



## Gender Based Behavioral Differences Towards COVID-19 and Preventive Protocols: A Narrative Literature Review

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### Abstract

#### Introduction

Gender based differences in behavior, or gendered behavior, to the social norms and roles expected by men and women have been the subject of various papers and research. More recently, gendered behaviors have been postulated to be the cause for higher infectivity and mortality rates in men. In the COVID-19 pandemic, multiple studies have noted that women have more knowledge about the virus, and are more likely to comply with the preventive protocols such as mask-wearing, hand hygiene and social distancing, when compared to men. This paper aims to review the effects of gendered behavior on compliance with COVID-19 protocols.

#### Methodology

A narrative literature review of the relevant literature was carried out in the PubMed, Google Scholar and BMC Public Health databases in the months of August, September and October 2021. The articles considering attitudes, behavior and/or perception of the COVID-19 virus and gender as an influencing factor for the above were taken into review.

#### Results

A total of 52 papers were selected after screening and based on the inclusion criteria. Overall, majority of the studies have shown that women are more likely to comply with the preventive protocols and have better knowledge and attitudes towards the virus than men. However, in countries such as India and Lebanon, it was found that men had better knowledge and preventive practices than women, which could be due to them going for work, and being exposed to the daily news of the virus than the women, who typically stay at home in those countries.

#### Discussion

Women are generally the main caretakers of the family and are more concerned with the health of the family and thus, would be more knowledgeable and aware of the virus, and more willing to take preventive measures when leaving the homes. Men are also more likely to engage in risk-taking behaviors, such as going to crowded places, and are less likely to practice hand hygiene. Thus, it is vital to ensure public polices include data analyses and targeted interventions for the vulnerable population.

**Keywords:** COVID-19; gendered behaviors; knowledge and attitude

#### Introduction

“Sex” is a term used in reference to a person’s biological status, the indicators for which are sex chromosomes, hormones, internal reproductive organs, and external genitalia. Gender, on the other

hand, refers to culturally defined roles, responsibilities and attributes associated with being, or perceived as, a man or woman<sup>[1]</sup>.

The effects of gender on social norms and behavior is the subject of many papers, most notable of which is Alice H. Eagly's "Sex differences in social behavior: A social-role interpretation<sup>[2]</sup>", which traces the roots of gender based differences in behavior, or gendered behavior, to the social norms and roles expected by men and women. Examples are:

1. Men as "strong" and "independent" and women as "weak" and "vulnerable"
2. Men engaging in "risk-taking and more competitive behaviors<sup>[3,4]</sup>".
3. Cultural roles such as men being the "heads of the family" while women are the "caretakers of the family"

These differences in behavior based on gender bring about gross disparities and inequities in healthcare, education and jobs.

In terms of healthcare, gendered behaviors have been postulated to be the cause for higher infectivity and mortality rates in men. During previous outbreaks of viral infections, such as the H1N1 pandemic, it was observed that women were more likely to engage in protective measures such as hand hygiene and mask wearing, when compared to men<sup>[5,6]</sup>. At present, in the COVID-19 pandemic, it has been noted by multiple studies, such as those by Galasso *et. al*<sup>[7]</sup> and Barber and Kim<sup>[8]</sup>, that men are less likely to practice social distancing, wear a face mask, and are less likely to perceive the virus as a threat. Despite

the empirical fact that men are more likely to experience adverse health consequences from COVID-19<sup>[9]</sup>, women report fear and more negative expectations about health-related consequences of COVID-19 than men. However, women are also more optimistic than men regarding the financial consequences of the pandemic. Women also report more negative emotional experiences generally during the pandemic. Though women report taking more preventative measures than men in response to the pandemic, gender differences in behavior are reduced after controlling for fear. These results shed light on how differences in emotional experiences of the pandemic may inform policy interventions.

### Aim of the Narrative Review

The purpose of this narrative review is to provide an overview on any gender based differences in behavior towards the COVID-19 preventive protocols seen during the pandemic.

### Methodology

#### Design and Search Methods

The narrative review was carried out in the months of August, September and October 2021, using PubMed, Google Scholar and BMC Public Health and combinations of keywords, as shown in Table 1. All existing literature available to date was taken into consideration.

**Table 1: Literature Search Tracking Sheet**

DATE OF SEARCH	DATABASE	YEARS SEARCHED	SEARCH TERMS	NO. OF ARTICLES FOUND
August 22nd	GOOGLE SCHOLAR	Since 2017	gender based+behavior+covid	41,200
		Since 2017	gender based+behavior+covid+india	18,700
		Since 2017	COVID-19, knowledge, attitudes, practice	24,200
October 4th	PUBMED	2020-2021	"Gender" and "behavior" and "covid"	405
October 5th		2020-2021	"Gender" and "attitudes" and "covid"	239

October 13 <sup>th</sup>		2020-2021	"covid" AND "attitudes" AND "behavior"	470
October 15 <sup>th</sup>		2019-2021	Attitude and practice; COVID-19; Knowledge	1546
		2019-2021	COVID-19; compliance; gender differences	32
		2019-2021	"behavior" AND "COVID-19" AND "gender"	421
October 13 <sup>th</sup>	<b>BMC</b>	2020-2021	"Gender" and "attitudes" and "Covid"	590

**Quality Appraisal**

To be included in the review, articles had to meet the following criteria which formed the review protocol:

- (1) Published in scientific journals;
- (2) Written in English;
- (3) Consider attitudes, behavior and/or perception of the COVID-19 virus

(4) Consider gender as an influencing factor for the attitudes, behavior and/or perception of the COVID-19 virus.

Titles and abstracts were initially viewed, with further review of the relevant articles and discarding of the non-relevant. A total of 67 articles were collected and screened using a title-abstract analysis. After exclusion of the non-relevant articles, a total of 52 articles were included, which have been summarized in Table 2.

**Table 2: Summary of the articles included for review**

S. No.	TITLE	AUTHOR	SAMPLE (Country, Age Groups)	SUMMARY
1.	Gender differences in COVID-19 attitudes and behavior: Panel evidence from eight countries <sup>[7]</sup>	Galasso V, Pons V, Profeta P, Becher M, Brouard S, Foucault M.	Australia, Austria, UK, USA, Italy, France, New Zealand, Germany	Women were more likely to perceive COVID-19 as a serious threat and follow COVID-19 protocols than men
2.	Gender specific differences in COVID-19 knowledge, behavior and health effects among adolescents and young adults in Uttar Pradesh and Bihar, India <sup>[10]</sup>	Jessie Pinchoff ,KG Santhya,Corinne White,Shilpi Rampal,Rajib Acharya,Thoai D. Ngo	Uttar Pradesh and Bihar, India; Ages 18-24	Women were seven percentage points (pp) less likely to know the main symptoms of COVID-19 and 22 pp less likely to practice key preventive behaviors compared to men

3.	The effect of messaging and gender on intentions to wear a face covering to slow down COVID-19 transmission <sup>[11]</sup>	Valerio Capraro, H��l��ne Barcelo	USA; ages 18 to 65+	Compared to women, men had lesser intentions and more negative emotions associated with wearing a face covering; men were found to believe that they will be relatively unaffected by the disease.
4.	COVID-19 Worries and Behavior Changes in Older and Younger Men and Women <sup>[8]</sup>	Sarah J Barber, PhD and Hyunji Kim, MA	USA; 18-35 and 65-81 age groups	Older men were comparatively less worried about COVID-19 than their younger counterparts. Compared with the other participants, older men had also implemented the fewest behavior changes.
5.	Anxiety, Self-Compassion, Gender Differences and COVID-19: Predicting Self-Care Behaviors and Fear of COVID-19 Based on Anxiety and Self-Compassion with an Emphasis on Gender Differences <sup>[12]</sup>	Mohammadpour M, Ghorbani V, Khoramnia S, Ahmadi SM, Ghvami M, Maleki M.	Kermenshah, Iran Ages 18 and above	Compared to men, women are more likely to observe social distancing
6.	Prevention Knowledge and Its Practice Towards COVID-19 Among General Population of Saudi Arabia: A Gender-based Perspective <sup>[13]</sup>	Freah Alshammary, Ammar Ahmed Siddiqui, Junaid Amin, Muhammad Ilyas, Hassaan Anwer Rathore, Ibne Hassan, Mohammad Khursheed Alam, Mohammad Amjad Kamal	Saudi Arabia	Women were more compliant with the WHO public health COVID-19 prevention advice than men.

7.	Attitudes toward COVID-19 and stress levels in Hungary: Effects of age, perceived health status, and gender <sup>[14]</sup>	Szabo, A., Ábel, K., & Boros, S	Hungary; 18–30, 31–59, and 60+ years age groups	Compared with men, women were concerned about the virus, agreed more with the government’s interventions in prevention, agreed more to wearing face masks, Women also reported more stress about the pandemic than men.
8.	Knowledge, attitudes, and practices toward COVID-19 among university students in Japan and associated factors: An online cross-sectional survey <sup>[15]</sup>	Asuka Hatabu, Xinhua Mao, Yu-Shi Tian	Japan	Women were more likely than men in showing conservative/safer attitudes than males in stance of closing bars and go to university.
9.	Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey <sup>[16]</sup>	Bao-Liang Zhong, Wei Luo, et al.	China; Ages 16 and above	Men were more likely to partake in risky behaviors such as going to crowded places, not wearing masks etc.
10.	Knowledge, attitudes, and practices against the growing threat of COVID-19 among medical students of Pakistan <sup>[17]</sup>	Khola Noreen, Zil-e-Rubab, Muhammad Umar, Mukhtiar Baig, Fizzah Baig	Pakistan	The female medical students were 2.545 times (p < .001) and 4.414 times (p < .001) more likely to have positive attitudes and good practices toward COVID-19 as compared to males.

11.	COVID-19 health awareness among the United Arab Emirates population[18]	Balsam Qubais Saeed, Iffat Elbarazi, Mai Barakat, Ahmed Omer Adrees, Kubais Saeed Fahady	UAE; Ages 18 and above	Females, 18-29 years, and married participants were significantly associated with a higher score of knowledge, while female, over 30 years old, the marital status of singles, college-level and higher, unemployed, were significantly associated with high mean practices score.
12.	Awareness and perception of COVID-19 among the general population: A Middle Eastern survey[19]	Ruba M. Jaber, Baraa Mafrachi, Abdallah Al-Ani, Mustafa Shkara	Jordan and Iran; Ages 18 and above	Females have higher scores in terms of awareness and compliance towards precautionary measurements.
13.	Knowledge, attitude, and use of protective measures against COVID-19 among nurses: a questionnaire-based multicenter cross-sectional study[20]	Ramzi Shawahna	Occupied Palestinian Territory	Higher knowledge and attitudes was predicted by being female, higher social status, higher level of education and having been previously infected with COVID-19.
14.	Knowledge, Attitudes, and Practices Towards COVID-19 Among Ecuadorians During the Outbreak: An Online Cross-Sectional Survey[21]	Benjamin R Bates, Ana L Moncayo, Jaime A Costales, Carolina A Herrera-Cespedes, Mario J Grijalva	Ecuador; Ages 18 and above	Woman, people over 50 years of age, and those with higher levels of schooling were the most optimistic. Men, 18-29 years of age, single, and unemployed people were found to engage in riskiest behaviors.
15.	Nursing Students' Perceptions, Knowledge, and Preventive Behaviors Toward COVID-19: A Multi-University Study [22]	Hamdan Mohammad Albaqawi, Nahed Alquwez, Ejercito Balay-Odao, Junel Bryan Bajet, Hawa Alabdulaziz, Fatmah Alsolami, Regie B. Tumala, Abdalkarem F. Alsharari, Hanan M. M. Tork, Ebaa	Saudi Arabia; Ages 18-45	Female, fourth year students, and gaining good perceived knowledge were associated with high actual COVID-19 knowledge.

		Marwan Felemban, Jonas Preposi Cruz		
16.	COVID-19 Worries and Behavior Changes in Older and Younger Men and Women[23]	Sarah J Barber, Hyunji Kim	USA; Age groups 18-35 and 65-81	Older men were found to be comparatively less worried about COVID-19 than their younger counterparts and had also implemented the fewest behavior changes.
17.	A cross sectional survey of knowledge, attitude and practices associated with COVID-19 among undergraduate students in China[24]	Yaling Peng, Chenchen pei, Ping Zhu	China Ages 17-25	Females showed significantly higher levels of positive attitudes than males.
	A cross sectional survey of knowledge, attitude and practices towards COVID-19 pandemic among the Syrian residents[25]	Sanaa Al Ahdab	Syria Ages 16 and above	Poor preventive practices were observed among male participants, than the female participants.
18.	Knowledge, attitude and Perception of Pakistanis towards COVID-19; a large cross sectional survey[26]	Zoya Fatima Rizwan Ladiwala, Rubaid Azhar Dhillon, Ibrahim Zahid, Omar Irfan, Muhammad Sharjeel Khan, Safia Awan, Javaid Ahmad Khan	Pakistan; Ages 15 and above	Female gender and an education level of minimum bachelors were significantly associated with adequate knowledge about the virus; better perception was found among those of female gender, a minimum education level of bachelor's and being employed in the healthcare system.
19.	Knowledge, attitude and practices of Sudanese people towards COVID-19 : an online survey[27]	Amal Abdelrahim Osman Mohamed, Eilaf Ali Mohamed Elhassan, Abdelrahim Osman Mohamed, Awab Aldow Mohammed, Hassan Alshaikh edris, Mohamed Alhadi Mahgoop, Mohamed	Sudan	Females practiced hand washing more frequently than males, and better preventive practices was associated with older age and female gender.

		Emadaldin Sharif, Maab Imadeldin Bashir, Rania Bashir Abdelrahim, Wegdan Ibraheim Idriss & Elfatih Mohamed Malik		
20.	Knowledge, attitude and practices related to COVID-19 among young, Lebanese population[28]	Samer Sakr, Ali Ghaddar, Imtithal Sheet, Ali H. Eid & Bassam Hamam	Lebanon, Ages 18-24	Males had more positive practices than females in relation to washing hands, avoiding crowds, disinfecting shoes, and clothes and had a lower frequency of going out.
21.	Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia[29]	Arina Anis Azlan, Mohammad Rezal Hamzah, Tham Jen Sern, Suffian Hadi Ayub, Emma Mohamad	Malaysia, Ages 18-73	Higher knowledge scores were associated with female gender, age above 50 and higher income, whereas those of low monthly income had the least knowledge scores. Males, age between 18 and 49, students and those of lower income were more likely to wear face masks. Females, ages between 18-29 and students were more likely to practice good hand hygiene.
22.	Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study[30]	Mohammed K. Al-Hanawi, Khadijah Angawi, Noor Alshareef, Ameerah M. N. Qattan, Hoda Z. Helmy, Yasmin Abudawood, Mohammed Alqurashi, Waleed M. Kattan, Nasser Akeil Kadasah, Gowokani Chijere Chirwa, and Omar Alsharqi1	Saudi Arabia; Ages 18 and above	Low-income, less-educated, young people, and males were found to have less knowledge, poor attitude and preventive practices.
23.	Knowledge, attitudes, and practices of Sudanese residents towards COVID-19[31]	Ahmed Hezima, Abdulmalek Aljafari, Abdulmoiz Aljafari, Abdulkader Mohammad, Ibrahim Adel	Sudan; Ages 18 and above	Women and people aged 18-25 years were more knowledgeable and had more positive attitudes towards COVID-19.
24.	Knowledge, attitudes, and practices towards	Bao-Liang Zhong, Wei Luo, Hai-Mei Li, Qian-Qian Zhang,	China; Ages 16 and above	Women were knowledgeable about COVID-19, hold optimistic attitudes, and have appropriate



	COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey[32]	Xiao-Ge Liu, Wen-Tian Li, Yi Li		practices towards COVID-19.
25.	Knowledge and practice of personal protective measures during the COVID-19 pandemic: A cross-sectional study in Saudi Arabia[33]	Abdulrahman S Bazaid, Abdu Aldarhami, Naif K Binsaleh, Subuhi Sherwani, Omar W Althomali	Saudi Arabia; Ages 18 and above	Females and those with higher income were positively associated with higher practice scores, while lower practice scores were associated with youth and residents of the northern and western regions of the Kingdom.
26.	Knowledge, Attitude and Practice toward COVID-19 among Egyptians[34]	Zeinab A Kasemy, Wael A Bahbah, Shima K Zewain, Mohammed G Haggag, Safa H Alkalash, Enas Zahran, Dalia E Desouky	Egypt; Ages 12-82	Females reported higher knowledge, better practices and low attitude. Furthermore while higher knowledge and attitude was seen among urban residents, practice level was high among the rural residents
27.	Knowledge, attitude and practice of residents in the prevention and control of COVID-19: An online questionnaire survey[35]	Kaihan Yang, Hui Liu, Lihua Ma, Song Wang, Yali Tian, Feifei Zhang, Zhuyue Li, Yuanyuan Song, and Xiaolian Jiang	China; Ages 18 and above	In terms of knowledge, females scored significantly higher than males.
28.	Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An online-based cross-sectional study[36]	Most. Zannatul Ferdous, Md. Saiful Islam, Md. Tajuddin Sikder, J. A. Zegar-Valdivia, Abu Syed Md. Mosaddek David Gozal,	Bangladesh	More frequent prevention practice factors were associated with female gender, older age, higher education, family income > 30,000 BDT, urban area residence, and having more positive attitudes.
29.	Who is wearing a mask? Gender-, age-, and location-related differences	Michael H. Haischer et al.	Wisconsin, America; Ages 2 and above	The odds of a female wearing a mask are significantly greater than males

	during the COVID-19 pandemic[37]			
30.	Gender Differences in Health Protective Behaviors During the COVID-19 Pandemic in Taiwan: An Empirical Study[38]	Jasmine Tan, Yilin Yoshi Kevin Sheng-Kai Ma, and Franck Mauvais-Jarvis,	Taiwan; Ages 18 to 85	Women were found to exhibit a higher perception the of pandemic risk, more likely to adopt health protective behaviors, such as wearing face masks, washing hands, avoiding public places, and practicing sanitization compared to men.
31.	Psychological and Behavioral Responses to the COVID-19 Pandemic in Greece[39]	Eleni Parlapani, Vasiliki Holeva, Panteleimon Voitsidis, Apostolos Blekas, Ioannis Gliatas, Georgia N. Porfyri, Adrianos Golemis, Kalliopi Papadopoulou, Aikaterini Dimitriadou, Aliko F. Chatzigeorgiou, Vasiliki Bairachtari, Sofia Patsiala, Marina Skoupra, Kleoniki Papigkioti, Christina Kafetzopoulou, and Ioannis Diakogiannis	Greece; Ages 18 and above	Female gender, older age and more severe anxiety symptoms were associated with COVID-19 fear.
32.	Compliance to Recommendations and Mental Health Consequences among Elderly in Sweden during the Initial Phase of the COVID-19 Pandemic—A Cross Sectional Online Survey[40]	Johanna Gustavsson, and Linda Beckman	Sweden; Ages 70 and above	Women were found to be significantly more worried about the virus, more willing to follow the protocols, had more negative feelings regarding isolation.
33.	The psychological and clinical impact of the COVID-19 pandemic on orthopaedic patients: An Italian	Lorenzo Moretti,1 Elsa Vitale, Marialaura Bettinsoli, Davide Bizzoca, Michelangelo Delmedico, Rocco Papalia, Giuseppe	Italy; Ages 18 and above	Fear of the virus was more in women than men. This study found no correlation between following preventive measures and gender.

	gender-specific analysis[41]	Solarino, and Biagio Moretti		
34.	Socio-demographic factors associated with self-protecting behavior during the Covid-19 pandemic[42]	Nicholas W. Papageorge, Matthew V. Zahn, Michèle Belot, Eline van den Broek-Altenburg, Syngjoo Choi, Julian C. Jamison, and Egon Tripodi	USA (California, Florida, New York and Texas) Ages	Women are more likely than men to increase and believe in the effectiveness of social distancing.
35.	Determinants of compliance to the facemask directive in Greece: A population study[43]	Georgios Labiris et al.	Greece; Ages 18 and above	Men, people <50 years and spectacle wearers showed significantly worse compliance in wearing masks.
36.	Risk perception and adherence to preventive behaviours related to the COVID-19 pandemic: a community-based study applying the health belief model[44]	Aziz Kamran, Khatereh Isazadehfar, Heshmatolah Heydari, Ramin Nasimi Doost Azgomi, and Mahdi Naeim	Ardabil province, Iran; Ages 20 to 70	Women showed better avoidance behavior and had a better attitude than men regarding the prevention of COVID-19.
37.	Impact of sex and gender on COVID-19 outcomes in Europe[45]	Catherine Gebahrd, Vera Regitz-Zagrosek, Hannelore K. Neuhauser, Rosemary Morgan, Sabra L. Klein	Europe and China	Sex and gender have a significant influence on the knowledge, attitudes and preventive practices; men having less knowledge and preventive practices than women.
38.	Sex, gender and COVID-19: a call to action[46]	Sofia B. Ahmed and Sandra M. Dumanski	Review	Men are less likely to take protective actions and stay home instead of going to work or other regular activities
39.	Hand Hygiene, Mask-Wearing Behaviors and Its Associated Factors during the COVID-19 Epidemic: A Cross-Sectional Study among Primary School	Xuyu Chen, Li Ran, Qing Liu, Qikai Hu, Xueying Du, and Xiaodong Tan	Wuhan, China; Ages 6 to 13	Schoolgirls had better hand-washing habits than the boys; higher grade, higher education level of mother and residence in Wuhan were the factors with better behavior in mask-wearing.

	Students in Wuhan, China[47]			
41.	Knowledge, attitudes and practices (KAP) towards COVID 19: A cross sectional study in South Korea[48]	Minjung Lee, Bee-Ah Kang & Myoungsoon You	South Korea; Ages 18 and above	Females and individuals with higher levels of education demonstrated higher levels of knowledge about the virus, which had a direct effect on the attitudes and practices.
42.	The impact of gender on emotional reactions, perceived susceptibility and perceived knowledge about COVID-19 among the Israeli public[49]	Inbar Levkovich, Shiri Shinan Altman	Israel; Ages 18 and above	Women reported higher levels of precautionary behavior and more negative emotional reactions toward COVID-19. No significant gender differences emerged in perceived susceptibility or knowledge about COVID 19.
43.	Differences in risk perception, knowledge and protective behavior regarding COVID-19 by education level among women and men in Germany. Results from the COVID-19 Snapshot Monitoring (COSMO) study[50]	Petra Rattay, Niels Michalski, Olga Maria Domanska, Anna Kaltwasser, Freia De Bock, Lothar H. Wieler, Susanne Jordan	Germany; Ages 18 to 74	In women, hand washing was more frequently practiced by those in the high-education group, whereas in men, no differences by education level were found. Higher compliance with social distancing was observed in men in the high-education group compared to those in the low-education group.
44.	The impacts of knowledge, risk perception, emotion and information on citizens' protective behaviors during the outbreak of COVID-19: a cross-sectional study in China[51]	Liangwen Ning, Jinyu Niu, Xuejing Bi, Chao Yang, Ze Liu, Qunhong Wu, Ning Ning, Libo Liang, Aishu Liu, Yanhua Hao, Lijun Gao & Chaojie Liu	China	Women and older people were also more likely to embrace protective behaviors.

45.	Knowledge and attitudes of us adults regarding COVID-19[52]	Christopher Hogan, Massud Atta, Paul Anderson, Tej Stead, Matthew Solomon, Paul Banerjee, Bryan Sleigh, John Shividat, Amanda Webb McAdams & Latha Ganti	USA; Ages 18 and above	Older adults and women were more concerned about contracting the virus.
46.	Knowledge, attitudes, anxiety, and preventive behaviours towards COVID-19 among health care providers in Yemen: an online cross-sectional survey[53]	Gamil Ghaleb Alrubaiee, Talal Ali Hussein Al-Qalah & Mohammed Sadeg A. Al-Aawar	Yemen; Ages 20 and above	Females were found to be more likely to exhibit preventive behaviors compared to their male counterparts
47.	Knowledge, attitudes, practices, and the effects of COVID-19 among the youth in Kenya[54]	Evalin Karijo, Sylvia Wamugi, Samuel Lemanyishoe, Jenny Njuki, Faith Boit, Vania Kibui, Sarah Karanja & Timothy Abuya	Kenya; Ages 18 to 35	Female respondents were more likely to identify more symptoms correctly compared to men, and had higher levels of awareness regarding the virus.
48.	Knowledge, Attitudes, and Practices (KAP) Towards COVID-19: An Online Cross-Sectional Survey of Tanzanian Residents[55]	Sima Rugarabamu, Mariam Ibrahim, Aisha Byanaku	Tanzania; Ages 18 to 75	Males, younger age groups and education of secondary or lower was associated with lower knowledge scores
49.	Knowledge, attitudes and practices (KAP) towards COVID-	Nouar Qutob, Faisal Awartani	Palastine; Ages 15 and above	Women were reported to be more aware of preventative measures

	19 among Palestinians during the COVID-19 outbreak: A cross-sectional survey[56]			
50.	Findings of a Cross-Sectional Survey on Knowledge, Attitudes, and Practices about COVID-19 in Uganda: Implications for Public Health Prevention and Control Measures[57]	Gerald Okello, Jonathan Izudi, Steven Teguzirigwa, Allan Kakinda, and Guido Van Hal	Uganda; Ages 18 and above	Females were more likely to practice public health preventive measures, more knowledgeable about COVID-19, and had positive attitudes towards directives and guidelines than males
51.	Indian community's knowledge, attitude, and practice toward COVID-19[58]	Balvir Singh Tomar, Pratima Singh, Deepak Nathiya, Supriya Suman, Preeti Raj, Sandeep Tripathi, Dushyant Singh Chauhan	India; Ages 18 and above	Males had better knowledge scores, while females had better attitude scores; both genders were associated with taking proper preventive measures when leaving home, but males were associated with better practice.
52.	Knowledge, attitudes, and practices towards COVID-19 among Colombians during the outbreak: an online cross-sectional survey[59]	Benjamin R. Bates, Adriana Villegas Botero & Mario J. Grijalva	Colombia; Ages 18 and above	Men were less likely to have avoided crowded places than women

## Discussion

The present review focused on the gender based differences in behaviors, attitudes and/or perceptions of the COVID-19 virus and preventive protocols.

Majority of the studies have found that women, or female gender, was significantly associated with better knowledge of the virus, better attitudes and were more compliant with the preventive practices

such as mask wearing, hand hygiene and social distancing.

The study by Mohsen Mohammadpour *et. al*<sup>[12]</sup>., postulates that women’s greater responsibility as the primary caretaker of the family could be cause for concern of the disease and transmission to the family members. The studies such as those by Capraro *et al*<sup>[11]</sup>., Hatabu *et al*<sup>[15]</sup>., Bao-Liang Zhong *et al*<sup>[16]</sup>. and Gebhard *et al*<sup>[45]</sup>., allude to “risk-taking behaviors” seen in men as the primary cause for lesser

preventive practices; for example, in the study by Hatabu et al., women reported to more likely than men in showing conservative/safer attitudes than males in stance of closing bars and go to university. The study by Gebhard et al., also mentions the risk behaviors such as smoking and drinking, which are higher among men worldwide, are associated with the risk of developing co-morbidities. Furthermore, the same study postulates that the gendered behaviors such as lower rates of hand washing and delayed healthcare seeking<sup>[60]</sup> could also be a reason for higher mortality rates in men than women during the COVID-19 pandemic.

On the other hand, the studies conducted in India by Pinchoff et al<sup>[10]</sup>. and Tomar et al<sup>[58]</sup>., and the study conducted in Lebanon by Sakr et al<sup>[28]</sup>., both found that men were associated with better knowledge about the virus, and better preventive practices, when compared to women. Both studies cite the fact that in these countries, men are usually the 'breadwinners' of the family, and had to go to work, even during the lockdown period; thus they had more exposure to the outside world, and thus were more knowledgeable than the women, who typically stayed at home. Moreover, in India, there is a literacy gap, with male literacy rate being higher (84.7%) than the female literacy rate (70.3%) (as of 2018)<sup>[61]</sup>.

The study by Galasso et al<sup>[7]</sup>., also speculated the gendered behaviors as a reason for the more efficient response to the pandemic by women-led countries such as New Zealand and Germany, when compared to the countries of USA and Brazil.

## Conclusion

It is clear that gendered behaviors can greatly influence the incidence and case fatality of a disease, especially communicable diseases such as COVID-19. While there have been many studies regarding this topic, more studies from countries such as India and Lebanon would be beneficial. Also, these studies would bring about more awareness and promote more discussions on gender norms and their effects on people.

Targeted health and awareness interventions towards vulnerable groups would be extremely beneficial. A study in Hong Kong by Leung et al<sup>[62]</sup> sending information to the women (wives, sisters, mothers) who live with men, thus influencing their practices.

The experiences from both past and present outbreaks and pandemics have clearly shown the importance of incorporating sex and gender analysis into the preparedness and response efforts of health interventions, and thus incorporating these findings into the public health policies and schemes must be done, in order to ensure sustained health equity.

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