

## Original Research Article

# Knowledge, attitude, and practice study of Middle East respiratory syndrome coronavirus in Oman

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## ABSTRACT

**Background:** In the 21<sup>st</sup> century, there has been an increase in the spread of various diseases. Middle East respiratory syndrome coronavirus (MERS-CoV) disease is one of them. In order to contain and eradicate the spread of MERS-CoV, assessing public knowledge, attitude, and practice is important. This public study was conducted in the eleven governorates of Oman for its assessment.

**Methods:** A national level cross-sectional survey was conducted online for a period of nine days using a questionnaire that contained forty-one questions. The questions were designed to evaluate public perception and understanding of MERS-CoV disease. The acquired data were analysed using SPSS software.

**Results:** A total of 505 people participated in the survey. The majority of the participants were males from the Muscat region (46%). The ages of the participants were between <20 to 60 years. The survey revealed that 60% of the participants were unaware about the disease ( $p<0.001$ ) and about 48% ( $p=0.003$ ) of them were unsure about the symptoms of the disease. Most people had a positive attitude towards preventing the spread of the infection. Adherence to precautionary measures was higher among the female participants (69%,  $p=0.021$ ). Primary information source for the public was through social media.

**Conclusions:** Overall, the surveyed population had a varied perspective about the disease and fair knowledge on the preventive measures. However, a large percentage of the participants were unclear about the epidemic situation and lacked knowledge on the disease, but showed a positive attitude towards curbing the spread of infection.

**Keywords:** MERS-CoV, Survey, Questionnaire, Muscat, SPSS

## INTRODUCTION

One or more curable diseases have been prevalent periodically during different seasons around the world, and governments are usually well-prepared to deal with the health situation. Occasionally, new strains of drug-resistant diseases have appeared in many regions of the world. Currently, the world is faced with a coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)

which was first detected in Wuhan city, Hubei Province in China.<sup>1,2</sup> The coronavirus is still prevalent, and the pandemic has claimed more than six million lives across the world.<sup>3</sup> Another similar disease was the outbreak of Ebola in August 2018 in the Eastern Democratic Republic of Congo and in Uganda in 2019, for which, 3470 cases were reported with 2287 deaths.<sup>4</sup> Earlier in June 2012 one case was reported in Saudi Arabia, where a person died of severe pneumonia coupled with failure of multiple organs.<sup>5</sup> The virus that caused the death was later identified and

named as the Middle East Respiratory Syndrome-Coronavirus (MERS-CoV).<sup>6</sup> After initial identification of the disease, the number of infected cases increased dramatically in 2014 and gradually decreased over the years. The decrease in reported cases was because of improved infection control and prevention measures taken by the health care sector in the Middle Eastern region. Globally, cases have been reported in 27 countries across Europe, Asia, Middle East, and North America, but predominantly have been found in the Middle East, which includes Saudi Arabia, UAE, Jordan, Oman, Qatar, Kuwait, Iran, and Lebanon.<sup>7,8</sup> According to the WHO report, the total number of reported cases till December 2022 was 2603, of which 935 were fatal. Most of the patients were males with ages ranging from 50 to 59.<sup>8</sup> The majority of the cases were reported from Saudi Arabia, which had, 2184 laboratory-confirmed cases and 813 deaths with a case fatality rate (CFR) of 37.2% and 34.5% globally.<sup>8</sup> Oman reported a total of 25 laboratory-confirmed cases since 2013 with seven fatalities.<sup>9,10</sup> In April 2022 one case was reported from Al Dhahira Governorate in Oman, where the patient had the history of direct contact with animals.<sup>10</sup>

Human coronaviruses (HCoV) has been found to cause bronchiolitis (respiratory disease), enteric and neurologic diseases and common cold in immunocompromised adults, elderly people, pregnant women and children, and patients with medial history of diabetes, renal failure, and chronic lung diseases.<sup>11,12</sup> The MERS-CoV genetically related to *Tylonycteris bat coronavirus HKU4* (BatCoV-HKU4).<sup>13</sup> Studies have shown that the RNA sequence of the coronavirus was found in the bat fecal matter and is also linked to the dromedary camels.<sup>12,14</sup> It is possible that the virus was transferred from African bats to camels in the past, but the actual source of the virus is still elusive.<sup>15</sup> It has been confirmed by Omrani et al that near-identical strains of MERS-CoV virus have been transmitted from camels to humans and primary transmission has been suggested to be contact with saliva of infected camels, consuming of milk and undercooked meat.<sup>16</sup> Secondary infection transmission could be through fomites and air, which is a concern for healthcare workers at hospitals as the pathogenic droplets can be transmitted within the confined area.<sup>17,18</sup> Coronavirus infection is generally caused in the lower respiratory tract. It causes fever with chills, breathing difficulty, cough, myalgia, gastrointestinal problems such as abdominal pain, vomiting, diarrhoea, and abnormalities in the chest X-ray and decrease in blood platelets were also observed.<sup>19,20</sup> The infection results in acute pneumonia and in some cases also resulted in renal failure.<sup>21</sup> The case reported in Oman also had a condition of multi-organ failure.<sup>9</sup> Special care needs to be administered at home for patients with MERS-CoV because of its contagious nature, and necessary precautions have to be taken to prevent the spread of the virus to other members of the family. Similarly, healthcare centers also face the problem of spreading the virus to other unsuspecting patients and healthcare workers in hospitals.

Several studies have been conducted to determine the awareness of the public to the disease, since knowledge about the disease can impede the spread of the virus among humans. A study conducted among 870 healthcare workers (HCW) in Najran region in Saudi Arabia indicated a high level of knowledge and positive attitude towards the disease.<sup>22</sup> Another study conducted among 391 healthcare workers at King Khalid University Hospital, Riyadh, Saudi Arabia, showed good knowledge and positive attitudes among different health workers. Knowledge and attitude were high among physicians when compared to nurses, pharmacists and technicians.<sup>23</sup> A similar type of study conducted among primary healthcare workers indicated knowledge level differences among the professions. Negative perception on MERS-CoV knowledge transfer was related to poor knowledge among less experienced HCWs and male HCWs.<sup>24</sup> On the contrary, dental students of Al-Farabi College in Jeddah had good knowledge on the virus and its spreading mechanisms.<sup>25</sup> A cross-sectional study among medical, dental, nursing and pharmacy students in Makkah, Saudi Arabia indicated that majority of the participants were aware of the cause of MERS, and the medical students had better knowledge on the disease compared to the students from other disciplines.<sup>26</sup> In a study in the United Arab Emirates indicated that majority of the university students had good knowledge about MERS-CoV and the descending order of knowledge level were, medical college students > dental > nursing > pharmacy students, and male students had better knowledge compared to female students.<sup>27</sup> Survey among primary school students in Almajmaah city, Saudi Arabia indicated a knowledge gap, negative attitude and poor practices, while among secondary school students in Sudair area in Saudi Arabia, students had a positive attitude towards the disease and their knowledge about the virus was primarily from their parents.<sup>28,29</sup> Survey among public participants from all regions of Saudi Arabia (714) indicated that the principal source of information was through social media. People in all regions had good knowledge about the virus with a positive attitude and knew the preventive mechanisms.<sup>20</sup> On the other hand, contradicting outcome was reported by Bawazir et al from analyzing the knowledge of the public (Saudi nationals).<sup>30</sup> The results revealed that the public had insufficient epidemiological knowledge about the virus. This suggests that public awareness studies on the disease are specific to the population under assessment and cannot be generalised. When the pilgrims who visited Saudi Arabia were surveyed, it showed that the pilgrims within the Saudi kingdom had good knowledge about the virus and its transmission mechanism compared to the non-Saudi nationals.<sup>31</sup> An extensive online survey was conducted by Alqahtani et al with 1812 participants across various countries in the Middle East, which included Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain, and Oman, highlighted the lack of proper understanding on the prevention and transmission of the MERS-CoV virus in the GCC (Gulf Cooperation Council) states.<sup>32</sup> Different countries in the Middle East have adopted different

strategies to increase the awareness of MERS among the public. The current study is designed to determine the awareness, knowledge, attitude, and practice by the public to combat the virus. In order to accomplish the task, a questionnaire with adaptations from the literature was distributed to the public using online means and rigorously analysed to determine knowledge level and awareness of the widely spreading disease. To the best of our knowledge, the current survey is the most comprehensive study of its kind to date conducted in Oman.

## METHODS

### Survey design

The national level survey was conducted online. The survey questions were adapted from the article Al-Dowyan et al with suitable modifications.<sup>20</sup> The questionnaire was split into five parts. The first part was focused on the socio-demographic characteristics of the participants (8 questions); the second part was designed to evaluate the knowledge of the public on MERS-CoV based on geographic regions (10 questions). The third part aimed to assess the participant's perception about causes, mode of transmission, symptoms, risk factors, treatment and prevention measures according to geographic region (8 questions). The fourth part was tailored to determine the attitude of the public based on gender (13 questions) and the fifth part accounted for the practice of taking precautions and vaccination to prevent the disease (2 questions). The questions were initially prepared in English and then translated into Arabic. The questionnaire had both English and Arabic languages. Participation was based on the individuals own consent.

### Sampling

The targeted population were the public Omanis in Oman across the 11 regions, which included Muscat, Ad Dakhiliyah, Al Batinah North, Al Batinah South, Ash Sharqiyah North, Ash Sharqiyah South, Ad Dhahirah, Musandam, Dohfar, Al Buraymi and Al Wusta. The age range expected was from less than 20 years to 60 years. The survey was conducted online for a period of nine days (15 December 2018 to 23 December 2018) due to time constraints.

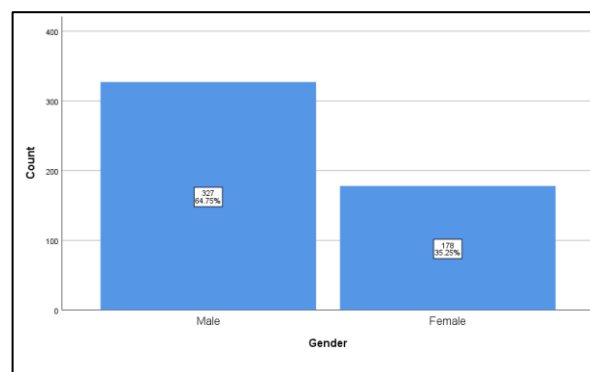
### Data analysis

The acquired data were analysed using SPSS (Statistical Package for Social Sciences software) Version 25. The study was summarised using descriptive statistics. Cross-tab analysis was used to analyse the results. Pearson's Chi-square test was used for differences testing. The data collected and analysed in this study were anonymous.

## RESULTS

A total of 505 people participated in the survey from 11 different regions in Oman. Majority of the people who

participated in the survey were from Muscat, with the age group between 20-30 years (55%). Very few people were between 51-60 years and none above 60 years (Table 1). The descending order of participants from different regions in Oman were, Muscat > Ad Dakhiliyah > Al Batinah North > Al Batinah South > Al Wusta > Dohfar > Ash Sharqiyah South > Ad Dhahirah > Ash Sharqiyah North, Al Buraymi > Musandam (3.6%). Most of the participants were male (Figure 1), unmarried (58 %) with a bachelor's degree, and were either working or studying with a reasonable income (Table 2).



**Figure 1: Survey taken by participants based on gender.**

Many participants across the region were uncertain about the disease (60%) with statistically significant association ( $p < 0.001$ ). The two regions with better understating ( $>45\%$ ) were Al Batinah North and Ash Sharqiyah South (Table 3-4). The majority of the participants were sure that they were not infected by the virus, nor were any of their family members or relatives or friends ( $>86\%$ ). More than half of the participants were not sure whether the virus was contagious and a treatment or vaccine was available for the disease, but knew that the spread of infection would rise during pilgrimage (Hajj and Umrah). Most of the participants seemed to agree to early diagnosis of the disease, isolation of suspected cases, and health education to prevent infection and spread of the disease.

Greater than 45% of people were uncertain on the different modes of virus transmission between people and animals, its symptoms, incubation period, and the risk factors associated with people with certain health conditions (Table 5). However, more than 50% of people know that MERS-CoV is caused by a virus and the common preventive measures to be taken. Major sources of information about the disease were through social media (40%). The attitude towards the disease slightly varied among male and female participants. Female participants were slightly more worried compared to their male counterparts about family members contracting the virus and therefore avoided going to public places ( $>70\%$ ), and were also unsure on whether the disease was fatal. More than 60% of both genders agreed that precautions could prevent the spread of infection, and greater than 78% were eager to be vaccinated against the disease (Table 6).

**Table 1: Socio-demographic characteristics of participants with respect to age (N=505).**

| Geographic region in Oman |               |                   |              |                         |              |                           |              |                           |             |                             |           |                              |             |                      |             |                   |              |                 |              |                   |           |                   |             |
|---------------------------|---------------|-------------------|--------------|-------------------------|--------------|---------------------------|--------------|---------------------------|-------------|-----------------------------|-----------|------------------------------|-------------|----------------------|-------------|-------------------|--------------|-----------------|--------------|-------------------|-----------|-------------------|-------------|
| Age (years)               | N (%)         | Muscat 232 (45.9) |              | Ad Dakhiliyah 53 (10.5) |              | Al Batinah North 38 (7.5) |              | Al Batinah South 32 (6.3) |             | Ash Sharqiya h North 20 (4) |           | Ash Sharqiyah South 22 (4.4) |             | Ad Dhahirah 21 (4.2) |             | Musandam 18 (3.6) |              | Dohfar 23 (4.6) |              | Al Buraymi 20 (4) |           | Al Wusta 26 (5.1) |             |
|                           |               | M                 | F            | M                       | F            | M                         | F            | M                         | F           | M                           | F         | M                            | F           | M                    | F           | M                 | F            | M               | F            | M                 | F         | M                 | F           |
|                           |               | 157<br>(67.7)     | 75<br>(32.3) | 42<br>(79.2)            | 11<br>(20.8) | 15<br>(39.5)              | 23<br>(60.5) | 25<br>(78.1)              | 7<br>(21.9) | 13<br>(65)                  | 7<br>(35) | 13<br>(59.1)                 | 9<br>(40.9) | 15<br>(71.4)         | 6<br>(28.6) | 7<br>(38.9)       | 11<br>(61.1) | 10<br>(43.5)    | 13<br>(56.5) | 13<br>(65)        | 7<br>(35) | 17<br>(65.4)      | 9<br>(34.6) |
| <20                       | 65<br>(12.9)  | 24<br>(10.3)      | 16<br>(6.9)  | 3<br>(5.7)              | -            | 1<br>(2.6)                | 5<br>(13.2)  | 2<br>(6.3)                | 1<br>(3.1)  | 1<br>(5)                    | 2<br>(10) | 1<br>(4.5)                   | 2<br>(9.1)  | 3<br>(14.3)          | -           | -                 | 3<br>(16.6)  | -               | -            | 1<br>(5)          | -         | -                 | -           |
| 20-30                     | 277<br>(54.9) | 98<br>(42.3)      | 35<br>(15.1) | 23<br>(43.3)            | 9<br>(17)    | 8<br>(21.1)               | 13<br>(34.2) | 15<br>(46.9)              | 4<br>(12.5) | 7<br>(35)                   | 3<br>(15) | 4<br>(18.2)                  | 7<br>(31.8) | 8<br>(38.1)          | 1<br>(4.8)  | 4<br>(22.2)       | 6<br>(33.3)  | 4<br>(17.4)     | 9<br>(39.1)  | 6<br>(30)         | 4<br>(20) | 4<br>(15.4)       | 5<br>(19.2) |
| 31-40                     | 119<br>(23.6) | 23<br>(9.9)       | 23<br>(9.9)  | 11<br>(20.8)            | 1<br>(1.9)   | 5<br>(13.2)               | 5<br>(13.2)  | 5<br>(15.6)               | 1<br>(3.1)  | 5<br>(25)                   | 2<br>(10) | 2<br>(9.1)                   | -           | 3<br>(14.3)          | 1<br>(4.8)  | 3<br>(16.7)       | 1<br>(5.6)   | 3<br>(13)       | 4<br>(17.4)  | 5<br>(25)         | 2<br>(10) | 10<br>(38.5)      | 4<br>(15.4) |
| 41-50                     | 40<br>(7.9)   | 11<br>(4.8)       | 1<br>(0.4)   | 4<br>(7.5)              | 1<br>(1.9)   | 1<br>(2.6)                | -            | 3<br>(9.4)                | 1<br>(3.1)  | -                           | -         | 5<br>(22.7)                  | -           | 1<br>(4.8)           | 4<br>(19)   | -                 | 1<br>(5.6)   | 3<br>(13)       | -            | 1<br>(5)          | 1<br>(5)  | 2<br>(7.7)        | -           |
| 51-60                     | 4<br>(0.8)    | 1<br>(0.4)        | -            | 1<br>(1.9)              | -            | -                         | -            | -                         | -           | -                           | -         | 1<br>(4.5)                   | -           | -                    | -           | -                 | -            | -               | -            | -                 | -         | 1<br>(3.8)        | -           |
| >60                       | -             | -                 | -            | -                       | -            | -                         | -            | -                         | -           | -                           | -         | -                            | -           | -                    | -           | -                 | -            | -               | -            | -                 | -         | -                 | -           |

M=male, F=female; N=number of participants.

**Table 2: Socio-demographic characteristics of participants based on marital status, education, occupation and monthly income.**

| Characteristics                                 | N   | %    | Characteristics       | N   | %    |
|-------------------------------------------------|-----|------|-----------------------|-----|------|
| <b>Marital status</b>                           |     |      | <b>Occupation</b>     |     |      |
| Married                                         | 213 | 42.2 | Don't work            | -   | -    |
| Single                                          | 292 | 57.8 | Other                 | 314 | 62.2 |
| <b>Education level</b>                          |     |      | <b>Monthly income</b> |     |      |
| Primary                                         | 3   | 0.6  | <200 OMR              | 135 | 26.7 |
| Intermediate                                    | 9   | 1.8  | 200-400 OMR           | 34  | 6.7  |
| Secondary                                       | 110 | 21.8 | 400-600 OMR           | 72  | 14.3 |
| Diploma                                         | 116 | 23   | 600-800 OMR           | 71  | 14.1 |
| Bachelor                                        | 211 | 41.8 | 800-1000 OMR          | 69  | 13.7 |
| Higher Education (master and doctorate degrees) | 56  | 11.1 | >1000 OMR             | 124 | 24.6 |
| <b>Occupation</b>                               |     |      |                       |     |      |
| Student                                         | 124 | 24.6 |                       |     |      |
| Medical field                                   | 50  | 9.9  |                       |     |      |
| Close contact with animal                       | 17  | 3.4  |                       |     |      |

N=number of participants.

**Table 3: Knowledge about MERS-CoV according to geographic regions.**

| Geographic region in Oman N (%)                                                                |               |               |               |               |              |              |                  |              |              |                  |              |              |                     |             |            |         |
|------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|--------------|--------------|------------------|--------------|--------------|------------------|--------------|--------------|---------------------|-------------|------------|---------|
| Questions                                                                                      | Muscat        |               |               | Ad Dakhiliyah |              |              | Al Batinah North |              |              | Al Batinah South |              |              | Ash Sharqiyah North |             |            | P value |
|                                                                                                | Y             | N             | NS            | Y             | N            | NS           | Y                | N            | NS           | Y                | N            | NS           | Y                   | N           | NS         |         |
| <b>Do you know about MERS-CoV?</b>                                                             | 68<br>(29.3)  | 132<br>(56.9) | 32<br>(13.8)  | 20<br>(37.7)  | 25<br>(47.2) | 8<br>(15.1)  | 18<br>(47.4)     | 17<br>(44.7) | 3<br>(7.9)   | 13<br>(40.6)     | 17<br>(53.1) | 2<br>(6.3)   | 6<br>(30)           | 14<br>(70)  | -          | 0.000*  |
| <b>Have you been infected by MERS-CoV?</b>                                                     | 3<br>(1.3)    | 222<br>(95.7) | 7<br>(3)      | -             | 47<br>(88.7) | 6<br>(11.3)  | -                | 37<br>(97.4) | 1<br>(2.6)   | 1<br>(3.1)       | 29<br>(90.6) | 2<br>(6.3)   | -                   | 20<br>(100) | -          | 0.536   |
| <b>Did any of your family or relatives or friends infected by MERS-CoV?</b>                    | 3<br>(1.3)    | 193<br>(83.2) | 36<br>(15.5)  | 3<br>(5.7)    | 42<br>(79.2) | 8<br>(15.1)  | -                | 36<br>(94.7) | 2<br>(5.3)   | 1<br>(3.1)       | 26<br>(81.3) | 5<br>(15.6)  | -                   | 19<br>(95)  | 1<br>(5)   | 0.044   |
| <b>Is MERS-CoV contagious?</b>                                                                 | 59<br>(25.4)  | 25<br>(10.8)  | 148<br>(63.8) | 24<br>(45.3)  | 1<br>(1.9)   | 28<br>(52.8) | 19<br>(50)       | 1<br>(2.6)   | 18<br>(47.4) | 11<br>(34.4)     | 3<br>(9.4)   | 18<br>(56.3) | 5<br>(25)           | 1<br>(5)    | 14<br>(70) | 0.000*  |
| <b>Do you think that infection increase in Hajj and Omrah?</b>                                 | 114<br>(49.1) | 13<br>(5.6)   | 105<br>(45.3) | 29<br>(54.7)  | 1<br>(1.9)   | 23<br>(43.4) | 24<br>(63.2)     | 2<br>(5.3)   | 12<br>(31.6) | 15<br>(46.9)     | 3<br>(9.4)   | 14<br>(43.8) | 16<br>(80)          | -           | 4<br>(20)  | 0.000*  |
| <b>Is there a treatment for MERS-CoV?</b>                                                      | 75<br>(32.3)  | 12<br>(5.2)   | 145<br>(62.5) | 17<br>(32.1)  | 8<br>(15.1)  | 28<br>(52.8) | 8<br>(21.1)      | 3<br>(7.9)   | 27<br>(71.1) | 5<br>(15.6)      | 4<br>(12.5)  | 23<br>(71.9) | 3<br>(15)           | 1<br>(5)    | 16<br>(80) | 0.001   |
| <b>Do you think the early diagnosis improves the treatment?</b>                                | 189<br>(81.5) | 8<br>(3.4)    | 35<br>(15.1)  | 43<br>(81.1)  | -            | 10<br>(18.9) | 30<br>(78.9)     | 1<br>(2.6)   | 7<br>(18.4)  | 27<br>(84.4)     | -            | 5<br>(15.6)  | 18<br>(90)          | -           | 2<br>(10)  | 0.332   |
| <b>Do you think the isolation of the suspected cases at emergency department is important?</b> | 155<br>(66.8) | 9<br>(3.9)    | 68<br>(29.3)  | 36<br>(67.9)  | 1<br>(1.9)   | 16<br>(30.2) | 24<br>(63.2)     | 2<br>(5.3)   | 12<br>(31.6) | 19<br>(59.4)     | -            | 13<br>(40.6) | 16<br>(80)          | 1<br>(5)    | 3<br>(15)  | 0.003   |
| <b>Is there a vaccine for MERS-CoV?</b>                                                        | 39<br>(16.8)  | 27<br>(11.6)  | 166<br>(71.6) | 14<br>(26.4)  | 3<br>(5.7)   | 36<br>(67.9) | 8<br>(21.1)      | 5<br>(13.2)  | 25<br>(65.8) | 3<br>(9.4)       | 4<br>(12.5)  | 25<br>(78.1) | 5<br>(25)           | 1<br>(5)    | 14<br>(70) | 0.018   |
| <b>Do you think that health education can help to prevent the disease?</b>                     | 202<br>(87.1) | 8<br>(3.4)    | 22<br>(9.5)   | 46<br>(86.8)  | -            | 7<br>(13.2)  | 35<br>(92.1)     | -            | 3<br>(7.9)   | 30<br>(93.8)     | -            | 2<br>(6.3)   | 18<br>(90)          | -           | 2<br>(10)  | 0.506   |

\*Result is significant at  $p \leq 0.001$ , Y=yes, N=no, NS=not sure, N=number of participants.

**Table 4: Knowledge about MERS-CoV according to geographic regions.**

| Geographic region in Oman N (%)                                                                |              |              |              |              |              |              |              |              |              |            |             |            |              |              |              |         |
|------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|-------------|------------|--------------|--------------|--------------|---------|
| Questions                                                                                      | Ad Dhahirah  |              |              | Musandam     |              |              | Dohfar       |              |              | Al Buraymi |             |            | Al Wusta     |              |              | P value |
|                                                                                                | Y            | N            | NS           | Y            | N            | NS           | Y            | N            | NS           | Y          | N           | NS         | Y            | N            | NS           |         |
| <b>Do you know about MERS-CoV?</b>                                                             | 4<br>(19)    | 17<br>(81)   | -            | 1<br>(5.6)   | 16<br>(88.9) | 1<br>(5.6)   | 7<br>(30.4)  | 16<br>(69.6) | -            | 4<br>(20)  | 15<br>(75)  | 1<br>(5)   | 1<br>(3.8)   | 25<br>(96.2) | -            | 0.000*  |
| <b>Have you been infected by MERS-CoV?</b>                                                     | -            | 19<br>(90.5) | 2<br>(9.5)   | -            | 18<br>(100)  | -            | -            | 22<br>(95.7) | 1<br>(4.3)   | -          | 20<br>(100) | -          | -            | 26<br>(100)  | -            | 0.536   |
| <b>Did any of your family or relatives or friends infected by MERS-CoV?</b>                    | 2<br>(9.5)   | 17<br>(81)   | 2<br>(9.5)   | -            | 18<br>(100)  | -            | -            | 21<br>(91.3) | 2<br>(8.7)   | -          | 20<br>(100) | -          | -            | 26<br>(100)  | -            | 0.044   |
| <b>Is MERS-CoV contagious?</b>                                                                 | 4<br>(19)    | 1<br>(4.8)   | 16<br>(76.2) | 2<br>(11.1)  | -            | 16<br>(88.9) | 5<br>(21.7)  | -            | 18<br>(78.3) | 9<br>(45)  | -           | 11<br>(55) | -            | 2<br>(7.7)   | 24<br>(92.3) | 0.000*  |
| <b>Do you think that infection increase in Hajj and Omrah?</b>                                 | 14<br>(66.7) | -            | 7<br>(33.3)  | 16<br>(88.9) | -            | 2<br>(11.1)  | 22<br>(95.7) | -            | 1<br>(4.3)   | 11<br>(55) | -           | 9<br>(45)  | 20<br>(76.9) | 1<br>(3.8)   | 5<br>(19.2)  | 0.000*  |
| <b>Is there a treatment for MERS-CoV?</b>                                                      | 3<br>(14.3)  | -            | 18<br>(85.7) | 2<br>(11.1)  | -            | 16<br>(88.9) | 3<br>(13)    | 1<br>(4.3)   | 19<br>(82.6) | 2<br>(10)  | -           | 18<br>(90) | -            | 1<br>(3.8)   | 25<br>(96.2) | 0.001   |
| <b>Do you think the early diagnosis improves the treatment?</b>                                | 21<br>(100)  | -            | -            | 18<br>(100)  | -            | -            | 22<br>(95.7) | -            | 1<br>(4.3)   | 16<br>(80) | -           | 4<br>(20)  | 25<br>(96.2) | -            | 1<br>(3.8)   | 0.332   |
| <b>Do you think the isolation of the suspected cases at emergency department is important?</b> | 14<br>(66.7) | 2<br>(9.5)   | 5<br>(23.8)  | 16<br>(88.9) | -            | 2<br>(11.1)  | 22<br>(95.7) | 1<br>(4.3)   | -            | 7<br>(35)  | 4<br>(20)   | 9<br>(45)  | 22<br>(84.6) | 1<br>(3.8)   | 3<br>(11.5)  | 0.003   |
| <b>Is there a vaccine for MERS-CoV?</b>                                                        | -            | -            | 21<br>(100)  | 1<br>(5.6)   | 1<br>(5.6)   | 16<br>(88.9) | 2<br>(8.7)   | 1<br>(4.3)   | 20<br>(87)   | 2<br>(10)  | -           | 18<br>(90) | -            | -            | 26<br>(100)  | 0.018   |
| <b>Do you think that health education can help to prevent the disease?</b>                     | 21<br>(100)  | -            | -            | 17<br>(94.4) | -            | 1<br>(5.6)   | 23<br>(100)  | -            | -            | 19<br>(95) | -           | 1<br>(5)   | 25<br>(96.2) | -            | 1<br>(3.8)   | 0.506   |

\*Result is significant at  $p \leq 0.001$ , Y=yes, N=no, NS=not sure, N=number of participants.

**Table 5: Participants perception about causes, mode of transmission, symptoms, risk factors, treatment and prevention measures of MERS-CoV according to geographic region.**

| Questions                                                                | Geographic region in Oman |               |                  |                  |                     |                     |             |           |           |            |           |         |
|--------------------------------------------------------------------------|---------------------------|---------------|------------------|------------------|---------------------|---------------------|-------------|-----------|-----------|------------|-----------|---------|
|                                                                          | Muscat                    | Ad Dakhiliyah | Al Batinah North | Al Batinah South | Ash Sharqiyah North | Ash Sharqiyah South | Ad Dhahirah | Musandam  | Dohfar    | Al Buraymi | Al Wusta  | P value |
|                                                                          | N (%)                     |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Which of the following is the cause of MERS CoV?                         |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Bacteria                                                                 | 13 (5.6)                  | -             | 1 (2.6)          | -                | 2 (10)              | 3 (13.6)            | 2 (9.5)     | -         | 1 (4.3)   | 2 (10)     | -         | 0.001   |
| Virus                                                                    | 120 (51.7)                | 30 (56.6)     | 27 (71.1)        | 23 (71.9)        | 9 (45)              | 12 (54.6)           | 11 (52.4)   | 12 (66.7) | 20 (87)   | 9 (45)     | 4 (15.4)  |         |
| Fungus                                                                   | 1 (0.4)                   | -             | -                | -                | 1 (5)               | -                   | -           | -         | -         | -          | -         |         |
| Immunodeficiency                                                         | 8 (3.4)                   | 2 (3.8)       | 1 (2.6)          | -                | 1 (5)               | -                   | 1 (4.8)     | -         | -         | 2 (10)     | -         |         |
| I don't know                                                             | 90 (38.8)                 | 21 (39.6)     | 9 (23.7)         | 9 (28.1)         | 7 (35)              | 7 (31.8)            | 7 (33.3)    | 6 (33.3)  | 2 (8.7)   | 7 (35)     | 22 (84.6) |         |
| Which of the following is (are) the mode(s) of transmission of MERS-CoV? |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Direct transmission during coughing                                      | 12 (5.2)                  | 1 (1.9)       | 8 (21.1)         | 1 (3.1)          | 1 (5)               | 2 (9.1)             | 1 (4.8)     | -         | 1 (4.3)   | 210        | -         | 0.024   |
| Touching surfaces contaminated with the virus                            | 9 (3.9)                   | 1 (1.9)       | -                | 3 (9.4)          | -                   | 2 (9.1)             | -           | -         | -         | -          | -         |         |
| Through infected camel and bats                                          | 1 (0.4)                   | 2 (3.7)       | -                | -                | -                   | -                   | -           | -         | 1 (4.3)   | -          | 1 (3.8)   |         |
| By consuming milk and meat of infected animals                           | 8 (3.4)                   | -             | -                | -                | -                   | -                   | -           | 1 (5.6)   | -         | 1 (5)      | -         |         |
| Direct contact with an infected patient                                  | 9 (3.9)                   | 1 (1.9)       | 3 (7.9)          | 1 (3.1)          | -                   | -                   | -           | 1 (5.6)   | -         | 3 (15)     | 1 (3.8)   |         |
| All of above                                                             | 85 (36.6)                 | 23 (43.4)     | 17 (44.7)        | 12 (37.5)        | 6 (30)              | 11 (50)             | 10 (47.6)   | 3 (16.6)  | 7 (30.5)  | 8 (40)     | 6 (23.2)  |         |
| Others                                                                   | 5 (2.2)                   | -             | -                | -                | 1 (5)               | -                   | 1 (4.8)     | 1 (5.6)   | -         | 1 (5)      | -         |         |
| Unsure                                                                   | 103 (44.4)                | 25 (47.2)     | 10 (26.3)        | 15 (46.9)        | 12 (60)             | 7 (31.8)            | 9 (42.8)    | 12 (66.6) | 14 (60.9) | 5 (25)     | 18 (69.2) |         |
| Which of the following is (are) symptom(s) of MERS CoV?                  |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| High temperature                                                         | 9 (3.9)                   | 4 (7.5)       | 2 (5.3)          | -                | -                   | 4 (18.2)            | 1 (4.8)     | -         | -         | 1 (5)      | -         | 0.003   |
| Cough, sore throat, blocked nose                                         | 13 (5.6)                  | -             | 2 (5.3)          | 3 (9.4)          | -                   | 1 (4.5)             | 2 (9.5)     | -         | -         | -          | -         |         |
| Difficulty of breathing                                                  | 19 (8.2)                  | -             | 1 (2.6)          | 2 (6.3)          | -                   | 1 (4.5)             | -           | -         | 1 (4.3)   | -          | -         |         |

Continued.

| Questions                                                       | Geographic region in Oman |               |                  |                  |                     |                     |             |           |           |            |           | P value |
|-----------------------------------------------------------------|---------------------------|---------------|------------------|------------------|---------------------|---------------------|-------------|-----------|-----------|------------|-----------|---------|
|                                                                 | Muscat                    | Ad Dakhiliyah | Al Batinah North | Al Batinah South | Ash Sharqiyah North | Ash Sharqiyah South | Ad Dhahirah | Musandam  | Dohfar    | Al Buraymi | Al Wusta  |         |
|                                                                 | N (%)                     |               |                  |                  |                     |                     |             |           |           |            |           |         |
| All of above                                                    | 81 (34.9)                 | 27 (50.9)     | 20 (52.6)        | 13 (40.5)        | 7 (35)              | 8 (36.4)            | 6 (28.6)    | 7 (38.9)  | 9 (39.2)  | 9 (45)     | 5 (19.2)  | 0.088   |
| Others                                                          | 3 (1.3)                   | -             | -                | -                | -                   | -                   | -           | -         | -         | 2 (10)     | -         |         |
| Unsure                                                          | 107 (46.1)                | 22 (41.6)     | 13 (34.2)        | 14 (43.8)        | 13 (65)             | 8 (36.4)            | 12 (57.1)   | 11 (61.1) | 13 (56.5) | 8 (40)     | 21 (80.8) |         |
| Symptoms appear after which of the following?                   |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| <2 days of infection                                            | 7 (3)                     | 1 (1.9)       | 4 (10.5)         | 1 (3.1)          | -                   | 3 (13.6)            | -           | -         | -         | -          | 1 (3.8)   | 0.088   |
| 2-5 days                                                        | 22 (9.5)                  | 9 (17)        | 5 (13.2)         | 3 (9.4)          | 2 (10)              | 4 (18.2)            | 1 (4.8)     | -         | -         | 1 (5)      | -         |         |
| 2-14 days                                                       | 8 (3.5)                   | 3 (5.7)       | 1 (2.6)          | 2 (6.3)          | -                   | -                   | 1 (4.8)     | 2 (11.1)  | -         | 1 (5)      | -         |         |
| Unsure                                                          | 59 (25.4)                 | 12 (22.6)     | 6 (15.8)         | 8 (25)           | 3 (15)              | 6 (27.3)            | 5 (23.7)    | 3 (16.7)  | 6 (26.1)  | 5 (25)     | 1 (3.8)   |         |
| Don't know                                                      | 136 (58.6)                | 28 (52.8)     | 22 (57.9)        | 18 (56.2)        | 15 (75)             | 9 (40.9)            | 14 (66.7)   | 13 (72.2) | 17 (73.9) | 13 (65)    | 24 (92.4) |         |
| Which of the following is (are) the risk factor(s) of MERS-CoV? |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Being old aged                                                  | 5 (2.2)                   | 2 (3.8)       | 1 (2.6)          | -                | -                   | -                   | -           | -         | 1 (4.3)   | 1 (5)      | -         | 0.011   |
| Individuals with cancer, chronic respiratory, diabetes          | 10 (4.3)                  | 2 (3.8)       | 2 (5.3)          | -                | 3 (15)              | 1 (4.6)             | 1 (4.8)     | -         | -         | -          | -         |         |
| Having awakened immune system                                   | 44 (19.1)                 | 10 (18.8)     | 8 (21.1)         | 8 (25)           | 2 (10)              | 5 (22.7)            | 1 (4.8)     | 1 (5.6)   | -         | 1 (5)      | -         |         |
| Traveling to parts of the world known to harbour the virus      | 45 (19.6)                 | 13 (24.5)     | 14 (36.8)        | 12 (37.5)        | 2 (10)              | 3 (13.6)            | 2 (9.5)     | 1 (5.6)   | 3 (13)    | 5 (25)     | -         |         |
| Pregnant women                                                  | 2 (0.9)                   | -             | -                | -                | -                   | 1 (4.6)             | -           | -         | -         | -          | -         |         |
| All of above                                                    | 1 (0.4)                   | -             | -                | -                | -                   | -                   | -           | -         | -         | -          | -         |         |
| Unsure                                                          | 123 (53.5)                | 26 (49.1)     | 13 (34.2)        | 12 (37.5)        | 13 (65)             | 12 (54.5)           | 17 (81)     | 16 (88.9) | 19 (82.7) | 13 (65)    | (100)     |         |

Continued.



| Questions                                                | Geographic region in Oman |               |                  |                  |                     |                     |             |           |           |            |           | P value |
|----------------------------------------------------------|---------------------------|---------------|------------------|------------------|---------------------|---------------------|-------------|-----------|-----------|------------|-----------|---------|
|                                                          | Muscat                    | Ad Dakhiliyah | Al Batinah North | Al Batinah South | Ash Sharqiyah North | Ash Sharqiyah South | Ad Dhahirah | Musandam  | Dohfar    | Al Buraymi | Al Wusta  |         |
|                                                          | N (%)                     |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Which of the following describes MER CoV treatment?      |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Supportive treatment                                     | 50 (21.6)                 | 20 (37.7)     | 14 (36.8)        | 9 (28.1)         | 3 (15)              | 6 (27.3)            | 1 (4.8)     | 1 (5.6)   | 2 (8.7)   | 3 (15)     | -         | 0.000*  |
| Vaccination                                              | 52 (22.4)                 | 8 (15.2)      | 10 (26.4)        | 7 (21.9)         | 4 (20)              | 3 (13.6)            | 3 (14.3)    | 1 (5.6)   | 3 (13)    | 7 (35)     | -         |         |
| Unsure                                                   | 32 (13.8)                 | 5 (9.4)       | 3 (7.9)          | 5 (15.6)         | -                   | 7 (31.8)            | 2 (9.5)     | 4 (22.1)  | -         | 2 (10)     | -         |         |
| I don't know                                             | 98 (42.2)                 | 20 (37.7)     | 11 (28.9)        | 11 (34.4)        | 13 (65)             | 6 (27.3)            | 15 (71.4)   | 12 (66.7) | 18 (78.3) | 8 (40)     | 26 (100)  |         |
| Which of the following describes MERS-CoV prevention?    |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Wash hands with water and soap                           | 19 (8.2)                  | 1 (1.9)       | -                | 3 (9.4)          | 1 (5)               | 1 (4.5)             | -           | -         | -         | 2 (10)     | -         | 0.047   |
| Avoid touching the eyes, nose with hands                 | 3 (1.3)                   | -             | -                | 1 (3.1)          | -                   | 1 (4.5)             | -           | -         | -         | -          | -         |         |
| Avoid contacts with infected people                      | 15 (6.5)                  | 3 (5.7)       | 10 (26.3)        | 4 (12.5)         | -                   | 3 (13.7)            | -           | 1 (5.6)   | 1 (4.3)   | 3 (15)     | 1 (3.8)   |         |
| Pay attention to other health habits                     | 26 (11.2)                 | 5 (9.4)       | 2 (5.3)          | 2 (6.3)          | 1 (5)               | 1 (4.5)             | 2 (9.5)     | 1 (5.6)   | -         | 3 (15)     | 1 (3.8)   |         |
| All of above                                             | 169 (72.8)                | 44 (83)       | 26 (68.4)        | 22 (68.8)        | 18 (90)             | 16 (72.7)           | 19 (90.5)   | 16 (88.9) | 22 (95.7) | 12 (60)    | 24 (92.3) |         |
| From where you have/got this information about MERS-CoV? |                           |               |                  |                  |                     |                     |             |           |           |            |           |         |
| Official websites of heath organizations                 | 24 (10.3)                 | 4 (7.5)       | 5 (13.2)         | 3 (9.4)          | 1 (5)               | -                   | 1 (4.8)     | 1 (5.6)   | -         | -          | -         | 0.000*  |
| Papers (newspapers /posters)                             | 11 (4.7)                  | 2 (3.8)       | 2 (5.3)          | 2 (6.3)          | -                   | 4 (18.2)            | 1 (4.8)     | -         | 2 (8.7)   | 1 (5)      | -         |         |
| Social media (WhatsApp, Twitter, Facebook)               | 62 (26.7)                 | 25 (47.2)     | 18 (47.4)        | 13 (40.6)        | 10 (50)             | 9 (40.9)            | 10 (47.6)   | 14 (77.7) | 5 (21.7)  | 12 (60)    | 23 (88.6) |         |
| Family, Friends, or Teachers                             | 27 (11.6)                 | 2 (3.8)       | 1 (2.6)          | 3 (9.4)          | 2 (10)              | 3 (13.6)            | 2 (9.5)     | -         | -         | 2 (10)     | 1 (3.8)   |         |
| Videos (channels/YouTube)                                | 15 (6.5)                  | 3 (5.7)       | -                | 1 (3.1)          | 1 (5)               | 3 (13.6)            | 4 (19)      | 2 (11.1)  | -         | 1 (5)      | 1 (3.8)   |         |
| Others                                                   | 93 (40.1)                 | 17 (32.1)     | 12 (31.6)        | 10 (31.2)        | 6 (30)              | 3 (13.6)            | 3 (14.3)    | 1 (5.6)   | 16 (69.6) | 4 (20)     | 1 (3.8)   |         |

\*Result is significant at  $p \leq 0.001$ , N=number of participants.

**Table 6: Attitude towards MERS-CoV according to gender.**

| Questions                                                                                                         | Gender |      |     |      |     |      |        |      |     |      |     |      | P value |
|-------------------------------------------------------------------------------------------------------------------|--------|------|-----|------|-----|------|--------|------|-----|------|-----|------|---------|
|                                                                                                                   | Male   |      |     |      |     |      | Female |      |     |      |     |      |         |
|                                                                                                                   | Y      |      | N   |      | NS  |      | Y      |      | N   |      | NS  |      |         |
|                                                                                                                   | N      | %    | N   | %    | N   | %    | N      | %    | N   | %    | N   | %    |         |
| Do you think that the MERS-CoV is fatal disease to any person?                                                    | 52     | 15.9 | 88  | 26.9 | 187 | 57.2 | 36     | 20.2 | 42  | 23.6 | 100 | 56.2 | 0.417   |
| Are you worried about one of your family members can get infection with MERS-CoV?                                 | 224    | 68.5 | 59  | 18   | 44  | 13.5 | 130    | 73   | 25  | 14.1 | 23  | 12.9 | 0.479   |
| Are you afraid to go to common places in order to avoid infection?                                                | 243    | 74.3 | 52  | 15.9 | 32  | 9.8  | 146    | 82   | 14  | 7.9  | 18  | 10.1 | 0.037   |
| If you take precautions, can the MERS-CoV infection be prevented?                                                 | 202    | 61.8 | 44  | 13.5 | 81  | 24.7 | 107    | 60.1 | 23  | 12.9 | 48  | 27   | 0.863   |
| If you know that the camels are sources for the transmission of MERS-CoV, would you consume camels’ milk or meat? | 49     | 15   | 215 | 65.7 | 63  | 19.3 | 12     | 6.7  | 136 | 76.4 | 30  | 16.9 | 0.013   |
| If there is a vaccine, would you take it?                                                                         | 256    | 78.3 | 22  | 6.7  | 49  | 15   | 157    | 88.2 | 6   | 3.4  | 15  | 8.4  | 0.022   |
| Is the available information about MERS-CoV in Oman Society sufficient?                                           | 27     | 8.3  | 232 | 70.9 | 68  | 20.8 | 9      | 5.1  | 133 | 74.7 | 36  | 20.2 | 0.386   |
| Are the protective measures sufficient for prevention of MERS-CoV?                                                | 52     | 15.9 | 127 | 38.8 | 148 | 45.3 | 23     | 12.9 | 71  | 39.9 | 84  | 47.2 | 0.665   |
| Is there negative effect of infection on Oman economy?                                                            | 129    | 39.4 | 38  | 11.7 | 160 | 48.9 | 68     | 38.2 | 13  | 7.3  | 97  | 54.5 | 0.238   |
| Does the government institutions able to control the epidemic?                                                    | 150    | 45.9 | 26  | 8    | 151 | 46.1 | 52     | 29.2 | 13  | 7.3  | 113 | 63.5 | 0.001   |
| Do you think yourself at risk of MERS-Cov?                                                                        | 105    | 32.1 | 55  | 16.8 | 167 | 51.1 | 54     | 30.3 | 24  | 13.5 | 100 | 56.2 | 0.471   |
| If you have one of the symptoms of the MERS-CoV, will you go to the Doctor?                                       | 256    | 78.3 | 37  | 11.3 | 34  | 10.4 | 150    | 84.2 | 14  | 7.9  | 14  | 7.9  | 0.266   |
| Do you take safety precautions and prevention?                                                                    | 185    | 56.5 | 64  | 19.6 | 78  | 23.9 | 123    | 69.1 | 23  | 12.9 | 32  | 18   | 0.021   |

Y=yes, N=no, NS=not sure, N=number of participants.

**Table 7: Practice of taking precaution and vaccination (if present) to prevent the MERS-CoV infection based on gender.**

| Questions                                                                        | Gender |      |        |      | P value |
|----------------------------------------------------------------------------------|--------|------|--------|------|---------|
|                                                                                  | Male   |      | Female |      |         |
|                                                                                  | N      | %    | N      | %    |         |
| Which of the following precautions do you take to prevent Coronavirus infection? |        |      |        |      |         |
| I wash hands often.                                                              | 53     | 16.1 | 22     | 12.4 | 0.094   |
| I avoid touching the eyes, nose and mouth with hands.                            | 13     | 4    | 4      | 2.2  |         |
| I throw the tissue in the trash after i use.                                     | 13     | 4    | 2      | 1.2  |         |
| I use masking to cover my nose in crowded places.                                | 13     | 4    | 4      | 2.2  |         |
| All of the above.                                                                | 235    | 71.9 | 146    | 82   |         |
| Which of the following is the reason for getting vaccination (if present)?       |        |      |        |      |         |
| Required for my job.                                                             | 28     | 8.6  | 22     | 12.4 | 0.039   |
| My family doctor advised me to do it.                                            | 36     | 11   | 22     | 12.4 |         |
| Because of my age.                                                               | 18     | 5.5  | 20     | 11.2 |         |
| It is free                                                                       | 139    | 42.5 | 72     | 40.4 |         |
| Other                                                                            | 106    | 32.4 | 42     | 23.6 |         |

N=number of participants.

Furthermore, people were convinced that they would not consume camels' milk or meat if found to be a source of transmission (70%). A significant proportion of the participants felt that the information on MERS-CoV in the Oman society was not sufficient (72%). A fair number of people were uncertain about the preventive measures taken by government institutions, its ability to control the epidemic, and the impact on the economy. About 53% of the participants were not sure whether they were at risk. Majority of the people were inclined to take all necessary safety measures to prevent being infected and would meet a doctor if symptomatic. Females (82%) had greater adherence to precautionary measures than males, and both genders were happy to be vaccinated free of cost (Table 7).

## DISCUSSION

The survey indicates a large proportion of the participants were from Muscat; this is because Muscat is the governorate with the highest population (1.3 million) in Oman.<sup>33</sup> The majority of the participants who took the survey were relatively young males, and this gender difference could be related to the country's male and female population. In a similar type of study conducted in Saudi Arabia by Al-Dowyan et al with 714 participants, in contrast to the current study, the majority of the participants were females (82.7%).<sup>20</sup> According to World Bank data, female population in Oman and Saudi Arabia were 38.9% and 42.2%.<sup>34</sup> The regions in Oman with higher female participation (>55%) in the survey were from Al Batinah North, Musandam, and Dohfar. The active participation age of most people in the survey was within the range of 21-40 years, a similar trend was also noticed in other studies.<sup>20,32,35</sup> Most of the participants had an undergraduate degree and were employed, which will be useful for acquiring the necessary information to

understand the epidemic situation and about the virus. The survey also indicated a small percentage of people in close contact with animals who were more vulnerable to the infection. Income of people is another factor that determines the extent to which a hygienic environment could be maintained, since participants with less income may not have the necessary resources to prevent the spread of infection.

Knowledge level about MERS-CoV among the surveyed population was limited, as the participants did not have a clear understanding about the virus, which was contrary to the study in Saudi Arabia where 99 % of the people surveyed knew about the virus.<sup>20</sup> The higher awareness level was probably due to large numbers of confirmed cases and widespread deaths throughout Saudi Arabia. However, participants from Al Batinah North and Ash Sharqiyah South regions in Oman showed slightly better knowledge levels. The majority of the population were sure that their close family and friends were not infected, suggesting the cases to be isolated events without a major impact on society. Lack of proper understanding of the virus and its treatments was evident through the unsure responses from the participants. This shows that general knowledge on the disease had not percolated sufficiently to the public in all regions of Oman. A similar trend was also reported by Bawazir et al in a study conducted in Riyadh, Saudi Arabia, in 2015.<sup>36</sup> A fair number of participants had awareness of person-to-person, and animals-to-person transmission routes and the various common symptoms. Knowledge on transmission modes and symptoms is essential for protection against the virus. The Ministry of Health in Oman had put in significant effort to be well-prepared to deal with the epidemic; nevertheless, public awareness was low.<sup>9</sup> On the contrary, knowledge on preventive measures such as washing hands,

avoiding touching eyes and nose was high. The response on primary information sources reported by Al-Dowyan et al in Saudi Arabia was also reflected in the current survey, where most people depended on social media for information, which was followed by information from family, friends, and teachers.<sup>20</sup> This suggests that when one person in a family is well-informed, it could provide awareness to the entire family and can help in the efforts taken by the government to spread the information.

With respect to the attitude towards the disease, responses by the people indicted concern towards going out in public and family members contracting the virus. The concern level varied with gender as female participants were slightly more apprehensive compared to male participants. Both genders had a positive attitude towards preventing the spread of the disease. Middle East is well known for breeding camels and using meat and milk as food source and it has been reported that infected camels are one of the important carriers of the virus and therefore people have to be vigilant to protect themselves from infected animals.<sup>25,37</sup> Majority of the people had positive attitude to endure privation of camels' milk and meat. People felt that the information about MERS-CoV in society was not sufficient and were also doubtful on the ability of the government institutions to manage an epidemic situation and its negative impact on the economy. The attitude towards following safety precautions was greater among the females. This was consistent with a study conducted in Saudi Arabia.<sup>20</sup> Vaccination is a safe and effective way to be protected against a disease. Most of the people have opted for free vaccination, while people in Saudi Arabia were prepared to take the vaccine after consultation with the family doctor.<sup>20</sup> Even though some findings of the current study conform to the findings from the earlier study by Alqahtani et al certain fundamental understandings on the disease were lacking.<sup>32</sup>

## CONCLUSION

The survey to study the knowledge, attitude, and practice to handle the Middle East Syndrome Coronavirus (MERS-CoV) in Oman was successfully conducted using an online survey with 505 participants. Most of the participants were males from the Muscat region. The awareness level of the people in Oman was not adequate. The data also showed that basic knowledge about the disease was lacking among a large group of participants. The attitude among the genders was positive towards preventing the spread of the disease, while the level of concurrence was higher among females. Conducting widespread awareness sessions by government institutions and health care workers in and around the cities would enhance the knowledge on the disease.

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