Research Paper

Correlation Between Social Capital and COVID-19 Indices: A Global Level Ecological Study

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ABSTRACT

Background: Given that COVID-19 spreads worldwide, it has become a public health priority. This study aims to investigate the correlation between social capital and the epidemiological indicators of COVID-19.

Methods: This survey is an ecological study, so all studied variables are aggregated. To collect the variables in the study, a data set was provided, which included the information of each country based on the cumulative deaths, case fatality rate, recovery rate, and the number of performed COVID-19 tests. We drew scatter plots of the social capital for the studied countries based on COVID-19 indices.

Results: In all the studied countries, the highest cumulative incidence rate of COVID-19 cases was in Montenegro (60310.56 per million), while the lowest cumulative incidence rate of cases was in Tanzania (8.42 per million). The highest and lowest cumulative incidence rate of death due to COVID-19 was in Belgium (1425.15 per million) and Burundi (0.08 per million), respectively. Also, social capital has a significant direct correlation with the cumulative incidence rate of cases (r=0.42, P<0.001), the cumulative incidence rate of death (r=0.31, P<0.001), and the number of performed COVID-19 diagnostic tests per million. Social capital was correlated with recovery and mortality rates (r= -0.21, P=0.007).

Conclusion: Considering that social capital has a statistically significant relationship with the indices of case fatality and recovery rates, it is possible to increase social capital with appropriate interventions by relevant individuals and organizations to improve the pandemic management in different countries.

Keywords: Coronavirus, Social capital, Ecologic study

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1. Introduction

Since COVID-19 is still spreading worldwide, it has become a public health priority [1, 2]. As of November 18, 2021, more than 255767656 cases and more than 5139781 deaths, and only 231171572 recovered cases of COVID-19 had been reported globally. The United States, India, and Brazil had the highest number of cases globally, with 48287925, 34478517, and 21977661 total cases, respectively. These countries had the worst hits in all aspects of the economy, medical, etc., from COVID-19 [3-9]. One of the differences among countries in terms of death and recovery rates of COVID-19 may be related to social factors that affect the adherence to health principles, such as physical distancing, wearing a mask, and washing hands frequently, which cause long-term disruptions in travel, work, as well as social and cultural activities. However, economic, legal, technological, geographical, and cultural barriers can limit the government's ability to effectively respond to crucial public health needs [1, 10, 11]. Putnam conceptualizes social capital as the behavior of networks and social relationships characterized by trust and reciprocal action [11-13]. Social capital considerations appear as a powerful reference for understanding how to improve the implementation of health interventions to effectively expand the health services for the entire community [10, 14, 15]. The definition of social capital in the context of epidemics is the social resources that have risen from networks of persistent social relationships under conditions of physical isolation, such as the COVID-19 epidemic [16-18]. Social capital has three dimensions: networks which are the individual's social relationships and interactions, which are considered essential components of social capital; the cooperation norm, which is the social capital criteria; and trust, which is an essential element for strengthening cooperation due to the predictability of behavior of others and includes personal and generalized trust [19, 20]. In public health, many researchers have studied social capital as a variable to improve health outcomes and a framework to evaluate public health interventions [21-23]. Aspects of social capital are evident in the community's efforts in the early phases of the epidemic and can complete the government's efforts.

Various studies have shown that social capital affects the characteristics of infectious diseases, such as death rate, recovery rate, new cases, and the number of diagnostic tests, just like the relative income inequality which forms a social pattern in the distribution of infectious diseases in societies [1, 24, 25]. Elgar et al. suggested that societies that are economically more unequal and lack sufficient capacity in some dimensions of social capital experienced more deaths from COVID-19. These findings indicate much newer cases and fewer recovery cases due to COVID-19. In addition, social trust and group affiliations were associated with higher mortality due to COVID-19, probably due to behavioral contagion and inconsistency with the physical distance policy [1, 21]. Social capital is a crucial determinant of health. For example, the states with lower levels of group social capital have more deaths from COVID-19 than states with higher levels of social capital. New studies have shown COVID-19 patterns with more transmission of infection and worse health consequences due to working conditions and overcrowded housing [26, 27]. Some research in the United States has shown mild correlations between state-level income inequality and COVID-19 cases, deaths, and other communicable diseases, such as sexually-transmitted diseases and tuberculosis [28, 29]. Social capital has received more attention in recent decades, particularly in collaboration and innovation research. Research has also recently begun to view social capital as a potential protector against the problems caused by COVID-19. By investigating income inequality, social bounds, and links that facilitate collective action, we can understand why some countries have experienced fewer COVID-19 deaths and more recovery than others. However, the benefits of social capital for surviving an epidemic have not yet been explored [1, 10]. Therefore, the present study was conducted to investigate the correlation between social capital and epidemiological indices of coronavirus disease, including the cumulative incidence rate of cases, the cumulative incidence rate of death, performed COVID-19 tests per million, the recovery rate, and the case fatality rate.

2. Methods

The present study investigated the relationship between COVID-19 indices, such as the cumulative incidence rate of cases, the cumulative incidence rate of death, the number of diagnostic tests per million, and the recovery rate with social capital. We collected the data on COVID-19 indices available on the Worldometer website (https://www.worldometers.info/) for the period from the first COVID-19 report to November 30, 2020. Also, the details about COVID-19 indices and the data collected on COVID-19 indices have been previously published [30].

Data availability was as follows, social capital data for 165 countries, the cumulative incidence rate of cases for 165 countries, the cumulative incidence rate of death for 157 countries, the number of diagnostic tests per million for 153 countries, the recovery rate for 159 countries, and the case fatality rate for 157 countries. Social capital data were available on the www.solability.com website in 2019 [31]. Social capital was defined as follows: Social capital is naturally occurring social relationships among persons which promote or assist the acquisition of skills and traits valued in the marketplace. Social capital is also an asset that may be as significant as financial capital in accounting for the maintenance of inequality in our society [32].

Statistical analysis

Scatter plot of social capital was drawn in terms of COVID-19 indices of the cumulative incidence rate of cases, the cumulative incidence rate of death, the number of diagnostic tests performed per million, the recovery rate, and the case fatality rate for all studied countries. The Spearman correlation coefficient was used to determine the correlation between social capital and COVID-19 indices.

3. Results

The study showed that among the studied countries, the highest cumulative incidence rate of COVID-19 cases was in Montenegro (60310.56 per million) and Luxembourg (54807.89 per million), while the lowest cumulative incidence rate of cases was in Tanzania (8.42 per million) and in Samoa (10.05 per million). The highest cumulative incidence rates of death due to COVID-19 were in Belgium (1425.15 per million) and Spain (1118.96 per million), while the lowest cumulative incidence rates of death were in Burundi (0.08 per million) and Tanzania (0.35 per million). The highest COVID-19 diagnostic tests performed per million were in Luxembourg (2180641.18 per million) and the United Arab Emirates (1682880.81 per million). In contrast, the lowest diagnostic tests per million were reported from Yemen (560.05 per million) and Niger (1885.52 per million). The highest recovery rates of COVID-19 were in Timor-Leste (100%) and Singapore (99.86%), and the lowest rates were in Belgium (6.48%) and France (7.28%). The highest case fatality rates of COVID-19 were in Yemen (28.34%) and Mexico (9.54%) and the lowest rates were in Singapore (0.05%) and Burundi (0.15%). Also, the highest social capital was in Finland (58.78%), and the lowest was in the Bahamas (23.91%).

Table 1 presents the correlation coefficient between COVID-19 indices and social capital. The present study shows that social capital has a significant direct correlation with the cumulative incidence rate of cases, the cumulative incidence rate of death, and the number of performed COVID-19 diagnostic tests per million (P<0.001), meaning that increasing social capital, the cumulative incidence rate of cases, the cumulative incidence rate of death and the number of performed COVID-19 diagnostic tests per million also increased. Social capital was inversely correlated with recovery and mortality rates, case fatality (P=0.007), and recovery rates (P=0.008). In countries with populations of ≥10 million, a significant direct relationship was observed between social capital and the cumulative incidence rate of the cases, the cumulative incidence rate of death, and the number of performed COVID-19 diagnostic tests per million (P<0.001). Social capital was inversely correlated with the recovery rate (P=0.03) but not the case fatality rate (P=0.11).

Table 1. The Spearman correlation between social capital index and COVID-19 indices

Variables	All Countries				Countries With ≥10 Million Population			
	No.	Correlation Coefficient	P	Comment*	No.	Correlation Coefficient	P	Comment
Cumulative incidence rate of cases (per million)	165	0.42	<0.001	Moderate	86	0.44	<0.001	Moderate
Cumulative incidence rate of death (per million)	157	0.31	<0.001	Weak	85	0.37	<0.001	Weak
Performed diagnostic tests per million	153	0.47	<0.001	Moderate	79	0.50	<0.001	Moderate
Recovery rate (%)	159	-0.21	0.007	Weak	81	-0.24	0.03	Weak
Case fatality rate (%)	151573	-0.21	0.008	Weak	85	0.17-	0.11	NS**

*0.00-0.19: "very weak"; 0.20-0.39: "weak"; 0.40-0.59: "moderate"; 0.60-0.79: "strong"; 0.80-1.0: "very strong"

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** Indicates no significance.

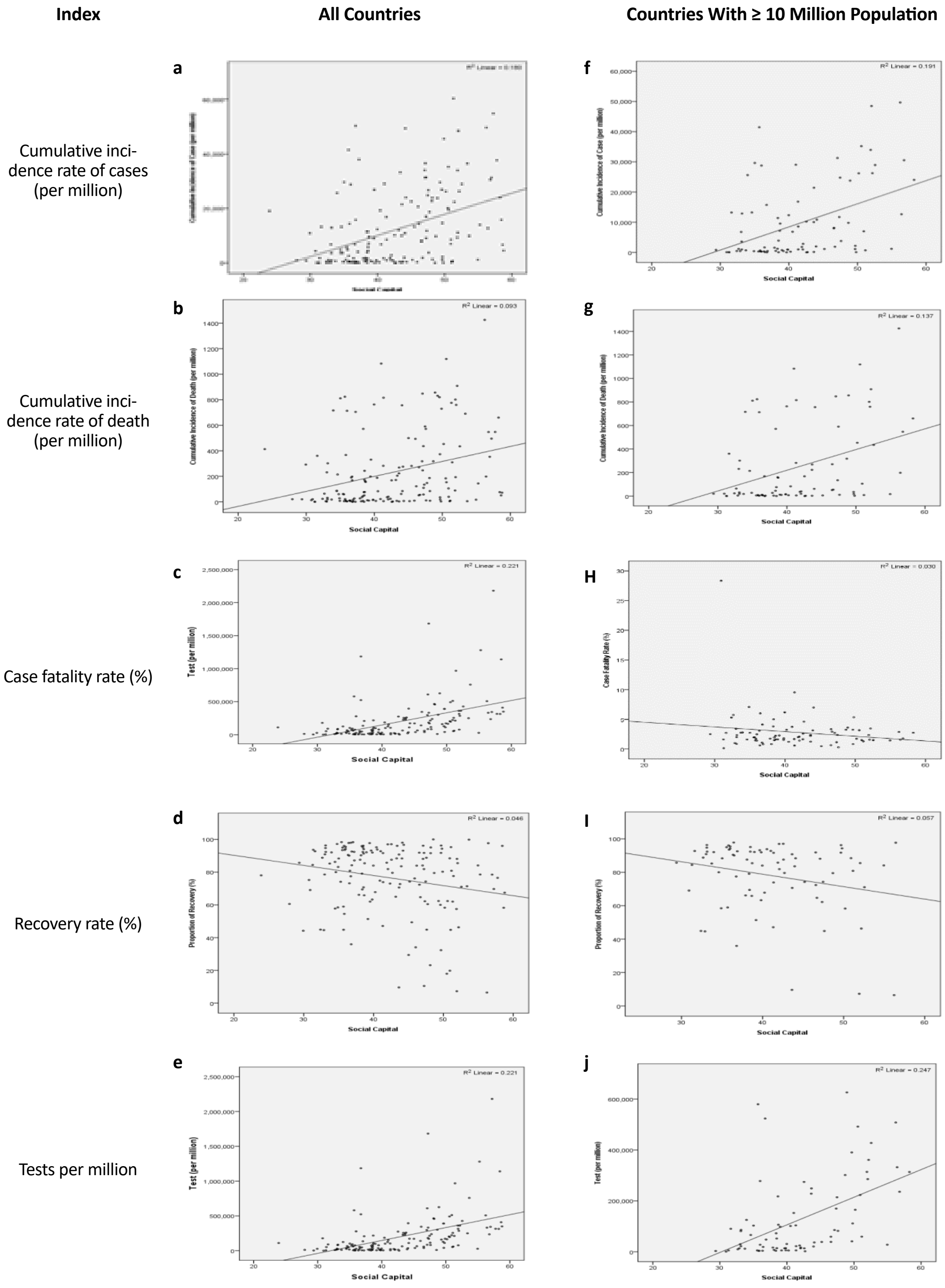

Figure 1. Scatter plot of correlation between social capital index and COVID-19 indices

a: Montenegro, Luxembourg, Bahrain, Belgium, Qatar, Czech Republic, Armenia, the United States, Panama, Switzerland, Israel, Slovenia, Spain, Georgia, France, Kuwait, Croatia, Austria, Argentina, the Netherlands, Brazil, North Macedonia, Peru, Portugal, Chile, Bosnia and Herzegovina, Costa Rica, Moldova, Italy, Poland, Colombia, Romania, Sweden, Oman, Maldives, the United Kingdom, Lithuania, Hungary, Malta, Jordan, Bulgaria, Serbia, Slovak Republic, Cabo Verde, the Bahamas, Lebanon, United Arab Emirates, Ukraine, Iceland, Russia, Ireland, Belize, Belarus, Denmark, Albania, Dominican Republic, South Africa, Iraq, Germany, Bolivia, Libya, Azerbaijan, Paraguay, Iran, Kyrgyz Republic, Honduras, Ecuador, Saudi Arabia, Greece, Singapore, Canada, Morocco, Estonia, Latvia, Suriname, Cyprus, Mexico, Tunisia, Nepal, Turkey, Kazakhstan, Guyana, India, Guatemala, Norway, El Salvador, Djibouti, Namibia, Trinidad and Tobago, Finland, Sao Tome and Principe, Botswana, Gabon, Philippines, Malaysia, Jamaica, Equatorial Guinea, RB Venezuela, Bangladesh, Guinea-Bissau, Uzbekistan, Indonesia, Algeria, Mauritania, Pakistan, Seychelles, Ghana, Uruguay, Kenya, the Gambia, Tajikistan, Afghanistan, Dominica, Japan, Egypt, Sri Lanka, Australia, Guinea, Lesotho, Senegal, Zambia, Ethiopia, Cameroon, Nicaragua, Haiti, Cuba, Comoros, the Republic of Korea, Zimbabwe, Madagascar, Bhutan, Mozambique, Angola, Rwanda, Syrian Arab Republic, Uganda, New Zealand, Mauritius, Sudan, Grenada, Togo, Brunei Darussalam, Nigeria, Liberia, Malawi, Sierra Leone, South Sudan, Benin, Mongolia, Mali, Burkina Faso, Chad, Republic of Yemen, Papua New Guinea, The Democratic Republic of Congo, Niger, China, Thailand, Burundi, Fiji, Timor-Leste, Cambodia, Vietnam, Samoa, Tanzania

b and c: All countries in (a) except Seychelles, Dominica, Bhutan, Grenada, Mongolia, Timor-Leste, Cambodia, and Samoa

d: All countries in (a) except the United Kingdom, Spain, Sweden, the Netherlands, the Democratic Republic of Congo, and Samoa

e: All countries in (a) except Comoros, Tajikistan, Burkina Faso, Chad, Sierra Leone, Nicaragua, Algeria, Sudan, Syrian Arab Republic, Tanzania, the Democratic Republic of Congo, and Samoa

f: All countries in (a) expect countries with < 10 million population

g and h: All countries in (a) except Seychelles, Dominica, Bhutan, Grenada, Mongolia, Timor-Leste, Cambodia, Samoa, and the countries with < 10 million population

i: All Countries in (a) Except the United Kingdom, Spain, Sweden, the Netherlands, the Democratic Republic of Congo, Samoa, and the countries with < 10 million population

j: All countries in (a) except Comoros, Tajikistan, Burkina Faso, Chad, Sierra Leone, Nicaragua, Algeria, Sudan, Syrian Arab Republic, Tanzania, the Democratic Republic of Congo, Samoa, and the countries with <10 million population

Figure 1 shows the scatter plot of the social capital index by cumulative incidence rate of cases, the cumulative incidence rate of death, the number of performed diagnostic tests per million, recovery rate, and case fatality rate in all countries and countries with populations of ≥10 million. In all countries, the highest R^2 was observed in case fatality rate (CFR) and the number of performed COVID-19 diagnostic tests per million (R^2=0.221). In countries with a population of ≥10 million, the highest R^2 was observed in the number of performed COVID-19 diagnostic tests per million (R^2=0.247) and the cumulative incidence rate of cases (R^2=0.191).

Figure 2 illustrates the box plot of the social capital index and COVID-19 indices. The horizontal line within the box represents the median. The box and error bars indicate the interquartile range and range, respectively.

4. Discussion

Consistent with Elgar et al. study, our study showed an inverse correlation between social capital and case fatality rate because, with the expansion of the social network, which is a subset of social capital, a person trusts others more and, as a result, has a greater desire to communicate with them. Also, at older ages, the desire of people to participate more in social activities and adherence to physical distancing, which is one of the preventive factors of COVID-19, decreases among them. These factors will lead to an increase in the number of patients and death. Therefore, the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) state that people 65 years and older are more likely to get COVID-19 due to chronic diseases. Therefore, they recommended that these people be vaccinated first. They concluded that adults 65 and older who received both doses of either Pfizer-BioNTech or Moderna COVID-19 vaccines showed a 94% reduced risk of COVID-19-related hospitalization. An evaluation was conducted at 24 hospitals in 14 states under real-world conditions, January-March 2021 [1, 33-35]. Another study suggests that countries with higher social capital had lower mortality and recovery rates for COVID-19, which is consistent with the present study. This result may be because countries with high social capital performed more COVID-19 diagnostic tests, which led to greater identification of patients with COVID-19 and reduced mortality [14]. Cary Wu et al. reported that countries with higher social capital were better able to respond to the pandemics. Thus, countries with higher social capital had higher cumulative incidence rates of cases and cumulative incidence rates of death. Also, high social capital in these countries has led to an increase in the number of diagnostic tests performed for COVID-19 and positive tests; therefore, increasing social capital can

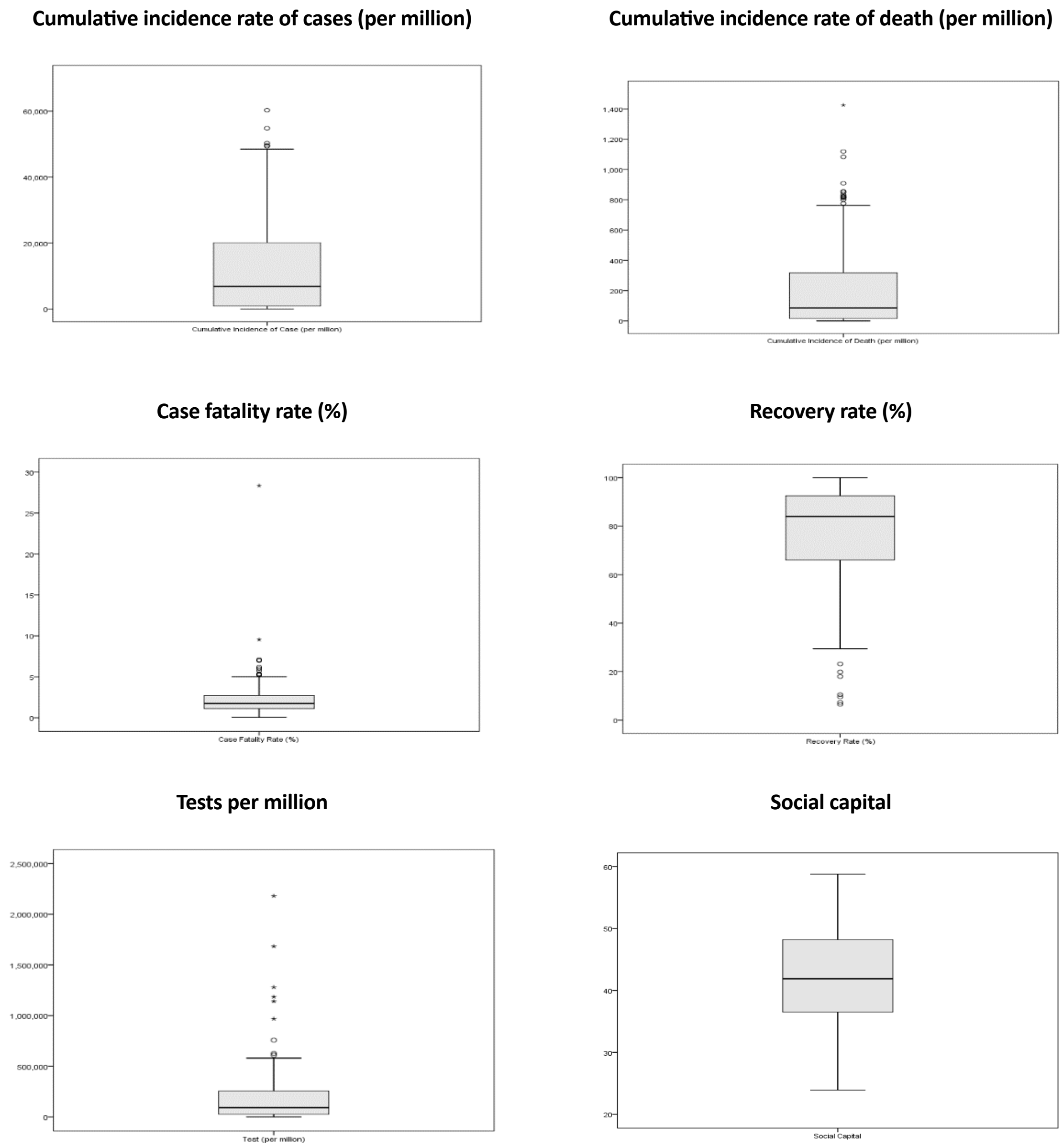

Figure 2. Box-plot of social capital index and COVID-19 indices

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affect all these factors, which is similar to the findings of the present study. WHO argues that polymerase chain reaction (PCR) testing is more accurate than rapid antigen testing, but in the case of the COVID-19 pandemic, these tests will also be valuable and useful. Therefore, it can be said that countries with higher social capital use PCR tests more, and countries with less social capital use rapid antigen tests. This will lead to accurate and rapid diagnoses of COVID-19 disease in countries with high social capital [36-38]. A study on the impact of social capital on individual responses to COVID-19 presented that social networks in countries with large populations and higher social capital harmed adherence to physical distancing, which led to an increased number of diagnostic tests and positive tests; as a result, these factors would also have an undesirable effect on the cumulative incidence rates of cases and deaths [18, 39-41]. One of the possible reasons for the relationship between social support and the cumulative incidence rate of fatalities can be that with the increase in social support, the number of people for corona diagnostic tests has increased. As a result, the number of positive cases has increased, further increasing the number of deaths. This result needs to be further investigated using analytical studies. Studies similar to ours showed that social capital had many advantages during a crisis and pandemic scenario. Societies with high social capital responded to pandemics more efficiently than societies with low social capital. The mortality rate was lower in societies with high social capital; therefore, increasing social capital indicators is emphasized. Social capital is associated with more diagnostic tests performed in these communities but is inversely related to the recovery rate [42-44]. Other studies consistent with the present study exhibited that social capital and community health indices were negatively correlated with COVID-19 growth rate at both state and country levels, and increasing social capital was related to the slower spread of COVID-19 infection and more adherence to physical distancing protocols resulting to decreased case fatality rate [45, 46].

5. Conclusion

Considering that social capital has a statistically significant relationship with the indices of case fatality rate, recovery rate, cumulative incidence rate of cases and death, it is possible to increase social capital with appropriate interventions by relevant individuals and organizations to improve the pandemic management in different countries.

Strength and limitation

The strength of the present study is that the relationship between social capital and COVID-19 indices was examined in 165 countries for the first time. But the limitation of this study is the use of ecological data and the possibility of ecological fallacy. Another study limitation was the lack of information on social capital in some countries.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences (Code: IR.SUMS.REC.1399.174).

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Authors' contributions

Designing the study: Alireza Mirahmadizadeh and Mousa Ghelichi-Ghojogh; Data collection: Kimia Jokari; Writing the manuscript: Alireza Jafari and Fatemeh Rezaei ; Revising the manuscript: Zahra Maleki and Roya Sahebi; Helping with statistical analysis and preparing the illustrations: Jafar Hassanzadeh and Fatemeh Rezaei; Editing the manuscript: Ali Akbari and Mehrzad Lotfi; Study conception and design, Approval of the final manuscript: All authors.

Conflict of interest

The authors declared no conflict of interest.

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References

[1] Elgar FJ, Stefaniak A, Wohl MJA. The trouble with trust: Time-series analysis of social capital, income inequality, and COVID-19 deaths in 84 countries. Social Science & Medicine. 2020; 263:113365. [DOI:10.1016/j.socscimed.2020.113365] [PMID] [PMCID]

[2] Azarpazhooh MR, Morovatdar N, Avan A, Phan TG, Divani AA, Yassi N, et al. COVID-19 pandemic and burden of non-communicable diseases: An ecological study on data of 185 countries. Journal of Stroke and Cerebrovascular Diseases. 2020; 29(9):105089. [DOI:10.1016/j.jstrokecerebrovasdis.2020.105089] [PMID] [PMCID]

[3] Akyol AD, Cetinkaya Y, Bakan G, Yarali S, Akkuş S. Self-care agency and factors related to this agency among patients with hypertension. Journal of Clinical Nursing. 2007; 16(4):679-87. [DOI:10.1111/j.1365-2702.2006.01656.x] [PMID]

[4] Gowda PG. A study of knowledge and self care practices in patients of type 2 diabetes mellitus: Array. Electronic Physician. 2012; 4(3):551-4. [Link]

[5] Rocha ICN, Pelayo MGA, Rackimuthu S. Kumbh mela religious gathering as a massive superspreading event: Potential culprit for the exponential surge of COVID-19 cases in India. The American Journal of Tropical Medicine and Hygiene. 2021; 105(4):868-71. [DOI:10.4269/ajtmh.21-0601] [PMID] [PMCID]

[6] Rocha ICN, Hasan MM, Goyal S, Patel T, Jain S, Ghosh A, et al. COVID-19 and mucormycosis syndemic: Double health threat to a collapsing healthcare system in India. Tropical Medicine & International Health. 2021; 26(9):1016-8. [DOI:10.1111/tmi.13641] [PMID] [PMCID]

[7] Rocha ICN, Goyal S, Rackimuthu S, Jain S. SARS-CoV-2 variants of concern: Implications on the second wave of COVID-19 in India. Le Infezioni in Medicina. 2021; 29(3):492-4. [DOI:10.53854/liim-2903-22] [PMID] [PMCID]

[8] Daneshfar M, Dadashzadeh N, Ahmadpour M, Haghi HR, Rahmani V, Frouzesh M, et al. Lessons of mortality following COVID-19 epidemic in the United States especially in the geriatrics. Journal of Nephropharmacology. 2021; 10(1):e06. [DOI:10.34172/npj.2021.06]

[9] Hamidian Jahromi A, Mazloom S, Ballard D. What the European and American health care systems can learn from China COVID-19 epidemic; Action planning using purpose designed medical telecommunication, courier services, home-based quarantine, and COVID-19 walk-in centers. Immunopathologia Persa. 2020; 6(2):e17. [DOI:10.34172/ipp.2020.17]

[10] Gilles I, Bangerter A, Clémence A, Green EG, Krings F, Staerklé C, et al. Trust in medical organizations predicts pandemic (H1N1) 2009 vaccination behavior and perceived efficacy of protection measures in the Swiss public. European Journal of Epidemiology. 2011; 26(3):203-10. [DOI:10.1007/s10654-011-9577-2] [PMID]

[11] Kokubun K, Yamakawa Y. Social capital mediates the relationship between social distancing and COVID-19 prevalence in Japan. Inquiry. 2021; 58:469580211005189. [DOI:10.1177/00469580211005189] [PMID] [PMCID]

[12] Szreter S, Woolcock M. Health by association? Social capital, social theory, and the political economy of public health. International Journal of Epidemiology. 2004; 33(4):650-67. [DOI:10.1093/ije/dyh013] [PMID]

[13] Pezeshgi A, Mubarak M, Djamali A, Mostafavi L, Moghadam-Kia S, Alimohammadi N, et al. COVID-19-associated glomerulopathy and high-risk apol1 genotype; Basis for a two-hit mechanism of injury? A narrative review on recent findings. Journal of Nephropathology. 2021; 10(2):e11. [DOI:10.34172/jnp.2021.11]

[14] Wong ASY, Kohler JC. Social capital and public health: Responding to the COVID-19 pandemic. Globalization and Health. 2020; 16(1):88. [DOI:10.1186/s12992-020-00615-x] [PMID] [PMCID]

[15] Wu C. Social capital and COVID-19: A multidimensional and multilevel approach. Chinese Sociological Review. 2021; 53(1):27-54. [DOI:10.1080/21620555.2020.1814139]

[16] Bian Y. Epidemic-specific social capital and its impact on physical activity and health status. Journal of Sport and Health Science. 2020; 9(5):426-9. [DOI:10.1016/j.jshs.2020.07.009] [PMID] [PMCID]

[17] Bartscher AK, Seitz S, Siegloch S, Slotwinski M, Wehrhöfer N. Social capital and the spread of covid-19: Insights from European countries. Journal of Health Economics. 2021; 80:102531. [DOI:10.1016/j.jhealeco.2021.102531] [PMID] [PMCID]

[18] Bai JJ, Du S, Jin W, Wan C. The impact of social capital on individual responses to COVID-19 pandemic: Evidence from social distancing. 2020; [Unpublished]. [DOI:10.2139/ssrn.3609001]

[19] Rezaei F, Yaseri M, Jahangiri L, Nejat S. [A survey on social capital in the students of Jahrom university of medical sciences in 2014 (Persian)]. Journal of Rafsanjan University of Medical Sciences. 2016; b15(4):295-306. [Link]

[20] Hao F, Shao W, Huang W. Understanding the influence of contextual factors and individual social capital on American public mask wearing in response to COVID-19. Health & Place. 2021; 68:102537. [DOI:10.1016/j.healthplace.2021.102537] [PMID] [PMCID]

[21] Cowling BJ, Ali ST, Ng TWY, Tsang TK, Li JCM, Fong MW, et al. Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: An observational study. The Lancet Public Health. 2020; 5(5):e279-88. [DOI:10.1016/S2468-2667(20)30090-6] [PMID]

[22] Story WT. Social capital and health in the least developed countries: A critical review of the literature and implications for a future research agenda. Global Public Health. 2013; 8(9):983-99. [DOI:10.1080/17441692.2013.842259] [PMID] [PMCID]

[23] Bian Y, Miao X, Lu X, Ma X, Guo X. The emergence of a COVID-19 related social capital: The case of China. International Journal of Sociology. 2020; 50(5):419-33. [DOI:10.1080/00207659.2020.1802141]

[24] Bor J, Cohen GH, Galea S. Population health in an era of rising income inequality: USA, 1980-2015. Lancet. 2017; 389(10077):1475-90. [DOI:10.1016/S0140-6736(17)30571-8] [PMID]

[25] Rutter PD, Mytton OT, Mak M, Donaldson LJ. Socio-economic disparities in mortality due to pandemic influenza in England. International Journal of Public Health. 2012; 57(4):745-50. [DOI:10.1007/s00038-012-0337-1] [PMID]

[26] Ahmed F, Ahmed N, Pissarides C, Stiglitz J. Why inequality could spread COVID-19. The Lancet Public Health. 2020; 5(5):e240. [DOI:10.1016/S2468-2667(20)30085-2] [PMID]

[27] Takian A, Kiani MM, Khanjankhani K. COVID-19 and the need to prioritize health equity and social determinants of health. International Journal of Public Health. 2020; 65(5):521-3.[DOI:10.1007/s00038-020-01398-z] [PMID] [PMCID]

[28] Mollalo A, Vahedi B, Rivera KM. GIS-based spatial modeling of COVID-19 incidence rate in the continental United States. The Science of the Total Environment. 2020; 728:138884. [DOI:10.1016/j.scitotenv.2020.138884] [PMID] [PMCID]

[29] Holtgrave DR, Crosby RA. Social capital, poverty, and income inequality as predictors of gonorrhoea, syphilis, chlamydia and AIDS case rates in the United States. Sexually Transmitted Infections. 2003; 79(1):62-4. [DOI:10.1136/sti.79.1.62] [PMID] [PMCID]

[30] Mirahmadizadeh A, Rezaei F, Jokari K, Moftakhar L, Hemmati A, Dehghani SS, et al. Correlation between environmental factors and COVID-19 indices: A global level ecological study. Environmental Science and Pollution Research International. 2022; 29(11):16667-77. [DOI:10.1007/s11356-021-16876-x] [PMID] [PMCID]

[31] T'ang J, Chan C, Chan NF, Ng CB, Tse K, Lau L. A survey of elderly diabetic patients attending a community clinic in Hong Kong. Patient Education and Counseling. 1999; 36(3):259-70. [DOI:10.1016/S0738-3991(98)00106-2] [PMID]

[32] Putnam R. Social capital: Measurement and consequences. Canadian Journal of Policy Research. 2001; 2(1):41-51. [Link]

[33] Goldney RD, Phillips PJ, Fisher LJ, Wilson DH. Diabetes, depression, and quality of life: A population study. Diabetes Care. 2004; 27(5):1066-70. [DOI:10.2337/diacare.27.5.1066] [PMID]

[34] Saghafi A, Aghaali M, Saghafi H. Acute kidney injury in hospitalized COVID-19 patients in Iran; A systematic review and meta-analysis. Journal of Renal Injury Prevention. 2021; 10(2):e09. [DOI:10.34172/jrip.2021.09]

[35] Benites-Flores IR, Valdivia-Vega RP, Alcalde-Ruiz SF, Espinoza-Rojas HJ. Clinical characteristics of acute kidney injury in the first 13 critically ill patients infected with SARS-CoV-2 (COVID-19) at a Peruvian hospital; A preliminary report. Journal of Nephropathology. 2021; 10(2):e15. [DOI:10.34172/jnp.2021.15]

[36] Menardo E, Viola M, Bacherini A, Angelini L, Cubelli R, Balboni G. The effects of the covid-19-induced lockdown on the social capital and cultural capital in Italy. Social Indicators Research. 2023; 1-22. [Link]

[37] Rizvi SA, Naqvi SA, Hussain Z, Hashmi A, Akhtar F, Zafar MN, et al. Living-related pediatric renal transplants: A single-center experience from a developing country. Pediatric Transplantation. 2002; 6(2):101-10. [DOI:10.1034/j.1399-3046.2002.01039.x] [PMID]

[38] Makridis CA, Wu C. How social capital helps communities weather the COVID-19 pandemic. Plos One. 2021; 16(1):e0245135. [DOI:10.1371/journal.pone.0245135] [PMID] [PMCID]

[39] Imbulana Arachchi J, Managi S. The role of social capital in COVID-19 deaths. BMC Public Health. 2021; 21(1):434. [DOI:10.1186/s12889-021-10475-8] [PMID] [PMCID]

[40] Murayama H, Nakamoto I, Tabuchi T. Social capital and COVID-19 deaths: An ecological analysis in Japan. International Journal of Environmental Research and Public Health. 2021; 18(20):10982. [DOI:10.3390/ijerph182010982] [PMID] [PMCID]

[41] Borgonovi F, Andrieu E, Subramanian S. Community level social capital and COVID-19 infections and fatality in the United States. Covid Economics. 2020; 32:110-26. [Link]

[42] Pitas N, Ehmer C. Social capital in the response to COVID-19. American Journal of Health Promotion. 2020; 34(8):942-4. [DOI:10.1177/0890117120924531] [PMID] [PMCID]

[43] Islam Z, Rocha ICN, Mohanan P, Jain S, Goyal S, Dos Santos Costa AC, et al. Mental health impacts of humanitarian crisis on healthcare workers in Yemen. Medicine, Conflict, and Survival. 2021; 37(2):112-7. [DOI:10.1080/13623699.2021.1950519] [PMID]

[44] Borgonovi F, Andrieu E, Subramanian SV. The evolution of the association between community level social capital and COVID-19 deaths and hospitalizations in the United States. Social Science & Medicine. 2021; 278:113948. [DOI:10.1016/j.socscimed.2021.113948] [PMID] [PMCID]

[45] Varshney LR, Socher R. COVID-19 growth rate decreases with social capital. MedRxiv. 2020; [Unpublished]. [DOI:10.1101/2020.04.23.20077321]

[46] Rocha IC, Cedeño TD, Pelayo MG, Ramos K, Victoria HOH. Myanmar's coup d'état and its impact on COVID-19 response: A collapsing healthcare system in a state of turmoil. BMJ Military Health. 2023; 169(2):103-4. [DOI:10.1136/bmj-military-2021-001871] [PMID]

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