Investigation of Paramedics, Attitude, Knowledge and Practice regarding the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in Iran

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Abstract

Background: The Middle East Respiratory Syndrome coronavirus (MERS-Co V) was known as a human pathogen associated with respiratory symptoms. This study aimed to investigate attitudes, knowledge, and practice about MERS-CoV in paramedics.

Methods: In this quasi-experimental study, 82 paramedics in Iran in April 2019 were selected in a stratified cluster sampling. Paramedics worked in Health Centers in Iran. We performed educational intervention in this study. A four-point Likert scale researcher-made questionnaire containing demographic (9 questions) and MERS-CoV (33 questions) items was administered to collect the data. The collected data were analyzed by SPSS 18 software.

Results: Out of 82 paramedics, who completed questionnaires, 42.7% (35 people) were male, 56.1% (46 people) had a diploma degree, and 19.5% (16 people) had less than 1 year of work experience. about the participants reported 2 laboratory-confirmed infections at Kerman State. In addition, 67.1% (32 people) passed a course to become familiar with disease. Theparamedics' mean age was 37.52±8.88. The knowledge mean score of paramedics was 12.82 (SD=10.04). The highly significant source of data collection in paramedics was the attendance in a course to become familiar with disease (43.9%, 36). The mean score of the practice of paramedics was 13.98 (SD=10.00). The most significant concern in neglecting travel to polluted areas in paramedics was public health defects (39%, 32). There was a significant relationship (P<0.05, t=9.06) between knowledge score and variables: gender (P=0.001), education level (P=0.001), and years in service (P=0.039).

Conclusion: The paramedic had concerns and tend to increase the knowledge regarding prevention. The awareness of the transmission of diseases was the most important factor for modifying practice and preventing diseases. Health decision-makers recognized preventive actions to hinder the transmission of this fatal virus.

Introduction

The Middle East Respiratory Syndrome coronavirus (MERS-CoV), a positive-sense RNA virus, is considered a universal worry due to producing illnesses of medical and veterinary importance. MERS-CoV is a member of the *Coronaviridae* family and includes about 26-33 kb and G+C contents varying from 32-43%.[1] The MERS outbreak appeared in the Middle East and is continuing up to now. The MERS-CoV appeared in Saudi Arabia in 2012. The first death case in Saudi Arabia was reported in June 2012 in Saudi Arabia. The second death case was reported in Qatar in 2012. The third death case was reported in England in February 2013 Followed by the fourth death case in 2013.[2] It is guessed that MERS Co-V has contaminated 2494 people with a Case Fatality Rate (CFR) of 37.1%.[3] It is estimated that there have been 1180 laboratory-confirmed infections and 483 deaths worldwide as of 31 May 2015.[4] It is estimated that there have been about 5 laboratory-confirmed infections. MERS-CoV results in respiratory, enteric, and nervous systems infections, sometimes bronchitis, bronchiolitis, pneumonia, liver cell, and renal disorders.[5, 6] Iranians took 75000 Trips to Saudi Arabia for the annual Hajj pilgrimages in 2015. The Centers for Disease Control and Prevention (CDC) in Iran and the World Health Organization (WHO) have published MERS-CoV trips and illness care advisories for pilgrims traveling to Saudi Arabia due to the potential risk for illness transmission. All cases reported from outside the Middle East have a history of recent travel to the Middle East.[7] The MERS-CoV transmission modes are an infected person's respiratory secretions, including coughing, direct contact between infected persons and other people via close contact, and dromedary camels through the cross-species MERS-CoV contagion.[8]

The zoonotic contagion from an unidentified reservoir and via mediator host to people is proposed. The MERS-CoV appearance in people from dromedary camel, and potentially earlier from the bat, is simplified via the application of a collaborative importing receptor, Dipeptidyl Peptidase 4 (DPP4).[9] Phylogenetic investigation shows that MERS-CoV is associated with bat-related clade 2c beta coronaviruses. The air can have an important role in MERS-CoV contagion. Deprivation of principled prevention measures, deprivation of definitive treatment, and deprivation of prophylactic vaccine lead to complex MERS-CoV illness. There are several reported cases of MERS-CoV worldwide, including Iran. Park et al. reported the birth of a healthy infant from a mother infected with MERS-CoV.[10] Assiri et al. reported that MERS-CoV infection during pregnancy could be related to maternal and perinatal disease and death.[11] Alserehi et al. reported the birth of a healthy newborn from a mother infected with MERS-CoV.[12] This study investigates attitudes, knowledge, and practice about MERS-CoV in paramedics.

Methods

Study Setting and Sample

A cross-sectional study was conducted on 82 paramedics working in Health Centers in Iran. In this quasi-experimental study, paramedics were chosen in April 2019 and classified into 31 groups from 31 provinces and based on population of each province. Based on stratified cluster sampling, 31 provinces were considered as 31 clusters and one participant out of every 1000,000 people in each province was selected. After that, paramedics in each province were selected following stratified random sampling. A researcher-made questionnaire that used four-point Likert scales, including demographic (9) and MERS-CoV (33) questions, was used to gather the data. The questionnaire was given to the paramedics in the first and the last session of MERS-CoV education. The validity and reliability of the questionnaire were examined. Paramedics completed the questionnaires in 40 minutes. Because of the authors' decision and the limitation of the paramedics' awareness about MERS-CoV, four-point Likert scales questions were used and the questions were grouped into three-layer including correct (equal to 1 degree), false (equal to 0 degrees), and unknown (equal to 0 degrees). Based on the tool key and the four-point Likert scale, the limitation of the paramedics' knowledge about the MERS-CoV score is grouped into four categories, including excellent layers (25-33), good (17-24), moderate (9-16), and weak (0-8). We decided to use four-point Likert scales since none of the paramedics selected the neutral option. The questions concerned the restriction of the paramedics' actions and attitude about MERS-CoV followed four-point Likert scales and were classified into four layers, including fully agreed (equal to 4 degrees), agreed (equal to 3 degrees), disagreed (equal to 2 degrees), and fully disagreed (equal to 1 degree). Based on four-point Likert scales, the restriction of the paramedics' actions and attitudes about MERS-CoV score was classified into four-layer, including very agreed (25-33), agreed (17-24), disagreed (9-16), very disagreed (0-8). The demographic questions were: gender, age, education, years of service, marital status, certificate of attendance in a course to become familiar with disease, number of laboratory-confirmed infections, and holding educational course for the undercovered population. The paramedics' knowledge about MERS-CoV questions includes MERS-CoV characterizations (3 questions), time of vaccine injection (1question), treatment (1 question), high-risk groups (3 questions), signs (2 questions), transmission (3 questions), prevention (10 questions), a guide for illnesses (4 questions), disinfection (2 questions), and occurrence rate (4 questions). The paramedics' practice about MERS-CoV questions includes 8 questions. The education method was performed by an educational booklet method during one 75-minute

session about MERS-CoV. Training the groups was done by the same educational booklet method, and the educational content was similar in groups. The 31 groups of paramedics' awareness and reaction about MERS-CoV are collected and evaluated by pre and post-test.[13]

Statistical Analysis

Since the Kolmogorov-Smirnov test showed the normal distribution of the data, the paired sample t–test was used to analyze the information. SPSS 18 software was used to conduct paired t-test (for categorical variables), independent sample t-tests, ANOVA, and descriptive statistics to analyze the gathered data. A P≤0.05 is regarded as significant. According to quantitative variables, the statistical analysis was performed after transforming all the quantitative and qualitative variables into quantitative by using maximum likelihood. Ten faculty members utilize content validity to check the validity of the questionnaire. The questionnaire's validity was measured and affirmed using the Lawshe formula based on the content validity of questions (CVR=0.80).[14] the authors used the test-retest method with eight paramedics in the pilot test to check the reliability of the questionnaire using Kuder-Richardson based on the internal correlation of questions (r=0.81).[14] We employ the GIS software package ArcGIS 9.2 for mapping and analyzing the data to investigate Health Centers locations.[15]

Results

Demographic Characteristics

Figure 1 shows demographic findings (Figure 1). The findings indicated that out of 82 paramedics who completed questionnaires, 42.7% (35 people) are male, 56.1% (46 people) have diploma degrees, and 19.5% (16 people) have less than 1 year in service. The mean of paramedics' years of service is 11.51 (SD=7.98), whereasthe minimum is lower than 1 year, and the maximum is 28 years. They are informed about 2 laboratory-confirmed infections at Kerman State. 67.1% (32 people) pass coerce of familiar to disease (Figure 1). The mean of paramedics' age is 37.52±8.88 (18-54).

Paramedics' Knowledge

The mean score of paramedics' knowledge before and after educational booklet method were 12.82 (SD=10.04) (moderate level, equal to 38%) (and the minimum is 0 and the maximum is 31 scores), and 25.46 (SD=5.20) (excellent level, equal to 76%) (and the minimum is 15 and the maximum is 33 scores), respectively (Table 1). This difference was statistically significant (P<0.001).

Paramedics' Knowledge Source

The highly significant source of information obtaining in paramedics was the attendance in a course to become familiar with disease (43.9%, 36) (Figure 2).
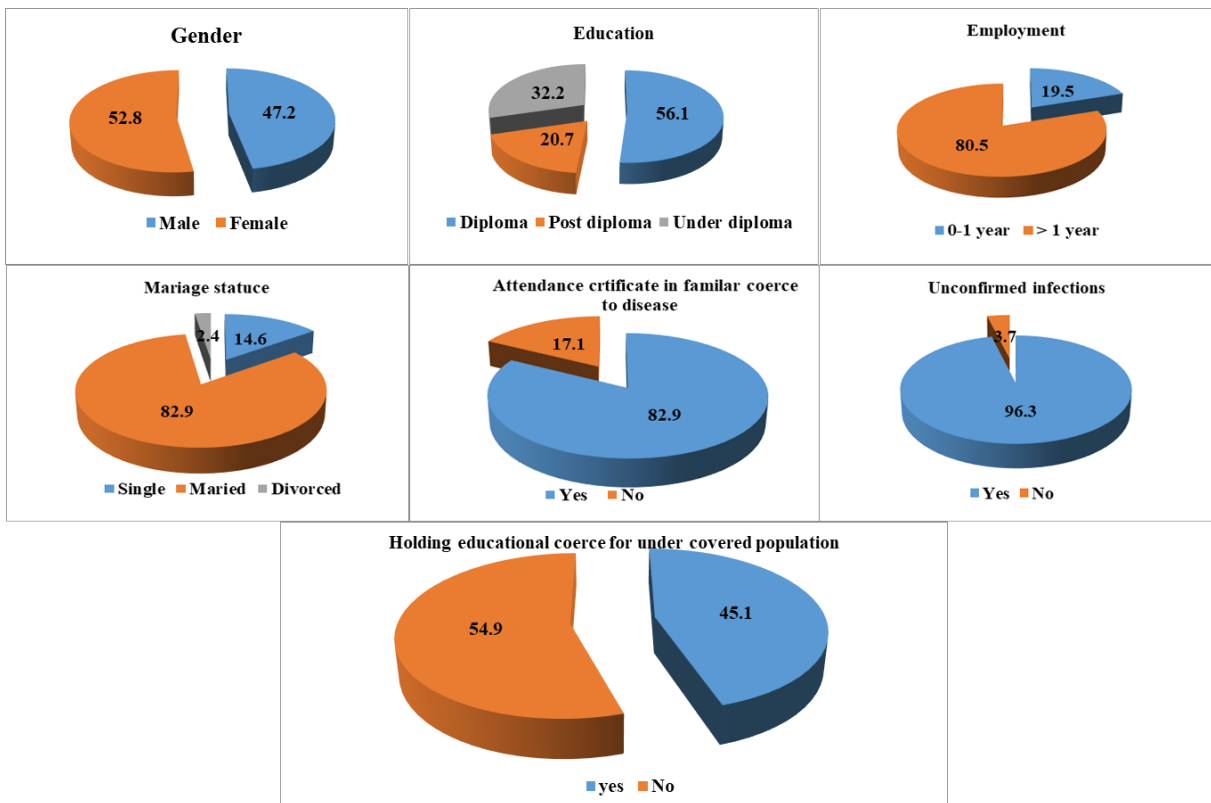

Figure 1: Demographic Characteristics of the Paramedics

Table 1: Frequency of Paramedics' Knowledge and Performance about Middle East Respiratory Syndrome coronavirus (MERS-CoV)

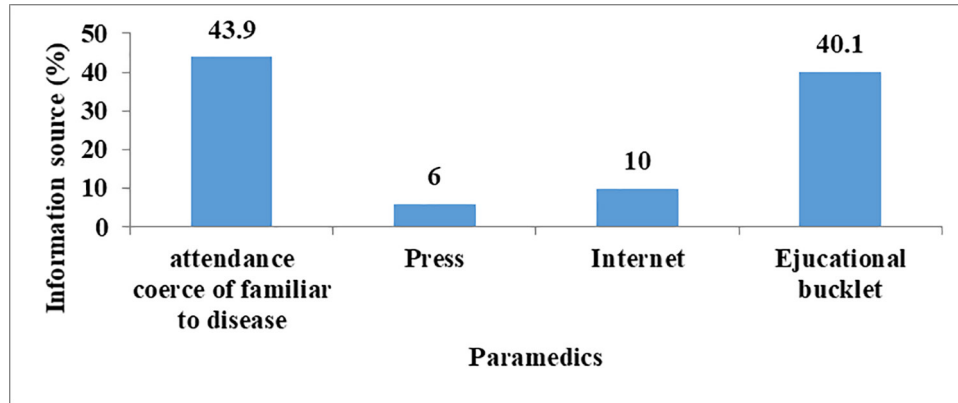|	Knowledge				Performance			
	Excellent (25-33)	Good (17-24)	Moderate (9-16)	Weak (0-8)	Very disagreed (0-8)	Disagreed (9-16)	Agreed (17-24)	Very agreed (25-33)
Pre-test	15 (18.4)	17 (20.7)	12 (14.6)	38 (46.3)	0 (0)	12 (14.6)	70 (85.3)	0 (0)
Post-test	46 (56.1)	35 (42.7)	1 (1.2)	0 (0)	0 (0)	0 (0)	0 (0)	82 (100)

Figure 2: Information Source in Paramedics

Table 2: The Mean and Standard Deviation of Paramedics' Knowledge and Performance about MERS-CoV

	Knowledge			Performance		
	Mean (Standard Deviaion)	Maximum	Minimum	Mean (SD)	Maximum	Minimum
Pre-test	12.82 (10.04)	31	0	13.98 (10.0)	31	12
Post-test	25.46 (3.66)	33	15	29.80 (5.08)	43	27
Paired t-test	t=9.06, degrees of freedom=30, P=0.001				t=7.49, degrees of freedom=27, P=0.001	

Table 3: Relationship between Study Variables

Knowledge	Variable	P value
Pre-test	Situation	Nonsignificant (0.076)
	Age	Nonsignificant (0.149)
	Gender	Significant (0.007)
	Education level	Significant (0.003)
	Marriage status	Nonsignificant (0.238)
	Years of service	Significant (0.05)
	Certificate of attendance coerce of familiarity with disease	Nonsignificant (0.082)
	Number of laboratory-confirmed infections	Nonsignificant (0.887)
	Holding educational coerce for under-covered population	Nonsignificant (0.265)
Post-test	Situation	Non significant (0.065)
	Age	Nonsignificant (0.138)
	Gender	Significant (0.001)
	Education level	Significant (0.001)
	Marriage status	Nonsignificant (0.227)
	Years of service	Significant (0.039)
	Certificate of attendance coerce of familiarity with disease	Nonsignificant (0.05)
	Number of laboratory-confirmed infections	Nonsignificant (0.876)
	Holding educational coerce for under-covered population	Nonsignificant (0.254)

Paramedics' Performance

The mean score of paramedics' performance before and after educational booklet method was 13.98 (SD=10.00) (disagreed level, equal to 38%) (and the minimum is 12 and the maximum is 31 scores), and 29.80 (SD=5.08) (very agreed level, equal to 89%) (and the minimum is 27 and the maximum is 43 scores), respectively (Table 2). This difference was statistically significant (P<0.001).

The results of the paired sample t-test in paramedics' Knowledge showed a significant difference between the two stages of the study, including the pre-test and post-test. In the educational booklet method, knowledge scores and demographic variables: gender (P=0.001), education level (P=0.001), and years in service (P=0.039), are seen as meaningful statistical

relationships (P<0.05). In addition, in the educational booklet method, performance scores and variables: gender (P=0.001), education level (P=0.001), and years in service (P=0.021) are seen as meaningful statistical relationships (P<0.05) (P<0.001) (Tables 2 and 3).

The results of the field-portable GPS and GIS receivers for rapidly mapping paramedics' knowledge and performance about MERS-CoV indicate that out of 82 paramedics in 31 provinces who completed questionnaires, 18.4% (15 paramedics living in 3 provinces, including Ardebil, Tabriz, and Tehran) obtained excellent level (25-33) (Figure 3).

Discussion

Paramedics' personnel is the first level of health service delivery. It is necessary to manage paramedics' personnel perfectly by a proper educational method. In this research, pilot study results showed no difference between the control and pre-test populations. In this research, the first of its type in Iran, the efficacy of this educational measure, such as the educational booklet method on paramedics' attitude, knowledge, and practice, is investigated. In the educational booklet method, it can be concluded that the mean paramedics' knowledge about MERS-CoV enhanced from 12.825 (moderate level, equal to 38%) to 25.46 (excellent level, equal to 76%) comparing education to the past. A study indicated that healthcare workers have good knowledge and a positive attitude toward the MERS.[16] So, it can be deduced that the higher efficiency of the educational booklet method on paramedics' awareness may be due to its effective characteristics and higher attractiveness. The paramedics' mean awareness about MERS-CoV intensely increases from 12.82 (SD=10.04) to 25.46 (SD=5.20) during education in the educational booklet method. The results of the paired sample t-test in paramedics' Knowledge show a significant difference between the two stages of the study, including pre-test and post-test (P=0.001). This result supports that education effectiveness is a function of the learning method.[16] Out of 82 paramedics who completed questionnaires, 46.3% (38 people) had weak knowledge before using the educational booklet method. Studies report that 35% of Australian pilgrims and 65% of French pilgrims knew MERS-CoV circulation on the Arabian Peninsula, respectively.[17, 18] Another study reports that above 50% of the prospective pilgrims have never heard of MERS-CoV.[19] In the educational booklet method, meaningful statistical relationships are observed between mean scores of knowledge, before and after learning. These findings were in line with other research. A study reports that performing a health education program at the entry points to Saudi Arabia improves pilgrims' knowledge.[20] A study shows that e-learning and lecture methods increase the nurses' knowledge about flu disease.[21] It is deducted that the educational booklet method is more influential because of enhancing paramedics' retention rates and information scores.

Attendance in s course to become familiar with disease (43.9%, 36) and educational booklet (40.1%, 33) are the most important sources of knowledge. A study indicates that the internet and social media are the most important sources of knowledge about MERS-CoV among most healthcare workers.[22] Another study reports that scientific journals are the most important source of knowledge about influenza A/H1N1 among healthcare workers.[23]
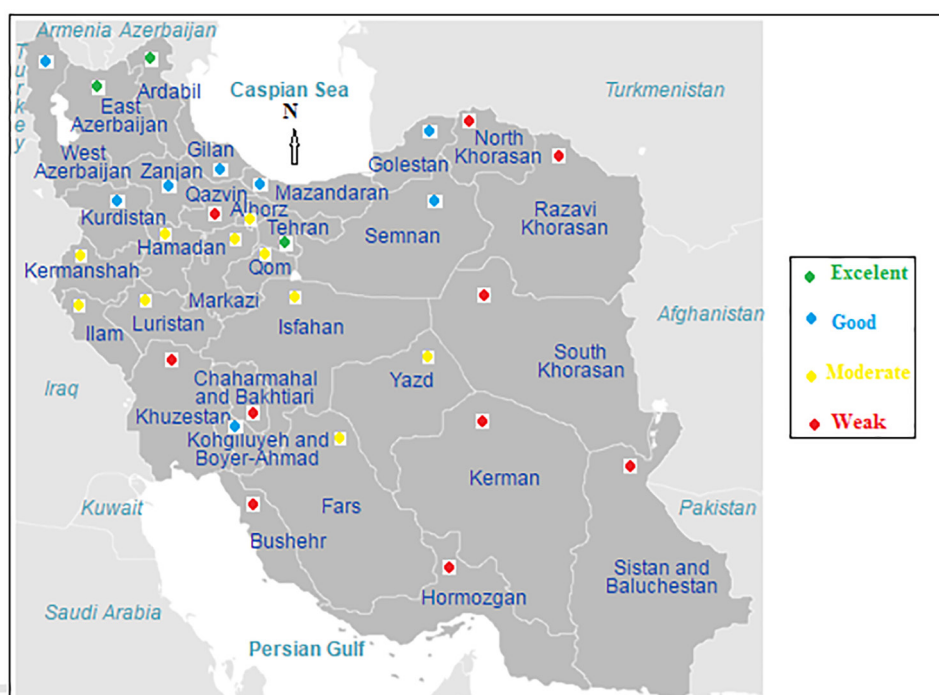

Figure 3: Knowledge Dispersion in Paramedics (Photo source: Authors)

A stdy indicates that community leaders (such as Imams) and healthcare professionals act in a significant role in health promotion measures.[24] Therefore, it can be concluded that the application of the newest educational technologies, such as the web-based courses to become familiar with disease, educational booklet, and health messages about MERS-CoV, are published via the internet. Iran's Ministry of Health, treatment, and medical education increases knowledge in paramedics. A study indicates that the health training program at the entrance locations to Saudi Arabia enhances pilgrims' awareness.[20] A stuy reports a need for an increased public health surveillance program to diagnose suspected cases according to WHO's recommended case definition and investigation protocol.[25] Out of 82 paramedics who completed questionnaires, 64.6% (53 people) and 62.2% (51 people) do not know MERS-CoV treatment and signs, respectively. Therefore, it can be concluded that the performance of intervention measures such as improving knowledge about MERS-CoV treatment and signs increases paramedics' knowledge. A study explains the differential transmissibility effect on the magnificence of self-limited outbreaks.[26] Out of 82 paramedics who completed questionnaires, 24.4% (20 people) do not know high-risk groups exposed to MERS-CoV illness, such as renal dialysis patients. Among 82 paramedics who completed questionnaires, 15.9% (13 people) did not know essential advice about MERS-CoV illness, such as the incubation period (two weeks). Therefore, these paramedics need to educate about MERS-CoV epidemiology for the best surveillance and control of disease, diagnosis of disease, and administration of the most efficient antiviral medications given before and after symptoms develop. A study explains the surveillance biases and transmissibility of MERS-CoV.[27] Out of 82 paramedics who completed questionnaires, 50% (41 people) had no knowledge about no or low protection via the seasonal influenza vaccine. A study offers no or low protection in contact with via the seasonal influenza vaccine.[28] Therefore, it can be concluded that the performance of intervention measures such as awareness programs on MERS-CoV via the health authorities increases paramedics' knowledge.

The most positive paramedics' attitudes are accentuated by getting a fever of more than 38 centigrade degrees, accentuated to apply to a face mask, and not traveling to polluted areas to avoid getting an infection. On the other hand, the most negative paramedics' attitudes are accentuated to not prescribing drug against MERS-CoV, not feeding in malnutrition group, not vaccinating to avoid getting an infection. A study reports that the positive healthcare workers' response is to wear protective equipment when dealing with healthcare-associated infections.[29] In the educational booklet method, it can be concluded that the mean score of paramedics' attitude about MERS-CoV enhances from 13.25 (moderate level, equal to 39%) to 26.61 (excellent level, equal to 77%) after comparing education to the past. Therefore, the performance of health education programs such as the educational booklet method leads to more positive paramedics' attitudes toward the declining trend of MERS-CoV prevalence via their active participation in the infection control program.

The most agreed paramedics' performances are practice to get a fever of more than 38 centigrade degrees, consume pasteurized milk and apply a face mask, and practice to hospitalize at home due to the illness with light symptoms to prevent the infection outbreak.

The most disagreed paramedics' performances are anxiety about drug resistance against MERS-CoV, anxiety about malnutrition in the aging group, and no practice in vaccinating in order not to get an infection. It can be concluded that the application of educational booklet methods regarding the use of personal protective tools such as face masks and gloves, hand hygiene, lifestyle improvement, and increasing knowledge about MERS-CoV infection result in lower morbidity and mortality due to MERS-CoV infection. Another study shows that healthcare workers had high-level performance in infection control practices.[30] In addition, the observer's presence improves the paramedics' performance and behavior.

Gender, education level, and years in service are seen as meaningful statistical relationships (P<0.05). Therefore, higher years in service increased the mean score for paramedics' knowledge due to more applied experience and more expertise.

Moreover, at a higher education level increased the mean score for paramedics' knowledge due to preevious experiences with similar viral epidemics such as SARS and clinical training. A study reports a need to enhance the healthcare providers' knowledge about MERS-CoV disease.[31] Age did not show a statistically significant relationship (P>0.1). However, anoher study reports a statistically significant relationship regarding the ageage (P<0.05).[32] Therefore, It can be concluded that gender is considered a significant predictor of paramedics' knowledge. This result is agreed with Almutairi et al.[33] Therefore, there is a need to provide facilities for female paramedics, such as more opportunities to meet other medical specialists through attending viral infections congress.

A study reports that the level of information about protective measures is not enough (64%).[34] Therefore, it can be concluded that higher education level leads to more protective measures and essential advice about MERS-CoV. A study reports that old Iranian pilgrims with low education levels have inadequate information about health issues, although they have good health practices and attitudes.[35] It is concluded

that the effect of education method on MERS-CoV is due to several reasons, such as differences in paramedics and teachers and how the curriculum in MERS-CoV is arranged. The conditions, resources, and educational purposes of the curriculum in MERS-CoV are necessary for influential education. Based on the results of the present study, the educational booklet method enhances the paramedics' knowledge and performance scores. Paramedics in the educational booklet method encounter the highly attractive education method, resulting in higher motivation, attendance, and practice. In addition, enhancing the paramedics' information improve their performances. The use of teaching methods, including educational booklets, an efficient and helpful educational method, is a positive perspective of the present study. It is suggested that other researchers can apply this method to save time and be cost-effective. The most significant concerns in neglecting travel to polluted areas in paramedics are public health defects (39%, 32). The research limitations consists of excluding other health workers and observer's effect on paramedics' performance and behavior. Moreover, although the total sample size was reasonable and based on pilot study results (n=82), it was still small. The control population was pre-test population, but it would be better if the control group was independent. These results are exploratory and warrant further investigation due to small sample size.

Conclusion

The results show that out of 82 paramedics who completed questionnaires, 18.4% (15 people) and 56.1% (46 people) had excellent knowledge before and after the educational booklet method, respectively.

Out of 82 paramedics who completed questionnaires, 8.5% (7 people) and 100.0% (82 people) had a positive attitude before and after the educational booklet method, respectively. Among 82 paramedics who completed questionnaires, 0.0% (0 people) and 100.0% (82 people) had a very agreeable performance before and after the educational booklet method, respectively. In this research, it is estimated that this educational intervention and its application can be reliable in fulfilling our demands in health centers and in increasing paramedics' knowledge, attitude, and performance about MERS-CoV infection. Moreover, since paramedics personnel have a very important role in coordinating and helping sick people during epidemics, related training and planning are recommended to prepare them for appropriate actions in such situations. It is suggested that further studies investigate other health workers and other microbial infections. Moreover, health decision-makers should consider such results to improve the paramedics' knowledge, attitude, and performance about MERS-CoV infection and to conduct training courses in this field continuously and operationally.

Conflict of interest: None declared.

References

1. Fehr AR, Perlman S. Coronaviruses: an overview of their replication and pathogenesis. Coronaviruses. 2015:1-23. doi:10.1007/978-1-4939-2438-7_1. PMID:25720466; PMCID: PMC4369385.

2. Farooq HZ, Davies E, Ahmad S, Machin N, Hesketh L, Guiver M, et al. Middle East respiratory syndrome coronavirus (MERS-CoV)—Surveillance and testing in North England from 2012 to 2019. International Journal of Infectious Diseases. 2020;93:237-44. doi:10.1016/j.ijid.2020.01.043. PMID:32004690; PMCID:PMC7129156.

3. Organization WH. Middle East respiratory syndrome coronavirus (MERS-CoV). 2019.

4. Zumla A, Hui DS, Perlman S. Middle East respiratory syndrome. The Lancet. 2015;386(9997):995-1007. doi:10.1016/S0140-6736(15)60454-8. PMID: 26049252; PMCID: PMC4721578.

5. Ramadan N, Shaib H. Middle East respiratory syndrome coronavirus (MERS-CoV): A review. Germs. 2019;9(1):35. doi:10.18683/germs.2019.1155. PMID: 31119115; PMCID: PMC6446491.

6. Chan RW, Hemida MG, Kayali G, Chu DK, Poon LL, Alnaeem A, et al. Tropism and replication of Middle East respiratory syndrome coronavirus from dromedary camels in the human respiratory tract: an in-vitro and ex-vivo study. The Lancet Respiratory Medicine. 2014;2(10):813-22. doi:10.1016/S2213-2600(14)70158-4. PMID: 25174549; PMCID: PMC7164818.

7. Asaad AM, El-Sokkary RH, Aedh AI, Alzamanan MAA, Khalil FO. Exploring knowledge and attitude toward Middle East respiratory syndrome-coronavirus (MERS-CoV) among university health colleges' students, Saudi Arabia: a cross sectional study. Am J Infect Dis Microbiol. 2019. doi: 10.3844/ajidsp.2019.37.43.

8. Alagaili AN, Briese T, Mishra N, et al. Middle East respiratory syndrome coronavirus infection in dromedary camels in Saudi Arabia. MBio. 2014;5(2). doi: 10.1128/mBio.00884-14. PMID: 24570370; PMCID: PMC3940034.

9. Van Den Brand JM, Smits SL, Haagmans BL. Pathogenesis of Middle East respiratory syndrome coronavirus. The Journal of pathology. 2015;235(2):175-84. doi:10.1002/path.4458. PMID: 25294366; PMCID: PMC7167882.

10. Park MH, Kim HR, Choi DH, Sung JH, Kim JH. Emergency cesarean section in an epidemic of the middle east respiratory syndrome: a case report. Korean journal of anesthesiology. 2016;69(3):287. doi:10.4097/kjae.2016.69.3.287. PMID: 27274377; PMCID: PMC4891544.

11. Assiri A, Abedi GR, Al Masri M, Bin Saeed A, Gerber SI, Watson JT. Middle East respiratory syndrome

coronavirus infection during pregnancy: a report of 5 cases from Saudi Arabia. Clinical Infectious Diseases. 2016;63(7):951-3. doi: 10.1093/cid/ciw412. PMID: 27358348; PMCID: PMC5812010.

12 Alserehi H, Wali G, Alshukairi A, Alraddadi B. Impact of Middle East Respiratory Syndrome coronavirus (MERS-CoV) on pregnancy and perinatal outcome. BMC infectious diseases. 2016;16(1):1-4. doi: 10.1186/s12879-016-1437-y. PMID: 26936356; PMCID: PMC4776369.

13 Kashi G, Doost KK. Comparison of the effect of lecture and video projector teaching methods on students' attitude, knowledge and practice. International Research Journal of Teacher Education. 2015;2(3):030-5.

14 Ghafourifard M, Haririan HR, Aghajanloo A. The opinion of nursing student about case-based teaching method and comparison with lecture. Future of medical education journal. 2013;3(1):8-12.

15 Kashi G, Khoshab F. An investigation of the chemical quality of groundwater sources. Donnish Jour Res Environ Stud. 2015;2(3):18-27.

16 Khan MU, Shah S, Ahmad A, Fatokun O. Knowledge and attitude of healthcare workers about middle east respiratory syndrome in multispecialty hospitals of Qassim, Saudi Arabia. BMC public health. 2014;14(1):1-7. doi:10.1186/1471-2458-14-1281. PMID: 25510239; PMCID: PMC4300996.

17 Gautret P, Benkouiten S, Salaheddine I, Belhouchat K, Drali T, Parola P, et al. Hajj pilgrims' knowledge about Middle East respiratory syndrome coronavirus, August to September 2013. Eurosurveillance. 2013;18(41):20604. doi:10.2807/1560-7917.es2013.18.41.20604. PMID: 24135123.

18 Tashani M, Alfelali M, Barasheed O, Fatema FN, Alqahtani A, Rashid H, et al. Australian Hajj pilgrims' knowledge about MERS-CoV and other respiratory infections. Virologica Sinica. 2014;29(5):318-20. doi: 10.1007/s12250-014-3506-y. PMID: 25338843; PMCID: PMC7091107.

19 Sahin MK, Aker S, Tuncel EK. Knowledge, attitudes and practices concerning Middle East respiratory syndrome among Umrah and Hajj pilgrims in Samsun, Turkey, 2015. Eurosurveillance. 2015;20(38):30023. doi:10.2807/1560-7917.ES.2015.20.38.30023. PMID: 26535787.

20 Turkestani A, Balahmar M, Ibrahem A, Moqbel E, Memish Z. Using health educators to improve knowledge of healthy behaviour among Hajj 1432 (2011) pilgrims. East Mediterr Health J. 2013;19(Suppl2):S9-12. doi:10.26719/2013.19.SUPP2.S9. PMID: 24673092.

21 Khatoni A, Nayery ND, Ahmady F, Haghani H. Comparison the effect of Web-based Education and Traditional Education on Nurses Knowledge about Bird Flu in Continuing Education. Iranian journal of medical education. 2011;11(2).

22 Nour MO, Babilghith AO, Natto HA, Al-Amin FO, Alawneh SM. Knowledge, attitude and practices of healthcare providers towards MERS-CoV infection at Makkah hospitals, KSA. Int Res J Med Med Sci. 2015;3(4):103-12.

23 Albano L, Matuozzo A, Marinelli P, Di Giuseppe G. Knowledge, attitudes and behaviour of hospital health-care workers regarding influenza A/H1N1: a cross sectional survey. BMC infectious diseases. 2014;14(1):1-7. doi:10.1186/1471-2334-14-208. PMID: 24739890. PMCID: PMC4021506.

24 Asekun-Olarinmoye IO, Asekun-Olarinmoye EO, Fatiregun A, Fawole OI. Perceptions and activities of religious leaders on the prevention of HIV/AIDS and care of people living with the HIV infection in Ibadan, Nigeria. HIV/AIDS (Auckland, NZ). 2013;5:121. doi: 10.2147/HIV.S42959. PMID: 23785246. PMCID: PMC3682906.

25 Malik M, Mahjour J, Opoka M, Mafi AR. Emergence of novel human coronavirus: public health implications in the Eastern Mediterranean Region. EMHJ-Eastern Mediterranean Health Journal, 18 (11), 1084-1085, 2012. 2012.

26 Blumberg S, Funk S, Pulliam JR. Detecting differential transmissibilities that affect the size of self-limited outbreaks. PLoS Pathog. 2014;10(10):e1004452. doi:10.1371/journal.ppat.1004452. PMID: 25356657. PMCID: PMC4214794.

27 Cauchemez S, Fraser C, Van Kerkhove MD, Donnelly CA, Riley S, Rambaut A, et al. Middle East respiratory syndrome coronavirus: quantification of the extent of the epidemic, surveillance biases, and transmissibility. The Lancet infectious diseases. 2014;14(1):50-6. doi: 10.1016/S1473-3099(13)70304-9. PMID: 24239323. PMCID: PMC3895322.

28 Partridge J, Kieny MP. Global production capacity of seasonal influenza vaccine in 2011. Vaccine. 2013;31(5):728-31. doi: 10.1016/j.vaccine.2012.10.111. PMID: 23149268.

29 Thu T, Anh N, Chau N, Hung N. Knowledge, attitude and practices regarding standard and isolation precautions among Vietnamese health care workers: a multicenter cross-sectional survey. Intern Med. 2012;2(4):115. doi:10.4172/2165-8048.1000115.

30 AlSaleh E, Ahmed I, Mwanri L. Healthcare workers' knowledge, attitudes and practices in King Fahad Hofuf hospital, Saudi Arabia. Journal of pharmaceutical and biomedical sciences. 2014;4(5):410-21.

31 Joukar F, Mansour-Ghanaei F, Soati F, Meskinkhoda P. Knowledge levels and attitudes of health care professionals toward patients with hepatitis C infection. World Journal of Gastroenterology: WJG. 2012;18(18):2238. doi:10.3748/wjg.v18.i18.2238. PMID: 22611318. PMCID: PMC3351775.

32 Gizaw GD, Alemu ZA, Kibret KT. Assessment of knowledge and practice of health workers towards tuberculosis infection control and associated factors in public health facilities of Addis Ababa, Ethiopia: A cross-sectional study. Archives of public health. 2015;73(1):1-9. doi:10.1186/s13690-015-0062-3. PMID: 25821581. PMCID: PMC4377015.

33 Almutairi KM, Al Helih EM, Moussa M, Boshaiqah AE, Saleh Alajilan A, Vinluan JM, et al. Awareness, attitudes, and practices related to coronavirus pandemic among public in Saudi Arabia. Family & community health. 2015;38(4):332-40. doi:10.1097/FCH.0000000000000082. PMID: 26291193.

34 Alqahtani A, Wiley K, Willaby H, BinDhim N, Tashani M, Heywood A, et al. Australian Hajj pilgrims' knowledge, attitude and perception about Ebola, November 2014 to February 2015. Eurosurveillance. 2015;20(12):21072. doi:10.2807/1560-7917.es2015.20.12.21072. PMID: 25846489.

35 Tabatabaei A, Mortazavi SM, Shamspour N, Shushtarizadeh N. Health knowledge, attitude and practice among Iranian pilgrims. Iranian Red Crescent Medical Journal. 2015;17(2):e12863. doi:10.5812/ircmj.12863. PMID: 25838929. PMCID: PMC4376984.