The Association Between COVID-19 Incidence and Mortality with Socioeconomic Development - A Global Ecological Study

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Abstract

Background: There is some evidence about the role of human development in the incidence and mortality of some diseases. The aim of this study was to investigate the relation between COVID-19 incidence and mortality with development indexes in different regions of the world.

Methods: This ecological study was conducted on data from January 11 to August 23, 2020. The development indexes included were Human development index (HDI), Inequality-adjusted HDI (IHDI), the Gini Coefficient, Gender Development Index (GDI), Gender Inequality Index (GII) and their components. The development indexes was obtained from the United Nations Development Program (UNDP). COVID-19 cases and mortality data of the countries involved in the pandemic were obtained from the European Centre for Disease Prevention and Control (ECDC). Data was analyzed by Spearman correlation coefficients and negative binomial regression through SPSS26.

Results: The highest and lowest incidence and mortality rates were in the AMRO and WPRO regions, respectively. The development indexes had no a significant linear correlation with COVID-19 incidence and mortality except in WPRO, where there was direct significant correlation between life expectancy at birth and inequality adjusted life expectancy with COVID-19 incidence and mortality ($P < 0.05$).

Conclusions: Our findings suggests limited evidence that countries level of development may directly influence morbidity and mortality from COVID-19. However, with regard to the ecological nature of this study, the reason for this association is difficult to determine.

Background

A novel coronavirus, named coronavirus disease 2019 (COVID-19), was identified as the cause of a cluster of pneumonia cases in Wuhan, a city in the Hubei province of China, at the end of 2019. On January 30, 2020, the World Health Organization (WHO) declared the outbreak a "Public Health Emergency of International Concern" (PHEIC) (1) and on 11, March 2020 WHO announced COVID-19 as a pandemic (2). Based on the WHO statistics 25 327 098 confirmed cases and 848 255 deaths happened in 216 countries, areas or territories up to 1 September 2020 (3). Hauser et al indicated that the expected burden of this disease for populations will increase with further expansion of the COVID-19 epidemic around the globe (4).

There is evidence about the role of human development in incidence and mortality of some diseases (5–7). Traditionally and before the first human development report of the United Nations Development Program (UNDP) in 1990, "development" had been defined, measured and expressed in economic terms. In fact, societies with strong economic background were considered highly developed and vice-versa (8). However, comparison of societies' development level based on only economic indicators may lead to unrealistic and unreliable results. In fact, economic indicators alone could not properly reflect the performance of countries in the other areas such as environment, public health, public education and etc (8). In 1990, the UNDP introduced a new concept of development which in addition to economic

indicators, consisted of health and education indicators and was called the Human Development Index (HDI) (9). In fact, the HDI was created to indicate that the people, and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone (10).

In 1995, the Gender Related Development Index (GDI) was introduced in the Human Development Report written by the UNDP. The aim of this index was to add a gender-sensitive dimension to the Human Development Index (HDI) and measure gender equality (11). The Gender Inequality Index (GII) is an index for measurement of gender disparity that was introduced in the 2010 Human Development Report's 20th anniversary edition by the UNDP. According to the UNDP, this index is a composite measure used to quantify the loss of achievement within a country due to gender inequality. The new index was introduced as an experimental measure to remedy the shortcomings of the previous indicators, GDI and the Gender Empowerment Measure (GEM), both of which were introduced in the 1995 Human Development Report (12).

The 2010 Human Development Report introduced an Inequality-adjusted Human Development Index (IHDI). While the simple HDI remains useful, it is stated that "the IHDI is the actual level of human development (accounting for inequality)", and "the HDI can be viewed as an index of potential human development or the maximum IHDI that could be achieved if there were no inequality" (13, 14).

The oldest development index is the Gini coefficient which was developed by the Italian statistician, Corrado Gini in 1912. Gini proposed that the difference between the hypothetical straight line depicting perfect equality, and the actual line depicting people's incomes, can be used as a measure of inequality. Gini index varies between 0, which shows perfect equitability where everyone has the same share of the good, and 1, where one person has everything (15).

There is no evidence about the role of social development in the control of COVID-19. This study was conducted to investigate COVID- 19 incidence and mortality in different regions of the world in relation to countries' level of development. COVID-19 has caused a considerable burden in the world, and evaluating the different incidence and mortality rates of the disease and its related factors may lead us to better understand the nature and trend of this disease.

Methods

This was an ecological study about the relation between COVID-19 incidence and mortality with the Human development index (HDI), Inequality-adjusted HDI (IHDI), Gini Coefficient, Gender Development Index (GDI), Gender Inequality Index (GII) and their components, conducted on data from January 11 to August 23, 2020.

HDI has three dimensions that include: life expectancy, education, and gross national income (GNI). Inequality - adjusted life expectancy, inequality - adjusted education and inequality - adjusted income indexes are the dimensions of IHDI. GDI has two components that include female and male HDI.

The development data of all world countries were not available. HDI was available for 173, IHDI and Gini Index for 144, and GDI and GII for 126 countries.

COVID-19 incidence and mortality data and development indicators were obtained from the European Centre for Disease Prevention and Control (ECDC) and United Nations Development Program (UNDP). Until August 23, 216 countries were affected by the COVID-19.

We analyzed the available data in the six WHO regions. These regions included the African Region (AFRO), Region of the Americas (AMRO), Eastern Mediterranean Region (EMRO), European Region (EURO), South-East Asia Region (SEARO) and Western Pacific Region (WPRO).

Spearman correlation coefficient were calculated and Negative Binomial (NB) regression models were used to examine the effect of HD indices on COVID 19 incidence and mortality. In NB regression, due to the large number of cases and deaths (response variable) and the small value of development indicators (independent variables), development indicators were multiplied by 100 to facilitate RR interpretation. Spearman correlation coefficient (r), Risk Ratios (RR) and p-values were reported. We considered a p-value < 0.05 as the level of statistical significance. SPSS version 26 and Stata version 14 were used to analyze the data.

Results

In total 22 945 248 new cases and 800 003 deaths due to COVID-19 were recorded worldwide until August 23, 2020. The number of cases and deaths in the AMRO region was 12 326 081 and 439 406, in EURO 3 955 045 and 217 765, in AFRO 987 990 and 20 069, in WPRO 444 123 and 9 517, in SEARO 3 459 461 and 66 392, in AMRO 1 772 548 and 47 854. The highest and lowest number of cases and death due to COVID-19 were in the AMRO and WPRO regions, respectively.

The results of Spearman correlation showed that in WPRO, there was a significant direct correlation between life expectancy at birth and inequality adjusted life expectancy with COVID-19 incidence and mortality (Table 1, A-F).

Increase in the HDI index was associated with an increased incidence in AMRO and AFRO areas and with an increased mortality in AMRO, EURO and AFRO.

The results for life expectancy at birth were inconsistent. Increase in life expectancy at birth index was associated with an increased incidence in AMRO area and an increased mortality in EURO, but a decreased incidence in SEARO.

Increase in the expected years of schooling index was associated with an increased incidence in EURO and AFRO and an increased mortality in AMRO, EURO and AFRO.

Increase in the mean years of schooling index was associated with an increased incidence in AFRO and an increased mortality in AMRO and AFRO.

The results for GNI were inconsistent. Increase in the GNI index was associated with an increased incidence in AFRO and an increased mortality in WPRO, but a decreased incidence in EURO and SEARO (Table 1, A-F).

Increase in the IHDI index was associated with an increased incidence in AMRO and AFRO and an increase mortality in WURO and AFRO.

The results for inequality adjusted life expectancy index were inconsistent. Increase in the inequality adjusted life expectancy index was associated with an increased incidence in AMRO and AFRO areas, an increased mortality in EURO and AFRO, but a decrease in both mortality and incidence in SEARO.

Increase in the inequality adjusted education index was associated with an increased incidence in AMRO and AFRO and an increased mortality in AFRO.

Increase in the inequality adjusted income index was associated with an increased incidence in EMRO and an increased mortality in EURO and EMRO (Table 1, A-F).

The results for GDI were inconsistent. Increase in GDI was associated with an increased incidence in WPRO but a decreased mortality in SEARO and EMRO.

The results for GII were inconsistent. Increase in the GII index was associated with an increased incidence in SEARO, and increased mortality in SEARO and EMRO, but a decreased incidence in AFRO and a decreased mortality in EURO.

Increase in male-HDI index was associated with an increased incidence in AMRO, EURO, AFRO and EMRO, as well as an increased mortality in AMRO, EURO and AFRO. But, the results for GII were inconsistent. Increase in female-HDI was associated with an increased incidence in AMRO and AFRO, and an increased mortality in AMRO, EURO and AFRO, but a decreased incidence in SEARO.

Increase in the Gini index was associated with an increased incidence and mortality in EURO and AFRO (Table 1, A-F).

Discussion

Past research has shown that public health outcomes are influenced by indicators of human development, such as education, employment, and income, probably because these variables impact access to public health infrastructure and general health of populations (16). Some researchers even believe that the COVID-19 epidemic around the world could have been estimated and mapped out to some degree of accuracy by simply taking into account some macro variables, such as the population size, HDI scores, and immigrant stock from the origin, at each destination (17).

In 14 regions of Asia, a moderate positive correlation was found between confirmed and deceased cases of COVID-19 with HDI (18). In inner São Paulo state municipalities, with a 10% increase in the Gini and

HDI index, the confirmed COVID-19 cases significantly increase 1.32 and 0.54 times, respectively (19) and with a 10% increase in Gini and HDI index, COVID-19 mortality increased significantly 0.6 times and insignificantly 1.42 times, respectively (19).

The incidence of COVID-19 was reported to have spatial dependence with moderate positive correlation with MHDI (municipal human development index) in the state of Ceará in Brazil (20). Another ecological study showed a significant positive correlation between the incidence of COVID-2019 and HDI around the world (21). In the present study, in developed regions including the United States and Europe, the HDI index was associated with an increase in cases.

Inequality in human development affects countries' capacity to respond to COVID-19. (22). The availability of resources is intertwined with the ability to react to a crisis and includes the ability to monitor the crisis for decision making, ability to treat those requiring medical attention and ability to develop new products and services to adapt to the changing circumstances in the health system and beyond (23).

Crises have multiple interconnected health, economic and social dimensions (23). GDP and HDI may create better public health infrastructure that affects the health of citizens in every country of the world, regardless of their listed UN or World Bank wealth status (22).

The public health policies to slow the spread of COVID-19 are premised on reducing human interaction and as a result will slow down economic activity (23). The response to COVID-19 has to balance public health priorities with economic and social activities, accommodating short-term measures to mitigate the spread of the virus and their long-term effects. A human development approach places protecting and enhancing human capabilities as the central anchor, guiding analysis and policy, with a systemic and long-term view. Countries and communities that can deal with COVID 19 through non-pharmaceutical interventions are expected to be better in the long run; but in short term, these interventions, can damage the economy or activities for which social distancing is difficult or impossible (23).

To the best of our knowledge, our study is the first to investigate the relation between several different socioeconomic indexes and COVID-19 incidence and mortality. One of the limitations of this study was the lack of development indicators for all countries involved in the COVID-19 pandemic.

Conclusion

Some socioeconomic indexes were directly associated with increased COVID-19 incidence and mortality around the world. Results of the present study can help policy makers and health officials determine the most vulnerable areas and plan to make socioeconomic improvements that can consequently enhance people's health.

The proposal of this research has been approved by Kerman University of Medical Sciences with the code of ethics IR.KMU.REC.1399.402.

Declarations

Ethics approval and consent to participate: Ethics approval was obtained from the Kerman University of Medical Sciences with the ethical code IR.KMU.REC.1399.402.

Consent for publication:

Not applicable.

Availability of data and materials:

The data that support the findings of this study are available from the corresponding author, [N.K.], upon reasonable request.

Competing interests:

The Authors declare that there is no conflict of interest.

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Authors' contributions: S.T., M.E., E.K., N.K., R.R and S.K. wrote the first draft, and the statistical analysis was conducted by R.E. and S.T. All authors contributed to the data collection, interpreting the results and commenting on the initial manuscripts.

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Tables

Table 1-A. Association of COVID-19 incidence and mortality with development indices in the American region								
Variables	Confirmed Case				Confirmed Deaths			
	RR (95% CI)	P- value	r _s	P- value	RR (95% CI)	P- value	r _s	P- value
AMRO								
HDI(n=33)	1.14 (1.09- 1.19)	<0.001	0.162	0.368	1.15 (1.09- 1.21)	<0.001	0.163	0.363
Life expectancy at birth (n=34)	1.00 (1.00- 1.00)	<0.001	0.204	0.247	0.99 (0.98- 1.01)	0.703	0.223	0.204
Expected years of schooling(n=34)	0.99 (0.97- 1.01)	0.511	0.283	0.105	1.02 (1.00- 1.03)	0.010	0.265	0.131
Mean years of schooling(n=33)	1.00 (0.99- 1.00)	0.112	0.098	0.589	1.04 (1.00- 1.08)	0.020	0.059	0.745
GNI(n=33)	1.00 (0.99- 1.00)	0.077	0.163	0.364	1.00 (0.99- 1.00)	0.153	0.148	0.411
IHDI(n=26)	1.38 (1.07- 1.78)	0.011	0.237	0.244	1.21 (0.72- 2.07)	0.469	0.212	0.298
Inequality adjusted life expectancy index(n=33)	1.14 (1.09- 1.18)	<0.001	0.228	0.201	0.92 (0.54- 1.55)	0.758	0.238	0.182
Inequality adjusted education index(n=29)	1.05 (1.02- 1.08)	0.001	0.030	0.879	1.46 (0.57- 3.78)	0.426	-0.002	0.992
Inequality adjusted income index(n=27)	1.24 (0.78- 1.98)	0.346	0.329	0.094	1.11 (0.40- 3.11)	0.833	0.301	0.127
GDI(n=28)	1.26 (0.84- 1.89)	0.262	-0.163	0.408	1.07 (0.68- 1.69)	0.741	-0.203	0.301
GII(n=29)	0.35 (0.07- 1.64)	0.185	-0.067	0.728	0.89 (0.81- 1.01)	0.059	-0.069	0.722
HDI- Male(n=29)	1.16 (1.11-	<0.001	0.294	0.121	1.48 (1.08-	0.040	0.285	0.134

	1.22)				2.03)			
HDI- Female(n=30)	1.14 (1.10- 1.19)	<0.001	0.242	0.197	1.52 (1.17- 1.98)	0.002	0.229	0.224
Gini Coefficient(n=21)	1.00 (0.99- 1.00)	0.637	-0.066	0.775	1.00 (0.99- 1.00)	0.851	-0.079	0.735

Table 1-B. Association of COVID-19 incidence and mortality with development indices in the European region								
Variables	Confirmed Case				Confirmed Deaths			
	RR (95% CI)	P- value	r _s	P- value	RR (95% CI)	P- value	r _s	P- value
EURO								
HDI(n=51)	1.02 (0.97- 1.06)	0.395	0.008	0.995	1.11 (1.06- 1.15)	<0.001	0.116	0.419
Life expectancy at birth (n=51)	1.00 (0.99- 1.00)	0.595	0.047	0.744	1.00 (1.00- 1.00)	<0.001	0.135	0.346
Expected years of schooling(n=51)	1.00 (1.00- 1.01)	0.024	0.186	0.192	1.00 (1.00- 1.00)	<0.001	0.285	0.043
Mean years of schooling(n=51)	0.99 (0.99- 1.00)	0.314	-0.175	0.220	0.99 (0.99- 1.00)	0.209	-0.149	0.297
GNI(n=51)	1.00 (1.00- 1.00)	0.834	-0.053	0.714	1.00 (1.00- 1.00)	0.018	0.067	0.639
IHDI(n=47)	0.98 (0.94- 1.03)	0.655	-0.086	0.567	1.06 (1.01- 1.12)	0.007	0.017	0.910
Inequality adjusted life expectancy index(n=49)	0.99 (0.96- 1.02)	0.783	0.059	0.687	1.08 (1.05- 1.12)	<0.001	0.161	0.270
Inequality adjusted education index(n=50)	1.00 (0.97- 1.03)	0.916	-0.061	0.673	1.00 (0.97- 1.03)	0.776	0.007	0.960
Inequality adjusted income index(n=45)	0.99 (0.94- 1.03)	0.726	-0.047	0.754	1.05 (1.01- 1.09)	0.015	0.010	0.946
GDI(n=49)	1.08 (0.99- 1.18)	0.062	-0.093	0.523	1.02 (0.87- 1.20)	0.747	-0.019	0.897
GII(n=49)	1.01 (0.98- 1.03)	0.520	-0.060	0.682	0.94 (0.92- 0.97)	<0.001	-0.179	0.220
HDI- Male(n=49)	1.16 (1.11-	<0.001	0.030	0.838	1.11 (1.06-	<0.001	0.148	0.311

	1.22)				1.15)			
HDI- Female(n=49)	1.03 (0.98- 1.07)	0.184	0.011	0.939	1.11 (1.07- 1.15)	<0.001	0.139	0.340
Gini Coefficient(n=46)	1.00 (1.00- 1.00)	<0.001	0.091	0.547	1.00 (1.00- 1.00)	<0.001	0.087	0.564

Table 1-C. Association of COVID-19 incidence and mortality with development indices in the African region								
Variables	Confirmed Case				Confirmed Deaths			
	RR (95% CI)	P- value	r _s	P- value	RR (95% CI)	P- value	r _s	P- value
AFRO								
HDI(n=46)	1.11 (1.08- 1.14)	<0.001	0.226	0.131	1.11 (1.08- 1.13)	<0.001	0.057	0.706
Life expectancy at birth (n=47)	1.00 (1.00- 1.00)	0.152	-0.020	0.896	1.00 (1.00- 1.00)	0.069	-0.116	0.438
Expected years of schooling (n=47)	1.00 (1.00- 1.00)	<0.001	0.046	0.759	1.00 (1.00- 1.00)	<0.001	-0.109	0.466
Mean years of schooling(n=46)	1.00 (1.00- 1.00)	<0.001	0.242	0.105	1.00 (1.00- 1.00)	<0.001	0.110	0.467
GNI(n=51)	1.00 (1.00- 1.00)	<0.001	0.206	0.174	1.00 (1.00- 1.00)	<0.001	0.082	0.594
IHDI(n=42)	1.15 (1.10- 1.19)	<0.001	0.301	0.053	1.14 (1.10- 1.19)	<0.001	0.187	0.236
Inequality adjusted life expectancy index(n=47)	1.05 (1.02- 1.09)	<0.001	0.012	0.939	1.06 (1.02- 1.09)	<0.001	-0.127	0.394
Inequality adjusted education index(n=43)	1.07 (1.05- 1.09)	<0.001	0.204	0.190	1.07 (1.05- 1.09)	<0.001	0.044	0.778
Inequality adjusted income index(n=43)	0.98 (0.95- 1.01)	0.281	0.150	0.337	0.99 (0.96- 1.01)	0.462	0.135	0.388
GDI(n=13)	1.11 (0.99- 1.25)	0.064	-0.292	0.334	0.99 (0.01- 84.95)	0.995	-0.385	0.194
GII(n=13)	0.82 (0.75- 0.89)	<0.001	-0.074	0.809	0.287 (0.08- 1.01)	0.053	0.058	0.851
HDI- Male(n=42)	1.13 (1.09- 1.17)	<0.001	0.265	0.090	1.12 (1.09- 1.15)	<0.001	0.080	0.613

	1.16)				1.16)			
HDI- Female(n=42)	1.08 (1.06- 1.11)	<0.001	0.220	0.161	1.07 (1.05- 1.09)	<0.001	0.031	0.844
Gini Coefficient(n=45)	1.00 (1.00- 1.00)	<0.001	0.087	0.568	1.00 (1.00- 1.00)	<0.001	-0.123	0.422

Table 1-D. Association of COVID-19 incidence and mortality with development indices in the Western Pacific region

Variables	Confirmed Case				Confirmed Deaths			
	RR (95% CI)	P- value	r _s	P- value	RR (95% CI)	P- value	r _s	P- value
WPRO								
HDI(n=14)	1.02 (0.91- 1.16)	0.718	0.464	0.095	0.99 (0.91- 1.07)	0.818	0.466	0.093
Life expectancy at birth (n=15)	1.00 (0.99- 1.00)	0.558	0.686	0.005	1.00 (0.99- 1.00)	0.247	0.660	0.007
Expected years of schooling (n=15)	0.99 (0.99- 1.00)	0.978	0.331	0.228	0.99 (0.99- 1.00)	0.645	0.336	0.221
Mean years of schooling(n=15)	0.99 (0.90- 1.09)	0.937	0.406	0.133	1.00 (0.99- 1.00)	0.761	0.390	0.151
GNI(n=15)	1.00 (1.00- 1.00)	0.915	0.429	0.111	1.00 (1.00- 1.00)	0.017	0.437	0.103
IHDI(n=11)	0.69 (0.11- 4.36)	0.699	0.545	0.083	0.98 (0.93- 1.04)	0.628	0.486	0.129
Inequality adjusted life expectancy index(n=15)	1.02 (0.94- 1.11)	0.598	0.670	0.006	1.03 (0.97- 1.08)	0.267	0.648	0.009
Inequality adjusted education index(n=13)	1.05 (0.98- 1.12)	0.140	0.511	0.074	1.01 (0.95- 1.07)	0.624	0.420	0.153
Inequality adjusted income index(n=11)	0.99 (0.95- 1.03)	0.710	0.345	0.298	0.97 (0.93- 1.02)	0.293	0.303	0.365
GDI(n=13)	1.30 (1.01- 1.67)	0.035	0.242	0.426	1.06 (0.80- 1.42)	0.650	0.116	0.706
GII(n=13)	1.00 (0.94- 1.07)	0.863	-0.467	0.108	0.99 (0.95- 1.03)	0.814	-0.443	0.130

HDI- Male(n=13)	0.99 (0.91- 1.11)	0.998	0.407	0.168	0.97 (0.91- 1.03)	0.428	0.381	0.199
HDI- Female(n=13)	1.01 (0.91- 1.12)	0.864	0.385	0.194	0.97 (0.90- 1.04)	0.422	0.315	0.295
Gini Coefficient(n=11)	1.01 (0.95- 1.07)	0.737	0.009	0.979	1.00 (1.00- 1.00)	0.114	0.050	0.884

Table 1-E. Association of COVID-19 incidence and mortality with development indices in the South-East Asia region								
Variables	Confirmed Case				Confirmed Deaths			
	RR (95% CI)	P-value	r _s	P-value	RR (95% CI)	P-value	r _s	P-value
SEARO								
HDI (n=10)	0.76 (0.52-1.13)	0.173	-0.006	0.987	0.82 (0.46-1.44)	0.485	0.061	0.868
Life expectancy at birth (n=10)	0.99 (0.99-0.99)	0.002	0.188	0.602	0.98 (0.96-1.00)	0.064	0.137	0.705
Expected years of schooling (n=10)	0.98 (0.96-1.02)	0.346	-0.018	0.960	0.99 (0.94-1.03)	0.630	0.155	0.668
Mean years of schooling (n=10)	1.01 (0.98-1.04)	0.497	0.406	0.244	1.02 (0.98-1.06)	0.345	0.474	0.166
GNI (n=10)	0.99 (0.99-0.99)	0.039	-0.236	0.511	0.99 (0.99-1.00)	0.251	-0.170	0.638
IHDI (n=10)	0.81(0.66-1.004)	0.055	0.207	0.567	0.85 (0.63-1.15)	0.300	0.268	0.454
Inequality adjusted life expectancy index (n=10)	0.81 (0.71-0.91)	0.001	0.200	0.580	0.75 (0.70-0.81)	<0.001	0.170	0.638
Inequality adjusted education index (n=10)	0.89 (0.77-1.02)	0.104	0.297	0.405	0.92 (0.75-1.13)	0.409	0.377	0.283
Inequality adjusted income index (n=10)	0.76 (0.40-1.43)	0.388	-0.261	0.467	0.87 (0.40-1.85)	0.721	-0.116	0.751
GDI(n=9)	0.24 (0.03-1.60)	0.143	-0.233	0.546	0.70 (0.60-0.81)	<0.001	-0.151	0.699
GII(n=8)	1.53 (1.36-1.71)	<0.001	0.429	0.289	1.68 (1.46-1.94)	<0.001	0.381	0.352
Male-HDI (n=10)	1.05	0.894	0.042	0.907	1.17	0.713	0.109	0.763

	(0.50- 2.17)				(0.50- 2.73)			
Female-HDI (n=8)	0.78 (0.62- 0.99)	0.044	-0.190	0.651	0.83 (0.60- 1.14)	0.258	-0.143	0.736
Gini Coefficient (n=10)	0.99 (0.98- 1.01)	0.720	-0.109	0.763	0.99 (0.98- 1.01)	0.958	-0.122	0.737

Table 1-F. Association of COVID-19 incidence and mortality with development indices in the Eastern Mediterranean region

Variables	Confirmed Case				Confirmed Deaths			
	RR (95% CI)	P- value	r _s	P- value	RR (95% CI)	P- value	r _s	P- value
EMRO								
HDI(n=19)	1.03 (0.99- 1.07)	0.117	0.386	0.103	1.02 (0.98- 1.06)	0.208	-0.119	0.627
Life expectancy at birth (n=21)	1.00 (1.00- 1.00)	0.125	0.299	0.189	1.00 (0.99- 1.00)	0.359	-0.105	0.649
Expected years of schooling (n=21)	1.00 (1.00- 1.00)	0.062	0.356	0.113	1.00 (1.00- 1.00)	0.086	0.099	0.668
Mean years of schooling(n=20)	1.00 (1.00- 1.00)	0.350	0.374	0.104	1.00 (1.00- 1.00)	0.600	-0.053	0.825
GNI(n=20)	1.00 (1.00- 1.00)	0.248	0.585	0.007	1.00 (1.00- 1.00)	0.055	0.093	0.696
IHDI(n=8)	1.01 (0.96- 1.06)	0.685	-0.048	0.911	1.02 (0.97- 1.08)	0.320	-0.167	0.693
Inequality adjusted life expectancy index(n=20)	1.01 (0.97- 1.04)	0.582	0.235	0.319	0.99 (0.95- 1.03)	0.874	-0.263	0.262
Inequality adjusted education index(n=16)	1.01 (0.99- 1.04)	0.225	0.418	0.107	1.01 (0.99- 1.04)	0.240	-0.106	0.696
Inequality adjusted income index(n=11)	1.08 (1.01- 1.16)	0.017	0.391	0.235	1.07 (1.01- 1.13)	0.018	0.273	0.417
GDI(n=14)	0.97 (0.90- 1.04)	0.406	-0.064	0.829	0.83 (0.76- 0.90)	<0.001	-0.332	0.246
GII(n=14)	1.01 (0.97- 1.05)	0.406	0.187	0.522	1.07 (1.04- 1.12)	<0.001	0.416	0.139
HDI- Male(n=19)	1.04 (1.00-	0.032	0.465	0.045	1.03 (0.98-	0.139	-0.075	0.759

	1.09)				1.07)			
HDI- Female(n=19)	1.02 (0.99- 1.05)	0.149	0.376	0.113	1.00 (0.97- 1.04)	0.725	-0.215	0.377
Gini Coefficient(n=11)	1.00 (0.99- 1.00)	0.944	-0.105	0.759	1.00 (0.99- 1.00)	0.433	-0.146	0.669