better. A normalized decision matrix again needs to be created in this method. The equations are as follows:

$$r_{ij} = \frac{C_{ij}}{Max(C_{ij})} \quad \text{(Benefit)}$$

$$r_{ij} = \frac{Min(C_{ij})}{C_{ij}} \quad \text{(Cost)}$$

In SAW, the Preference value for each variable can be calculated as,

$$v_i = \sum_{j=1}^{n} w_j r_{ij} \quad [48, 46]$$

In WPM, preference values can be calculated as,

$$v_i = \prod_{j=1}^{n} \left(r_{ij}^{w_j}\right) \quad [46]$$

Results and Discussion

COVID-19 infections in Bangladesh

In Bangladesh, the first 3 cases of COVID-19 were reported on the 8th of March and increased gently over time. Nevertheless, the number of cases increased significantly over time from the first week of April. The total number of COVID-19 cases identified during April and May are 7716 and 39,486, respectively, while 51 cases were found between 8[th] March to 31[st] March (IEDCR, *https://dghs-dashboard.com/pages/covid19.php*, 5[th] May 2020). Another 75,507 cases were found until 24[th] June (IEDCR, *https://dghs-dashboard.com/pages/covid19.php*, 24[th] June 2020).

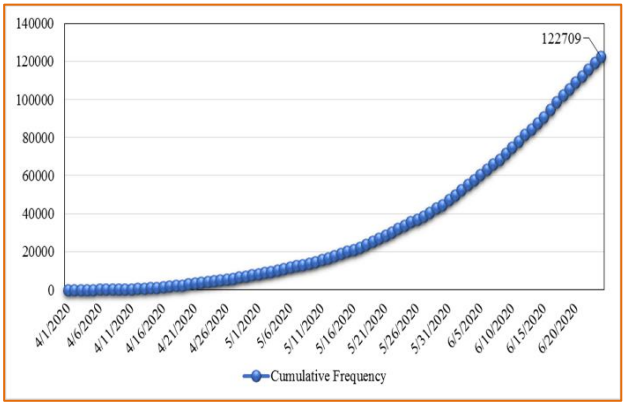


Figure 1: Number of new Covid-19 cases per day; Cumulative percentage curve shows the regular increment rate of patients.

This enormous increase of COVID-19 patients may have evolved as negligence of people about COVID-19, and the different stakeholders have made some paradoxical decisions. For example, the light coming from Europe arrives at the airport, though the country restricts all the national and international flights [49]. The government authority announced public shouldn't move their station during lockdown to avoid community transmission. However, the people did not restrict their movement immediately, which led them outside of the capital. Therefore, people spread the COVID-19 to every part of the country. Furthermore, BGMEA decided to open the garments factories on 4th April 2020. Garment workers started moving toward their workplace. Latterly, the same institution changed its decision to close the factories to consider on behalf of the health risk to the workers. Community transmission mostly occurred at that time through their arrival and subsequent departure. The number of infected patients increases day by day, and the cumulative number of patients also accelerates (Figure 1 and Figure 2).

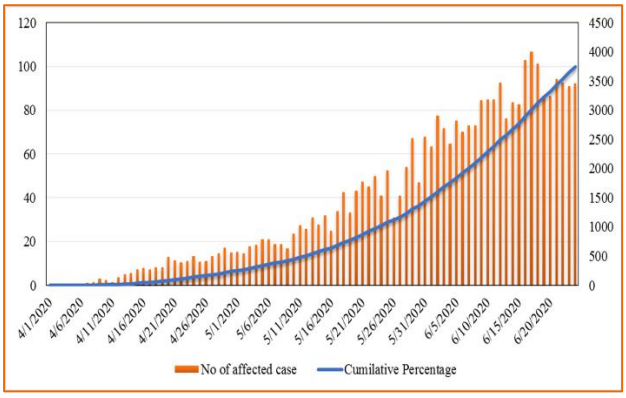


Figure 2: Ogive curve showing cumulative growth of Covid-19 cases.

Trend and Forecast of COVID-19 infections in Bangladesh

Although the 1st COVID-19 case was identified in early March, the rapid growth of infected people started in April. Here, data for the time series forecasting and trend analysis were shown from 1st April to 24th June (12 weeks). Additional four weeks of infection prediction also be added in the time series. The line chart showed the forecasting line, including the 16th week. The total number of affected persons was approximately 4912 as per time series forecasting in a single day with an R-Squared value of 0.92 (Figure 3).

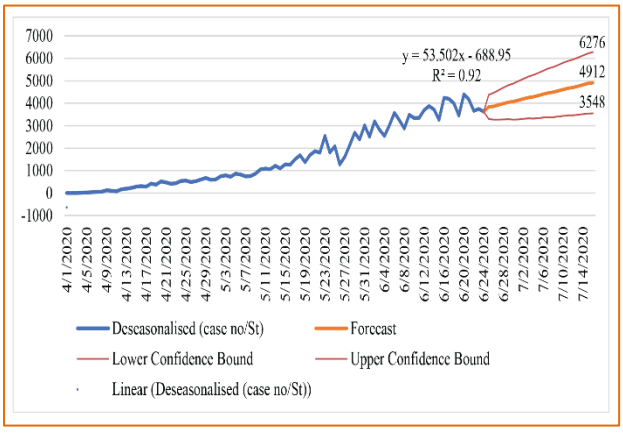


Figure 3: Time series plot of Covid-19 cases within 16th July; the forecast line moves upward, as the number of patients will increased day by day.

From this trend analysis, the upper confidence bound showed a speedy increase of patients in the upcoming days. The lower confidence bound indicated that the number of cases would remain similar (Figure 3). Some factors can fluctuate the number of cases depending on the day. Because Bangladesh is cladding insufficiency of the testing kit, for this reason, some COVID-19 patients cannot be adequately detected. These circumstances can affect the actual number of patients as the management reopened well through the offices, marketplaces, and transport. However, Peoples are still frequently moving from place to place without taking safety measures. Social distancing is not appropriately maintained by most of the people in Bangladesh. These types of negligence may cause a significant increase in COVID-19 patients.

Infected Rate vs. Death rate in Bangladesh

In Bangladesh, about 37.8% of people owing to below 30 years were diagnosed with Novel Coronavirus, according to IEDCR data (24th June 2020). However, recent statistics of IEDCR showed that the death rate of old people was higher, about 39%. Hence, the infection rate and age death rate showed an inverse relationship (Figure 4). The key reasons for people of young age (<30) being more infected because of disobeying and don't care about the authority decisions even though declared lockdown remains. Usually, this younger age group gets rid of this virus after a few days, having a high immune system. On the other hand, the elderly (>60) has a weakened immune system and suffer from numerous senile diseases such as fatigue, body ache, rheumatic pain, dementia, sinus infection, trouble breathing, asthma, palpitation, high blood pressure, incompetence micturition, etc. [50]. The patients had already suffered from one or more of these diseases are likely to be in a riskier situation. These days, older people are rare without multiple health issues. Therefore, the death toll is high in the 60+ age group in Bangladesh, even though being in the comparatively less affected class.

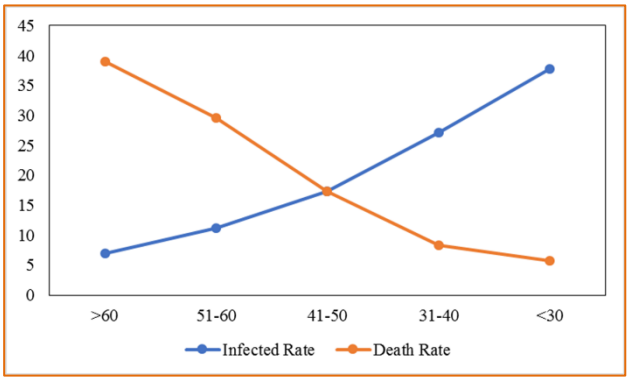
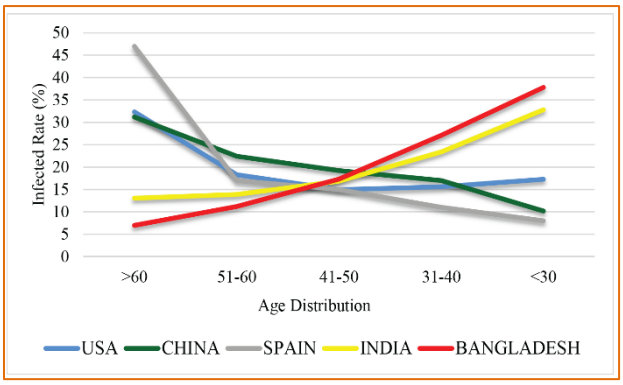


Figure 4: Infected vs death rate graph; death rate is high (39%) at >60 age group and higher infected rate (37.8%) is under <30 age group.

Comparison of COVID-19 Infection among Bangladesh and other countries by age group

Neighboring country India showed nearly the same curve as Bangladesh. It had the highest 32.78% of patients in the <30 age group (37.8% in Bangladesh) and the lowest 13.07% of patients in the>60 age group against 7% in Bangladesh for the same age group. The comparative information has been presented in a line chart and box-whisker plot (Figure 5A, 5B).

Other countries like the USA, Spain, and China had the highest percentage of patients (32.33%, 31.2%, and 47%) in the>60 age group, respectively. The lowest share of COVID-19 cases (14.96%) belongs to the 41-50 age group in the USA. Moreover, 10.2% and 8% cases were found in the <30 age group in China and Spain, respectively.



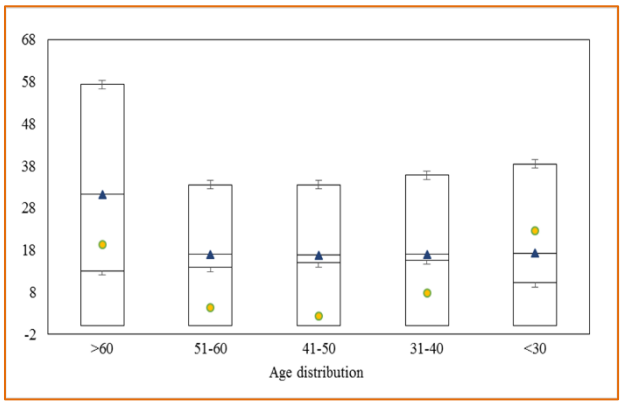


Figure 5: Age Distribution of infected people; (A) Line chart shows the different patterns of infected patients by age among different countries; (B) Box-whisker plot shows the distribution of mean, median, mode, 1st quartile, 3rd quartile and outliners at different age group.

Demography is certainly a significant cause of this type of difference, as we guessed primarily. According to the Bangladesh population census (2011), about 61% of people belong to the < 30 age group. Similarly, per the Indian population pyramid (2016), about 57.2% of people belong to the <30 age group. The number of older people is growing faster than the younger generation in the USA. According to the US census bureau, the growth rate is around 31.5% for the generation group of 45-64 and 15.1% for the age group of >65. In Spain, about 24.94 % of the population belongs to the 0-24 age group, about 30.59 % in the>55 age group, and the remainder (about 55.53 %) belongs to the 25-54 age group (population pyramid, 2017). About 22.62% of the population in China belongs to the>60 age group (China Pyramid of Population, 2018). Therefore, the overall number of young and working-age people is comparatively higher in India and Bangladesh.

The socio-cultural infrastructure and lifestyle of the Young and working-age population pose many similarities. The most common phenomenon between these two countries is fanaticism and superstition. These two characteristics led a significant portion of society to lead a stubborn and unhealthy life. The infected prevalence showed the same trend in different age groups. As the number of older people is higher in the USA, the level of the infected rate for older age groups in the United States is higher. In Spain, the percentage of the>55 age group is comparatively higher than in others, so the incidence of infection within this group is high. China also displayed the same trend as Spain and the USA.

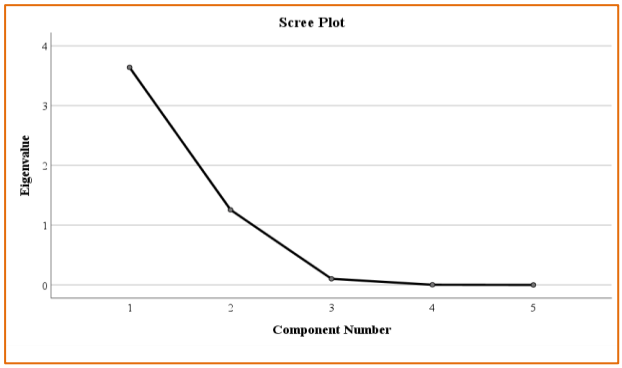


Figure 6 (A): Scree plot of the PCA.

Around 31% of those affected were over 60 years of age. All of this information has been summarized in Figure 6 (A). As the health status started to worsen with age due to several senile diseases [51], COVID-19 affects the people of >60 age groups more. Except for demography, others factors are also responsible for the variation of COVID-19 cases among different age groups in these countries. One of these issues, i.e., socio-cultural thoughts, are sometimes difficult to present with some lacking authentic data sources. However, a few issues can be discussed based on social media and different social networking sites. For instance, in developing countries like the USA, Spain, and China, young people may have updated recreational facilities, which is very much needed during the lockdown. This sort of facility is more helpful in keeping the young people at home and making them safe. On the contrary, those countries' authorities can convince the people about the COVID-19 pandemic situation. Though India is now being developed to some extent, most of its young people may not be able to have these sorts of facilities like the developed world. Bangladesh is still a developing country, and most people live underneath the neediness line. So, the young people can't get those kinds of facilities. Also, the authorities and defense forces are unable to control people.

Principal Component Analysis (PCA)

PCA analysis was applied to determine the association between the parameters and principal components. Eigenvalues greater than one were considered to demarcate the principal components. The scree plot of the PCA is shown in Figure 6 (B). Therefore, two principal components were derived from the analysis. These two components explained 97.91% of the variation in the data. Amongst different age groups, PC1 explains the highest 72.79% of the variation, whereas PC2 explains 25.12% of the total variation. The age group of <30 and 31-40 had the highest positive relation with PC1, while >60 and 51-60 had the highest negative association with PC1. Besides, the 41-50 age group had the highest positive relation with PC2, whereas a strong negative association couldn't find in PC2 (Table 1).

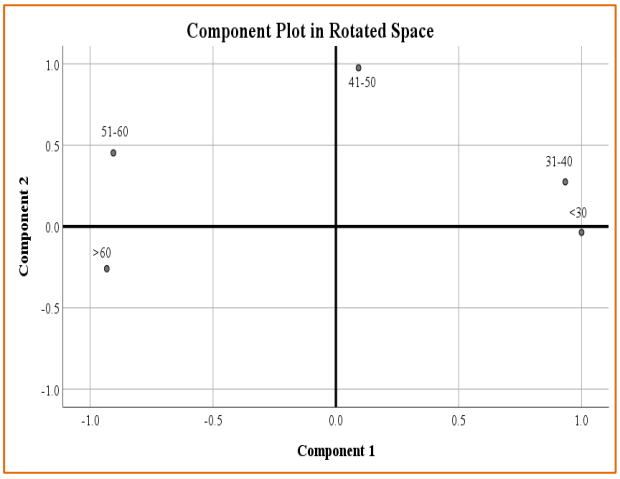


Figure 6 (B): Biplot showing the relation of components in rotated space.

Table 1: Component matrix for PCA analysis.

Variables (age group)	PC1	PC2
<30	0.986	-0.149
31-40	0.985	0.162
>60	-0.981	-0.148
51-60	-0.805	0.545
41-50	0.296	0.943
Eigenvalue	3.64	1.26
Variability (%)	72.79	25.12
Cumulative %	72.79	97.91

Multi-criteria Decision Making (MCDM)

Entropy Weight:

Here the weight of entropy for each parameter, i.e., different age groups and five countries, is determined. The weighted entropy values for each parameter are shown below (Table 2). These weighted entropy values are used to determine the ranking solutions of MCDM methods, including topsis, advance topsis, SAW, and WPM.

Table 2: Entropy weight for calculating the ranks of topsis, advance topsis, SAW and WPM methods of MCDM.

Age Distribution (%)				
>60	51-60	41-50	31-40	<30
0.43	0.05	0.013	0.09	0.41
Country				
USA	China	Spain	India	Bangladesh
0.07	0.09	0.41	0.12	0.29

Topsis and Advance Topsis Method:

Topsis and Advance Topsis methods showed that the>60 age group was at higher risk of infection in the five countries with the rank of five (Table-3). This applied method suggested that between 51-60 and <30 age groups rank varied between 3rd to 4th with moderate risk and 41-50 age group always showed the first rank with lower risk thread in terms of infection rate of COVID-19.

Table 3: Values and Rankings of Topsis, Advance Topsis, SAW, and WPM methods

	Topsis		Advance Topsis		SAW		WPM	
Age Group	Closeness Coefficient	Rank	Closeness Coefficient	Rank	V	Rank	V	Rank
>60	0.38	5	0.50	5	1.09	5	1.71E-05	5
51-60	0.44	4	0.57	3	1.55	2	4.28E-04	2
41-50	0.49	1	0.66	1	1.77	1	7.35E-04	1
31-40	0.45	2	0.61	2	1.44	3	1.38E-04	3
<30	0.44	3	0.55	4	1.17	4	2.57E-05	4

Simple additive weighting (SAW) and weight product method (WPM):

Simple additives weighting and weight product method showed the same rating as Topsis and Advanced Topsis. According to these criteria, >60 age group people are at higher risk of infection rate for COVID-19 with the fifth rank. The age group below <30 has a comparatively low-risk infection compared to group >60 with fourth rank (Table 3). People under 41-50 age groups are safe worldwide with the first rank const

Causes to affect young and working-age people in Bangladesh by COVID-19

During the COVID-19 pandemic, young and working-age individuals are affected most, as seen from the study's observed data and subsequent analysis. The high infected rate occurred mainly due to the lacking knowledge and awareness. Working-age individuals are predominantly involved in work and business activities. These guys are always threatening older people, especially in a joint family. According to the pilot survey among young people, most youngsters prefer not to stay at home due to dysfunctional relationships with parents and other family members, freedom-seeking inclination, boredom, gang activities, etc. Gang activities lead to underage smoking, gambling habits, and drug abuse, which in turn causes societal demoralization. Nearly 25 lakhs are substance addicts. Around 80 % of drug users in Bangladesh are teenagers and young people between the ages of 15 and 30 [52]. After opioid abuse, about 80% of drug users lose control in their everyday lives and continue to lose morals and judgments [44]. This is one of the significant factors to get them alienated from the family, which also drives them to have negative health consequences. Like most members of civil society, young individuals are likely to move out of the house too. This form of inclination has increased because of societal practices and family issues. To get this sort of anxiety instantly released, people start going outside. This could also be because those affected by COVID-19 are young and working-age. Wide exposure to the outer environment coupled with uncontrolled as well as unhealthy lifestyles has made the young ones more vulnerable to the disease. Ignoring the rapid pace of COVID-19 transmission,

people in Bangladesh are still adamant about visiting the markets and other crowded places. Sometimes, they visit those places without any significant reasons. These types of activities have proven to be life-threatening and risky in this country. In the context of Bangladesh, young people from all classes/sectors can pose a threat to other family members since they can work as a bearer of the disease. The threat is more severe for the elderly ones in a pandemic like COVID-19. The resultant scenario would be more satisfactory if the analysis was conducted on a wide-angle dataset.

Limitations of this Study

The Covid-19-infected were only studied for 12 weeks over the summer from April 1st to June 24th. Participants in this research range from under 30 to over 60 years old. The prevalence of infection in children and pregnant women must be considered while analyzing the data since these groups are more vulnerable to covid-19's effects. In this study, only the summer impacts were examined; therefore, winter effects might likely differ.

Conclusion

In this study, the time series forecasting method, PCA, and MCDM were utilized to foresee the eventual fate of the COVID-19 pandemic in Bangladesh. Analysis has also been made to assess and disseminate risk for various age groups and discover the potential reasons for variety among the age groups in different countries. Within 108 days of the COVID-19 pandemic, 122,709 patients were found, and as indicated by time-series forecasting, the number of patients will be roughly 211843. If this sort of progression stays at its genuine rate, at that point, the nearest future will be an excess of trying for Bangladesh through the health sector, which is not prepared to carry the load. Preliminary statistical analysis showed differences in COVID-19 cases in certain age groups in Bangladesh and India compared to Europe and the USA. Unlike the developed countries, Bangladesh has got much younger patients, while the death toll is higher among the old people as expected. The PCA analysis specifically determines the highest positive association among the youths and demonstrates the highest negative association among the older in PC1. On the other hand, the 41-50 age group had the highest positive relation with PC2, whereas a strong negative association couldn't be found in PC2. Again, the MCDM ranking solutions demonstrated the general risk investigation for various age groups among various nations. As per the MCDM result, the fifth position was constantly saved of infection rate for >60 age group, which was in peril, and the age bunch <30 switches its position between 3rd to the fourth rank showing the nearly lower chance of getting infected. Dissimilarity among the various age group in various nations happened because India and Bangladesh hold a relatively higher number of young and working-age people. In contrast, the USA, Spain, and China hold many old individuals. Moreover, the infection among adolescents was involved in employment and business activities. Various sorts of addiction and gambling activities, social demoralization, dysfunctional relationship with guardians and relatives, freedom looking for intentions, and so on also lead them towards the danger due to COVID-19. These make a huge threat to the old guardians and other family members and the community too. Immunity and discipline in lifestyle are most significant for the COVID-19 pandemic and its control. Youngsters have nearly dynamic immunity but less control over their life. Therefore, it makes them highly likely to be affected, while they get rid of easily through gifted immunity. However, the risk is carried through the veteran part of the community in the meantime.

Abbreviation

COVID-19: Coronavirus Disease-19; WHO: World Health Organization; MCDM: Multi-Criteria Decision Making; SAW: Simple Additive Weighting; WPM: Weighting Product Method; PCA: Principal Component Analysis; IEDCR: Institute of Epidemiology, Disease Control and Research

Declaration

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Availability of data and materials

Data will be available by emailing monir1.gm@gmail.com; monir@korea.ac.kr

Authors' contributions

MM designed, planned, conceptualized, MM, TAA and AHANK drafted the original manuscript. TAA, AKS, PS, MIN, SA and HAA was involved in statistical analysis and interpretation; MIN, SA and HAA contributed in data analysis, and validation; MM, TAA, AHANK, AKS and PS contributed to editing the manuscript, literature review, and proofreading; TAA, HAA and MM, were involved in software, mapping, and proofreading during the manuscript drafting stage.

Ethics approval and consent to participate

We conducted the research following the Declaration of Helsinki, and data is open for use from the original sites that is why authors no need to any approval and consent to participation.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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