

# Perception of Ophthalmologists to COVID-19 Using Health Belief Model

Enmar Almazyad (✉ [e.almazyad@gmail.com](mailto:e.almazyad@gmail.com))

King Khaled Eye Specialist Hospital

Abeer Ahmad

King Khaled Eye Specialist Hospital

Deema Jomar

King Khaled Eye Specialist Hospital

Rajiv Khandekar

King Khaled Eye Specialist Hospital

Samar Al-Swailem

King Khaled Eye Specialist Hospital

---

## Research Article

**Keywords:** COVID-19, Health measures, Ophthalmology, Health belief model

**Posted Date:** November 25th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-110199/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

## Purpose:

To assess ophthalmologists preparedness in such a critical period in the history of pandemics, a logical socio-psychological framework assessment using the health belief model (HBM) is essential to evaluate their risk perception, their willingness to actively participate in engaging in protective health behavior and acknowledge its benefits and their capability to perform adequate successful methods in limiting the spread of COVID-19 and overcome the barriers they might encounter while implementing such precautions.

## Methods:

A cross-sectional study conducted in King Khaled Eye Specialist Hospital using a questionnaire-based (HBM) was distributed to 135 ophthalmologists in the institute to evaluate their risk perception on COVID-19, and determine which components of the HBM contribute to preventive health behavior related to the COVID-19 infection.

## Results:

The questionnaire had a reasonable response rate ( 79.3%, 107 ophthalmologists including; 48 consultants, 51 fellows, and 36 residents). The study demonstrated that this model is useful and mapped how several components were significantly correlated to actions. Most significantly, perceived susceptibility was the most important predictor of action. The second most important determinant of action was the perceived benefit.

## Conclusion:

Pandemics such as COVID-19 are more likely to happen again in the future. Explicit attention to factors influencing motivation, such as threat perception to adopt appropriate health-related behavior to limit the spread of communicable diseases, is necessary. This study has successfully represented preparedness and risk behavior perception of ophthalmologists to the novel COVID-19 pandemic in one of the largest tertiary eye hospitals in the middle east using the health belief model.

# Introduction

Coronavirus disease 19 (COVID-19) is a current international pandemic emergency declared by the world health organization (WHO) on 11th March 2020<sup>1</sup>. Since then, it had a significant impact on the economy, society, and most importantly, it affected medical practice worldwide, including ophthalmology<sup>2</sup>.

As there is no specific treatment for COVID-19 and vaccines are still under clinical trials<sup>3</sup>, the current approach is directed towards alleviating the virus's signs and symptoms as well as limiting the spread of the outbreak by global WHO efforts and local governmental public health policies<sup>4</sup>.

Since the outbreak, healthcare workers worldwide, ophthalmologists in particular due to the nature of their work and closeness to patients during the examination, are concerned about their exposure to this vast spreading virus<sup>5,6</sup>. Moreover, many publications have emerged suggesting the virus can present as conjunctivitis and its possibility of transmission through ocular tissue<sup>7-10</sup>. And, several ophthalmic societal groups are in consensus about the risk of this novel virus. Consequently, they have issued strategical plans to provide optimal ophthalmic care while ensuring ophthalmologists' personal and work-field safety by raising their awareness and educate them to practice appropriate precautions<sup>11</sup>.

However, whether ophthalmologists will trust and be willing to comply with recommended precautionary behaviors is not absolute. Researchers have developed several social-psychological frameworks to assess willingness to engage (or lack of engagement) in preventive measures and predict health-related behaviors. The most well-known and favorably influential is the health belief model (HBM)<sup>12-14</sup>. The HBM has been used to develop appropriate interventions to change health-related behaviors by targeting various aspects of the model's key constructs and was extremely useful in previously recognized communicable diseases<sup>15-20</sup>.

According to the HBM, modifying factors such as; perceptions of the disease, perceptions of the behavior, and cues to action simultaneously influence the likelihood of taking a recommended preventive health action. The value of health-related behaviors is avoiding sickness. The expectation is that a specific health action could prevent the condition for which people consider they might be at risk<sup>13,14,21-23</sup>.

In order to assess ophthalmologists preparedness and behavior in such critical period in the history of pandemics, a logical socio-psychological framework assessment using HBM is essential to evaluate their risk perception, their willingness to actively participate in engaging in protective health behavior and acknowledge its benefits and their capability to perform adequate successful methods in limiting the spread of COVID-19 and overcome the barriers they might encounter while implementing such precautions. Therefore, the present study aims to evaluate ophthalmologists risk perception on COVID-19 in one of the largest tertiary eye hospitals in the Middle East and Gulf region, King Khaled Eye Specialists Hospital, using health belief model (HBM) and determine which components of the HBM contribute to preventive health behavior related to the COVID-19 infection.

## **Methodology**

### Study design:

The study is a cross-sectional, web-based questionnaire held at King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia, during the beginning of the COVID-19 pandemic (April-May 2020). The target population comprises ophthalmologists at different levels (residents, fellows, and consultants). The hospital's institutional review board approved the study. Informed consent was implemented at the beginning of the web-based questionnaire to explain the purpose of the study. Participation was voluntary, and ophthalmologists can withdraw their participation at any time.

## Questionnaire:

The questionnaire consisted the following parts: (a) items requesting sociodemographic information including age, gender, marital status ( single, married, widowed), living status ( living alone, living with family members or with spouse and kids) nationality, experience/level at work ( resident, fellow, consultant), subjected to quarantine ( yes, no), the reason of quarantined (travel, exposure).; (b) Health status: any chronic diseases (yes, no), what are they ( Diabetes mellitus, Asthma, other), for women (pregnant or not). (c) items that are measuring the HBM variables, including the four categories of susceptibility, severity, benefits, and barriers, self-efficacy, and cues to action (the items in each category are shown in supplementary Table 1).

For the different components, multiple questions were included. We formulated these questions using other referenced studies who were aiming to explore different determinants in engaging in certain health behavior<sup>15–20,24</sup>. The questions were also formulated in an agreement between epidemiologists and researches in the institute's research department.

Items in the HBM predictor categories will be measured on a 5-point Likert-type scale, with the following possible responses: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), and strongly agree (5). Each of the HBM scales was a sum of answers for several questions. The scores on each of the scales were averaged to form the independent variable higher scores indicating higher risk perception, perceived severity, benefits, barriers, and self-efficacy.

## Data analysis and Sample size:

Our primary outcome measure is to find the relation between different components and compliance with preventive behavior (action). To obtain a sample size, we have focused on an essential determinant of engaging in a preventive behavior, such as perceived susceptibility. We hypothesize that there is no correlation between the two components,  $r=0$ . However. We assume that finding a moderate positive correlation between perceived susceptibility and preventive behavior (action) of approximately 0.6, with 80% of power (adequate power in psychology research) and an alpha of 5%, we will need around 56 ophthalmologists (Statistical software PASS Version 2020).To compensate for non-responders, we included an additional 20%, resulting in a total of 67.

Item analysis was performed for each component to measure the reliability using the Cronbach alpha. Questions that increased the reliability of components were removed to eliminate overestimation. For items with a low Cronbach alpha, the results should be reported carefully. To measure the association of the different components of the HBM model, with the "action" component scores, a Pearson correlation coefficient will be calculated. A multiple regression analysis was performed to analyze to what extent the different components of the HBM model determine the dependent variable "Action" (preventive measures). The regression coefficient, 95% confidence intervals, will be presented. Significance for the correlation will be set at a p-value  $<0.05$ .

## Results

Out of 135 Ophthalmologists in King Khaled Eye Specialist Hospital, 107 responded to the questionnaire with a 79.3% response rate, including; 48 consultants, 51 fellows, and 36 residents, table1 summarizes participants' characteristics and demographics [table1].

The Cronbach's alpha shows a reliable unidimensional module per each HBM component [table 2].

All the components had a high average mean score on the Likert scale except for perceived barriers [table3].

<b>Table1: Ophthalmologists (N=107) demographics and characteristics.</b>		
<b>Characteristics</b>	<b>Number</b>	<b>Percentage%</b>
<b>Gender</b>		
· Male	63	58.9
· Female	44	41.1
<b>Nationality</b>		
· Saudi	94	87.9
· Non-Saudi	13	12.1
<b>Age (Mean±SD)</b>		
<b>Minimum</b>	34.39± 9.725	
<b>Maximum</b>	25	
	63	
<b>Marital status</b>		
· Married	46	43
· Single	61	57
<b>Pregnancy status of females</b>		
· Pregnant	4	9.1
· Not pregnant	40	91.9
<b>Living status</b>		
· With family	80	74.8
· Alone	27	25.2
<b>Experience level</b>		
· Consultant	35	32.7
· Fellow	40	37.4
· Resident	32	29.9
<b>Experienced quarantine</b>		
· Yes	16	14.9
· No	91	85.1
<b>Reason for quarantine (if quarantined)</b>		
· Recent travel	11	68.8

·	Early COVID-19 symptoms	2	12.5
·	Not known	3	18.7
<b>Comorbidities</b>			
·	Diabetes	4	3.7
·	Hypertension	6	5.6
·	Asthma	8	7.5
·	Dyslipidemia	2	1.7
·	Ischemic heart disease	1	0.9
·	Non-Ischemic heart disease	1	0.9
·	SLE	1	0.9
·	None	89	83.2
·	Combination	4	3.7

<b>Table2:</b> Cronbach's alpha per HBM component.	
<b>Components</b>	<b>Cronbach's alpha</b>
Perceived Susceptibility	0.78
Perceived Severity	0.69
Perceived Benefits	0.73
Perceived Barriers	0.76
Self-efficacy	0.71
Cues to Action	0.67
Action	0.79

<b>Table3: Mean Component HBM model ( N= 107).</b>		
<b>Components</b>	<b>Mean score</b>	<b>SD</b>
Perceived Susceptibility	4.3	0.41
Perceived Severity	4.1	0.55
Perceived Benefits	4.1	0.68
Perceived Barriers	2.7	0.80
Self-efficacy	3.7	0.68
Cues to Action	4.0	0.58
Action	4.6	0.40
<i>The average score on the questionnaire is shown per Health Belief Model component, with the following distribution: Strongly disagree (1), disagree (2), neither (3), agree (4) and strongly agree (5).</i>		

Figure 1 illustrates the correlation between the different components of the HBM and action. The components, perceived susceptibility, perceived severity, perceived benefits, self-efficacy, and cues to action all show a significant positive relation with action. Perceived susceptibility has the highest correlation coefficient and is, therefore, most closely related to action. This positive correlation shows that the higher ophthalmologists perceive their susceptibility to the disease, the more they carry out protective behavior. This is also the case for perceived severity, perceived benefits, self-efficacy, and cues to action. There was no significant correlation perceived between perceived barriers and actions. However, there is a negative correlation, meaning the lower the perceived barriers, the higher their compliance with protective behavior and vice versa [figure1].

Additionally, a multiple regression analysis was performed to see to what extent the different components of the HBM explained the dependent variable action. The regression coefficient (B) was adjusted for confounding factors such as age, gender, marital status, living status, subjected to quarantine, and systemic co-morbidities. Overall, all components together (perceived susceptibility, perceived severity, perceived benefit, perceived barriers, self-efficacy, and cues to action) accounted for 65% of the variance in action. The regression analysis demonstrated that action could be explained significantly by the components of the HBM ( $F= 5.788, p<0.001$ ). Most importantly, perceived susceptibility and Perceived benefit had significantly affected action. In fact, according to the regression analysis, Perceived susceptibility could be considered the best predictor of action as it had the most significant effect on action ( $\beta = 0.378, p <0.001$ ) [table4].

**Table4:** Multiple Regression Analysis of the relation between HBM components and Action (N=107).

Components	Beta (B)*	Significance (P)
Perceived susceptibility	0.378	0.001**
Perceived severity	0.072	0.261
Perceived benefit	0.156	0.004**
Perceived barriers	-0.062	0.185
Self-efficacy	0.092	0.087
Cues to Action	0.102	0.083
Variance	0.65	0.001

\*Regression coefficient (B) adjusted for, age, gender, marital status, living status, subject to quarantine and syst. co-morbidities.

\*\* Significant  $p < 0.05$

## Discussion

This study has successfully represented preparedness and risk behavior perception of ophthalmologists to the novel COVID-19 pandemic in one of the largest tertiary eye hospitals in the middle east using the health belief model. After extensive literature review using search engines; PubMed, google scholar, research gate, and Cochrane, this is the first reported study that has constructed a focused, mapped analysis that described ophthalmologists' perception behavior to the current COVID-19 pandemic.

This model mainly emphasizes on the attitudes and beliefs of individuals to explain and predict their health behavior. It primarily focuses on two main aspects of health behavior *threat perception* and *behavioral evaluation*. Threat perception consists of the disease's perceived susceptibility and the perceived severity of the consequences of the disease, and it plays an essential role in health-related behavior. The behavioral evaluation consists of perceived benefits of a recommended health behavior, and possible barriers that individuals may encounter to engage in this health behavior. It also

incorporates two critical elements into its assessments about what it takes to get an individual to be more engaged in such behaviors. These two elements are *cues to action* and *self-efficacy*<sup>13,14,21,22,25,26</sup>.

We learned from previous outbreaks such as; influenzas in 2003 and Ebola in 2013<sup>15,17,19</sup>, that the effectiveness of the control of communicable diseases epidemics is primarily determined by the perception of risk of the infection, health-related behavior of the population and health care providers and their willingness to comply to recommended preventive methods. Therefore, to promote sufficient precautionary behavior among the population and health care providers, public health authorities need to know how individuals perceive risks and its severity, how they perceive the effectiveness and acknowledge precautionary methods such as hygiene, quarantines, wearing masks, maintaining social distance and following patients' care protocols by physicians(13-16,18-26) .

Likewise, O Zawat's thesis compromised large scale comparative studies into perceived threat and risk perception of emerging infectious diseases, including SARS and Avian influenza. He concluded that most studies on SARS and avian influenza found an association between higher risk perception and engaging in precautionary actions. Thus, suggesting that in stimulating precautionary actions in the control of outbreaks, specific attention should be paid to stimulate a high enough perceived threat to ensure that people will engage in these precautionary actions and enhance their efficacy beliefs and their trust in doing so<sup>17-19</sup>. Similarly, this current study mapped ophthalmologists' behavior utilizing HBM, and it showed that; perceived susceptibility, perceived severity, perceived benefits, self-efficacy, and cues to action all had a significant relation with action. In particular, perceived susceptibility has the highest correlation and is accordingly the most closely related to action. These correlations interpret that the higher ophthalmologists perceive their susceptibility for COVID-19, the more they carry out protective behavior.

Furthermore, multiple regression analyses revealed that perceived susceptibility was the best predictor of action and therefore had the most significant effect on action.

Also, we have to consider that threat perception is not the only determinant of protective behavior. Individuals have to believe that the benefit of a recommended health behavior is efficient and have the confidence of self-competence to apply successful behavior, which is described by the theory of *response efficacy* and *self-efficacy*, respectively. Our findings have confirmed this concept as the perceived benefit was the second most crucial component of the model, influencing action<sup>12-15,17-19,21-23</sup>.

Possibly, such findings are rationalized by the fact that ophthalmologists are conscious that they are at high risk of contracting COVID-19 and have substantial exposure among other healthcare workers due to their proximal working distance to patients along with extended critical clinical examination duration their practice and surgery. Consequently, affected their health risk behavior. One advantage of this study is that it took place at the beginning of the pandemic where the knowledge gap about the virus still existed, making it an accurate representation of ophthalmologists' alertness in a time where evidence about a novel virus pandemic was still limited.

Nevertheless, whether these findings represent all ophthalmologists' perception worldwide of this pandemic as a response to global health care efforts or a reflection of local public health efforts that varies between institutes and countries, these positive results, still supports previous mentioned socio-psychological study's outcomes. Emphasizing the importance of measuring these factors and address them adequately to achieve successful compliance and control of infectious disease pandemics<sup>11,12,23,13-15,17-19,21,22</sup>.

Finally, our study limitation was related to the fact that most reviewed articles with HBM based questionnaires lacked an existing validated questionnaire for perceived threat and risk perception of infectious diseases. Therefore, the questionnaire was specifically developed for the project reported in this paper [supplementary table1]. It was based upon an earlier questionnaire used in previously discussed studies, then revised by two epidemiologists within our research department, and HBM component reliability was assessed by Cronbach's alpha [table2].

In conclusion, Pandemics such as COVID-19 are more likely to happen more often in the future. Studies have found that an individual's desire to implement a change in health behavior is not enough to adhere to preventive measures and overcome barriers. Therefore, explicit attention to factors influencing motivation, such as threat perception to adopt appropriate health-related behavior to limit the spread of communicable disease, is necessary. To assess such behavior, Health belief model was used to give insight on risk perception and adhere to risk-reducing behavior. This study demonstrated that this model is useful and concluded how several components were significantly correlated to actions. Most significantly, perceived susceptibility was the most important predictor of action. The second most important determinant of action was the perceived benefit.

## **Declarations**

**Funding: None.**

**All authors declare no conflict of interest/Competing interests**

**All authors declare no competing financial interest**

**This Project was IRB approved in King Khaled Eye Specialist Hospital**

**All methods were performed in accordance with the relevant guidelines and regulations of the institution.**

**Consent to participate: Informed consent was implemented at the beginning of the web-based questionnaire to explain the purpose of the study. Participation was voluntary, and ophthalmologists can withdraw their participation at any time.**

**Consent for publication Not applicable.**

**Availability of data and material** The datasets generated and/or analyzed during the current study are available from the corresponding author on request.

**All authors contributed to writing this review have approved the final draft. In details:**

- **Enmar Mazyad Almazayad:** literature search, figures, study design, data collection, data analysis, data interpretation, writing, review manuscript
- **Abeer Ahmad:** literature search, figures, study design, data analysis, data interpretation, writing, review manuscript
- **Deema Jomar:** data collection, writing, review manuscript
- **Rajiv Khandekar:** study design, data analysis, data interpretation, writing, review manuscript
- **Samar Al-Swailem:** study design, data collection, writing, review manuscript

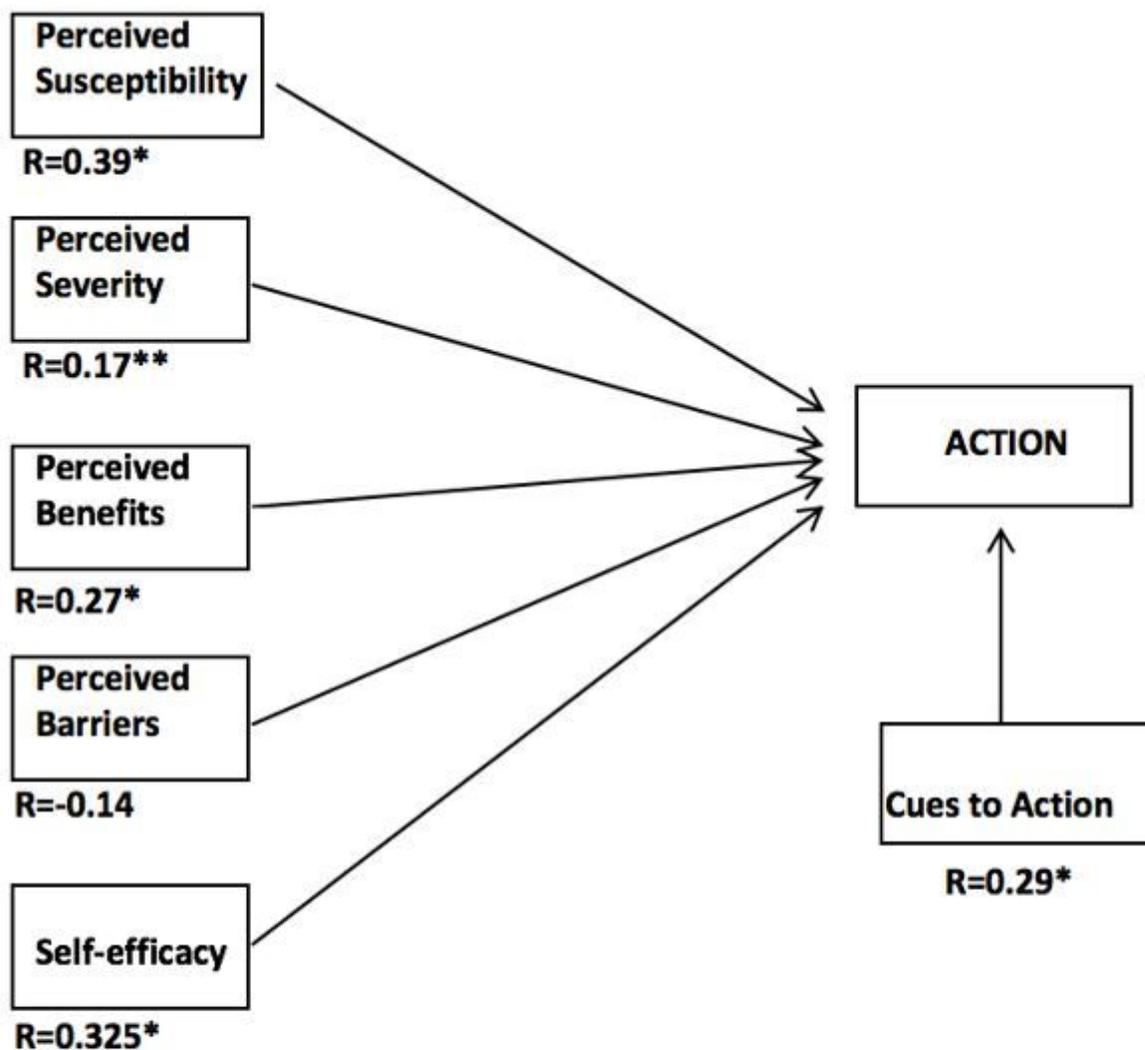
## References

1. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. Available at: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--11-march-2020>. (Accessed: 21st March 2020)
2. Safadi, K. *et al.* Ophthalmology practice during the COVID-19 pandemic. *BMJ Open Ophthalmol.* **5**, 487 (2020).
3. Draft landscape of COVID-19 candidate vaccines. Available at: <https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines>. (Accessed: 23rd August 2020)
4. Q&A on coronaviruses (COVID-19). Available at: <https://www.who.int/news-room/q-a-detail/q-a-coronaviruses>. (Accessed: 21st March 2020)
5. Ophthalmologists must be protected from COVID-19 - EuroTimes. Available at: <https://www.eurotimes.org/ophthalmologists-must-be-protected-from-covid-19/>. (Accessed: 7th July 2020)
6. Coronavirus kills Chinese whistleblower ophthalmologist - American Academy of Ophthalmology. Available at: <https://www.aao.org/headline/coronavirus-kills-chinese-whistleblower-ophthalmol>. (Accessed: 21st March 2020)
7. Hu, K., Patel, J. & Patel, B. C. *Ophthalmic Manifestations Of Coronavirus (COVID-19)*. StatPearls (StatPearls Publishing, 2020).
8. Scalinci, S. Z. & Trovato Battagliola, E. Conjunctivitis can be the only presenting sign and symptom of COVID-19. *IDCases* **20**, e00774 (2020).
9. Wu, P. *et al.* Characteristics of Ocular Findings of Patients with Coronavirus Disease 2019 (COVID-19) in Hubei Province, China. *JAMA Ophthalmol.* **138**, 575–578 (2020).
10. Ma, D. *et al.* Expression of SARS-CoV-2 receptor ACE2 and TMPRSS2 in human primary conjunctival and pterygium cell lines and in mouse cornea. *Eye* **34**, 1212–1219 (2020).

11. Nguyen, A., Gervasio, K. & Wu, A. Differences in SARS-CoV-2 recommendations from major ophthalmology societies worldwide. *BMJ Open Ophthalmol.* **5**, e000525 (2020).
12. Carpenter, C. J. A meta-analysis of the effectiveness of health belief model variables in predicting behavior. *Health Commun.* **25**, 661–669 (2010).
13. Glanz, K. & Bishop, D. B. The Role of Behavioral Science Theory in Development and Implementation of Public Health Interventions. *Annu. Rev. Public Health* **31**, 399–418 (2010).
14. Glanz, K., Rimer, B. & Viswanath, K. *Health behavior and health education: theory, research, and practice.* (John Wiley & Sons, 2008).
15. Tenkorang, E. Y. Effect of knowledge and perceptions of risks on Ebola-preventive behaviours in Ghana. *Int. Health* **10**, 202–210 (2018).
16. Siddiqui, T. R., Ghazal, S., Bibi, S., Ahmed, W. & Sajjad, S. F. Use of the Health Belief Model for the Assessment of Public Knowledge and Household Preventive Practices in Karachi, Pakistan, a Dengue-Endemic City. *PLoS Negl. Trop. Dis.* **10**, e0005129 (2016).
17. De Zwart, O. *et al.* Perceived threat, risk perception, and efficacy beliefs related to SARS and other (emerging) infectious diseases: Results of an international survey. *Int. J. Behav. Med.* **16**, 30–40 (2009).
18. O, Z. Exploring Risk Perceptions of Emerging Infectious Diseases. *Int. J. Behav. Nutr. Phys. Act. - INT J BEHAV NUTR PHYS ACT* (2009).
19. Lau, J. T. F., Kim, J. H., Tsui, H. & Griffiths, S. Perceptions related to human avian influenza and their associations with anticipated psychological and behavioral responses at the onset of outbreak in the Hong Kong Chinese general population. *Am. J. Infect. Control* **35**, 38–49 (2007).
20. Zeigheimat, F., Ebadi, A., Rahmati-Najarkolaei, F. & Ghadamgahi, F. An investigation into the effect of health belief model-based education on healthcare behaviors of nursing staff in controlling nosocomial infections. *J. Educ. Health Promot.* **5**, 23 (2016).
21. Rosenstock, I. M. Historical Origins of the Health Belief Model. *Health Educ. Monogr.* **2**, 328–335 (1974).
22. Janz, N. K. & Becker, M. H. The Health Belief Model: A Decade Later. *Heal. Educ. Behav.* **11**, 1–47 (1984).
23. Painter, J. E., Borba, C. P. C., Hynes, M., Mays, D. & Glanz, K. The use of theory in health behavior research from 2000 to 2005: A systematic review. *Annals of Behavioral Medicine* **35**, 358–362 (2008).
24. Ghanbari, M. K., Farazi, A. A., Shamsi, M., Khorsandi, M. & Esharti, B. Measurement of the Health Belief Model (HBM) in Nurses Hand Hygiene among the Hospitals. *World Appl. Sci. J.* **31**, 811–818 (2014).
25. Fall, E., Izaute, M. & Chakroun-Baggioni, N. How can the health belief model and self-determination theory predict both influenza vaccination and vaccination intention? A longitudinal study among university students. *Psychol. Heal.* **33**, 746–764 (2018).

26. Coe, A. B., Gatewood, S. B. S., Moczygemba, L. R. & Goode, J.-V. 'Kelly' R. The use of the health belief model to assess predictors of intent to receive the novel (2009) H1N1 influenza vaccine. *Inov. Pharm.* **3**, 1 (2012).
27. Lewis, K. L. & Thompson, J. M. Health care professionals' perceptions and knowledge of infection control practices in a community hospital. *Health Care Manag. (Frederick)*. **28**, 230–239 (2009).

## Figures



*\*Correlation is significant at the  $P < 0.001$  level (2 sided)*

*\*\*Correlation is significant at the  $P < 0.05$  level (2 sided)*

## Figure 1

Correlation between the different components of the Health belief Model and Action

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Supplementarytable.docx](#)