

Original Article

COVID-19: Global Trends and Possible Causes of Disease

Hira Maqsood*

Student of Health Management, Institute of Health Management, Dow University of Health Sciences, Karachi, Pakistan

*Correspondence to: Hira Maqsood
hera_khan@outlook.com

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Abstract

Background and Purpose: Covid-19 has infected large proportion of the populaces, and the continuous rise in incidence impelled the declaration of pandemic. The present study expatiated the trends in Covid-19, and explored the significance of immunity and inhabitancy, as well as the possible causes of the pandemic.

Materials and Methods: This ecological study recruited twenty States enduring gruelling trends in the incidence of Covid-19 by 30 September 2020. Each State was selected using non-random non-probability sampling. Incorporate data excerpted both primary and secondary sources, browsed using PubMed, DOIA, and Google Search Engine. The analysis began by contrasting the healthy life expectancy, against the Covid-19 incidence rate. Following that, the researcher assessed the incidence inconsideration to populaces' immunity and inhabitancy profile. Immunity is determined by general hygiene, food sufficiency, and daily sleep hours. While air pollution, UV-radiations, and temperature attributes inhabitancy. Both immunity and inhabitancy profiles were evaluated by forming clusters. Statistical analysis was performed using SPSS Software, version 16.

Result: The findings positively associated healthy life expectancy to Covid-19 incidence rate ($r=0.02$), which meant that the nations indexed high on health profile, and reported high incidence rate. The cluster-1 analysis corroborated the association of nations' hygiene practice ($r = -0.34$) and food sufficiency ($r = -0.08$) to a relatively low incidence rate. Whereas, low concentration of air pollution ($r = -0.5$) in territories played relatively insignificant role in the outbreak and outgrowth of disease. However, cluster-2 observed convincing figures in torrid regions, abided by intense UV-radiation ($r = -0.15$) and high temperature ($r = -0.48$). The complete evaluation of data showed the significance of immunity, but failed to manifest relationship considering inhabitancy profile, in low incidence of COVID-19.

Conclusion: COVID-19 trends continue to escalate globally, and nations demonstrate high standing on immunity or inhabitancy profile, frequently falling prey to deadly infection. Thus, they pose ambiguity in associating the exact causations, whether poor health or polluted environment are overall reprehensible for the pandemic disease.

Keywords: Covid-19; Immunity; Inhabitancy

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1. Introduction

Covid-19 has infected and inflicted a large proportion of the populaces. Globally, 34,254,558 have been convicted of lethal coronavirus, with 96% cures and 4% collapses up to date (1). The continuous rise in incidence has impelled the declaration of a pandemic.

According to field experts, Covid-19 belongs to the coronavirus family, and the virus propagates in masses as susceptible host contract saliva droplets are released through sneezing or coughing from an infected patient. The discharged infection remains suspended in the air for around three hours, and the single source is culpable for infecting more than six people in the vicinity. The exponential growth rate of infectivity is calculated to be 0.2 to 0.3 per day (20).

The proportion characterizing oldsters, immune-deficit, and comorbid attributes the vulnerable host (3). Immunity deficiency, body incapacity to defend against pathogens, and readily stems of the poor sustenance and sanitation constitute the susceptible prey to the communicable disease (4). Likewise, the inhabitancy parameters, the atmospheric factors determine the acceleration or deceleration of aerial borne disease propagation, as demonstrated by the inconsistency in reported global trends (1). The study concisely expatiated the global trends in Covid-19, and explored the significance of immunity and inhabitancy, and the possible causes of the pandemic disease.

2. Materials and Methods

The ecological study was performed deploying twenty States enduring gruelling trends in incidence of Covid-19 by 30 September 2020. Each State was selected

using non-random non-probability sampling. The enlisted States included Japan, Indonesia, Poland, Ukraine, Philippines, Germany, Canada, Italy, Mexico, Romania, UK, Russia, France, Sweden, Belgium, S Africa, Colombia, Spain, USA, and Peru. Formerly, 50 States had been considered for the study, but due to the limited availability of data, the analysis was executed at a smaller scale recruiting 20 participants.

The study incorporated data excerpted of both primary and secondary sources, browsed using PubMed, DOIA, and Google Search Engine. Most figurative data for the studied variables were derived from World meter (1), The World Bank (5), World Life Expectancy (6), Weather-Atlas (7), UNICEF (8), FAO, IFAD, UNICEF, WFP and WHO (9), World Economic Forum (10), and Big Think (11), while the discussed literature embroiled narrative review of 16 authorized publications till date.

The analysis began by contrasting the healthy life expectancy, showing health status of the population against cumulative incidence rate (total cases per 1000), plotting a graph, and revealing vulnerability and invulnerability of nations to Covid-19.

Afterwards, the incidence rate (IR) was assessed in consideration to populaces' profile of immunity and inhabitancy. Immunity is succinctly determined by indexation of general hygiene (hygiene practice by the proportion of total populace), indices of food sufficiency (food accessibility to the proportion of total populace), and indicated daily sleep hour, whereas environmental air pollution (pm 2.5 mean annual exposure), endured ultraviolet radiations, and exposed degree

temperature (Centigrade) attributes inhabitancy. The values for UV index and temperature is observed for the month, which reports the peaked figure, and the highest cumulative incidence rate (daily cases per 1000). Evaluating both immunity and inhabitancy profile was performed considering Covid-19 incidence rate by forming clusters. Formulated cluster 1 and

cluster 2 constituted 15 and 5 States, respectively. In addition, the correlation coefficient for calculated clusters and for complete data (without cluster) was computed. All statistical analyses were performed using SPSS-V.16. The complete articulation phase lasted for four months from June to September 2020.

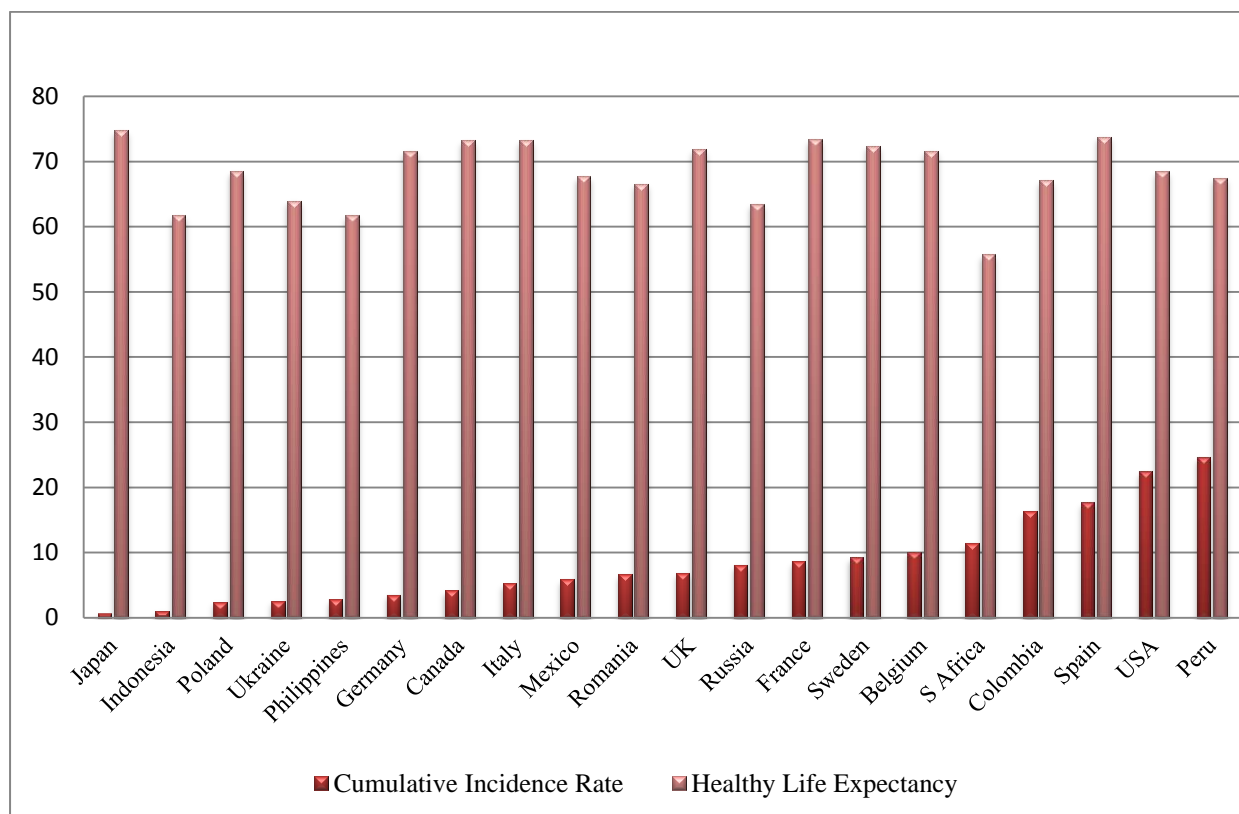


Figure 1. Graphical Plot of Invulnerability and Vulnerability to COVID-19

3. Result

The world observes a significant rise in the reported cases of Covid-19 in West, East, North, and South. Selected 20 nations stand among the top 50 most affected by this pandemic till date, though the initial outbreak took place in the east, including the Philippines, Indonesia, Japan with 311, 287, 83, per 1000 cases, respectively. But Covid-19 has surged to a significant figure in the USA (7,457,803), leaving all far behind. While Russia (1,176,286) and Colombia (829,679) run for second and

third, among the States suffering from Covid-19. The highest cumulative incidence rate per 1000 individual (total cases) was reported in Peru (24.6), and the least was documented in Japan (0.66). (Figure 1) Whereas, as is shown in Table 1, Spain and Belgium has so far experienced the greatest incidence spike of 0.29 (daily cases).

The graphical plot revealed conspicuous figures in territories, indexed high on health profile, experienced great vulnerability, and encountered great

incidence rate (total cases). The study positively associated healthy life expectancy to total cumulative incidence rate ($r=0.02$). As depicted in Figure 1, the States comprising Peru (IR=24.6), USA (IR=22.5), Spain (IR=17.7), and Colombia (IR=16.3) sustain prolonged healthy living, and report severity in cumulative incidence rate (total cases) than nations executing shorter life span including Indonesia (IR=1), Ukraine (IR=3), and the Philippines (IR=3).

Clusters 1 analysis corroborated the association of nations' hygiene practice and food sufficiency to a relatively low cumulative incidence rate. Whereas, low concentration of air pollutants in mostly Northern and Western territories played a relatively insignificant role in the outbreak

and outgrowth of the disease. While cluster 2 in addition to general hygiene demonstrated the effectiveness of sleeping span in reduced vulnerability to disease. Cluster 2 observes convincing figures in torrid regions; abide by intense UV radiation and high temperature. As is depicted in Table 1, despite depleted salubrious status concomitant with the inept ecosystem, few cases were recorded in hot regions.

The complete data evaluation revealed similar findings to cluster 1, and stated the significance of immunity in the incidence of Covid-19, but it failed to manifest a significant relationship considering inhabitancy (Table 1).

Table 1. Evaluation of Health and Environmental Profile considering COVID-19 incidence

Selected States	Immunity Profile			Inhabitancy Profile			COVID-19 Incidence		
	Food Sufficiency (1-FI)%	Hygiene Index (%)	Sleeping Hours (hrs.min)	UVI	Temperature (°C)	Air Pollution Pm2.5	Total Cumulative Incidence Rate (t) (per 1000)	Daily Cumulative Incidence Rate (d) (per 1000)	Observed Peak (month)
Cluster 1									
Japan	97.2	81.7	6.17	9	27	12	0.7	0.02	August
Indonesia	91.9	64	6.53	12	23	17	1	0.02	September
Poland	94.7	68	7.05	4	13	21	2.4	0.04	September
Ukraine	81	71	7.11	4	15	20	2.6	0.09	September
Germany	96.4	78	7.2	4	9	12	3.5	0.08	April
Canada	95	54	7.29	5	17	6	4.2	0.07	May
Italy	92.9	57	7.09	4	10	17	5.2	0.11	March
Romania	85.3	84	7.1	5	18	15	6.6	0.11	September
UK	94.4	75	7.34	4	16	10	6.8	0.15	September
Russia	93.8	63	7.07	5	13	16	8.1	0.08	May
France	94.4	62	7.29	4	17	12	8.6	0.24	September
Sweden	94.6	78	7.28	5	16	6	9.3	0.17	June
Belgium	89.7	60	7.31	4	15	13	10.1	0.19	September
Spain	92.5	61	7.13	6	20	10	17.7	0.29	September
USA	90.8	60	7.2	8	24	7	22.5	0.24	July
Final Centers	92.31	67.78	7.08	5.53	16.83	12.93	7.29	-	-
CC(rt)	-0.08	-0.34	0.44	-0.01	0.23	-0.52	-	-	-
Cluster 2									
Philippines	47.5	78	6.37	12	19	18	2.8	0.06	August
Mexico	72	88	6.55	12	18	21	5.9	0.08	August
S Africa	48.9	44	7.18	4	13.4	25	11.3	0.23	July
Colombia	57	65	6.5	12	14	17	16.3	0.26	August
Peru	62	56	6.45	10	16.5	25	24.6	0.31	August
Final Centers	57.48	66.2	6.64	10	16.18	21.2	12.18	-	-
CC (rt)	0.18	-0.60	-0.03	-0.15	-0.48	0.44	-	-	-
Distance between final Cluster centers			36.44			Iterations	2		
Complete Data Analysis									
CC (rt)	-0.28	-0.44	0.06	0.14	0.06	0.0			

Note: FI=Food Insecurity, CC=Correlation Coefficient, rt=total cases. Source: Worldometer, 2020* World Life Expectancy, 2019* the World Bank, 2018* Weather-Atlas, 2020* UNICEF, 2019* FAO, IFAD, UNICEF, WFP and WHO. 2019* Which countries get the most sleep – and how much do we really need? 2019* Revealed: Dutch are least hygienic Europeans, 2018*

4. Discussion

This study, in line with the rise in COVID-19, revolved around the emerging global trends and threats. Nations have undergone lockdown for weeks and months in compliance with WHO regulations to halt the growing epidemic, and incorporate preventive measures, including the use of vaccine, to slow the rapid spread. The current study aimed at determining the possible causes of pandemic disease, revealing the insignificance of populations' high standing on health profile, to reduce susceptibility to disease. On the other hand, the nation's immunity profiles demonstrated by high assurance of sustenance and sanitation, reported less intensity in some territories, while relatively low occurrence was observed in inhabitations enduring high indexation on atmospheric parameters. Thus, the posed ambiguity in associating the exact causations, whether poor health or polluted environment, was culpable for disease susceptibility and spread.

According to WHO, nations should secure 60 years of life span marked by the absence of disease to execute a healthy profile. Most populaces at North, West, East, and Mediterranean execute a healthy prolonged life span of seven decades, characterized by disease-free life span. The nations in the South exhibit healthy years below 60, representing degenerative health status (6). The assessment of healthy life expectancy against the incidence rate in the total population in our study has reported a positive relation, and has revealed that the States with healthy stature were found excessively prone to Covid-19. The present study also evaluated the nations' immunity profile considering food sufficiency, hygiene index and sleeping span (4). This profile

begins with food security as a measure of nourishment, characterized by the adequacy of quality and quantity of food, which is integral for psychological and physiological body development. According to FAO, the food insufficiency has threatened over half of the world populaces. Insecurity of food is most prevalent in Africa (50%), Latin America (30%), and Asia (23%) (9). Malnutrition accounts for serious contagious diseases including influenza, SARS, and dysentery marked by the severe epidemic. An unhealthy regimen impels a 50 to 60% increased susceptibility to pneumonia (12). Covid-19 severely afflicts the nations who have endured a high proportion of food insecurity, including Peru (38%), Colombia (43%), and South Africa (51%), recording 24.6, 16.26, and 11.33 total incidence rates per 1000 individuals, respectively. However, Japan with 2.8% of food insecurity observes a total incidence rate of 0.66 per 1000 individuals.

In addition to a healthy regimen, great emphasis is placed on personal hygiene, defined by hand washing before eating and after expelling. In accordance to substantive finding, the respiratory infection was frequently reported among adolescent and adults, 2 to 5 times and 4 to 8 times per year, respectively. The findings emphasized the dominance of Corona among other respiratory viruses (13), and signified the role of regular hand washing in the prevention of airborne infection in clinical and community setups. Another finding revealed 50% to 70% reduction in risk of vehicle-borne disease through the incorporation of healthy hygiene. Frequent handwashing with soap ensues a 31% decline in digestive disorders and respiratory infections (12). Research recruited 111 households with 84

patients of influenza, and assessed the efficacy of deploying facial mask and hand hygiene by index patient in discharge of respiratory viruses to other household members, suggesting significant reduction in secondary patients, and 69%, 22%, and 8% of the families reported one, two and three cases, respectively, in addition to the primary source (14). Similarly, the utility of facial mask and hand hygiene ensures protection to health personnel at the sight of 11 index SARS patients. 241 staff members remaining disinfected, and only 13 were infected by the end of the study. Contracted individuals reported skipping of one or more preventive means (15). The calculated correlation coefficient for clusters and complete data in our study also confirmed the significance of hygiene practice preventing from being victim to COVID-19.

Finally, considering sleep regulates the body psychological and physiological wellbeing. Deepness and duration of sleep influence the efficacy of the immune system (16). According to experts, 7 to 8-hour sleep is essential for the execution of a strong immune system (17). Sleeping for short hours comrades increased vulnerability to various deleterious diseases. Frequent sleeplessness is a common cause of increased sufferance of cold viruses. The analysis performed on 674 subjects, including 62% females and 38% males determined the correlation between insomnia and respiratory infections revealing a positive relationship ($r=0.265$), greater vulnerability to Upper Respiratory Tract Infection ($r=0.233$) than Lower Respiratory Tract Infection ($r=0.203$), and more significance in males ($r=0.327$) than in females ($r=0.225$) (18). However, in our finding, most of the people in States from North and West

sleep relatively long hours, resulting in increased vulnerability to COVID-19 than the nations in East and South. The embodied territories in cluster 2, revealed six hours of daily sleep, reporting dissociation ($r=-0.03$) to the infection.

On the other hand, inhabitancy profile defined by environmental exposures significantly determined the masses subsistence. Virus, bacteria, and fungi seldom survives in intense UV radiation, at high temperature and humidity. According to the findings, health facilities with UV exposures demonstrated greater compliance with infection control protocols (20). Also, it was found important to limit the spread of communicable disease by obstructing the transmission of the infectious agent from person to person in public gatherings. UV radiation between 0.13 to 7.1 and temperature range of 19.9°C to 26°C defines the peak period for respiratory infection in northern territories (19). Our analysis of both clusters 1 ($r=-0.01$) and 2 ($r=-0.13$), corroborated the efficacy of UV radiation to relatively low incidence rate.

Based on the experimental study, a high temperature of about 38°C enables the loss of virus infectivity within 24 hours and 4 weeks in air-conditioned ambiances (21). Middle East region with excess of air-conditioned ambiances constitute a large percentage of SARS Coronavirus epidemics as observed in 2002 to 2003. The risk of SARS coronavirus incidence rises by 18 times in low temperature (21). The countries including Japan and Indonesia, bearing high temperature 27°C and 23°C, respectively, encounter overall low incidence of cases than the states sustaining at low temperature.

Air pollution is culpable for populace health diminution. Indexing beyond

15Ug/m³ impels some deleterious health outcomes (22). According to the research finding, there was an observed interaction between particulate matter 2.5 and airborne viruses coming cross (23), revealing an early 30 minutes as the significant influence of pm 2.5 on the virulence of infectious agents (23). Our study reported that the incidence of Covid-19 was significantly high in less polluted regions, reveal the cluster 1 ($r = -0.52$) analysis, including mostly the northern and western States.

Considering the existent trends, this study also highlighted some measures effective in alleviating and averting the disease, including UV blood irradiation (5 to 7% of total blood volume UV exposure) an application excessively used in the past before the advent of vaccinations manifesting efficacy by marking progression in the recovery of 75 patients suffering from pneumonia at the site of exposure, shortening the hospital stay by facilitating early discharge (24). Also, few random studies embraced the utility of measures characterizing home remedies effectually exercise, and evaluated against respiratory infections, including hypertonic saline (salt water), reporting 93% reduction in symptoms among patients suffering from Upper Respiratory Tract Infections including Corona, by frequent gargling and rinsing nose. The subjects experienced 22% decline in disease period, and 30% decrease in virus release and replication (25). Finally, curcumin antiviral activities are cited in numerous studies, demonstrating great effectivity in the suppression of influenza. The findings also referred to the role of curcumin vs disease mark by immune deficiency, such as HIV-1 (26).

5. Conclusion

The COVID-19 trends continue to escalate all around the world, regardless of high standing on immunity or inhabitancy profile. Some nations demonstrated high salubrity and sustainability, less frequently falling prey to deadly infection. The other torrid regions, abide by intense UV radiation and high temperature, revealed relatively lower incidence rate. Thus, posing ambiguity in associating the exact causations, whether poor health or polluted environment, is reprehensible for the disease overall pandemic. Therefore, populaces required to exercise care and cure, regardless of sign or symptoms.

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Declarations

Ethics approval and consent to participate

Issuance of No Objection Certificate by Institute of Health Management, for publishing the article fulfils the journal requisition.

Consent to publications

Not applicable.

Conflicts of Interest

The authors declare that there is not conflict of interest.

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