ORIGINAL ARTICLE

Managing COVID-19 by Leaders in Different Countries During the Pandemic

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Abstract

Background: This study compared male and female leaders' management of the COVID-19 pandemic using key indices.
Methods: We conducted an ecological study. Data on COVID-19 for 213 countries were collected from the *Worldometer* website. The cumulative incidence of cases and deaths, case fatality rate, recovery rate, and rate of screening tests were computed. When present, the gender of the head of the state, head of government, and health minister was determined using *Wikipedia*. The study used an ANOVA test to compare COVID-19 indices by the gender of the state leaders and health ministers, along with non-parametric tests like Kruskal-Wallis and Mann-Whitney U because of using aggregated variables.
Results: In the parametric analysis, we found no significant difference in most key indices related to the COVID-19 pandemic between the male- and female-led countries, except for the COVID-19 screening rate in countries with populations of ≥5 million (head of state: P=0.045; head of government: P=0.025). In the non-parametric analysis, male- and female-led countries with populations of ≥5 million differed significantly in the case fatality (head of state: P=0.014; health minister: P=0.023) and recovery rates (head of state: P=0.045; head of government: P=0.011).
Conclusion: Generally, there appears to be no significant difference between male and female political authorities in terms of most COVID-19 pandemic management indices. Nonetheless, male-led countries possessed better patient recovery rates, while female-led countries had more COVID-19 screening tests.

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Introduction

An outbreak of an unknown disease was reported in the Wuhan province of China in December 2019, which was later named the coronavirus disease 2019 (COVID-19) by the World Health Organization (WHO). Outside of China, the first case was reported in Thailand.[1,2] Within a few months, the disease extended across all continents except Antarctica. Following the spread of the disease worldwide and, with the assessments of the WHO, a pandemic was declared on March 11, 2020 [1]. Until July 27, 2024, there have been 704,753,890 COVID-19 cases and 7,010,681 deaths all around the world.[3] Early in the pandemic, many media outlets reported that female political leaders were doing better than men in managing the COVID-19 pandemic.[4] There are different leadership and management characteristics between men and women. Women are more risk-averse in dealing with human life but are more risk-taking in the economic areas. Hence, in dealing with the COVID-19 pandemic, women in leadership roles seem to prefer taking remarkable risks with their economies by locking down early rather than

endangering the lives of their people. Female leaders are more democratic, participative, empathetic, and confident, and display good communication skills.[5] Most women in leadership pay particular attention to health, education, human safety, capacity-building, and accomplishment of feminine norms of behavior like caring and nurturing, and possess both masculine and feminine leadership features.[4, 6, 7] On the other hand, the favorite policies of men are based on interventions in masculine matters, such as showing power and decisiveness regarding crime or defense.[4]

Most of the studies and media have pointed to the remarkable performance of the President of Germany, Angela Merkel, the Icelandic Prime Minister, Katrín Jakobsdóttir, the Prime Minister of New Zealand, Jacinda Ardern, the Prime Minister of Finland, Sanna Marin, and the President of Taiwan, Tsai Ing-Wen in curbing the COVID-19 crisis.[4-6, 8] The basis of such claims is that female leaders reacted immediately to the first wave of the crisis and began an earlier lockdown, with fewer COVID-19 cases and deaths compared with male-led countries.[5, 7] However, previous studies have suggested that, due to the small number of countries led by women, there is a possibility of selection bias and lack of power in such analyses. In addition, studies on female-led countries are mostly limited to members of the Organization for Economic Co-operation and Development (OECD). Another factor mentioned is that some female-led countries, like Iceland and New Zealand, vary in location and main routes from many other countries as they are secluded, remote, and mostly rural island countries.[4, 8]

Now the question is whether female leaders could really manage the COVID-19 crisis better than their male counterparts? To answer this question, we obtained data regarding COVID-19 indices from most countries rather than merely OECD-member nations. To comprehensively evaluate the performance of countries in the COVID-19 pandemic, we conducted an investigation based on the gender of the head of state, head of government, and/or health minister.

Methods

We conducted an ecological study and collected data on 213 countries, including the number of cases, number of deaths, number of COVID-19 tests, number of recoveries, and population size, which were available on the *Worldometer* website.[3] Then, we calculated the following indices: the cumulative incidence of cases (per million); the cumulative incidence of deaths (per million); the case fatality rate (%); the recovery rate (%); and the rate of COVID-19 testing (per million).

In the next step, for each country, we determined the gender of the head of the state, head of government, and/or health minister using *Wikipedia*.[9] The head of the state was regarded as the public representative of a country who epitomizes a state in its unification and legitimacy. Based on the form of government and power in countries, the head of the state can be a ceremonial official like the British queen or can simultaneously be the head of the government who commands the entire army, such as the president of the United States.[10] The head of government is the first or second official in a country who manages a cabinet including the ministers or secretaries who direct executive departments. The head of government may differ from the head of state in terms of the position, individual, and roles in each country. The head of government can be a president, chancellor, or prime minister who has different levels of authority according to the governing system in each country.[11]

Statistical Analysis

We first analyzed data from all 213 countries and then selected countries with populations of ≥5 million and analyzed their data separately. The ANOVA test was used to compare the COVID-19 indices between states according to the gender of the head of state, head of government, and health minister. A post hoc analysis was performed to find significant differences between the pairs. Given that the involved variables or indices were aggregated or ecologic units, we also used non-parametric tests, including the Kruskal-Wallis test and Mann-Whitney U test. Furthermore, due to the fact that some previous studies used parametric tests while others used non-parametric tests, we analyzed our data using both methods to facilitate better comparisons with the literature.

Ethical Consideration

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

Results

Table 1 shows the distribution of the selected political authorities in 213 countries and in countries with a population of ≥5 million in terms of gender, frequency, and percentage.

We used indices of the cumulative incidence of cases, the cumulative incidence of deaths, the case fatality rate, the recovery rate, and the rate of COVID-19 testing for our analysis.

Table 2 displays a comparison of selected COVID-19 indices by gender of the head of state in the two scenarios of all countries and countries with a population of ≥5 million.

Table 1: Distribution of the heads of states, heads of governments, and health ministers by gender in two scenarios of all countries and countries with ≥5 million people

Gender		Female		Male		Not present		All	
Position		No.	%	No.	%	No.	%	No.	%
Head of state	All countries	15	7	164	77	34	16	213	100
	≥5 million pop.	8	66.6	98	80.3	16	13.1	122	100
Head of government	All countries	14	6.6	147	69.0	52	24.4	213	100
	≥5 million pop.	9	7.4	75	61.5	38	31.1	122	100
Health minister	All countries	49	23	162	76.1	2	0.9	213	100
	≥5 million pop.	29	23.8	93	76.2	0	0	122	100

Table 2: Comparison of selected COVID-19 indices by the gender of the head of state in two scenarios of all countries and countries with ≥5 million people

COVID-19-related indices	Country	Average	Gender				Not present		P value*
			Female		Male				
			Mean	SD	Mean	SD	Mean	SD	
Cumulative incidence of cases (per million)	All	12,866	14,771	13,336	12,132	15,708	15,569	17,474	0.461
	≥5 m	10,768	12,940	13,081	9,804	12,345	15,587	15.256	0.221
Cumulative incidence of deaths (per million)	All	221.9	223.6	209.6	220.9	310.5	226.6	325.1	0.995
	≥5 m	229.6	188.6	220.1	216.2	299.1	332.7	426.1	0.364
Case fatality rate (%)	All	1.92	1.54	0.97	2.02	2.52	1.61	1.72	0.520
	≥5 m	2.35	1.29	1.12	2.56	3.02	1.62	0.91	0.241
Recovery rate (%)	All	78.1	72.02	24.8	77.52	20.7	83.92	19.8	0.152
	≥5 m	77.5	72.39	27.8	77.57	18.6	80.28	23.6	0.675
Test rate (per million)	All	239,941	253,289	178,166	174,500	294,566	561,998	836,506	0.000**
	≥5 m	162,858	169,985	129,765	138,329	237,753	307,999	343,397	0.045***

*ANOVA. **According to the post hoc analysis; indicates a significant difference between not having a head of state and having a male or female head of state. ***According to the post hoc analysis; indicates a significant difference between not having a head of state and having a male head of state.

Table 3: Comparison of selected COVID-19 indices by the gender of the head of government in two scenarios of all countries and countries with ≥5 million people

COVID-19-related indices	Country	Average	Gender				Not present		P value*
			Female		Male				
			Mean	SD	Mean	SD	Mean	SD	
Cumulative incidence of cases (per million)	All	12,867	14,569	13,630	12,907	16,560	12,294	14,466	0.892
	≥5 m	10,768	10,929	11,131	10,600	13,096	11,061	13,032	0.983
Cumulative incidence of deaths (per million)	All	221.99	193	285.4	198.7	285.3	226.6	357.8	0.131
	≥5 m	229.6	206.9	344.8	196.8	295.3	299.9	339.6	0.252
Case fatality rate (%)	All	1.92	1.20	0.89	1.85	2.56	2.33	1.75	0.214
	≥5 m	2.35	1.44	1.04	2.29	3.26	2.71	1.78	0.446
Recovery rate (%)	All	78.1	76.8	24.1	75.9	22.6	84.5	12.9	0.043**
	≥5 m	77.5	72.8	24.3	75.9	21.5	81.9	13.6	0.242
Test rate (per million)	All	239,942	385,395	416,156	505,851	294,566	121,316	169,169	0.055
	≥5 m	162,858	354,659	410,822	169,974	260,319	103,573	159,693	0.025***

*ANOVA. **Indicates a significant difference between not having a head of government and having a male head of government. ***Indicates a significant difference between a female, male, and absent head of government.

According to the post hoc analysis, there was no significant difference in the head of state position in terms of gender for the COVID-19 indices of cumulative incidence of cases, cumulative incidence of deaths, case fatality rate, and the recovery rate in all countries and in countries with ≥5 million people. However, there was a significant difference in this position in the index of COVID-19 testing rate (per million) in all countries (P=0.000) and in countries with populations of ≥5 million (P=0.045).

As Table 3 presents, according to the post hoc analysis, there was no significant difference in the head of government position for the COVID-19 indices of cumulative incidence of cases, cumulative incidence of deaths, and case fatality rate in all countries and in countries with ≥5 million people, as well as in the recovery rate in countries with ≥5 million population and test rate in all countries.

However, the post hoc analysis indicated a significant difference between not having a head of government and having a male head of government for the COVID-19 indicator of recovery rate (P=0.043).

Furthermore, there was a considerable difference between the female gender, male gender, and not having a head of government for the indicator of COVID-19 test rate (per million) in all countries (P=0.055) and in countries with population of ≥5 million (P=0.025), with the latter being statistically significant.

As Table 4 shows, we could not find any statistically significant difference in the selected COVID-19 indices when comparing the gender of the health ministers in all countries and in countries with population of ≥5 million.

In the next stage, we made a non-parametric comparison of the selected COVID-19 indices according to the gender of the political authorities in both scenarios (Table 5).

In the comparison of all countries using the Kruskal-Wallis test, we found a significant difference for the indicator of case fatality rate when comparing the heads of the states (P=0.000) and heads of governments (P=0.011). In countries with populations of ≥5 million, significant differences existed for this index in the head of state position with the Kruskal-Wallis test (P=0.014) and in the health minister position with both the Kruskal-Wallis and Mann-Whitney U test (P=0.023). In addition, there was a significant difference for the indicator of recovery rate in the gender comparison of the head of state position with the Kruskal-Wallis test (P=0.045) in countries with population of ≥5 million. The head of government position also showed such a difference in the Kruskal-Walli's test across all countries (P=0.006) and for countries with population of ≥5 million (P=0.011). For the COVID-19 test rate, a significant difference was found only in the gender comparison of the head of state position using the Kruskal-Walli's test (P=0.044) for all countries.

Discussion

The present study compared the performance of male and female world leaders in dealing with the COVID-19 crisis using the indices of cumulative incidence of cases and deaths, case fatality rate, recovery rate, and test rate. There was no significant difference between male- and female-led countries in most of the COVID-19 pandemic management indices. Male leadership appeared to be better able to manage the proportion of recovery, while female leadership seemed to be superior in performing COVID-19 screening tests.

Table 4: Comparison of selected COVID-19 indices by the gender of the health minister in two scenarios of all countries and countries with ≥5 million people

COVID-19-related indices	Country	Average	Gender				Not present		P value*
			Female		Male				
			Mean	SD	Mean	SD	Mean	SD	
Cumulative incidence of cases (per million)	All	12,866	12,302	15,657	13,180	15,981	1,337	1,791	0.555
	≥5 m	10,768	11,472	13,242	10,549	12,787	-	-	0.737
Cumulative incidence of deaths (per million)	All	221.99	237	328.8	218.9	300.7	100	141.4	0.796
	≥5 m	229.6	311.8	387.5	204.1	285.1	-	-	0.107
Case fatality rate (%)	All	1.92	1.96	1.60	2.48	2.56	3.84	5.43	0.498
	≥5 m	2.35	2.65	1.59	2.26	3.04	-	-	0.519
Recovery rate (%)	All	78.07	73.9	23.88	79.1	19.9	96.2	5.44	0.158
	≥5 m	77.5	71.2	24.2	79.5	17.8	-	-	0.051
Test rate (per million)	All	239,941	239,006	408,346	242,443	459,599	61,025	77,126	0.850
	≥5 m	162,858	138,364	175,601	170,579	273,817	-	-	0.553

*ANOVA

Table 5: Non-parametric comparison of selected COVID-19 indices by the gender of political authorities in two scenarios of all countries and countries with ≥5 million people

COVID-19-related indices	Country	Political authority		
		Head of state	Head of government	Health minister
		P value[a]	P value[a]	P value[b]
Cumulative incidence of cases (per million)	All	0.225	0.650	0.438
	≥5 m	0.412	0.724	0.633
Cumulative incidence of deaths (per million)	All	0.582	0.208	0.770
	≥5 m	0.812	0.146	0.186
Case fatality rate (%)	All	0.000*	0.011*	0.716
	≥5 m	0.014*	0.067	0.023*
Recovery proportion (%)	All	0.296	0.006*	0.075
	≥5 m	0.045*	0.011*	0.066
Test rate (per million)	All	0.044*	0.152	0.725
	≥5 m	0.539	0.359	0.764

[a]Kruskal-Wallis test, [b]Mann-Whitney U test. *Indicates significance at a level of 0.05.

Similar to our study, some studies found no significant difference in the indices related to COVID-19 between countries led by men and women.[4, 8, 12] In contrast, other reports suggested that female-led countries handled the epidemic better than male-led countries.[5-7, 13] Garikipati and Kambhampati indicated that female leaders managed the COVID-19 crisis better than male leaders as they offered a prompter lockdown response and had fewer cases and deaths.[5] Sergentand Stajkovic compared COVID-19 outcomes like death and early stay at home orders between female and male governors in the United States and found that states with female governors had earlier stay at home orders and fewer deaths.[7] Furthermore, Coscieme et al. revealed that female-led countries had much lower COVID-19 deaths per capita and were able to flatten the epidemic curve faster than their male-led counterparts. According to them, most of the women-led countries are those that pay more attention to social equality, human needs, and generosity. Additionally, these societies mostly accept political programs related to social and environmental welfare. However, this is a preprint and has not undergone peer review.[13]

By non-parametric analysis, we found that when a head of state was present, there was a significant difference between COVID-19 fatality rates in countries managed by men (mean=2.56±3.02%) vs. women (mean=1.29±1.21%). However, Windsor et al. reported no considerable difference in COVID-19 fatality rates between men-led and women-led countries. Contrary to other studies, these researchers found that countries with more female representatives as legislators went through a worse COVID-19 crisis and reported more deaths.[4]

Purkayastha et al. suggested that women-led countries differed from men-led countries in terms of public health standards for controlling the prevalence of COVID-19 globally. However, the results of their study were not significant. Also, they noted that women-led countries had higher COVID-19 test rates though this was again statistically insignificant.[8] On the other hand, the present study revealed a significant difference in this regard. To be specific, countries that had female heads of states had a greater rate of screening tests for COVID-19 than countries with male head of states.

The effective communication of leaders with society fulfills a vital role in managing crises like COVID-19. Although the current study did not evaluate the role of communication with society, Aldrich and Lotito investigated this parameter during the current pandemic and found no significant difference between male- and female-led countries. However, these researchers noted that countries with more female legislators had a delay in school closures.[12]

This study has some strengths. We analyzed key COVID-19 indices to compare the management of male and female leaders, focusing on outcomes rather than activities. Both parametric and non-parametric tests were employed in the analysis to enhance comparisons with the literature; some studies utilized parametric tests while others used non-parametric tests. There was a limitation. As our study is ecological in nature, it may be subject to the ecological fallacy. We recommend conducting further studies using alternative methods to analyze individual data.

Conclusion

In the present study, we compared a number of key COVID-19 indices between countries led by men and women, using both parametric and non-parametric analytical methods; however, found very few significant differences. Nonetheless, our study revealed that male leaders achieved better recovery rates than female leaders, while women-led countries had higher screening test rates, highlighting the interest of female leaders in issues concerning human health and safety. However, no statistically significant difference was found in the main outcomes of the disease, i.e., the number of cases and deaths.

Authors' Contribution

A.M. developed the study design and performed the statistical analysis. M.H.SH. wrote the final draft of the study. M.S.F prepared and cleaned the data. R.S. interpreted the results and wrote the first draft of the study. All authors have read and approved the final manuscript.

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Conflict of Interest

The authors declare no competing interests.

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