





ORIGINAL PAPER  
INFECTIOUS DISEASES

# Beyond knowledge: Evaluating the practices and precautionary measures towards COVID-19 amongst medical doctors in Jordan

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## Abstract

**Background:** Health Care Workers (HCWs), including medical doctors, played a pivotal role as a first-line defence against the COVID-19 pandemic. Because of high exposure, HCWs are at an increased risk of contracting the disease.

**Aims:** This study aims to assess the level of precautionary measures, both at home and the workplace, amongst medical doctors who were on duty during the national lockdown in Jordan.

**Methods:** A cross-sectional study was conducted between March 23 and May 1, 2020, utilising a self-administered web-based questionnaire to examine a sample of medical doctors (n = 270) working at different healthcare institutions in Jordan. Likert scale was used to code the data and generate means and percentages.

**Results:** The most practiced on-duty precautionary measures were cleaning hands with water and disinfectant for more than 20 seconds (47.4%), followed by proper hygiene before and during meals (38.9%). The most practiced off-duty measures were taking off clothes before entering the residential place (65.9%) and prohibiting visitors (58.1%). Overall, the mean work protection percentage score was 73.8% (range: 28%-100%), while the mean home safety percentage score was 71.3% (range: 25%-100%). Work protection score was positively correlated with the home safety score. Female doctors were found to be more precautionary at home than males. Doctors with chronic illness(es) were found to be less precautionary than their healthier counterparts. Participants who isolated themselves expressed the highest level of home safety practice. Doctors who reported to smoke were found more precautionary at home and doctors who preferred to work during lockdowns were more precautionary at the workplace.

**Conclusion:** The level of precautionary behaviour of medical doctors in Jordan was not optimal. More attention and efforts are needed to enhance the adherence of doctors to precautionary guidance. Strengthening the role of infectious disease and infection control units within healthcare settings remains a necessity.

**What's known**

- Proper practice of preventive and precautionary measures amongst health care workers is vital during the COVID-19 pandemic.
- Little is known about home-related precautionary measures amongst medical doctors and healthcare workers in developing countries.

**What's new**

- The level of precautionary behaviours of medical doctors in Jordan was satisfactory in general.
- Home-related precautionary measures were not properly followed by most doctors.
- Home-related precautionary measures were not optimum amongst doctors who live with high-risk groups or have morbidity risk factors.
- Work-related precautionary measures should be effectively implemented and audited.

**1 | INTRODUCTION**

Coronaviridae are single-stranded, non-segmented RNA viruses known to cause enzootic infections in birds and mammals.<sup>1</sup> In the last two decades, new strains of coronaviridae have crossed the animal-human barrier to cause zoonotic infections resulting in worldwide and regional outbreaks. Previously, two coronaviridae outbreaks had erupted in 2002 and 2012, namely the Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) outbreaks, respectively.<sup>2</sup> The SARS outbreak, which originated in Southern China in November 2002 and had spread to around 17 countries worldwide, afflicted more than 8000 humans.<sup>3</sup> The MERS outbreak emerged in Saudi Arabia in 2012 and has spread to 21 countries globally. The number of human cases reported who were infected with MERS was estimated to be 2,506 people with a 34.0% case-fatality rate.<sup>4-6</sup> Around the end of December 2019, a rapidly spreading viral infection was reported in Wuhan city in China and was associated with respiratory illnesses ranging from a simple common cold to severe respiratory illnesses including croup, bronchiolitis and pneumonia.<sup>7</sup> This emerging viral disease was named Coronavirus Disease-19 (COVID-19) and the causative virus was named SARS-CoV-2.<sup>8</sup> Unlike previously recognised coronaviruses, SARS-CoV-2 is highly contagious and transmitted from person to person through the inhalation of aerosols of respiratory droplets and direct contact with infected individuals.<sup>9</sup> This transmission mode expedited the spread of the disease and could explain the highly significant number of infected people globally.<sup>10</sup> In Jordan, the first case of COVID-19 was reported at the beginning of March 2020, followed by a surge of cases later that month, which led the local authorities to enforce public health measures including nation-wide curfew, lockdowns, travel restrictions and implementation of mask-wearing, social distancing and decreasing social gatherings.<sup>11</sup>

Although the national public health measures had an impactful role in controlling the infection spreading and reducing the number of cases, they had multiple adverse effects on other health compartments, principally on people suffering from chronic disorders and health emergencies prioritisation, in addition to worsening the psychosocial and financial condition of the general population.<sup>12</sup>

The epidemiological curve stood flattening even after gradual relaxing of the public health measures until later in August 2020, when a resurgence of cases appeared at Jabir's point of entry (Jordanian Syrian border) and subsequent spread of the infection to cause many clusters in most of the country. The Jordanian national authorities issued the community transmission category in late September 2020. They imposed sets of laws, regulations and public health measures, in addition to enhancing the health system capacity and case management to meet the stark increase in cases and mortality.

Until this moment, there is no definitive antiviral drug against SARS-CoV-2, although dexamethasone has been proven to be effective in reducing mortality in severely ill patients.<sup>13</sup> Despite that three vaccines have been approved against SARS-CoV-2 by the American FDA for emergency use, public awareness of dealing with highly infectious respiratory diseases still plays a vital role in limiting the spread of the infection, especially in middle and low-income countries, where health systems have, at best, a limited capacity to respond to outbreaks and delayed access to the newly developed vaccines. The World Health Organization (WHO) recommends preventing human-to-human transmission by protecting close contacts and healthcare workers from being infected through a plethora of measures.<sup>14</sup> Primary preventive measures include regular hand washing, physical distancing, using hand sanitizers, wearing masks that cover the mouth and nose, especially in crowded places and practising respiratory etiquette when coughing or sneezing. Therefore, control measures seem to be the primary intervention to minimize the spread of the virus in both health care settings and the community, and thus, the management of the COVID 19 crisis is mainly dependent on people's adherence to the recommended preventive measures. Such measures are likely to be affected by the knowledge, attitudes and practices of the public. Doctors and other healthcare workers (HCWs) are at a high risk of contracting COVID-19 since they are in the frontline of the response to the pandemic.<sup>15</sup> Long working hours, fatigue and occupational burnout among HCWs because of the emotional, physical and mental exhaustion caused by excessive and prolonged stress, have been reported as well.<sup>16</sup>

A poor understanding of the disease spread and prevention among HCWs is likely to result in delayed identification of cases and

treatment of COVID-19 and may result in its rapid spread. Since the declaration of the pandemic by the WHO, many HCWs have lost their lives because of COVID-19. To date, little data are available that describe the knowledge, attitude and practices (KAPs) of HCWs towards the COVID-19 pandemic. A study with majorly Asian HCWs and medical students indicated that they had insufficient knowledge about COVID-19 but had a positive attitude towards preventing transmission. However, while the overall knowledge and attitudes of HCWs were reasonable, their general practices on the use of personal protective equipment were not satisfactory, suggesting that more efforts are required to evaluate the best practice of HCWs both on-duty and in places of residence.<sup>17</sup>

Effective infection control measures, including regular skill-based training and/or orientation for all categories of HCWs are essential to improve the mitigation measures against the COVID-19 pandemic.<sup>18</sup> A recent study revealed that Jordanian medical students showed an acceptable level of knowledge about the COVID-19 virus and implemented the recommended strategies to prevent its spread.<sup>19</sup> Accordingly, more investigation of the KAPs of HCWs is required, especially that there has been an increasing incidence of confirmed cases (more than 1000) amongst HCWs in Jordan according to unpublished estimates by the Jordanian Ministry of Health. In this study, we provide data describing the comprehension, attitudes and practice of medical doctors who were professionally active during the curfew and lockdown in Jordan. Our study mainly aimed to measure the medical doctors' level of precaution towards the COVID-19 pandemic during and after working hours in Jordan.

## 2 | METHODS

### 2.1 | Sample and data collection

A cross-sectional study was conducted targeting medical doctors who were working during the curfew and lockdown in Jordan. Data collection was performed between March 23 and May 1, 2020, utilising an anonymous online questionnaire constructed using Google Forms. The study questionnaire was designed based on the American Centres for Disease Control and Prevention (CDC) recommendations ([www.cdc.gov/coronavirus/2019-ncov](http://www.cdc.gov/coronavirus/2019-ncov)).

Participation in the study is entirely voluntary. A link to the questionnaire was published on major social media platforms specialised for practicing medical doctors in Jordan and the Jordan Medical Association webpage. The link was also shared personally by the participants using WhatsApp messenger; thus, employing a snowball convenience sampling strategy. On the introductory page of our survey questionnaire, a detailed description of our study objectives was provided to participants. To ensure that only medical doctors in Jordan be involved in this study we clearly explained the eligibility criterion for participation that was being a practicing medical doctor in Jordan during the lockdown and pandemic period. Participants who have met this criterion and were willing to participate could

confirm that by choosing a statement provided at the end of the introductory page and that was (*I confirm that I am a practicing medical doctor in Jordan during the pandemic and I am willing to voluntarily participate in this study*). Besides, there were no incentives or any rewards upon filling out the questionnaire; thus, submitting more than one response was unlikely. Despite the aforementioned measures taken and the distribution of the study questionnaire on social media platforms of medical doctors in Jordan, the nature of using social media platforms to recruit research participants is still challenging concerning participants who could possibly not fulfil eligibility criteria but still can submit a response.

The questionnaire was written and distributed in the English language, with no needed translation into Arabic or other languages, as medical education, national exams and clinical practice demand strong English language proficiency.

### 2.2 | Assessment tool

The online questionnaire comprised three main sections: Sociodemographic section, which assessed the age of the participant, gender, medical specialty and hospital/healthcare institution name, existence of comorbidities (eg, asthma, diabetes mellitus, hypertension, ischemic heart disease, lung disease and others), smoking status (although not distinctive between cigarettes or waterpipe smoking, both are common practices in Jordan) and household characteristics. Moreover, the first section assessed the number of people living with the participant, their age distribution, comorbidities and currently pregnant status for females. Finally, the on-duty professional status of the participating doctors was confirmed. The second section comprised of questions related to COVID-19 knowledge and perception, including (a) preparatory health education, which was assessed by asking the participants if they ever attended lecture(s) and/or training about COVID-19, (b) preference to work during curfew, (c) presence of confirmed cases of COVID-19 in the same healthcare facility, (d) exposure to direct contact with active COVID-19 cases, (e) existence of COVID-19 standardised protocol at the healthcare facility and (f) discomfort and anxiety level during working hours because of the virus spreading.

Household characteristics were used to generate the household risk profile to measure the potential risk of transmitting COVID-19 to their household members. Medical doctors who were living alone were considered as having no household risk profile, coded as 0. Each one of the following household characteristics was considered as a household risk item and was coded as 1: individuals older than 60, individuals with chronic disorders or persistent disabling comorbidities, children of 6 years old or younger and pregnant women. Participating physicians living with more than five household members were considered to have a higher household risk and coded as 2. The household risk profile was calculated by the summation of all household risk items indicated above. The scores ranged between 0 and 6 for no risk and the existence of all household risks, respectively.

In the third section, the COVID-19 precautionary behaviours were assessed at two levels: work and home precaution. Measures of questionnaire precautionary behaviour were derived from Centres for Disease Control and Prevention (CDC) recommendations ([www.cdc.gov/coronavirus/2019-ncov](http://www.cdc.gov/coronavirus/2019-ncov)).

COVID-19 precautionary behaviours at work were assessed by frequency of performing the following seven precautionary items: wearing a surgical mask, wearing gloves, physical distancing, hand washing, using hand sanitisers, cleaning/sanitising routinely used instruments (eg, stethoscope) and food hygiene (eg, washing cups and dishes before and after use). A Four-point Likert scale was used for each precautionary behaviour (no = 1, rarely = 2, often = 3, always = 4). Work precautionary behaviour total score was computed by summing up responses to each of the seven items (individual scores). Individual score minimum and maximum expected values ranged between 7 and 28, respectively. The Precautionary measure percentage scores were then calculated by dividing each participant's total score by 28, the maximum score, multiplied by 100%. This percentage was referred to as the *Work Protection Score (WPS)*.

The COVID-19 precautionary behaviours at home were assessed by the frequency of performing the following 11 precautionary items: wearing a mask on the way to home, avoiding touching the face, self-isolation, prohibiting visitors, proper air conditioning of rooms, cleaning surfaces (eg, cell phones), taking off clothes upon home entry, separating wash of clothes (laundry), avoiding sharing, proper cleaning of household items (eg, spoons and dishes), cleaning of bought items before use or consumption. Similarly, a four-point Likert scale was applied to each question (no = 1, rarely = 2, often = 3, always = 4). The total score was calculated by summing up responses to the 11 items and a percentage of home precautionary measures was calculated as indicated for the work percentage score and was referred to as the *Home Protection Score (HPS)*.

## 2.3 | Statistical analysis

Data were entered into SPSS version 24 for quality control and analysis. Descriptive statistics were performed for categorical and continuous data. Numbers, percentages, means and standard deviation (SD) values were presented as appropriate. Mean score values were presented and compared by categorical variables using independent sample t-test or ANOVA as appropriate. Mean scores (percentages) were compared using Pearson correlation and correlation coefficients were reported. P values for all statistical tests were presented using an  $\alpha$  level of 0.05 to determine statistical significance. Internal reliability was calculated and Cronbach's Alpha values were reported.

## 2.4 | Ethical considerations

This study was conducted conforming to the Declaration of Helsinki and the code of conduct of research on human subjects

in Jordan. The questionnaire ensured the confidentiality and anonymity of the study participants. A brief paragraph was included within the questionnaire describing the nature and objectives of our study, inclusion criteria for participation, voluntary participation and withdrawal. Interested participants were requested to provide their informed consent. This study was approved by the Institutional Review Board.

## 3 | RESULTS

### 3.1 | Sample characteristics

The total number of respondents was 270 medical doctors who were on-duty during the COVID-19 response. Table 1 presents the sample's sociodemographic characteristics. Nearly two-thirds of study participants were males (65.2%,  $n = 176$ ). More than half of the participants were younger than 30 years old (54.4%,  $n = 147$ ). Only two medical doctors older than 49 years have participated in the study, with no participants aged 60 years or more. Most participating medical doctors reported working at healthcare institutions that were receiving and treating active COVID-19 patients; namely, King Abdullah University Hospital (KAUH) in northern Jordan (23%,  $n = 62$ ), Ministry of Health (17.1%,  $n = 46$ ) and Royal Medical Services (49.3%,  $n = 133$ ) in central and southern Jordan. Ministry of Health sector was presented with two leading hospitals: Prince Hamza Hospital (1.5%,  $n = 4$ ), Al-Basheer Hospital (5.2%,  $n = 14$ ), which were allocated to admitting and treating active COVID-19 cases, and other governmental healthcare institutions (10.4%,  $n = 28$ ).

Internal medicine professionals represented the highest proportion of participants (40.1%,  $n = 108$ ), followed by general surgeons (15.2%,  $n = 41$ ), radiologists (8.5%,  $n = 23$ ) orthopaedics (5.6%,  $n = 15$ ) and otolaryngologists (4.4%,  $n = 12$ ). Forty-one participants were smokers (15.2%) and 38 (14.1%) participants reported having chronic comorbidity or persistent disabling morbidity. About 6% ( $n = 16$ ) of participants self-reported to have asthma diagnosis, 2.9% ( $n = 8$ ) hypertension, 1.1% ( $n = 3$ ) diabetes mellitus (DM), 0.7% ( $n = 2$ ) cardiovascular disease, and 4.5% ( $n = 12$ ) with other chronic disorders or disabilities.

### 3.2 | COVID-19 related knowledge and perception

Table 2 shows seven items that measure preparedness, household transmission risk, case contact and COVID-19 risk perception. About 70.4% of participants ( $n = 190$ ) reported never receiving specialised training or official lectures about COVID-19. Only 22 (8.2%) had specialised training and official lectures about COVID-19 and 58 (21.5%) had received either training or lectures about COVID-19.

Medical doctors of King Abdullah University Hospital, which is a teaching hospital, were the highest trained/lectured compared with doctors in other sectors, with 54.8% had been lectured and/

**TABLE 1** Sociodemographic characteristics of participating medical doctors

	Frequency	Percent (%)
<b>Gender</b>		
Female	94	34.8
Male	176	65.2
<b>Age group</b>		
<30	147	54.4
30-39	111	41.1
40-49	10	3.7
50-59	2	0.7
<b>Smoking status</b>		
Non-smoker	229	84.8
Smoker	41	15.2
<b>Co-morbidities</b>		
No	232	85.9
Yes	38	14.1
<b>Health Institute</b>		
King Abdullah University Hospital	62	23.0
Royal medical services	133	49.3
Jordanian University Hospital	7	2.6
King Hussein Cancer Centre	8	3.0
Al-Basheer Hospital	14	5.2
Prince Hamza Hospital	4	1.5
Other Ministry of health Facilities	28	10.4
Non-for-Profit Organisations	7	2.6
Private sector	7	2.6
<b>Medical Specialty</b>		
Anaesthesiologist	8	3.0
Emergency Doctor	7	2.6
ENT	12	4.4
Family Medicine	5	1.9
General Physician	15	5.6
Gynaecology/Obstetric	8	3.0
Internist	108	40.0
Neurology	3	1.1
Neurosurgery	2	0.7
Ophthalmology	6	2.2
Orthopaedic	15	5.6
Others	8	3.0
Paediatric	7	2.6
Public Health/Health Management	2	0.7
Radiology	23	8.5
General Surgery	41	15.2
Live alone	18	6.7
<b>Household</b>		
Live with less than five people in the same house	132	48.9

(Continues)

**TABLE 1** (Continued)

	Frequency	Percent (%)
Live with more than or equal to five people in the same house	97	36.0
Live with children younger than 6 y	60	22.2
Live with people older than 60 y	69	26.0
Live with people with comorbidities and/or disabilities	57	21.1
Live with pregnant lady(ies)	13	4.8

or trained about COVID-19. In comparison, only 8.7% of Jordanian Ministry of Health medical doctors and 20.3% of Royal Medical Services have been lectured and/or trained about the same topic, considering that these three sectors are the main sectors managing COVID-19 cases in Jordan.

Fifty-three medical doctors (19.6%) had a history of direct contact with COVID-19 patients, while 64.7% were working in hospitals containing verified COVID-19 cases. About two-thirds (63.2%) reported the presence of standard management protocol by their institutions. Almost half (47%,  $n = 127$ ) preferred not to work during the epidemic. More than three-quarters (75.2%) described feeling uncomfortable or anxious during working hours; 29 (10.7%) were extremely anxious or even terrified while they were at work (Table 2). Moreover, only 18 (6.7%) were living alone (household transmission risk = 0), 109 (40.4%) were living with less than five people in the same household or with one COVID-19 risky group. The remainder ( $n = 143$ , 53%) were living with two or more of the COVID-19 risk groups.

### 3.3 | Assessment of precautionary measures

Nearly one-third of the medical doctors rarely never used masks or preserved sufficient distancing during working hours (35.2%, 35.5%, respectively) (Table 3). In contrast, more than 90% were practising handwashing with water and disinfectants often to always (93.0%, 90.4%, respectively); these two measures were the most to which medical doctors were firmly committed. Removal of clothes before going inside the house was always conducted by 65.9% of medical doctors, followed by prohibiting visitors (58.1%) and washing used indoor tools (52.6%).

Internal reliability was analysed for work and home precautionary measures. Cronbach's Alpha for work and home precautionary items was 0.79 and 0.87, respectively.

Work protection percentage score ranged between 28.6% and 100% ( $M = 73.82\%$ ,  $SD = 15.14\%$ ), while home safety percentage score ranged between 25% and 100% ( $M = 71.33\%$ ,  $SD = 16.84\%$ ). A positive correlation between work and home protection percentage scores was significantly correlated ( $r = .41$ ,  $P < .001$ ).

As shown in Table 4, female participants had higher precautionary behaviour percentage scores at home than their male counterparts (Male ( $M$ ) = 68.61%, Female ( $M$ ) = 76.43%,  $P = .00$ ). No gender

**TABLE 2** Risk comprehension, awareness and attitude of participating medical doctors during the national lockdown after the emergence of COVID-19 confirmed cases in Jordan

Item	Frequency	Percent (%)
Work preference during outbreak		
Prefer not to work	127	47.0
Prefer to work	143	53.0
Existence of COVID-19 case management standard protocol		
No	99	36.7
Yes	171	63.3
Attending training about COVID-19		
No	229	84.8
Yes	41	15.2
Attending lecture about COVID-19		
No	209	77.4
Yes	61	22.6
COVID-19 case contact		
No	217	80.4
Yes	53	19.6
Self-perceptive anxiety level during work		
No discomfort at all	38	14.1
Uncomfortable	112	41.5
Anxious	91	33.7
Extremely anxious	29	10.7
Household Risk Profile		
Self-Isolated	18	6.7
Lives with one kind of high-risk groups	109	40.4
Lives with two kinds of high-risk groups	68	25.2
Lives with three kinds of high-risk groups	26	9.6
Lives with four kinds of high-risk groups	34	12.6
Lives with five kinds of high-risk groups	15	5.6

difference was detected in the work precaution behaviour score ( $P = .23$ ).

No significant differences were detected in Work Precautionary Behaviour (WPB) and Home Precautionary Behaviour (HPB) by age groups (WPB:  $P = .86$ ; HPB:  $P = .99$ ). Moreover, smokers were found to be significantly more home cautious than non-smokers ( $P = .02$ ) but not at work ( $P = .22$ ). The workplace had no role in changing the precautionary level of physicians (WPB:  $P = .61$ ; HPB:  $P = .91$ ). Similarly, no significant difference was detected by medical specialty (WPB:  $P = .08$ ; HPB:  $P = .89$ ).

Physicians who had chronic illness(es) were found to be more cautious at home ( $P = .02$ ), with no difference in work precautionary behaviour ( $P = .95$ ). House-mate risk had a remarkable effect on home precautionary behaviour ( $P = .01$ ). Physicians who were

living alone were the highest cautious at home ( $M = 84.34\%$ ) and the least cautious were physicians with three high-risk groups ( $M = 64.95\%$ ). Living hood status had no impact on work precautionary behaviour ( $P = .55$ ).

Neither receiving COVID-19 related training (WPB:  $P = .16$ ; HPB:  $P = .23$ ) nor lectured about COVID-19 (WPB:  $P = .39$ ; HPB:  $P = 0.55$ ) had a role in significant modification of work and home precautionary action level. Also, contact with confirmed COVID-19 patients did not appear to significantly increase the level of precaution (HPB:  $P = .34$ ; HPB:  $P = .26$ ). However, physicians who preferred to work during COVID-19 had significantly higher work and home safety measures than those who preferred staying at home (WPB:  $P = .017$ ; HPB:  $P = .065$ ).

Finally, we assessed whether there is a correlation between commitment to precautionary measures and self-reported anxiety levels of participants. A significantly higher level of work precautionary behaviour was detected amongst groups showing extreme anxiety or no discomfort at all with means of 76.72% and 79.14%, respectively ( $P = .03$ ) (Table 4). Alternatively, participants who reported being uncomfortable or anxious had lower levels of precautionary measures (Mean = 73.69% and 70.84, respectively). However, no statistically significant difference between the level of self-reported anxiety and level of home precautionary behaviour was identified ( $P = .97$ ) (Table 4).

## 4 | DISCUSSION

The majority of medical doctors stood on duty during the nationwide curfew in Jordan and were considered the first-line barrier against COVID-19. They were exposed to a high number of patients and in direct contact with COVID-19 suspected, probable and confirmed cases, making them more vulnerable to acquire the disease. The risk of infection was not exclusive to the health of medical doctors, but also associated with potential to transmit the infection to their families, and broadly, to the community. A high level of precautionary measure is of tremendous value and should reflect infection prevention behaviours. This study aimed at assessing the precautionary measures of medical doctors working during the initial stages of COVID-19 spread in Jordan. The results indicate that precautionary measures implemented by medical doctors were not optimal with a mean precautionary level score of 71.3% and 73.8% for at work and at home measures, respectively. These levels may be seen as "unsatisfactory" amongst this critical subpopulation. We expected higher precautionary scores as medical doctors are considered the most educated subpopulation in regard to COVID-19.

Despite that the literature is overwhelmingly rich in the vital evaluation of knowledge, attitudes and practice studies amongst HCWs towards COVID-19, there is a lack of assessment when it comes to the actual practises and precautionary measures, especially the precautionary behaviour after work or within households, that was not well investigated previously. Our results may then be

**TABLE 3** Precautionary behaviours during work and at home, and the level of adherence of medical doctors to each behavioural measure during the national lockdown after the emergence of COVID-19 confirmed cases in Jordan.

Measure	All the time/excessively		Often		Rarely/sometimes		No at all	
"At home" self-isolation (living alone or in a separate room)	44	16.3%	45	16.7%	84	31.1%	97	35.9%
Wearing mask (outside workplace)	24	8.9%	30	11.1%	45	16.7%	171	63.3%
Prohibiting visitors	157	58.1%	42	15.6%	39	14.4%	32	11.9%
Proper air conditioning of shared space inside a home	92	34.1%	85	31.5%	60	22.2%	33	12.2%
Avoid touching face and mouth with unwashed hands	95	35.2%	100	37.0%	57	21.1%	18	6.7%
Avoid sharing household items with family members	100	37.0%	63	23.3%	53	19.6%	54	20.0%
Wash used household items properly (eg, spoons and dishes)	142	52.6%	70	25.9%	35	13.0%	23	8.5%
Cleaning "high touch" surfaces (eg, Phone)	95	35.2%	94	34.8%	55	20.4%	26	9.6%
Take off clothes at home arrival	178	65.9%	48	17.8%	28	10.4%	16	5.9%
Washing clothes separately	137	50.7%	47	17.4%	46	17.0%	40	14.8%
Cleaning bought items before indoor use or consumption	133	49.3%	56	20.7%	51	18.9%	30	11.1%
Proper surgical Mask use	66	24.4%	109	40.4%	43	15.9%	52	19.3%
preserving social distancing	52	19.3%	122	45.2%	49	18.1%	47	17.4%
Hand wash with water and disinfectants >20 s	128	47.4%	123	45.6%	14	5.2%	5	1.9%
Wearing gloves	67	24.8%	108	40.0%	64	23.7%	31	11.5%
Sterillium-based hand wash	118	43.7%	126	46.7%	13	4.8%	13	4.8%
Cleaning of medical tools (eg, stethoscope)	88	32.6%	106	39.3%	57	21.1%	19	7.0%
Hygiene during meals (eg, Washing dishes before meals)	105	38.9%	82	30.4%	27	10.0%	56	20.7%

considered a unique approach that not only evaluated precautionary measures at both work and home, but also correlated such measures and reported a positive correlation between them. This points out the importance of a comprehensive approach to deal with precautionary measures amongst HCWs. Focusing only on one dimension will undermine the other and increase the risk of disease transmission within healthcare facilities.

The low precautionary scores might be rationalised by the lenient epidemiological situation, which is possibly attributed to the early public health response,<sup>20</sup> at the time of the study when there were few clusters of cases in specified areas of the country. Thus, medical doctors may have discerned low infection potential (risk). Furthermore, it may reflect a sense of immunity within this community that fosters disregarding adhering to precautionary measures. The role of infection control units and infectious disease specialties should then be strengthened to better communicate the risk of COVID-19 and present evidence that HCWs are not immune to COVID-19. The effective national response during March 2020, [national lockdown, closure of all borders and isolation (quarantining) of all airport arrivals for 14 days], and the consequent reduction in patients' flow in hospital, combined with active surveillance, contact

tracing, as well as isolation and quarantining of cases and contacts, may have presented themselves as reassurance messages amongst medical doctors and further strengthened the sense of immunity against COVID-19.<sup>21</sup> Moreover, the national and global shortage of Personal Protective Equipment (PPE) in the early few months of the pandemic may have influenced the reported low precautionary measures regarding PPE. Still, lack of protective equipment is supposed to increase precaution by other behavioural measures as used in our tool, but our results indicated low adherence to all measures.

The results emphasise the importance of more training, monitoring and evaluation of doctors' adherence in all health care facilities, besides, to boost and maintain adherence to satisfactorily preventive measures and ultimately aiming at robust precautionary behaviour by HCWs. In related prospects, each precautionary measures' adherence might need to be addressed individually to investigate the poor practice's reasons and update methods to promote these behaviours. Eventually, re-evaluation of national protocols, standardisation and consolidation of the followed guidelines are advised. Strengthening the risk assessment and risk communication process would be an effective option to enhance the awareness and self-responsibility of medical doctors.

**TABLE 4** The relationship between COVID-19 related work and home precaution scores, and sociodemographic characteristics, risk comprehension, attitude and practice of medical doctors in Jordan during the national lockdown

	Work Precaution Score		Home Precaution Score	
	Mean (%)	SD (%)	Mean (%)	SD (%)
<b>Gender</b>				
Male (n = 176)	73.01	15.04	68.61	17.10
Female (n = 94)	75.33	15.32	76.43	15.15
	P = .23		P = .00	
<b>Age</b>				
Less than 30 (n = 147)	74.00	14.60	71.30	17.60
More than 30 (n = 123)	73.66	15.84	71.34	16.01
	P = .86		P = .99	
<b>Workplace</b>				
KAUH (n = 62)	75.06	14.50	71.15	18.90
RMS (n = 133)	72.61	14.42	70.75	16.11
MoH (46)	74.38	17.03	72.58	16.37
Others (n = 29)	75.86	16.88	72.41	16.88
	P = .61		P = .91	
<b>Specialty</b>				
Internal Medicine (n = 108)	72.39	15.67	70.73	17.63
Surgical (n = 84)	72.70	13.30	71.70	14.44
Non-surgical (n = 78)	77.10	15.92	71.77	18.25
	P = .08		P = .89	
<b>Chronic disease</b>				
Yes (n = 38)	77.63	14.52	65.61	20.54
No (n = 232)	73.20	15.19	72.27	16.01
	P = .95		P = .02	
<b>Household Risk Profile</b>				
Self-Isolated (n = 18)	78.77	14.05	84.34	11.92
Lives with one kind of high-risk groups (n = 109)	72.67	16.94	70.23	17.79
Lives with two kinds of high-risk groups (n = 68)	75.21	12.78	70.42	16.17
Lives with three kinds of high-risk groups (n = 26)	75.00	15.29	64.95	17.42
Lives with four kinds of high-risk groups (n = 34)	71.75	14.89	74.06	14.89
Lives with five kinds of high-risk groups (n = 15)	72.62	13.41	71.33	13.80
	P = .55		P = .01	
<b>Smoking status</b>				
Yes (n = 41)	76.48	14.53	77.11	13.67
No (229)	73.35	15.24	70.30	17.16
	P = .22		P = .02	
<b>Attending lecture about COVID-19</b>				
Yes (n = 61)	75.30	17.10	70.20	22.03
No (209)	73.40	14.54	71.66	15.04
	P = .39		P = .55	
<b>Attending training about COVID-19</b>				
Yes (n = 41)	76.92	15.55	68.40	21.65
No (n = 229)	73.27	15.04	71.90	15.82
	P = .16		P = .23	

(Continues)



TABLE 4 (Continued)

	Work Precaution Score		Home Precaution Score	
	Mean (%)	SD (%)	Mean (%)	SD (%)
COVID-19 case contact				
Yes (n = 53)	72.04	17.88	69.00	17.66
No (n = 217)	74.26	14.41	71.90	16.62
	P = .34		P = .26	
Work preference during the outbreak				
Yes (n = 143)	75.90	13.47	73.11	16.83
No (127)	71.49	16.58	69.33	16.69
	P = .017		P = .065	
Self-perceptive anxiety level during work				
No discomfort at all (n = 38)	79.14	13.38	71.11	16.61
Uncomfortable (n = 112)	73.69	14.30	71.10	17.82
Anxious (n = 91)	70.84	15.33	71.98	15.52
Extremely anxious (n = 29)	76.72	18.02	70.53	17.98
	P = .03		P = .97	

In a similar study in Jordan, Suleiman et al measured the preparedness of medical doctors who might be in contact with COVID-19-positive patients towards COVID-19 risk in March 2020.<sup>22</sup> The knowledge and adherence scores were  $8 \pm 1.3/10$  and  $8.4 \pm 1.5/10$ , respectively, which seem consistent with our results, considering differences in the utilised tools in the two studies. The self-score of preparedness to deal with doctors' COVID-19 cases was low ( $4.9 \pm 2.4/10$ ).<sup>22</sup> The resulted scores were considered unsatisfactorily low by the authors. Unlike our findings, Suleiman et al identified a significant increase in preparedness and awareness with contacting active COVID-19 cases, standard protocol in the institution and increased concern about the outbreak. Our data showed that doctors experiencing higher anxiety levels towards transmitting the disease were practising higher precautions, while on-duty. Lastly, smoking and chronic morbidities were significantly associated with higher home precautions but not with the workplace precaution. However, a study on the general Jordanian population revealed that smoking and the presence of chronic illnesses were linked with more sense of danger from COVID-19.<sup>23</sup> It is noteworthy that our analysis did not assess differences related to cigarette vs waterpipe or E-cigarette smoking, which are commonly practiced in Jordan, suggesting a limitation in our analysis.

From March 18 to April 29, 2020, the prevalence of positive COVID-19 cases amongst asymptomatic HCWs in King Abdullah University Hospital, a teaching hospital affiliated with a medical school, was 0%.<sup>24</sup> This ideal result can be attributed to high preparedness lead by human capitals with high medical profiles, who invested in health promotion, extensive training, lecturing HCWs and strict guidelines and regulations to suppress infection transmission.

It is important to note that the present study measured adherence of doctors to internationally recommended precautionary behaviour without assessing (observing) performance accuracy. For example, we tested doctors' commitment towards wearing

facemask properly, but we did not examine if they were performing that correctly. A discrepancy between overall awareness and actual correct practice of healthcare students and professionals has been described before.<sup>25</sup> Despite that 71.2% of participants recorded high levels of awareness, only 45.4% were aware of the correct sequencing in using masks and respirators, and 52.5% were knowledgeable about the preferred hand hygiene method for visibly soiled hands.<sup>25</sup>

A higher level of precaution was detected in Iran as strict gloves wearing and facemask using all the time were found to be taken by 43.3% and 51.8% of HCWs, respectively, compared with 24.8% and 24.4% of Jordanian doctors.<sup>26</sup> Eighty-seven percent were washing hands always at work, and 84.6% preserved distancing strictly during work time, compared with 47.4% and 19.3%. These significant differences could be explained by the gross difference in the epidemiological situation in both countries. The exponential increase of cases in Iran might have imposed a greater risk of transmission and increased precautionary levels consequently.

To the best of our knowledge, this work is the first to explore household safety behaviour amongst medical doctors during the COVID-19 pandemic in the Middle East. In a general population study by the American CDC, 42% of participants strongly agreed and 35% somewhat agreed that they have a high level of awareness regarding cleaning and disinfecting their home to prevent SARS-CoV-2 transmission.<sup>27</sup> Compared with our participants' adherence to home precautionary precaution, 52.6% were washing used household items excessively, 49.3% and 50.7% were cleaning bought items before indoor use and washing used clothes separately all the time.

A limitation of our present study is that the survey tool has missed doctors who are not active on social media. Moreover, less than ten physicians did participate in the study were older than fifty years. The reason could be either the low representation of older physicians on social media or that older groups were more abandoning

going to work as they are at high-risk people (the Jordanian Ministry of Health stopped the medical duties of all HCWs older than 60 years). Accordingly, an increase in the reported precautionary behaviour at both the workplace and home is to be expected in case the sample was more inclusive to medical doctors without access to social media platforms. Additionally, as this study was based on a self-reported questionnaire, there was a chance that the participants responded inaccurately to the survey's questions; hence, the study survey could be subject to response bias. Finally, a major limitation in this study is related to the non-randomised sampling technique (convenience sampling) which limits the generalisability of our results.

## 5 | CONCLUSION

Medical doctors' precautionary measures towards COVID-19, both at home and at work, were not optimal in Jordan during the first month of the epidemic. This is of great concern as it puts this population subgroup at risk of transmitting the disease not only to local communities but also to patients within healthcare settings, who may be already at higher risk of infection. Focused risk assessment and evaluation may be a priority within healthcare settings along with strengthening the role of infection control units.

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## DISCLOSURE

The authors have no conflicts of interest to declare that are relevant to the content of this article.

## DATA AVAILABILITY STATEMENT

The dataset generated and/or analysed during the current study is not publicly available because of compliance with institutional guidelines but is available from the corresponding author on a reasonable request.

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