

A bi-continental review of the knowledge and adherence to COVID-19 public health guidelines in north and south America

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ABSTRACT:

- **Objective:** Since the outbreak of the novel coronavirus (COVID-19) in December 2019 there has been a rapid spike in COVID-19 burden in North and South America, many physical, psychological, social, health and financial human endeavors have been affected. Hence, this review aims at assessing the knowledge and adherence of Americans to the public health guidelines of COVID-19 management using literature.
- **Materials and methods:** The selected representative studies on knowledge and practice were done using Google Scholar, PubMed and Scopus using the keywords “COVID-19”, “knowledge”, “adherence” and “North and South America”.
- **Results:** The result revealed a relatively good knowledge but relatively poor adherence to the laid down public health guidelines such as social distancing, wearing of masks, avoiding crowded places, handwashing etc. Since most respondents were residents, this gives a clear indication on the level of adherence to the public health guidelines and indicates where poor practice of the public health guidelines dominates and where negative attitudes likely due to ignorance, negligence and the inability to read and write as well as disbelief take root. However, educated individuals, that are middle aged had fair adherence.
- **Conclusions:** We recommend that the populace need to put more conscious effort towards curtailing the spread of the virus by adhering to the public health guidelines to curb the spread of the virus and enhance the eradication of the pandemic.
- **Keywords:** COVID-19, Knowledge, Adherence, Public Health Guidelines, North America, South America.

INTRODUCTION

Since the outbreak of COVID-19 was identified around December 2019, it is rapidly spreading with confirmed cases in about 219 countries. Global incidence and mortality are on rapid increase, with new confirmed cases and mortality reported daily, and this has imposed threat to global health and economy¹. Some of the notable symptoms include dry cough, cold, fever and respiratory distress alongside inflammation¹.

From the COVID-19 statistics presented by the World Health Organization (WHO) as of June 7, 2021, there are 173,318,532 confirmed cases and 3,729,486 deaths globally. USA which is in North America has 33,369,389 cases and 597,220 deaths, ranking 1st globally, Brazil in South America has 16,947,062 cases and 473,404 deaths, ranked 3rd globally^{2,3}.

Public health has been in the frontline since the pandemic started; a disease outbreak which is almost an endemic that now resides with the global populace and



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cut across North and South America. North and South America are crucial in the global evaluation of progress in the reduction of COVID-19 as these two continents are home to the United States and Brazil, both of which are the top two countries globally with the highest incidence and mortality associated with COVID-19^{2,3}.

The level of adherence to social and public health guidelines has been a question that the populace plays a significant role in answering and doing justice, since there have been different waves of the statistical indices of this virus which is dependent on the level of adherence to the guidelines and precautionary measures established. This evaluation would help to assess the level of knowledge and awareness of COVID-19 and adherence to the stated public health guidelines⁴. This review article aims to review the knowledge and adherence to the COVID-19 public health guidelines among the American population.

MATERIALS AND METHODS

Literature Search

Literature search was done in December 2020 on Google Scholar, PubMed and Scopus using the keywords “COVID-19”, “knowledge”, “adherence” and “North and South America”. Preprints that have not been peer-reviewed, non-COVID-19 studies and review articles were excluded. From Figure 1, the initial search generated 136 articles, which was filtered with abstract, title and full text to 38 articles and after elimination of preprints, 8 articles that had the respondents of survey/questionnaire as citizens, residents, individuals were fi-

nally selected for this review article others with other class of respondents were eliminated. The other articles were excluded by abstract, title or full text after the authors have read the abstract or articles and discovered the articles do not adhere to the objectives of our review. Only 8 articles that clearly met the objectives of this review were chosen.

Studies on Knowledge and Adherence to COVID-19 Public Health Guidelines

The eight selected articles on knowledge and adherence to COVID-19 public health guidelines used for this review made use of questionnaires/surveys as research instruments with the number of respondents ranging from 378 to 2399 for a total of 76,202 respondents. The respondents consisted basically of adults above 18 years, individuals, citizens, chronic disease patients, residents, rural dwellers and sample populations from the USA where most of the samples were drawn, North America, Mexico, Ecuador and Brazil.

RESULTS

Knowledge about COVID-19

Table 1 shows eight articles selected based on information about COVID-19 among chronic disease patients in the USA with respondents/sample population from North America, Mexico, Ecuador and Brazil. All the articles that were reviewed reported relatively good knowledge about COVID-19 among respondents.

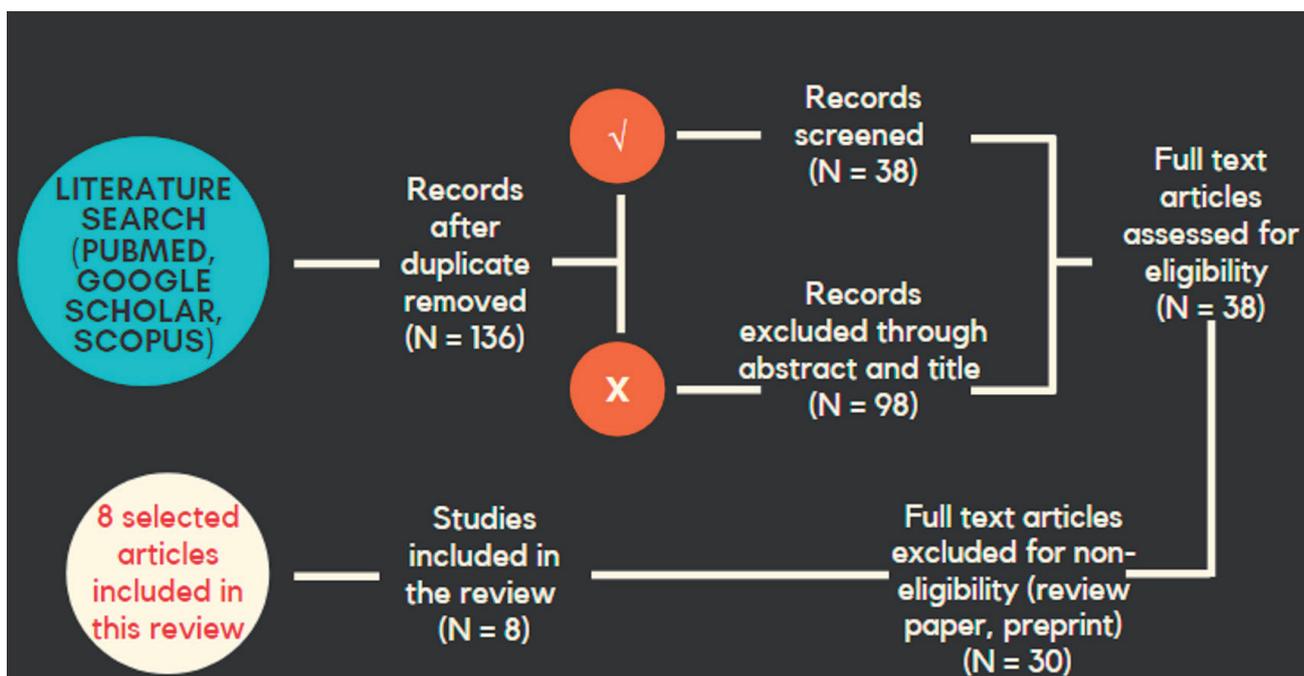


Figure 1. Flow chart of Literature search and article selection.

Table 1. Knowledge studies overview.

No	Author	Type of Study	Country	Participants	Number of Participants	Instrument	Result	Strength level of Evidence
1	5	Cross-sectional survey linked to 3 active clinical trials and 1 cohort study	USA	Adults aged 23 to 88 years living with 1 or more chronic conditions	630 adults	Telephone interview. REDCap web-based survey software	Many adults with comorbid conditions lacked critical knowledge about COVID-19 and, despite concern, were not changing routines or plans.	Multivariable linear regression models were used to estimate least-squares means (with 95% CIs) for the continuous outcome of perceived concern. For dichotomous outcomes, a multivariable Poisson distribution was used rather than odds ratios for the relative risk estimates.
2	6	Cross-sectional study was conducted online	North America and Europe	Adults living primarily in North America and Europe	2013 adults	Conducted online using the Qualtrics platform	NA	Chi square tests were used to compare adherence to social distancing behaviors, obtained in the first, second and third week of recruitment. Logistic regression analyses were used to test the association between socio-demographic (age, gender, education, country of residence, medical status, and COVID-19 symptoms), psychological (conspiracy beliefs, health literacy, prosocial behavior, distress), and motivational predictors and social distancing behavioral outcomes.
3	7	Cross-sectional survey	Mexico	People originating from 32 municipalities were surveyed which are Yucatan (17) and Chiapas (15)	378 people	Questionnaire survey	There is a lack of knowledge and intention to wear a face mask and of maintaining social distancing measures, as compared to other preventative measures (e.g., hand washing and social distancing amongst others).	Statistical analysis, done and express in % at C.I (Confidence Interval) 95%
4	8	Web-based survey	United States, Kuwait, and South Korea.	Respondents, of which 207 (43%) lived in the United States, 181 (38%) lived in Kuwait, and 94 (20%) lived in South Korea	482 respondents	Global survey-deploying	The mean for knowledge using online platforms of -7.37 and a maximum of 5.53, showing poor overall knowledge on COVID-19.	Ordered orbit regression was 0.01, with a minimum

Continued

Table 1 (Continued). Knowledge studies overview.

No	Author	Type of Study	Country	Participants	Number of Participants	Instrument	Result	Strength level of Evidence
5	9	Cross-sectional, internet-based questionnaire	Ecuador	Individuals	2399 individuals participated	Collected online snowball and referral methodology	People in Ecuador high levels of knowledge (9.92, S.D 1.35) related to COVID-19	Independent-samples t-test, one-way analysis of variance (ANOVA), and Chi-Square tests, as appropriate, were used to compare members of different demographic grouping's knowledge scores, attitudes, and self-reported practices. Binary logistic regression analyses to identify demographic factors associated with each attitude and practice
6	10	Cross-sectional national survey	USA	Citizen	1243 participants	Cross-sectional national survey Qualtrics Panels	There was a good knowledge of COVID-19 (85% score with SD 17%)	Participants reported the frequency on a 5-point scale ranging from "never" to "multiple times a day. The Spearman correlation was used to estimate the association between correct responses ("accurate knowledge") and trust in different information sources. Chi-square statistics and significance levels were used to evaluate whether there were more adherent participants among those who trusted a particular information source than among those who did not trust a particular source.
7.	11	Chain sampling procedure	Brazil	Individuals 18 yrs above	45,161 participants	Self-administered online questionnaire	NA	The effects of the covariate categories were verified by the OR statistical test taking a 5% significance level. The analyses were performed using the Statistical Package for the Social Sciences (SPSS) computer program
8.	12	Online survey	Brazil	Individuals 18 yrs above	23,896 Respondents	Questionnaire survey	NA	Descriptive statistics were presented using means with standard deviation (SD) for continuous outcomes, and percentages (%) for categorical variables. The Wilcoxon test was used to compare the number of days of work per week before and after the epidemic. Multiple linear regression was performed to analyze factors associated with adherence to national prevention restrictive measures; the composite adherence score

Wolf et al⁵ reported that in the USA, adults with chronic disease had heard of COVID-19. 24.6% of the respondents said they were “very worried” about being infected with the coronavirus, and 12.9% were not worried at all; 50.4% said they were as worried about COVID-19 as much as they are about influenza, 42.6% were more worried about being infected with COVID-19 than with influenza. Very few participants (9.5%) believed that they would definitely or probably be infected with the coronavirus. The article also reported that more than half (53.6%) of infected persons will have only mild symptoms and that 14.2% of them will die of COVID-19. Most participants correctly identified at least 3 symptoms (71.7%) and 3 ways to prevent infection (69.8%).

Coroiu et al⁶ reported that the knowledge score about COVID-19 was not measured. In Mexico, where respondents were rural dwellers living in Chiapas and Yucatan, the respondents thought that people over 60 years of age (74.3% and 71.2%, respectively) and/or with pre-existing conditions (71.1% and 56.5%, respectively) were most at risk for developing complications or/and death due to COVID-19. Less awareness exists about other groups that are at risk for the disease (pregnant women, under-5s and people living with HIV) and about minor COVID-19. Compared to the adult population in Chiapas, the adolescent population showed less knowledge of COVID-19 symptoms (e.g., 66% of adults and 36.3% of adolescents identified dry cough as one of the symptoms) and preventive measures (e.g., 75% of adults and 44% of adolescents identified maintaining social distancing as a preventive measure). Among this population, there is a lack of knowledge and intention to wear a face mask and of maintaining social distancing measures, as compared to other preventive measures e.g., hand washing and social distancing amongst others⁷.

Based on report by Al-Hasan et al⁸, the mean for knowledge in the United States was 0.01, with a minimum of 7.37 and a maximum of 5.53, showing poor overall knowledge on COVID-19. Individuals who believe that efforts made by the government in response to the pandemic are positive were shown to follow adherence guidance on social distancing and sheltering. Also, higher perception that government response efforts are positive leads individuals to believe that others will also follow adherence guidance on social distancing and sheltering.

Bates et al⁹ stated that the mean COVID-19 knowledge score was 9.88 (SD 1.46, range 0-12), suggesting a moderate to high rate of knowledge. People with different educational levels showed different degree of knowledge about COVID-19, among individuals who had only completed elementary education, knowledge scoring was significantly lower than all other education levels, and individuals who held a master's degree or higher education level had a scoring higher than all other educational levels. Knowledge scores also differed by employment status, with persons who were unemployed, househusbands/housewives, or manual laborers scoring lowest, and individuals who work in health and med-

icine scoring highest (gender, age, marital status, and place of residence were not associated with differences in levels of knowledge).

Fridman et al¹⁰ reported that the mean COVID-19 knowledge score was 85% (SD 17%); this indicates that on average, people responded to 10 out of 12 questions correctly. However, only 306/1243 participants (30.6%) answered all the knowledge questions correctly. Some items were more difficult than others, as represented by the lower percentages of people who answered them correctly.

Adherence Towards COVID-19

Table 2 highlights articles reporting adherence and practice of COVID-19 public health guidelines conducted in North and South America. According to Wolf et al⁵, more than 58.6% (half) of the total number of patients reported that the coronavirus had caused a change in their daily routine “a lot,” whereas 78.1% said that they had to change their existing plans as a result. Men, black persons, those with LEP lower health literacy, or 3 or more chronic conditions, those living below the poverty level, and unmarried, unemployed, or retired people had a lower tendency of making changes because of the coronavirus. After multivariable adjustments, these patients got used to life amidst the pandemic. In contrast, respondents who were interviewed later in the 1-week survey period had a report that their daily routine had changed “a lot”. One in 5 respondents (20.8%) reported that they were “very prepared” for a widespread outbreak. Nearly a third (29.1%) had no confidence that a nationwide outbreak could be prevented by the federal government; 10.2% were very confident of success in preventing the outbreak on the part of the federal government.

Coroi et al⁶ in North America showed that what would facilitate adherence to social distancing behaviors includes working remotely from home; those that had bachelors and master's degree followed the guidelines while those aged 65 above did not adhere to the guidelines. Avoiding contact outside of one's household, avoiding in-person socializing, female gender, being 45 years of age or older, distress, and motivations for social distancing, maintaining a 2-m distance from others, prosocial attitudes, help adhere to these public health guidelines.

In Mexico, 80.3% of adults, 88.8% of community authorities, and 80% of adolescents in Yucatan identified hand washing as a preventative measure for COVID-19, in comparison to 87.5% of adults and 90.9% of adolescents in Chiapas. Mask-wearing intentions were low. Less than 40% of adults in both states, 40.7% of community authorities in Yucatan, and fewer than 5 out of 10 adolescents identified that, if they experienced symptoms of COVID-19, they would wear a mask. In almost all groups, between 37.0%-40.4% of the population believed that spraying alcohol or bleach on the skin can eliminate SARS-CoV-2 from the body surface⁷.

Table 2. Knowledge studies overview.

Author	Country of Study	Participants	Adherence rating	Adherence result
5	USA	Older adults living with 1 or more chronic conditions	(58.6%) reported they had to change their daily routine “a lot,” whereas 78.1% said that they had changed existing plans.	Overall, many adult patients were not ready to adhere to the unplanned public health issue especially amongst black LEP (Low health literacy)
6	North America and Europe	English-speaking adults residing in North America (38.8%) and Europe (59.5%)	Adherence to social distancing recommendations ranged from 45% for “working from home or remotely” to 90% for “avoiding crowded places/non-essential travel”, with men and younger individuals (18-24 years) showing lower adherence compared to women and older individuals	Adherence to social distancing recommendations vary depending on the behaviour, with none of the surveyed behaviours showing perfect adherence.
7	Mexico	Residents of Yucatan and Chiapas.	Mask-wearing intentions were low. Less than 40% of adults in both states, 40.7% of community authorities in Yucatan, and fewer than 5 out of 10 adolescents identified that, if they experienced symptoms of COVID-19, they would wear a mask	There is a lack of knowledge and intention to wear a face mask and of maintaining social distancing measures, as compared to other preventative measures (e.g. hand washing and social distancing amongst others which explains why there is low adherence to this guideline
8	United States, Kuwait, and South Korea	Citizens	Individuals who reside in the United States are more likely to follow adherence than. However, the United States, the agreement on the reopening of businesses does not have any effect on any adherence outcomes	The supports the finding that a higher knowledge level is influential in shaping the decisions on self-adherence for the United States.
9	Ecuador	Citizens	While 88.3% avoided going to crowded places, 93.8% wore masks and 96.6% observed handwashing. 49.5% of the participant believe in the ultimate success of controlling the pandemic, and 64.2% believes Ecuador would win over the pandemic,	Participants reported high levels of adoption of preventive practices.
10	USA	Citizen	The positive social distancing behavior, staying 6 feet from other people, the 1243 participants reported frequencies of always (n=801, 64.4%), usually (n=287, 23.1%), sometimes (n=104, 8.4%), rarely (n=24, 1.9%), and never (n=27, 2.2%)	In total, only 32% of participants reported adhering to all seven recommended social distancing behaviors. The most compliant behavior was avoiding gatherings with 5 or more people. The least compliant behaviors were meeting people face-to-face and walking close to others.
11	Brazil	Residents	Of the 45,161 participants, 74.2% (73.8-74.6%) reported intense adherence to the measures. Non adherence details include men. (31.7%), those aged 30 to 49 (36.4%), those with low education levels (33.0%), those who worked during the pandemic (81.3%), those resident in the North (28.1%) and Midwest (28.5%) regions of the country.	The results show that a large part of the Brazilian population adhered to the physical contact restriction measures. Some 60.0% reported having intense contact restriction with other people, while 15.0% adopted total physical contact restriction and only went out when they needed health care.
12	Brazil	Residents	23,896 respondents were analyzed (mean age: 47.4 years). Due to COVID-19 restrictions, half (51.1%) of the professionals reported working from home. Regular handwashing was practiced by 98.7% of participants; 92.6% reported adhering to the 1.5-2 m physical distancing rule, but only 45.5% wore a face mask when going outside. While 29.3% of respondents found it relatively easy to stay at home, indoor confinement was extremely difficult for 7.9% of participants.	Participants showed a satisfactory level of adherence to national COVID-19 prevention guidelines. Although, younger people, male, persons living in a rural area/village or popular neighbourhoods, students and workers reported less preventive behaviour.

In the United States, Al-Hasan et al⁸ reported that there was a positive association self-adherence in people believing others would adhere to the guidelines, though this is influenced by government response efforts, business reopening agreements, as well as the intensity of information source use, social media use, and knowledge about the COVID-19 pandemic.

In Ecuador, overall, respondents reported that adopting the practices recommended limits the spread of COVID-19⁹. A supermajority of the participants reported that they practice avoiding crowded places (88.3%), always wearing a mask when outside the home (93.8%), and washing their hands for at least 20 seconds upon returning home (96.6%). When leaving their home, usually once a week, participants reported having done so for essential purposes and maintaining the recommended 2-m distance from other people. Men, young people, single people, and unemployed people engaged in the riskiest behaviors of non-adherence. Even among these populations, however, report of compliance with recommended behaviors was extremely high. Importantly, the fact that people know about it did not mean they avoid crowded places or wearing a mask.

In total, only 32% of participants reported adhering to all seven recommended social distancing behaviors. The behavior most complied with was avoiding gatherings with 5 or more people. The behavior least complied with was meeting people face-to-face and walking close to others. For the positive social distancing behavior, staying 6 feet from other people, the 1243 participants reported frequencies of always staying 6 feet away (n=801, 64.4%), usually (n=287, 23.1%), sometimes (n=104, 8.4%), rarely (n=24, 1.9%), and never (n=27, 2.2%). The statistics include those who have not left the house in the past seven days. Participants were considered adherent if they did not engage in risk-increasing behaviors or always stayed 6 feet apart from other people¹⁰.

A great number of the Brazilian population adhered to the physical contact restriction measures. The report says 60% had intense contact restriction with other people, while 15.0% adopted total physical contact restriction and did not go out except they needed health care¹¹. Most participants (92.6%) reported that they adhered to the 1.5-2m social distancing rule; 69.5% said they covered their mouth and nose when they sneeze and washed their hands afterwards; 45.5% wore a face mask when going outside; staying at home was found to be extremely difficult for 7.9%, but 29.3% considered it not difficult in any way¹².

DISCUSSION

Essence of evaluating the knowledge and adherence to COVID-19 Public Health guidelines

This present review showed the variations in the knowledge and adherence to the public health guideline of COVID-19 amongst people in North and South America. Many studies on knowledge showed relatively good knowledge of respondents about COVID-19. However,

perhaps lack of belief in the source of information on social media and as well as the government is the reason for the poor level of adherence to the public health guidelines. This review put into consideration original data obtained from individuals, citizens and residents of specific geographical locations. This could give a clear picture of adherence by the populace. It was reported in Brazil that younger people, male, persons living in a rural area/village or popular neighborhoods, students and workers practiced less preventive behaviour¹². Anti-social traits, especially lower levels of empathy and higher levels of callousness, deceitfulness, and risk-taking, this is directly associated with lower compliance with containment measures in Brazil. These traits explain at least partially, the reason why people continue with non-adherence to the containment measures even with increasing numbers of cases and deaths¹³. Educational level (up to tertiary), amongst Ecuadorians who have a very good knowledge of COVID-19 were found to influence satisfactory adherence⁹. Sensitizing and awareness amongst the populace through health education especially among rural dwellers and the aged would go a long way in mitigating the spread of COVID-19 as is seen in the Mexican rural dwellers of Yucatan and Chiapas⁷. Most participants of the selected studies used in this review identified social media, internet, TV and health practitioners as the major sources of information¹⁰. These channels should be leveraged to enhance adherence to COVID-19 public health guidelines. As further research would be to measure the compliance to the guidelines we gradually expect declines in the incidence and mortality caused by the virus.

LIMITATIONS

This study was representative of the two continents, we are therefore limited to the scope of study population that was utilized in the original research papers.

CONCLUSIONS

COVID-19, which is a pandemic, is gradually becoming endemic and it is affecting several aspects of human endeavors namely physical, psychological, social, health and financial amongst others. The selected representative studies on knowledge and practice reviewed showed relatively good knowledge and relatively poor adherence to the laid down public health guidelines such as social distancing, wearing of masks, avoiding crowded places, handwashing, etc.

Since most respondents were citizens and residents in their locality, this gives a clear indication of the level of adherence to the public health guidelines where poor practice dominates and negative attitude occurs due to ignorance, negligence and the inability to read and write. However, educated individuals, that are middle aged had fair adherence to the public health guidelines.

We recommend that to strike a balance, more awareness and campaign so that rural dwellers can understand

that correct information dissemination via the established channels would help bridge the gap. Overall, the populace of North and South America still needs to put more profound and definite effort towards curtailing the spread of the virus since it is still the leading continent in the incidence and mortality associated with this virus globally.

What is already known on this topic:

- COVID-19 which is a pandemic is gradually becoming endemic and it is affecting several aspects of human endeavors namely physical, psychological, social, health and financial amongst others.
- Public health has been in the frontline since the pandemic started which is almost an endemic that now resides with the global populace and cut across North and South America.
- North and South America are crucial in the global evaluation of progress in the reduction of COVID-19 as these two continents are home to the USA and Brazil, both of which are the top three countries globally with the highest incidence and mortality associated with COVID-19.

What this study adds:

- Assessing the knowledge and adherence of Americans to the public health guidelines of COVID-19 using literature.
- To strike a balance, more awareness and campaign so that rural dwellers can understand that correct information dissemination via the established channels would help bridge the gap.
- Overall, the populace of North and South America still needs to put more profound and definite effort towards curtailing the spread of the virus since it is still the leading continent in the incidence and mortality associated with this virus globally.

ACKNOWLEDGEMENTS:

We want to acknowledge every public health officer, as well as researcher in the frontline of ending the COVID-pandemic.

COMPETING INTEREST:

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTION:

Conceptualization: JOT; Design; OEO Initial Draft: JOT and TKAT Review: JOT, OEO, TKAT, ASO and EO.

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