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Understanding COVID-19 preventive behavior: An application of the health belief model in the Philippine setting

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Abstract:

BACKGROUND: With the Philippines emerging as the hotspot in the Western Pacific Region for the COVID-19 cases, the study aimed to understand the COVID-19 preventive behavior of Filipinos using the health belief model (HBM).

MATERIALS AND METHODS: The cross-sectional study included 304 respondents recruited for the whole month of July 2020 through various social media platforms. Participants were requested to answer an online questionnaire, and results were analyzed using SPSS software.

RESULTS: The majority of respondents were female (71.1%), with an average age of 29, college graduate (57.6%), and living in an area where modified general community quarantine is implemented (63.2%). Good preventive behavior was noted among the participants, and not shaking of hands with others and refraining from touching of surfaces were reported as the most practiced behavior. Spearman's correlation and Pearson's Chi-square showed that age and sex are significant predictors for the HBM constructs and preventive behavior. Furthermore, results showed that cues to action, self-efficacy, and perceived barrier have a significant association with COVID-19 preventive behavior.

CONCLUSION: Findings prove that HBM is useful in understanding preventive behaviors in times of coronavirus pandemic. Strategies that promote a supportive environment and help overcome the perceived barriers can guide Filipinos to adopt the desired health behavior. Interventions to promote preventive behaviors should be focused on males and younger individuals.

Keywords:

COVID-19 preventive behavior, Filipino COVID-19, health belief model, Philippines

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Introduction

COVID-19 is a novel pandemic that has caused a tremendous negative impact on the health and economy of many countries around the world. Current evidence shows that SARS-CoV-2, the virus causing the disease, is transmitted between people through respiratory droplets and contact routes.^[1] Efforts to minimize the spread of the infection focus on behavioral interventions and protective behaviors like

home quarantine, frequent handwashing, and social distancing.

In the absence of vaccines, large-scale social distancing measures – workplace nonattendance, school closure, and lockdown – appear to be the most effective means of mitigation.^[2] In the US, one study noted that 3–4 months of moderate distancing could actually save 1.7 million lives and lead to substantial economic benefits.^[3] However, noncompliance to social distancing has been observed, and the

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behavior has been linked to several factors, including political reasons^[4] and personal expectations like duration of self-isolation.^[5]

Public health experts have used different theories and models to explain the various factors influencing health behavior. One of the most commonly used frameworks in public health research is the health belief model (HBM). The general acceptance and popularity of the theory are due to its reliability in predicting behavior. According to the HBM, the behavior is predicted by a person's perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. The model is designed to explain the reasons why people are compliant or noncompliant to preventive health behaviors.

While there is one study that explored the COVID-19 preventive behavior in Iran,^[6] cultural differences may influence the variables. Unlike other countries around the world, the Philippines has been in various forms of community quarantine and has the world's longest and strictest lockdown. Reports show that the end to this lockdown is still not in sight because of the failure in controlling the pandemic, thus making the country with the fastest rise in virus cases in the Western Pacific Region.^[7] This situation raises a unique challenge for both public health practitioners and government authorities. There is a need to better understand the factors influencing COVID-19 preventive behaviors in order to ensure the public's compliance and cooperation. By obtaining the possible predictors of the said behavior using the HBM, this can serve as a pivotal point in the planning, promotion, and implementation of better health program protocols to prevent the further spread of the disease in the country.

Materials and Methods

Study population

The cross-sectional study targeted participants who were currently living in the Philippines, at least 18 years old, and have access to the internet. Since this was an online survey study, participants were selected through convenience sampling technique. Eligible participants were recruited through Facebook, a popular social media platform in the country. The researchers posted the link of the online questionnaire on private accounts and shared in public pages and groups for the whole month of July 2020. Researchers requested the participation of their online friends through recruitment posts and personal messages with an included link to the online survey. To widen the coverage, they also asked their online friends to share the link. Furthermore, the link was also posted on public groups on Facebook and requested the administrators of organizations and institutions to

post the questionnaire link on their respective pages. At the end of the online data collection period, the online survey was closed and data were then analyzed.

Research instrument

The research tool was adapted from one published study in Iran.^[6] In order to fit the Philippine setting, the questionnaire was slightly modified, translated into the Filipino language, and pilot tested. To check for the internal consistency, Cronbach's alpha was calculated. A revision was done until the internal consistency for both English and Tagalog versions was within the acceptable range. The final English and Tagalog versions have an internal consistency of 0.776 and 0.644, respectively. Both were converted into Google Forms to facilitate the online survey.

The questionnaire included three sections – demographic profile, HBM constructs, and COVID-19 preventive behaviors. The demographic profile included age, birthdate, sex, educational background, and the lockdown category of the participants. The lockdown category was included because the government, through the interagency task force on emerging infectious diseases, classified each area in the country into various categories. They are the enhanced community quarantine (ECQ), modified ECQ (MECQ), general community quarantine (GCQ), and modified GCQ (MGCQ), which are enumerated based on decreasing restrictions in terms of social movement and business operations. ECQ is the strictest type of lockdown where most establishments were closed, only food businesses and health-care institutions were allowed to operate, and only one person per household was allowed to go out for essential errands.

The questionnaire also included 22 questions about HBM constructs and 7 questions on COVID-19 preventive behaviors. All were on 1–5 Likert scales, which range from strongly agree to strongly disagree. Participants were asked to click on the option that best describes their current status and their understanding of each statement. Once done, they only need to click the submit button and there was no incentive given for their participation.

Ethical consideration

Ethical clearance was obtained from an ethics review board prior to the conduct of the study. A voluntary informed consent form was included on the first page of Google forms. All participants who agreed were asked to click on the "I agree" box before proceeding to answer the rest of the questionnaire. All data obtained were treated with extreme confidentiality.

Statistical analysis

The Mann–Whitney U-test, Pearson's Chi-square, and Spearman's rank correlation analyses were run to

determine the association between the participant’s demographics (sex, lockdown category, and age) with both HBM constructs and their COVID-19 preventive behaviors. On the other hand, Spearman’s rank correlation analysis was also used to investigate the effect of each HBM construct on the performance of COVID-19 preventive behavior. All *P* values were computed at a two-sided 5% level of significance.

Results

A total of 304 responses from eligible participants were analyzed. The respondents of the online survey have an average age of 29.0 ± 10.4, mostly female (71.1%), college graduates (57.6%), and living in an area where MGCQ is implemented (63.2%). Of the different constructs in the study, Table 1 shows that the perceived benefits (4.7) and perceived self-efficacy (4.7) had the highest mean, followed by perceived severity (4.5), cues to action (4.4), preventive behavior (4.2), perceived susceptibility (3.6), and perceived barriers (3.5).

Table 2 summarizes the correlation result of the participant’s demographic profile with the HBM constructs and preventive behavior. Based on the results, only age and sex have a significant association with the constructs under study. Age showed a

Table 1: Demographic profile of the study participants

Parameter	n (%)
Age*	29.0±10.4
Sex	
Male	88 (28.9)
Female	216 (71.1)
Educational attainment	
High school level	19 (6.3)
College level	48 (15.8)
College graduate	175 (7.6)
Postgraduate	60 (19.7)
Vocational	2 (0.7)
Lockdown category	
MGCQ	192 (3.2)
GCQ	81 (26.6)
MECQ	23 (7.6)
ECQ	8 (2.6)
Health belief model constructs*	
Perceived susceptibility	3.6±1.0
Perceived severity	4.5±0.6
Perceived barriers	3.5±0.7
Perceived benefits	4.6±0.6
Perceived self-efficacy	4.7±0.5
Cues to action	4.4±0.7
Preventive behavior*	4.2±0.6

*Mean±SD. SD=Standard deviation, MGCQ=Modified general community quarantine, GCQ=General community quarantine, MECQ=Modified enhanced community quarantine, ECQ=Enhanced community quarantine

significant positive relationship with perceived susceptibility (*P* = 0.04), perceived barriers (*P* < 0.001), and cues to action (*P* < 0.001), which indicates that as age increases, the mean scores of these constructs also increase. Findings also revealed a significant association of the participant’s sex on perceived self-efficacy (*P* = 0.02), cues to action (*P* = 0.01), and preventive behavior (*P* = 0.001).

Further analysis of the association of sex with HBM constructs was done by comparing the mean scores among males and females using the Mann–Whitney U-test [Table 3]. Based on our findings, mean scores for perceived severity, perceived self-efficacy, cues to action, and preventive behavior were significantly higher among females than in males.

In terms of COVID-19 preventive behavior, Table 4 shows that overall, there was a good practice among the participants of the study as represented by their mean score. Not shaking of hands with others and refraining from touching of surfaces was the most practiced behavior, and not touching the eyes, nose, or mouth and not taking of cellphone out from the pocket/bag was the least practiced.

Table 5 summarizes the result of Spearman’s correlation of HBM constructs with the participants’ preventive behavior. Among the different constructs, only three showed a significant association. Both perceived self-efficacy and cues to action have a significant direct relationship with preventive behavior, whereas perceived barriers showed a significant indirect relationship.

Discussion

COVID-19 is steadily increasing in the world, and in the Philippines, the cases continue to rise, necessitating a second round of stricter implementation of MECQ in the country’s capital city and the continuous implementation of various types of community quarantine in different areas.^[8] With the rising number of Filipinos infected with the novel disease, the researchers aimed to determine the COVID-19 preventive behaviors of Filipinos and the role of the HBM constructs to their adherence to health protocols.

Out of the demographic profile studied, age and sex were shown to be important variables affecting the HBM constructs. Participants have increasing perceived susceptibility as they age, and this is probably because age has always been considered as a predictor of fatal outcome in COVID-19 cases.^[9] Older people are at higher risk of contracting COVID-19 due to the physiological body changes that come with aging as well

as the potential underlying comorbidities and decreased immune function that they experience which can make them more susceptible to the complications of the disease. Furthermore, the elderly who have existing comorbidities are more likely to engage in health-promoting behaviors since they feel that noncompliance will render them more susceptible to the infection.^[10]

Table 2: Association of the participants' age, sex, educational attainment, and lockdown category with health belief model constructs

Socio-demographics	Constructs	r	P
Age**	Perceived susceptibility	0.116	0.04*
	Perceived severity	-0.055	0.34
	Perceived barriers	0.162	<0.001*
	Perceived benefits	0.045	0.43
	Perceived self-efficacy	0.102	0.08
	Cues to action	0.211	<0.001*
	Preventive behavior	0.099	0.09
Sex***	Perceived susceptibility	-	0.84
	Perceived severity	-	0.08
	Perceived barriers	-	0.68
	Perceived benefits	-	0.65
	Perceived self-efficacy	-	0.02*
	Cues to action	-	0.01*
	Preventive behavior	-	<0.001*
Educational attainment***	Perceived susceptibility	-	0.06
	Perceived severity	-	0.45
	Perceived barriers	-	0.81
	Perceived benefits	-	0.79
	Perceived self-efficacy	-	0.99
	Cues to action	-	0.48
	Fatalistic beliefs	-	0.25
Lockdown category***	Perceived susceptibility	-	0.68
	Perceived severity	-	0.30
	Perceived barriers	-	0.62
	Perceived benefits	-	0.54
	Perceived self-efficacy	-	0.80
	Cues to action	-	0.98
	Fatalistic beliefs	-	0.72
	Preventive behavior	-	0.80
		-	0.63

*Significant at $P < 0.05$, **Spearman's rank correlation, ***Pearson's Chi-square

Table 3: Comparison of mean scores for the various health belief constructs and preventive behavior among males and females

HBM Constructs and Preventive Behavior	Male	Female	P
Perceived susceptibility	3.6±1.0	3.6±1.1	0.85
Perceived severity	4.4±0.6	4.6±0.6	0.04*
Perceived barriers	3.5±0.8	3.5±0.7	0.92
Perceived benefits	4.7±0.6	4.7±0.6	0.50
Perceived self-efficacy	4.6±0.7	4.8±0.5	<0.001*
Cues to action	4.2±0.8	4.5±0.7	<0.001*
Preventive behavior	4.0±0.5	4.3±0.6	<0.001*

*level of significance at < 0.05

It was also noted that female respondents have higher perceived severity, perceived self-efficacy, cues to action, and preventive behavior. When compared with a previous study involving hospital staff workers, females are also reported to have a higher score of perceived threat.^[11] This result coincides with another published study which noted that men tend to have lower rates of handwashing, social distancing, wearing masks, and proactively seeking medical help.^[12] The same result was noted in a large-scale international investigation that shows women are more likely to engage in health behaviors than men.^[13] The result of the present and previous studies is interesting, considering that reports show that the number of men who died from COVID-19 is 2.4 times that of women.^[14] This only shows the need to intensify public interventions that address the unique needs of men when it comes to COVID-19.

The results also showed that the participants have good COVID-19 preventive behavior. However, it is noted that when outside, taking out of cellphones from their pocket/bag is a common practice among the participants of the study. This result is not surprising given the fact that nowadays, most people use their cell phones when outside to communicate with their families and friends amid the pandemic. While there are no documented cases of COVID-19 transmission through cell phone use, Han *et al.* cited one study in China which reported that the virus has been isolated from door handles and cell phones^[15] and that human coronaviruses can persist on inanimate surfaces for up to 9 days.^[16] The evidence of transmitting various respiratory infections via contaminated hands and contaminated inanimate objects comes from several studies.^[17] Therefore, individuals may have a higher risk of being infected with COVID-19 if they touch their nose, mouth, or eyes after contacting contaminated items.

Another area for improvement revealed in the study is the frequent touching of the nose, mouth, and eyes with hands. Face-touching behavior is a common practice and has been associated as a potential vector for self-inoculation and transmission of respiratory infections. As such, it is recommended that increasing awareness of face-touching behavior and improving the understanding of self-inoculation as a route for transmission can help break the transmission cycle of common respiratory diseases.^[18] While the use of face mask has been mandatory in the country and many parts of the world, it has been noted that its use promotes face touching. In a study conducted in Mexico, patients with face mask touched their face 11.41 times on average and ranged up to 80 times. The study suggests that face-touching behavior has a role in COVID-19 transmission, and thus, mask use should be accompanied by proper hand hygiene and reminders not to touch

Table 4: Summary of the participant’s preventive behavior

Item	Mean score	Interpretation
When outside, I keep a distance of at least one meter from others	4.5±0.7	Always Good practice
I don’t shake hands with others and refrain from touching surfaces	4.6±0.7	
I wash my hands with alcohol each time I touch something	4.5±0.7	
I do not touch my eyes, nose, and mouth by hand	3.9±0.9	Often
When outside, I do not take my cellphone out from my pocket/bag	3.1±1.1	
I place a tissue paper or bend my elbow in front of my mouth and nose when coughing or sneezing	4.3±1.0	Always
I wash my hands with soap and water without touching anything after entering the home	4.5±0.8	
Overall	4.2±0.6	

Table 5: Association of the health belief model constructs with COVID-19 preventive behavior

HBM constructs	r	P
Perceived susceptibility	-0.049	0.40
Perceived severity	0.008	0.89
Perceived barriers	-0.139	0.02*
Perceived benefits	0.094	0.10
Perceived self-efficacy	0.247	<0.001*
Cues to action	0.173	<0.001*

*Significant at $P < 0.05$

one’s face in order to be more effective in preventing COVID-19 infection.^[19] These findings are consistent with what the WHO emphasizes on the importance of frequent hand hygiene, along with respiratory etiquette, environmental cleaning, and disinfection to prevent the transmission of COVID-19 infection.^[1]

Of the HBM constructs, perceived self-efficacy and cues to action were noted to be positively correlated with the COVID-19 preventive behavior. Findings are congruent with the results conducted in Saudi Arabia and Iran, showing that participants with higher perceived self-efficacy and cues to action scores are more likely to adhere to the coronavirus preventive measures than those with lower scores. The researchers have emphasized the importance of the existence of high perceived self-efficacy as a way to overcome perceived barriers^[6,20].

Self-efficacy is an important construct considered to be a predictor of health behavior in various settings, and improvement of this can increase the likelihood of adopting a particular behavior.^[21-23] Self-efficacy reflects people’s confidence in their capacity to change behavior and deal with the problem. In the context of COVID-19, self-efficacy does not only lead to higher preventive behavior but also to better mental health status. Studies show that it is a mediating variable associated with lesser stress and anxiety. Individuals with higher self-efficacy scores have better mental health status. This is quite interesting, considering that the current pandemic has a strong negative impact on the lives of people.^[11,24,25]

Cues to action is another construct found to be associated with the COVID-19 preventive behavior. This refers

to the stimulus needed to trigger the decision-making process for a person to adopt a recommended health action. The theoretical construct is pivotal in influencing health behaviors.^[26,27] In the present study, the stimulus includes external cues such as mass and social media information, government regulation, and the presence of supportive infrastructures. To help individuals take action, the Philippine government enforces mandatory use of face mask and compulsory infrastructure changes for businesses prior to re-opening like provision of barriers and foot markings, and adherence to several public health measures related to personal protection, environmental sanitation, physical and social distancing, and travel-related measures. Information as to COVID-19 is widely disseminated, and Filipinos identified traditional media such as television and radio as main sources of information about the virus.^[28] It has been shown in various studies that when the environment is more supportive, people are more likely to adopt the desired behavior.^[29,30] The existing laws and regulations in the country on COVID-19 prevention and the relatively conservative attitude of Filipinos may explain the higher preventive behavior observed in the study. In India, one study even mentioned that participants perceived the following government’s protocols as an effective way to avoid infection.^[10]

The last construct found that this time negatively associated with COVID-19 preventive behavior is the perceived barrier. This construct serves as a deterrent, and individuals must be able to overcome it to adopt the desired behavior. In the present study, the participants’ perceived barriers were hand hygiene, face touching, staying at home, social distancing, and non-readiness of businesses. These factors were strongly related to the scarcity of masks and disinfecting solutions, especially during the first part of the year, when the pandemic was just starting. In the country, it was this time when hoarding of face mask and alcohol, panic buying, establishments limiting the purchase of commodities, and price increase were very common.^[31] In addition to the supply-related barriers, the mandatory home quarantine and social distancing were concepts new to people. Thus, they were perceived as barriers since many do not fully understand their benefits, and they

have negative associations with it. Home quarantine is related to various psychological stresses such as fear, frustration, boredom, and financial loss.^[32] During the H1N1 pandemic, researchers found that in order to increase compliance to home quarantine, clear, consistent, and simple information about it should be provided by authorities.^[33]

Limitations

While the study offers a timely approach to understanding COVID-19 preventive behavior in a developing country like the Philippines, it has its own limitations. First, since it was conducted during community lockdown, the convenience sampling method and online survey were the only options available to the researchers. Thus, sample clustering may have limited the generalizability of the study. Second, the present work relied on the self-reported behaviors and responses of the participants, and thus, the actual behavior and responses may vary. The responses are also subject to recall bias as participants may be unable to report accurate estimates.

Conclusion

The study proved that the HBM is useful in understanding COVID-19 preventive behavior. Strategies that increase self-efficacy, promote cues to action, and overcome the perceived barriers can help Filipinos adopt the desired health behavior. This may include offering a more supportive environment like the availability of masks and hand sanitizers in public places, foot markings to remind social distancing measures, credible social media campaigns on promoting preventive behaviors, and intensified implementation of home quarantine measures for nonessential outdoor errands. In addition, dissemination of specific and actionable information through current media coverage (i.e., online and mobile platforms) may be impactful in delivering public health messages to increase positive attitude toward preventive behavior. It may also be important to leverage the influence of the community such as family and friends in inducing and sustaining behavior change. Finally, interventions to promote COVID-19 preventive behavior among Filipinos should be focused on males and younger individuals, and key health messages used to drive information must be contextualized in a manner that considers the culture and existing practices of local people in the country.

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Conflicts of interest

There are no conflicts of interest.

References

1. WHO. Modes of Transmission of Virus Causing COVID-19: Implications for IPC Precaution Recommendations. Available from: <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>. [Last cited on 2020 May 20].
2. Singh R, Adhikari R. Age-structured impact of social distancing on the COVID-19 epidemic in India. 2020. p. 1-9. Available from: <http://arxiv.org/abs/2003.12055>. [Last accessed on 2020 Jul 20].
3. Michael Greenstone VN. Does Social Distancing Matter? Univ Chicago, Becker Friedman Inst Econ Work Pap 2020; (No. 2020-26). Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3561244. [Last accessed on 2020 Jul 20].
4. Painter M, Qiu T. Political Beliefs affect Compliance with COVID-19 Social Distancing Orders (July 3,2020). Available at SSRN:<https://ssrn.com/abstract=3569098> or <http://dx.doi.org/10.2139/ssrn0.3569098>. [Last accessed on 2020 Sep 05].
5. Briscese G, Lacetera N, Mario Macis MT. Compliance with COVID-19 social-distancing measures in Italy: The role of expectations and duration. IZA Discussion Paper, 13092. Available from: <https://www.nber.org/papers/w26916>. [Last accessed on 2020 Sep 05].
6. Shahnazi H. Assessing Preventive Health Behaviors from COVID-19 Based on the Health Belief Model (HBM) among People in Golestan Province : A Cross-Sectional Study in Northern Iran. *Infectious Disease of Poverty*, 17 Nov 2020; 9 (1):57. DOI: 10.1186/s40249-020-00776-2. [Last accessed on 2020 Aug 21].
7. Gomez SA. At six months, Manila enters world's longest COVID-19 quarantine; September 15, 2020. Available from: <https://www.efe.com/efe/english/portada/at-six-months-manila-enters-world-s-longest-covid-19-quarantine/50000260-4343512>. [Last cited on 2020 Oct 30].
8. Bloomberg. Philippines now has worst COVID-19 outbreak in Southeast Asia; August 7, 2020. Available from: <https://www.japantimes.co.jp/news/2020/08/07/asia-pacific/philippines-coronavirus-southeast-asia/>. [Last accessed on 2020 Aug 21].
9. Ruan Q, Yang K, Wang W, Jiang L, Song J. Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. *Intensive Care Med* 2020;46:846-8.
10. Jose Regi, Narendran Meghana, Bindu Anil, Nazeema B, Manju L, Benny PV. Public perception and preparedness for the pandemic COVID 19: A health belief model approach. *Clin Epidemiol Glob Heal* 2020; 20 June 2020:1-6. [Doi. org/10.1016/j. cegh. 2020.06.009].
11. Bashirian S, Jenabi E, Khazaei S, Barati M, Karimi-Shahanjarini A, Zareian S, *et al.* Factors associated with preventive behaviours of COVID-19 among hospital staff in Iran in 2020: An application of the Protection Motivation Theory. *J Hosp Infect* 2020;105:430-3.
12. Griffith DM, Sharma G, Holliday CS, Enyia OK, Valliere M, Semlow AR, *et al.* Men and COVID-19: A biopsychosocial approach to understanding sex differences in mortality and recommendations for practice and policy interventions. *Prev Chronic Dis* 2020;17:E63.
13. Clark C, Davila A, Regis M, Kraus S. Predictors of COVID-19 voluntary compliance behaviors: An international investigation. *Glob Transit* 2020;2:76-82.
14. Jin JM, Bai P, He W, Wu F, Liu XF, Han DM, *et al.* Gender differences in patients With COVID-19: Focus on severity and mortality. *Front Public Health* 2020;8:152.
15. Han Q, Lin Q, Ni Z, You L. Uncertainties about the transmission routes of 2019 novel coronavirus. *Influenza Other Respir Viruses* 2020;14:470-1.
16. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of

- coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J Hosp Infect* 2020;104:246-51.
17. Scott E. Community-based infections and the potential role of common touch surfaces as vectors for the transmission of infectious agents in home and community settings. *Am J Infect Control* 2013;41:1087-92.
 18. Kwok YL, Gralton J, McLaws ML. Face touching: A frequent habit that has implications for hand hygiene. *Am J Infect Control* 2015;43:112-4.
 19. Perez-Alba E, Nuzzolo-Shihadeh L, Fonseca-Ruiz A, Aguirre-García GM, Hernández-Guedea MA, Perez-Rodriguez E, *et al.* Frequency of facial touching in patients with suspected COVID-19 during their time in the waiting room. *Infect Control Hosp Epidemiol* 2020;1:1-2. doi:10.1017/ice.2020.389.
 20. Alsulaiman SA. Health Crisis in the Kingdom of Saudi Arabia: A Study of Saudis' Knowledge of Coronavirus, Attitudes toward the Ministry of Health's Coronavirus Preventive Campaigns, and Trust in Coronavirus Messages in the Media. ProQuest Diss Theses May, 2018. p. 224. Available from: http://search.proquest.com.ezp-prod1.hul.harvard.edu/docview/2058095303?accountid=11311%0Ahttps://hollis.harvard.edu/openurl/01HVD/HVD_URL?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genre=dissertations+%26+theses&sid=ProQ:ProQuest+. [Last accessed on 2020 Sep 15].
 21. Buglar ME, White KM, Robinson NG. The role of self-efficacy in dental patients' brushing and flossing: Testing an extended health belief model. *Patient Educ Couns* 2010;78:269-72.
 22. Sheeran P, Maki A, Montanaro E, Bryan A, Klein WM, Miles E, *et al.* Supplemental material for the impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Heal Psychol* 2016;35:1178-88.
 23. Gammage KL, Klentrou P. Predicting osteoporosis prevention behaviors: Health beliefs and knowledge. *Am J Health Behav* 2011;35:371-82.
 24. Yıldırım M, Güler A. COVID-19 severity, self-efficacy, knowledge, preventive behaviors, and mental health in Turkey. *Death Stud* 2020 July 16; 1-8. Doi: 10.1080/07481187.2020.1793434. [Accessed last September 20, 2020].
 25. Xiao H, Zhang Y, Kong D, Li S, Yang N. The effects of social support on sleep quality of medical staff treating patients with coronavirus disease 2019 (COVID-19) in January and February 2020 in China. *Med Sci Monit* 2020;26:e923549.
 26. Chou PH, Wister AV. From cues to action: Information seeking and exercise self-care among older adults managing chronic illness. *Can J Aging La Rev Can du Vieil* 2005;24:395-408.
 27. Walker KK, Steinfort EL, Keyler MJ. Cues to Action as Motivators for Children's Brushing. *Health Commun* 2015;30:911-21.
 28. Lau LL, Hung N, Go DJ, Ferma J, Choi M, Dodd W, *et al.* Knowledge, attitudes and practices of COVID-19 among income-poor households in the Philippines: A cross-sectional study. *J Glob Health* 2020;10:011007.
 29. Lin CY, Liao Y. Perceptions of activity-supportive environment and motorcycle use among urban Taiwanese adults. *BMC Public Health* 2017;17:665.
 30. Tan S, Cao F, Yang J. The Study on Spatial Elements of Health-Supportive Environment in Residential Streets Promoting Residents' Walking Trips. *Int J Environ Res Public Health* 2020;17 (14), 5198; <https://doi.org/10.3390/ijerph17145198>. [Last accessed on 2020 Sep 20].
 31. Nicomedes CJ, Avila RM. An Analysis on the Panic of Filipinos during COVID-19 Pandemic in the 2020. March 2020. p. 1-13. DOI: 10.13140/RG.2.2.17355.54565. [Last accessed on 2020 Sep 20].
 32. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, *et al.* The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *Lancet* 2020;395:912-20.
 33. Kavanagh AM, Bentley RJ, Mason KE, McVernon J, Petrony S, Fielding J, *et al.* Sources, perceived usefulness and understanding of information disseminated to families who entered home quarantine during the H1N1 pandemic in Victoria, Australia: a cross-sectional study. *BMC Infect Dis* 2011;11:2.