



## Comparative analysis on predictors of preventive health behaviors related to COVID-19: An analysis of situation in Saudi Arabia and Pakistan

Sehar-un-Nisa Hassan<sup>1</sup>, Asma Ayyed AL-Shammari<sup>2</sup>, Aqeela Zahra<sup>3</sup>✉, Rania Fathy<sup>4</sup>, Ahmed Abdelmaksud Mohammed Ahmed<sup>5</sup>

<sup>1</sup>Assistant Professor, College of Public Health and Health Informatics, University of Ha'il, Ha'il-81451, Kingdom of Saudi Arabia; Email: s.nisa@uoh.edu.sa

<sup>2</sup>Assistant Professor, College of Public Health and Health Informatics, College of Science, University of Ha'il, Ha'il-81451, Kingdom of Saudi Arabia. Email: as.alshammari@uoh.edu.sa

<sup>3</sup>Assistant Professor, Department of Family and Community Medicine, College of Medicine, University of Ha'il, Ha'il-81451, Kingdom of Saudi Arabia. Email: a.zahra@uoh.edu.sa

<sup>4</sup>Lecturer, College of Applied Medical Sciences, University of Ha'il, Ha'il-81451, Kingdom of Saudi Arabia; Email: rfathy79@gmail.com

<sup>5</sup>Assistant Professor, College of Arts and Social Sciences, University of Ha'il, Ha'il-81451, Kingdom of Saudi Arabia, Email: aa.mohammed@uoh.edu.sa

### ✉Corresponding author

Assistant Professor, Department of Family and Community Medicine, College of Medicine, University of Ha'il, Ha'il-81451, Kingdom of Saudi Arabia;  
Email: a.zahra@uoh.edu.sa

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### ABSTRACT

**Background:** Various countries of the world implemented unprecedented measures from January-May 2020 to control the rapid spread of COVID-19 virus. This paper aims at analysis of people's risk perceptions, knowledge and preventive health behaviors as well as levels of satisfaction with efficiency of preventive measures implemented in the context of COVID-19 pandemic across two countries. **Methods:** An online survey to collect data from Kingdom of Saudi Arabia (KSA) and Pakistan during the months of April-May 2020. Analysis focused on cross-country comparison in people's risk perceptions, knowledge, beliefs, adherence to preventive health behaviors and levels of satisfaction with efficiency of preventive measures in the context of COVID-19 pandemic. Linear regression model was applied to identify the significant predictors of preventive health behaviors. **Results:** The sample comprised of 421 participants, between the age of 18 to 70 years; (47%) reside in KSA and (53%) in Pakistan. In total sample (45%) perceived themselves at 'high risk' for COVID-19. Saudi nationals reported significantly higher levels of fear ( $p < .001$ ). Higher proportion of

male participants in this sample from KSA lacked accurate knowledge about symptoms and causes of the COVID-19 virus ( $p < .001$ ). Those living in Pakistan more likely to 'use face mask when going outside' ( $p < .001$ ) and those residing in KSA more likely to 'disinfect the surfaces regularly at house' ( $p < .01$ ). Knowledge about symptoms ( $p < .001$ ) and preventive measures ( $p < .05$ ) increase the likelihood of use of facemask. Respondents from Pakistan were less satisfied with efficiency of preventive measures implemented in various settings ( $p < .001$ ). *Conclusions:* The current study findings urge to improve accuracy of people's knowledge about symptoms and causes of COVID-19 in KSA. There is need for stringent measures at all levels to enhance the levels of satisfaction with efficiency of preventive measures in Pakistan.

**Keywords:** COVID-19 pandemic, knowledge, practice, preventive measures, health behavior, disease perception

## 1. INTRODUCTION

Coronavirus Disease 2019 (COVID-19), first detected in December 2019 in Wuhan, China, has created public health emergency across the globe. The disease is highly contagious, and it spread rapidly across the world and was declared a pandemic by the World Health Organization (WHO) on 30th January 2020 (Chavez et al., 2020). The healthcare authorities of the countries promptly responded to this outbreak and implemented several preventive measures as per the WHO guidelines to control the spread of COVID-19. No medical treatment or vaccine is available currently. Therefore, non-pharmaceutical interventions can minimize the risk of transmission of COVID-19 virus in the community. However, they are only effective if people adhere to these restrictions and precautions at the individual and community level. Adopting health behaviors is mainly dependent upon people's perceptions about the risk or threat of disease. Previous research supports that interventions that focus on changing attitude about disease risks, access to accurate knowledge about symptoms, causes and preventive actions are more successful in adopting appropriate health behaviors (Choi & Kim, 2018; Ferrer & Klein, 2015).

The risk perceptions about infectious diseases are influenced by various factors such as age, education and professional background (Zahra et al., 2015). The existing literature indicates that people belonging to different social, demographic, and economic backgrounds have different perceptions regarding the determinants of health, which subsequently affect their attitudes and health behaviors (Sun et al., 2013). Evidence suggests that, in the general population the formation of risk perceptions is likely to be influenced by their access to the correct information about a threat and the capability to understand it (Grenen et al., 2016; Reyna et al., 2009). Other factors, which govern these risk perceptions, are individual first-hand experiences of people. For example, individuals perceive their risk of disease as high when someone in their family has diagnosed with disease (Allwood et al., 2014). People's knowledge about the causes and symptoms of the disease also influences the formation of accurate – or inaccurate – risk perceptions. Finally, risk perceptions are determined by the information of threat represented in the media and its frequency (Boonchutima et al., 2017; Young et al., 2013). Statistical data about disease prevalence and its repeated presentation on media is likely to create more fear in the general population about the disease and expected to develop pessimistic perceptions about the risk (Lerner & Keltner, 2000). This results in more disengagement due to feeling of helplessness and fewer chances to comply with appropriate health behaviors, which has repercussions. People who have accurate perceptions about risks and accurate knowledge are likely to engage in proper health behaviors during such outbreaks.

Keeping in view the global health impacts of COVID-19 pandemic, there is an urgent need to identify and understand the factors associated with risk perceptions, fear, and accuracy of people's knowledge and adherence to preventive health behaviors. Analysis of the difference in knowledge, attitude and behavior across different nationalities can provide a broader view of the current situation. It can help the policy makers to create more tailored health policies for people with specific backgrounds. Therefore, this study was conducted to assess the risk perceptions, fear levels, common myths, and accuracy of knowledge about causes, symptoms, prevention and treatment options of COVID-19 by choosing a sample from the general population in Kingdom of Saudi Arabia (KSA) and Pakistan. This study also examined predictors of adherence to COVID-19 preventive measures and differences in satisfaction of the general population with community level preventive measures implemented by the government authorities.

## 2. METHOD

### Survey design and participants

This study was carried out during the lock-down period of COVID-19 outbreak in many countries of the world. We collected the data for this cross-sectional survey mainly from the general population of the KSA and Pakistan between April and May 2020. This was to conduct some comparative analysis of study variables. The subject matter experts from fields of Public Health and Behavioral Science designed and reviewed the study questionnaire, which was distributed both in English and Arabic language by using online

Google forms. The invitation to participate in the study and informed consent with an online link of the study questionnaire was distributed through various social media applications, including WhatsApp, Twitter, Snapchat, and emails to reach out to maximum people. The total number of participants who completed the online survey was (N=421).

### **Study Questionnaire Content and Outcome Measures**

The study questionnaire obtained detailed information about various social and psychological factors that may associate with adherence to COVID-19 preventive measures.

#### **Sociodemographic variables**

It includes data about gender, age nationality, current residence, education, profession, marital status and number of children.

#### **Risk perceptions and justifications**

A 10-point Likert rating scale was used to obtain data about participants' perceptions of their risk to catch COVID-19 virus, keeping in view their country's current situation. The rating was categorized as 'high' if the participant rating is >5 and 'low' if the participant <5. The participants also choose reason for their high or low ratings from three given options '*my job factor*', '*my knowledge factor*', '*my community circumstances*' and an opening ended option.

#### **Self-ratings of knowledge about COVID-19**

Participants were asked to rate their understanding of symptoms, causes and preventive measures/treatment for COVID-19 on a 5-point rating scale. These items obtained data about participants' own judgment regarding their knowledge about symptoms, causes and preventive measures/treatment options for COVID-19.

#### **Actual knowledge about COVID-19**

Participant's accuracy of knowledge was assessed by a set of items that inquired about specific symptoms, causes and preventive and treatment options for COVID-19.

#### **Adherence to preventive measures**

Participants were asked to report their levels of adherence with four preventive practices for COVID-19. These include 'social distancing'; 'wearing facemask'; 'washing hands more frequently than usual' and 'disinfecting surfaces in homes'. The response categories included 'No=0', 'Yes sometimes=1' and 'Yes always=2'. The sum of scores on these four items was used to assess the levels of adherence to preventive measures, which is treated as an outcome variable in this analysis.

#### **Myths about COVID-19**

A set of nine items assessed the most prevalent myths among study participants. These myths were related to the causes and cure of COVID-19. For instance, '*new coronavirus was deliberately created*'; '*coronavirus effects only old and already sick people*'; '*hot water baths can prevent coronavirus*'. Response categories included 'Yes', 'No' and 'I don't know'.

#### **Levels of satisfaction with measures taken at the community level**

A set of six items assess the levels of satisfaction of participants with preventive practices followed in the home settings, market places and workplaces. Satisfaction with the effectiveness of measures taken by the government authorities to control the spread of coronavirus infection, effectiveness of measures taken by healthcare organizations for treatment of coronavirus infection and effectiveness of measures taken by travel agencies to prevent spread of coronavirus infection.

Besides the above content for this survey questionnaire, participants were asked to rate their general health status on a 10-point rating scale from bad to excellent. Participants also choose from the given list of options the major source of their current information about COVID-19.

#### **Statistical Analysis**

IBM SPSS version 20 was used for statistical analysis. Descriptive statistics (mean score, standard deviation and percentage values) were computed to describe the characteristics of participants on demographic and other study variables. The comparative analysis was carried out to see the pattern of responses between the participants who were living in the KSA and Pakistan. T-test and chi-

square were applied to test the significance of these differences at ( $p$ -value=.05). A linear regression model was applied to determine the significant predictors of adherence to preventive practices by choosing  $p$  value=.05 and 95% CI.

### 3. RESULTS

The total number of participants who completed the online survey was ( $N=421$ ) with ( $n=196$ ; 47%) living in Saudi Arabia and ( $n=225$ ; 53%) living in Pakistan at the time of the study. Table 1 shows the demographic profile of participants from these two countries separately. In sample from Saudi Arabia, (54%) were female participants, (56%) were Saudis by nationality and (73%) had university education with diverse occupational fields. In sample from Pakistan, (61%) were male participants, all (100%) were Pakistani by nationality and (89%) had university education with diverse occupations.

**Table 1** Demographic Characteristics of Participants ( $N=421$ )

Demographic Variables		Living in Saudi Arabia $n=196$ (47%)	Living in Pakistan $n=225$ (53%)
Age in years	Range; Mean (S.D.)	18 - 70 yrs.; 35 (10.4)	18 - 66 yrs.; 29 (7.6)
		* $f$ (%)	$f$ (%)
Gender	Female	105 (54%)	89 (39%)
	Male	91 (46%)	136 (61%)
Nationality	Saudi	106 (56%)	0 (0%)
	Pakistani	43 (23%)	225 (100%)
	Others	36 (20%)	0 (0%)
Education	No formal Education	0 (0%)	2 (1%)
	School	29 (15%)	2 (1%)
	College	24 (13%)	19 (9%)
	University	137 (72%)	194 (89%)
Occupation	Student	26 (14%)	47 (22%)
	Homemaker	58 (30%)	29 (13%)
	Academics/Teaching	39 (21%)	22 (10%)
	Healthcare	27 (14%)	31 (14%)
	Administrative	31 (16%)	39 (18%)
	Military	2 (1%)	22 (10%)
	Business	5 (3%)	6 (3%)
	Engineer	2 (1%)	21 (10%)

\* $f$ =frequency;  $f$  & % may vary due to missing data on some variables

A comparative analysis of participant's ratings on general health status, fear due to COVID-19 pandemic and risk perceptions to catch COVID-19 virus across gender and nationality in these two countries are shown in Table 2. Concerning health status, male participants in Saudi Arabia rated their health status better in comparison to male participants in Pakistan ( $p<.01$ ). Comparison across countries showed that scores on both fear and risk perception scale were significantly higher for those participants who were living in Pakistan in comparison to those living in Saudi Arabia ( $p<.01$ ). Within Saudi Arabia, participants who were Saudi nationals had significantly high ratings on the fear scale and risk perceptions to catch the COVID-19 virus in comparison to Pakistani and other nationalities ( $p<.001$ ) (Table 2).

#### Reasons for High Risk perceptions to catch COVID-19 virus

In a total sample, 45% of the participants perceived their risk as high (>5 on 10-point rating scale) and 51% perceived their risk as low ( $\leq 5$ ). Among the participants who reside in Saudi Arabia, a higher proportion of participants (32%) ascribed high risk to 'community factor'; (29%) attributed it to 'knowledge factor' and (30%) ascribed it to 'job factor'. Among the participants who reside in Pakistan, (65%) attributed the high risk to 'community factors'; (24%) ascribed it to 'job factor' and (6%) ascribed it to 'knowledge factor'.

**Table 2** Differences in mean scores of participants on General Health Status, Fear Scale and Risk perception Scale in context of COVID-19 pandemic (N=421)

Study Variables		Living in Saudi Arabia n=196 (47%)	Living in Pakistan n=225 (53%)	
General Health Status (Scale of 1-10)		Mean Scores	Mean Scores	t-test and p-value
Gender t=ns	Female	8.2	8.0	ns
	Male	8.6	8.1	2.07**
Nationality F=ns	Saudi	8.3	-	-
	Pakistani	8.5	7.9	1.92**
	Others	8.3	-	-
Fear due to COVID-19 pandemic (Scale 1-10)				
Gender t=ns	Female	5.8	6.3	ns
	Male	5.7	5.6	ns
Nationality F=7.81***	Saudi	6.3	-	-
	Pakistani	4.5	5.8	3.19***
	Others	5.7	-	-
Risk perceptions to catch COVID-19 virus (Scale 1-10)				
Gender t=ns	Female	5.0	5.9	2.16**
	Male	5.0	5.8	2.34**
Nationality F=3.52**	Saudi	5.4	-	-
	Pakistani	4.1	5.8	4.16***
	Others	4.5	-	-

\*\*\*p<.001; \*\*p<.01, \*p<.05; ns=non-significant

**Table 3** Cross-country comparison of male and female participants on accuracy and inaccuracy of knowledge about symptoms, causes and prevention/treatment of COVID-19 virus (N=421)

Study Variables	Accurate knowledge		Lack of accurate knowledge		Chi-square
	Living in Saudi Arabia	Living in Pakistan	Living in Saudi Arabia	Living in Pakistan	
Knowledge about Symptoms	f%	f%	f%	f%	$\chi^2$
Male	48(21%)	117(53%)	37(17%)	20 (9%)	21.5***
Female	66 (35%)	61 (32%)	39 (21%)	23 (12%)	ns
Knowledge about Causes					
Male	63 (28.5%)	123 (56%)	21 (9.5%)	14 (6.5%)	8.53***
Female	88 (47%)	72 (38%)	17 (9%)	12 (6%)	ns
Knowledge about Prevention					
Male	66 (30%)	115 (52%)	19 (9%)	22 (10%)	ns
Female	86 (45.5%)	55 (29%)	19 (10%)	29 (15.5%)	6.64**

\*\*\*p<.001; \*\*p<.01, \*p<.05; ns=non-significant

### Knowledge of participants about COVID-19 virus

Table 3 demonstrates that a significantly higher proportion of male participants living in Saudi Arabia have inaccurate knowledge about symptoms and causes of the COVID-19 virus in comparison to male participants in Pakistan ( $p < .001$ ). In another set of questions, participants self-rated their knowledge of symptoms, causes and prevention of the COVID-19 infection on a 5-point Likert rating scale. The mean score of participants' lies in the range of 4.1 – 4.5 indicating that overall participant self-rate their knowledge as 'accurate' and not able to recognize any inaccuracies in their knowledge about COVID-19 virus. A non-significant difference on self-ratings of knowledge between participants who actually had accurate factual knowledge and who had not accurate factual knowledge also supported this inference.

### Adherence to preventive practices related to COVID-19

In a total sample, 81% reported that they always avoid going outside for social purpose, 53% reported always using facemask when going outside, 86% reported always washing hands more than usual and 44% reported disinfecting surfaces regularly at home. The mean score on the sum of the above-mentioned four preventive practices was ( $M=6.0$ ;  $S.D.=1.8$ ). The comparison of mean scores across two countries showed those living in Pakistan had significantly higher mean scores ( $M=1.54$ ;  $S.D.=.71$ ;  $p < .001$ ) on the 'use of facemask when going outside'. Participants in Saudi Arabia had significantly higher mean scores ( $M=1.35$ ;  $S.D.=.76$ ;  $p < .01$ ) on 'disinfecting the surfaces regularly at the house'.

A summary of the unstandardized and standardized regression coefficients with a 95% confidence interval are given in Table 4. The overall regression model fit was significant at  $p < .001$  for two preventive practices, including the 'use of facemask' and 'disinfecting surfaces regularly'. Region of living (Pakistan), precise knowledge about symptoms and preventive measures were significant predictors of 'use of facemask'. A better of understanding about symptoms of COVID-19 increases the chances of using facemask by 15% and better knowledge about the preventive measures of COVID-19 approximately 10% increase in the likelihood of using a facemask. Gender (female) and region (KSA) were significant predictors of 'disinfecting surfaces regularly' at  $p < .001$  and  $p < .05$  respectively.

**Table 4** Linear Regression model table for predicting practice of preventive measure related to COVID-19

Predictor Variables	Use of facemask				Disinfecting surfaces regularly			
	B	$\beta$	t	95% CI	B	$\beta$	T	95% CI
	F=7.75*** ; R <sup>2</sup> =.09				F=4.53*** ; R <sup>2</sup> =.06			
Gender	-.110	-.070	ns	-.261-.041	-.310	-.194	-3.89***	-.466 - .153
Region of living	.367	.234	4.61***	.210-.523	-.183	-.114	-2.20*	-.346 - .020
Risk perception	-.020	-.068	ns	-.049-.008	.003	.011	Ns	-.026 - .033
Knowledge of symptoms	.273	.158	3.17**	.104-.442	.024	.013	Ns	.152-.199
Knowledge of causes	.018	.008	ns	-.188-.225	.146	.066	Ns	.360-.067
Knowledge of preventive measures	.195	.104	2.13*	.375-.015	.057	.029	Ns	.243 - .130

\*\*\* $p < .001$ ; \*\* $p < .01$ , \* $p < .05$ ; ns=non-significance

### Myths about COVID-19

Figure 1 shows the specific percentage of participants believing in each myth related to COVID-19. The most common myth thought was that the virus only affects older people (30%).

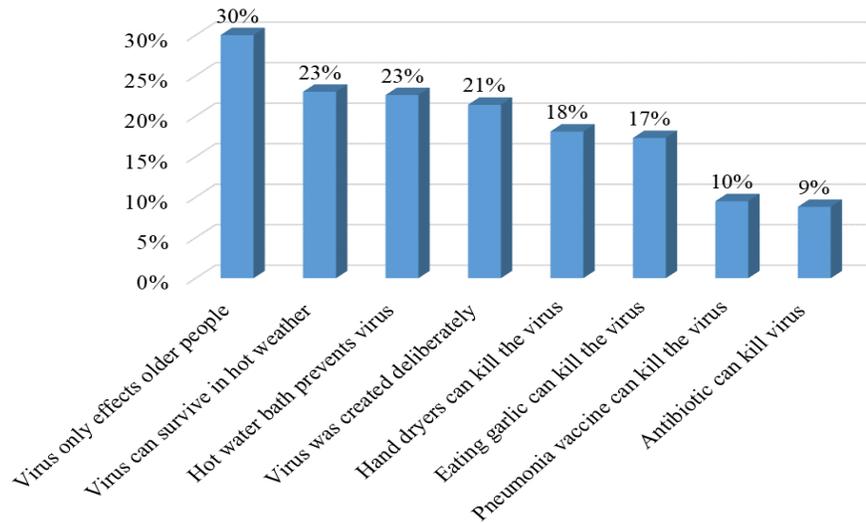
### Sources of Access to information

In total sample (17%) of participants reported they got information primarily from social media, (13%) reported the main source is newspapers and (5%) reported television. Approximately (65%) reported retrieving information from multiple media sources. In this sample, (17%) of participants reported they do not know whom to contact in case if they get COVID-19 infection.

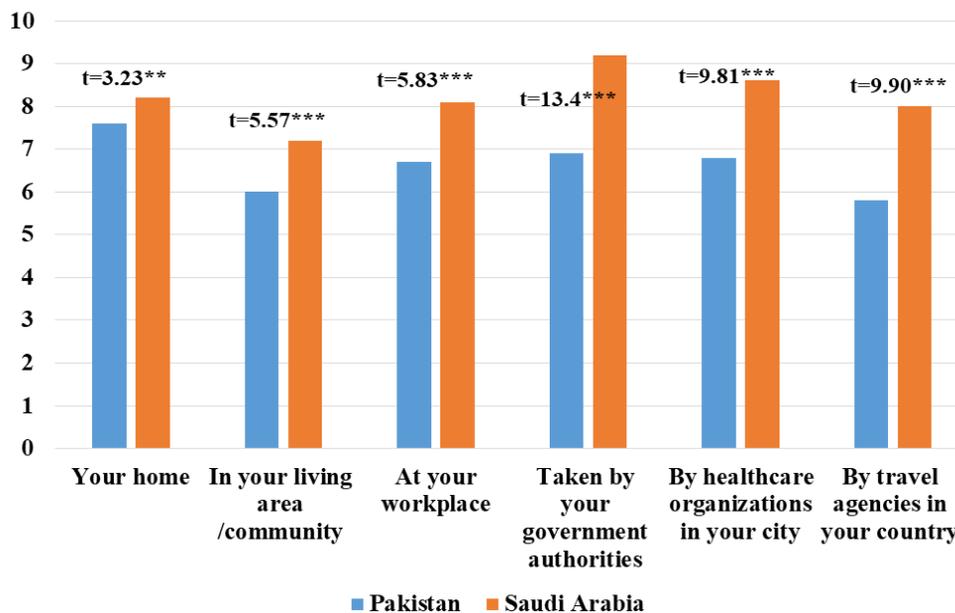
### Satisfaction with Effectiveness of Preventive Measures

Figure 2 shows levels of satisfaction with effectiveness of preventive measures implemented in the community in terms of mean scores and its statistical significance by t-test. There were statistically significant differences in levels of satisfaction with effectiveness

of preventive measures implemented at the community level. Participants from Saudi Arabia reported higher levels of satisfaction with efficiency of preventive measures compared to Pakistan and the differences were significant at  $p < .001$ .



**Figure 1** % of participants believing on myths related to COVID-19.



\* $t$ -statistic and  $p$ -value \*\*\* $p < .001$ ; \*\* $p < .01$ , \* $p < .05$ ; ns=non-significance

**Figure 2** Levels of satisfaction with effectiveness of preventive measures implemented in the community in terms of mean scores.

#### 4. DISCUSSION

COVID-19 pandemic affected various countries of the world with its rapid spread in few months. This pandemic was associated with infodemic, in which an excessive amount of information had been shared on various media platforms during the first few months of this epidemic. Many people around the globe were rigorously following the websites, social media and mobile apps to keep track of the number of people affected in their cities, country, region and globally. This generated a significant amount of fear and anxieties among general population (Asmundson & Taylor, 2020). WHO guidelines stressed upon implementation of preventive measures such as lock-down, travel restrictions and social distancing (World Health Organization (WHO), 2019). Besides, social media and other platforms also delivered several messages about excessive hand washing, use of facemasks, hand gloves and disinfectants as

preventive measures. The suggested preventive interventions required people to change in their hygienic and social behaviors. In this context, it is imperative to investigate several factors, such as risk perceptions, fear, knowledge, beliefs and adherence to preventive practices. Besides, it is also important to examine people's levels of satisfaction with the effectiveness of community level preventive measures to ensure their efficiency. This study provides useful insights through a comparative analysis of populations from two countries on these aspects. Few of the most salient findings relate to general health status, fears due to COVID-19 pandemic and risk perceptions of people in both countries. Findings demonstrated a significant difference in the public health status of people in two regions. This is in consistent with previous evidence, which has shown that developing countries such as Pakistan are exposed to increased health burden due to several economic and social factors (Boutayeb & Boutayeb, 2005). There is a need for better policies and programs to address these factors in less developed countries to achieve equity in health, which has been a major priority for WHO.

In the context of COVID-19 pandemic, the levels of fear found to be significantly higher in Saudi populations in comparison to others. Literatures suggest that a moderate level of anxiety can play a role in enforcing people to abide by some of the preventive measures. However, excessive fear likely to have a toll on the emotional and psychological functioning of people. Therefore, it is essential to normalize levels of concern in the community, which can be a precursor of extreme stress reactions, anxiety and distress and has consequences on individual's psychological health. The lack of scientific knowledge in this novel virus is also a source of apprehension in the medical community. Slow progress in the development of effective interventions caused tremendous fear and feelings of uncertainty in general population (Wang et al., 2020). The current study findings did not find 'fear' and 'risk perceptions' as significant predictors of adherence to preventive behaviors. These findings can be interpreted in light of previous literature, which demonstrate that though risk perceptions act as triggers for adoption of preventive actions (Wiedemann & Schütz, 2005). However, maintaining these behaviors are determined by several other factors such as social, economic, cultural context and specific health beliefs (Renner et al., 2008). We found that a higher proportion of male participants in Saudi Arabia lack accurate knowledge about the causes and symptoms of COVID-19. Besides, several myths were also commonly prevalent among study participants. These findings underscore the need to educate people by providing correct knowledge about symptoms, causes and preventive measures.

The predictive analysis validates previous evidence that people's awareness about the disease determines their response and adherence to preventive measures during epidemics (Adou et al., 2019). The reason for less use of facemask among the Saudi sample could be strict lock-down measures during April and May. People were quarantined in their own homes; thus, the use of facemask became a less relevant preventive practice. Above 80% of the people in this sample reported maintaining social distancing and washing hands regularly. There were no significant differences between people having accurate and inaccurate knowledge on the practice of these two preventive practices. Previous literature suggests that media has a role in influencing public perceptions and compliance with preventive behaviors (Young et al., 2008). The ongoing COVID-19 pandemic has massive media coverage and (65%) of participants reported retrieving information from multiple print and electronic media sources. Data for this study was collected during the peak times of pandemic around the globe. Both these factors might have contributed to increased compliance with these two preventive measures at the individual level. One of the significant findings is related to people's lack of knowledge regarding whom to contact in case if they get the COVID-19 virus. This finding strongly emphasizes improving health communication.

The other most valid finding is related to levels of satisfaction of people with the efficiency of preventive measures. The lower levels of satisfaction among participants from Pakistan align with their high ratings of fear and risk perceptions. Pakistan needs to adopt reasonable, responsive strategies at the community level to improve the standards of satisfaction among people concerning the efficiency of preventive measures.

We acknowledge some limitations to our study findings including the use of a self-report online survey questionnaire which might influence the recruitment of participants. This is reflected by the over representation of female participants in the Saudi sample and male participants in the Pakistani sample. Therefore, comparative analysis concerning both gender and region was reported in this paper. Secondly, the self-representation bias might have influenced people's responses on adherence to preventive practices. Thirdly, data for this study was collected during strict lock-down measures in KSA. In Pakistan the lock-down measures were partially implemented which might be a source of significant differences in levels of satisfaction with the efficiency of preventive measures.

## 5. CONCLUSION

In conclusion, the COVID-19 pandemic has caused a substantial fear in all populations. There are significant differences in health status, risk perceptions, the accuracy of knowledge and levels of satisfaction with the efficiency of preventive measures between two regions' populations. In both countries, people comply with the precautionary measures to a certain extent. Public authorities need

to play a more active role in improving health communication and normalize the fear and risk perceptions of people associated with such pandemics.

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### Conflict of interest

All authors declare no conflicts of interest in this paper.

### Ethical approval

This study has been reviewed and approved by Research Ethics Committee at the University of Ha'il dated 18/8/2020 and approved by university president letter number Nr.55456/5/41.

### Data and materials availability

All data associated with this study are present in the paper.

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