ORIGINAL ARTICLE

Middle East respiratory syndrome–related knowledge, preventive behaviours and risk perception among nursing students during outbreak

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Aims and objectives. The aim of this study was to survey nursing students' Middle East respiratory syndrome–related knowledge, preventive behaviours and risk perception to examine the correlations among the variables during a Middle East respiratory syndrome outbreak.

Background. Middle East respiratory syndrome is a new viral respiratory illness. Nursing students who engage in clinical practice at hospitals may have been exposed to Middle East respiratory syndrome infection during the Middle East respiratory syndrome outbreak.

Design. This study was a descriptive cross-sectional survey.

Methods. Participants (n = 249) were nursing students in their third or fourth year of the programme who were engaged in clinical practice for eight hours per day at the tertiary hospitals with Middle East respiratory syndrome patients. Knowledge, preventive behaviours and risk perception related to Middle East respiratory syndrome were measured using scales developed through a preliminary survey and validity testing.

Results. The subjects' knowledge level of Middle East respiratory syndrome was 84·4%; their practice of preventive behaviours was rated at 44·5%; and their risk perception rating was 2·4 out of 5. Middle East respiratory syndrome–related risk perception was significantly different according to gender and Middle East respiratory syndrome education. Middle East respiratory syndrome–related knowledge was significantly correlated with preventive behaviours and risk perception.

Conclusion. Considering the low scores for items regarding knowledge and preventive behaviours, it is necessary to develop effective and systematic publicity and education programmes for nursing students. Enhancing Middle East respiratory syndrome–related knowledge by considering cooperation between hospitals and universities will sharpen nursing students' risk perception of the disease and effectively increase their preventive behaviours.

Relevance to clinical practice. Similar to other emerging infectious diseases, Middle East respiratory syndrome outbreaks may occur in other countries. The results of this study can be used to develop and apply efficient and feasible Middle East respiratory syndrome education programmes for nursing students during Middle East respiratory syndrome outbreaks.

What does this paper contribute to the wider global clinical community?

- Middle East respiratory syndrome coronavirus (MERS-CoV) is a new viral respiratory illness and nursing students in clinical rotations at hospitals with MERS-infected patients may have been at risk for infection.
- The nursing students' knowledge level of MERS was 84·4%; their practice of preventive behaviours was rated at 44·5%; and their risk perception rating was 2·4 out of five; MERS related knowledge was significantly correlated with preventive behaviours and risk perception.
- The results about such a new infectious disease are meaningful as basic information for improving nursing students' nursing education and nursing practice and may be reflected in clinical practice.

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Introduction

Middle East respiratory syndrome coronavirus (MERS-CoV) is a new viral respiratory illness, first reported in Saudi Arabia in 2012 (Centers for Disease Control [CDC] 2015). Like other emerging infectious diseases, MERS outbreaks may occur anywhere in the world (CDC 2015). A patient infected with MERS-CoV was first identified in Korea on 11 May 2015. He was a 68-year-old businessman who had resided in the Middle East region for 13 days before returning to Korea (Hui *et al.* 2015, Korea Centers for Disease Control [KCDC] 2015). The first patient presented symptoms such as high fever and coughing and was diagnosed late on the 19th of June (KCDC 2015). As a result of his late diagnosis, MERS began to spread through the hospital. The importation of this emerging infectious disease created a national medical crisis in Korea. As of November 25, 2015, there were 186 patients with diagnosed with MERS, and over 16,000 people had been in contact with MERS patients. Of those infected either by patient zero or secondarily, 38 (20·4%) have died (KCDC 2015). Of particular import, 39 (21%) of those infected were healthcare workers (HCWs), including eight doctors and 15 nurses, who were caring for or treating MERS patients (KCDC 2015).

Nursing students have various clinical experiences, and, similar to other HCWs (Maltezou & Tsiodras 2014), they have a relatively high risk of exposure to infection (Choi & Yang 2010). In particular, nursing students in clinical rotations at hospitals with MERS patients may have been at risk for infection. However, there have been few previous studies regarding MERS-related knowledge, preventive behaviours and risk perception among nursing students.

Background

Many studies about MERS and healthcare workers have been conducted in Middle Eastern countries. These studies include the epidemiology of HCWs' contact with MERS patients or the risk of infection in HCWs who have had contact with MERS patients (Bialek *et al.* 2014, Hall *et al.* 2014, Maltezou & Tsiodras 2014); HCWs' knowledge and attitudes regarding MERS (Khan *et al.* 2014); and the MERS-related knowledge, attitude and performance of Hajj

pilgrims (Gautret *et al.* 2013). Lack of knowledge within the general population about an infectious disease can create fear, misunderstanding and prejudice, which may lead to the avoidance of infected people or HCWs (Gautret *et al.* 2013, Khan *et al.* 2014). The transmission of MERS-CoV to HCWs has also been reported in other countries (Assiri *et al.* 2013, Memish *et al.* 2013). As hospitals continue to admit patients who may have contracted MERS, the rapid identification of the disease and effective implementation of infection control precautions could help protect HCWs (Bialek *et al.* 2014, Hall *et al.* 2014).

Moreover, to prevent the spread of an infectious disease, it is important to correctly follow prevention strategies. A basic survey of nursing students' MERS-related knowledge, preventive behaviours and risk perception is necessary because MERS is currently spreading in hospitals throughout Korea. Although hospital practice has been discontinued at this time, nursing students are future professionals who will be expected to cope with emerging infectious diseases (Choi & Yang 2010). By surveying the MERS-related knowledge, preventive behaviours and risk perception in those nursing students at high risk of exposure to MERS, we hope to provide basic information for designing health education programmes to efficiently and feasibly prevent MERS-CoV infection in nursing students and contribute to their compliance of infection prevention guidelines and health promotion.

Materials and methods

Study aims

The purpose of this study was to survey nursing students' MERS-related knowledge, preventive behaviours and risk perception during a MERS outbreak. The specific goals of this survey were to examine these factors in nursing students, analyse the differences according to the subjects' general characteristics and assess their correlations.

Study design, participants and procedure

This study was a descriptive cross-sectional survey. Nursing students from two- to four-year nursing college programmes in two cities were sampled using convenient

sampling. Participants were limited to nursing students in their third or fourth year of the programme who were engaged in clinical practice for eight hours/day at tertiary hospitals in Seoul, Gyeonggi-do and Incheon treating MERS patients. At the request of those medical institutions handling MERS patients, and in full agreement with the school committee from the study participants' university, the nursing students' clinical rotations at those hospitals have been put on hiatus indefinitely. Instead, classes usually held in a hospital settings were conducted at the schools, with each lecture room being supplied with alcohol hand rub. Additionally, those nursing students with tympanic temperatures above 37·5 °C (the baseline for diagnosing MERS) were prohibited from attending school (KCDC 2015).

Data were collected between 26th–28th June 2015. The questionnaire was administered in person during onsite visits to each class. The responses were collected by the researcher at the end of the survey sessions.

The sample size was calculated using G-Power version 3.1 (Faul *et al.* 2007). The lowest number of participants for the required sample size was 134 for a significance level of 0·05, moderate effect size of 0·15 and power of 0·95 in correlation analysis. However, dropout rate was considered and 260 students were sampled. Questionnaires with unanswered items were excluded, leading to 249 questionnaires being used for the final data analysis.

Measures

Data were collected using a questionnaire divided into four sections: demographics, MERS-related knowledge, preventive behaviours for MERS and risk perception of MERS.

Demographics

The first section of the questionnaire contained items surveying demographic information, including gender, grade, age, religion, MERS education and type of MERS education. The demographic information items were composed based on a review of the previous literature (Choi & Yang 2010, Gautret *et al.* 2013).

MERS-related knowledge

The scale for the level of MERS-related knowledge was developed by the researcher of this study based on the CDC (2015) and KCDC (2015) guidelines for responding to MERS, as well as the items used to survey the MERS-related knowledge of Saudi Arabian HCWs (Khan *et al.* 2014). This scale consisted of 16 items, and its content validity index (CVI) was tested on a four-point scale (1 = 'not related'; 4 = 'very related') by two infection

control nurse practitioners, one infectious disease specialist and one nursing professor. One item that scored ≤2 was removed, and the 15-item scale was then used in a pilot study with 20 randomly selected nursing students not included in the study sample. The final scale used in this survey had 15 items.

The 15 items surveyed the participants' knowledge of the cause of MERS onset (three items); transmission mechanisms (two items); symptoms and latent period (two items); examination, treatment and prevention methods (seven items); and guidelines for patient care (one item). A high score was defined as a high level of knowledge. A correct answer was assigned 1 point and an incorrect answer or 'don't know' were assigned 0 points. The total score was converted into a percentile. The final CVI assessed by experts was 0·95; the reliability (Kuder-Richardson 20) in the pilot study and this survey were 0·65 and 0·72, respectively.

Preventive behaviours for MERS

The scale for evaluating the performance rate of preventive behaviours was developed by this study's researcher based on items used to survey the MERS prevention practices of Hajj pilgrims (Gautret *et al.* 2013) and the KCDC (2015) guidelines for responding to MERS in Korea. The content validity of the scale was tested by two infection control professors, two infection control nurse practitioners and one infectious disease specialist. The CVI of this scale was 0·90. The nine-item scale consisted of five items about reducing the use of public places in daily life, one item about avoiding people with cough, one item about intensive cleaning and disinfection, one item about handwashing and one item about talking with people nearby. The participant was assigned one point if he or she practised the behaviour and 0 points if he or she did not practise or care about the behaviour. The total score ranged from 0–9; a high score was defined as a high performance rate. The total score was converted to a percentile. The reliability (Cronbach's α) of the scale was 0·73 in the pilot study with 20 nursing students and 0·77 in this survey about preventive behaviour for MERS.

Risk perception of MERS

Middle East respiratory syndrome–related risk perception was defined as the subject's fear of being infected with MERS; the scale on risk perception of MERS was developed by this study's researcher based on SARS-related risk perception as suggested by Brug *et al.* (2004). The CVI of this scale, as tested by two infection control nurse practitioners, one infectious disease specialist and one nursing

professor, was 0·90. The scale had two items (i.e. 'I may be infected with MERS more easily than others' and 'I am afraid to be infected with MERS'), and each item was answered on a four-point scale from 1 ('not at all') to 4 ('absolutely yes'). A high score was defined as a high-risk perception of MERS infection. The reliability (Cronbach's α) of the scale was 0·76 in the pilot study with 20 nursing students and 0·72 in this survey about risk perception of MERS.

Data analysis

Collected data were analysed using SPSS/WIN version 21.0 (IBM, Armonk, NY, USA). The major variables (MERS-related knowledge, preventive behaviours and risk perception) were verified to have normal distribution using the Kolmogorov–Smirnov test. The subjects' general characteristics and MERS-related knowledge, preventive behaviours and risk perception were analysed through frequencies, percentages, means and standard deviations. The reliability of the related variables was calculated using Cronbach's α. Differences in the major variables according to general characteristics were analysed using independent *t*-test, and the correlations among the variables were computed using the independent Pearson's correlations test.

Ethical considerations

Approval for conducting this study was obtained from the institutional review board of our university (1044396-201504-HR-029-01).

Results

Subjects' characteristics

Of the 249 subjects, 88·4% were women, and the average age of all subjects was 21·9 years. In addition, 52·2% of the subjects were in their last year of college, and 57·4% held no religious beliefs. Among the participants, 51·4% had received some form of MERS education, and 86·7% of the education programmes came primarily from watching TV reports.

The perception of MERS-related risk was significantly different according to gender and MERS education ($p < 0.05$). MERS-related knowledge and preventive behaviours were not significantly different according to the subjects' general characteristics (Table 1).

Characteristics of MERS-related knowledge, preventive behaviours and risk perception

The mean level of MERS-related knowledge was 84·4%. The MERS-related knowledge item with the highest correct-answer rate (97·6%) was 'When coughing frequently, the use of a mask prevents droplet transmission (True)'. However, the items with the lowest correct-answer rates were 'MERS is diagnosed using sputum, laryngopharyngeal discharge, and bronchial washing fluid (True)' (57·6%) and 'MERS is treated with other antiviral drugs on the market (False)' (59·6%).

The mean performance rate of MERS-related preventive behaviours was 44·5%. The MERS-related preventive

Table 1 Differences in the level of knowledge, preventive behaviours and risk perception of Middle East respiratory syndrome according to sample characteristics (n = 249)

Variables	Characteristic	n (%)	Knowledge (range: 0–100%) M ± SD	t	Preventive behaviours (range: 0–100%) M ± SD	t	Risk perception (range: 1–5) M ± SD	t
Gender	Male	29 (11·6)	83·2 ± 18·9	0·247	36·4 ± 32·7	2·877	1·8 ± 0·9	14·4*
	Female	220 (88·4)	84·6 ± 13·7		45·6 ± 26·6		2·5 ± 0·9	
Grade	Junior	119 (47·8)	83·8 ± 11·8	0·446	41·0 ± 24·7	3·840	2·3 ± 0·9	1·457
	Senior	130 (52·2)	85·0 ± 16·4		47·7 ± 29·4		2·7 ± 1·0	
Age in years	M ± SD (range)	21·9 ± 1·8 (20–32)						
Religion	Have	106 (42·6)	85·0 ± 13·4	0·327	45·4 ± 27·7	0·225	2·4 ± 0·9	0·446
	Do not have	143 (57·4)	84·0 ± 15·1		43·8 ± 27·3		2·4 ± 1·0	
Received MERS education	Yes	128 (51·4)	85·0 ± 13·8	0·500	45·3 ± 27·3	0·209	2·5 ± 1·0	6·216*
	No	121 (48·6)	83·7 ± 15·1		43·7 ± 27·7		2·2 ± 0·9	
MERS education types[†]	TV	111 (86·7)	85·4 ± 85·4	0·592	46·4 ± 26·8	1·427	2·3 ± 0·9	0·378
	Others	17 (13·3)	82·6 ± 13·7		37·9 ± 30·2		2·1 ± 1·1	

MERS, Middle East respiratory syndrome; TV, television; M, mean; SD, standard deviation.
*$p < 0.05$. Computed by independent *t*-test.
[†]Only calculated for subjects who answered 'yes' for the received MERS education variable.

behaviour items with the highest performance rates were 'I washed the hands more often than usual' (85·5%) and 'I avoided coughing around people as much as possible' (65·9%). However, the items with the lowest performance rates were 'I reduced the use of public transportation' (26·1%) and 'I increased the frequency of cleaning and disinfecting items that can be easily touched with hands (i.e. door handles and surfaces)' (29·7%).

The total mean score of MERS-related risk perception was 2·4 out of 5, and the score for fear of being infected with MERS was 2·7 out of 5 (Tables 2 and 3).

Correlations among the main variables

Middle East respiratory syndrome–related knowledge was significantly correlated with preventive behaviours ($r = 0.27$; $p < 0.01$) and risk perception ($r = 0.13$; $p < 0.05$), and level of preventive behaviours was significantly correlated with risk perception ($r = 0.29$; $p < 0.01$) and age ($r = 0.14$; $p < 0.05$; Table 4).

Discussion

Middle East respiratory syndrome is a novel infectious disease that emerged about three years ago, and its cause, transmission mechanism and remedy are not yet evident (Al-Tawfiq & Memish 2014, Hall *et al*. 2014; CDC 2015).

Emerging infectious diseases like MERS can happen anywhere throughout the world, and nursing students who are easily excluded from a hospital's group of healthcare workers can also be exposed to the risk of infection (Maltezou & Tsiodras 2014).

This study is meaningful because, to the best of our knowledge, it is the first study regarding MERS-related knowledge, preventive behaviours and risk perception among nursing students, who will be future HCWs. There have been few previous studies regarding MERS-related knowledge, preventive behaviours and risk perception among nursing students; therefore, some of the results of this study were compared with studies on other new emerging infectious diseases with similar coronavirus.

According to the results of this study, Korean nursing students' MERS-related knowledge level was high (84·4%). However, they had low performance rates of preventive behaviours (44·5%). More than half of the subjects in this study received some form of MERS education, most of which was obtained through TV, which is similar to the findings from a previous study in which knowledge about emerging infectious diseases was obtained by watching TV reports independently of the subjects' nursing studies (Brug *et al*. 2004). The reason for this finding may be because universities and hospitals in Korea did not have time to prepare education programmes for nursing students due to the abrupt importation of MERS; however, MERS-related news

Table 2 Level of knowledge related to MRES (n = 249)

Items (True or False; possible range: 0·0–100·0%)	Correct-answer rate (%)
MERS is a respiratory infectious disease caused by coronavirus. (T)	82·3
The first MERS case occurred in the Arabian Peninsula of the Middle East region. (T)	94·0
The origin of MERS is not clear, but is believed to have been transmitted through contact with an infected camel. (T)	79·8
The main symptoms of MERS are fever, cough and dyspnea, and there can also be headache, sore throat, running nose, vomiting, nausea and diarrhoea. (T)	95·6
The latent period of MERS is 2–14 days. (T)	81·9
MERS is diagnosed using sputum, laryngopharyngeal discharge and bronchial washing fluid. (T)	57·6
MERS is usually transmitted through droplets. (T)	79·9
MERS is transmitted through close contact with a patient (i.e. family, cohabitation and patient care). (T)	89·9
MERS can be prevented through handwashing or sanitisation. (T)	87·3
When coughing frequently, the use of a mask prevents droplet transmission of MERS. (T)	97·6
MERS can be prevented through covering the mouth and nose with tissue paper and washing the hands after coughing and sneezing. (T)	89·6
MERS is prevented by vaccination. (F)	81·1
MERS is treated with other antiviral drugs in the market. (F)	59·6
If symptoms are observed within 14 days from contacting a MERS patient or a visit to the Middle East region, the person should inquire at a nearby public health centre. (T)	91·9
MERS patients should wear protective equipment, such as N95 mask, gown, gloves and eye protection equipment. (T)	96·4
Total	84·4

MERS, Middle East respiratory syndrome; T, true; F, false.

Table 3 Preventive behaviours and risk perception of MERS (n = 249)

Items	
Preventive behaviours for MERS (possible range: 0·0–100·0%)	%
I cancelled or postponed meetings with friends, eating-out and sport events	30·1
I reduced the use of public transportation	26·1
I went shopping less frequently	38·6
I reduced the use of closed spaces, such as library and theatre	36·4
I avoided coughing around people as much as possible	65·9
I avoided places where a large number of people gathered	54·7
I increased the frequency of cleaning and disinfecting items that can be easily touched with hands (i.e. door handles and surfaces)	29·7
I washed the hands more often than usual	85·5
I discussed, with my family and friends, what we should do if infected with MERS	34·1
Total	44·5
Risk perception of MERS (possible range: 1–5)	$M \pm SD$
I may be infected with MERS more easily than others	2·1 ± 1·0
I am afraid to be infected with MERS	2·7 ± 1·3
Total	2·4 ± 1·0

M, mean; SD, standard deviation; MERS, Middle East respiratory syndrome.

Table 4 Pearson's correlation coefficients for the main study variables (n = 249)

Variables	1	2	3	4
1. MERS-related knowledge	1·00	–	–	–
2. Preventive behaviours for MERS	0·27**	1·00	–	–
3. Risk perception of MERS	0·13*	0·29**	1·00	–
4. Age in years	−0·07	0·14*	0·03	1·00

MERS, Middle East respiratory syndrome.
*$p < 0.05$, **$p < 0.01$; Computed using independent Pearson's correlation test.

has been telecast almost every day since the identification of the first MERS patient. Accordingly, it is necessary for hospitals and universities to prepare follow-up education programmes regarding MERS characteristics for nursing students. The study items with the two highest correct-answer rates (i.e. 'When coughing frequently, the use of a mask prevents droplet transmission' and 'Nursing staff for MERS patients should wear special protective equipment', respectively) were similar to an item in a previous report

about MERS-related knowledge among Saudi Arabian HCWs (Khan *et al.* 2014). In that previous report, the item with the highest correct-answer rate was 'Special caution is used in medical acts for patients with MERS symptoms' (Khan *et al.* 2014). This study items with the lowest correct-answer rates were about the diagnosis and treatment of MERS. Similar to our study's findings, the level of knowledge about the treatment of MERS was very poor among HCWs in a previous study (Al-Tawfiq & Memish 2014, Khan *et al.* 2014). MERS is diagnosed with the polymerase chain reaction using sputum, laryngopharyngeal discharge and bronchial washing fluid (CDC 2015; KCDC 2015). The preliminary diagnosis of MERS is the starting point for isolation and nursing of patients, which can influence the patients' definite diagnosis and release from isolation. It is essential to understand accurate collection methods and wear protective equipment for preventing infection during specimen sampling (CDC 2015; KCDC 2015). Considering the low correct-answer rate for the items related to MERS diagnosis, educating nursing students about the collection and management of specimens from hospital patients is necessary.

The nursing students' MERS-related preventive behaviours rated at 44·5%, which was lower than both their knowledge level and the performance rate (90·1%) of Hajj pilgrims (Gautret *et al.* 2013). The item with the highest performance rate was 'I washed my hands more often than usual.' This is a positive result in this study that confirms prior study's findings that HCWs showed a high performance rate of handwashing during an outbreak of Severe Acute respiratory syndrome (SARS) (Quah & Hin-Peng 2004, Imai *et al.* 2005) and that handwashing lowered the morbidity and mortality of SARS (Brug *et al.* 2004). Handwashing is a basic life habit for preventing all infectious diseases; therefore, it is necessary for the government and universities to intensify education regarding continuous and effective handwashing behaviours for nursing students who will eventually work in the healthcare field (Quah & Hin-Peng 2004, Imai *et al.* 2005, Khan *et al.* 2014).

The risk perception of MERS was 2·4 out of 5. The risk perception for students who had received MERS education was high compared to their counterparts (2·5 vs. 2·2). MERS education can be effective in increasing risk perception, and systematic education programmes need to be developed based on the content desired by the students. In this study, risk perception of MERS was particularly high among women, which was consistent with a previous report in which the risk perception was significantly higher in women who were Saudi Arabian HCWs (Khan *et al.* 2014). However, the attitudes of nursing students towards

emerging infectious diseases varied according to gender (Tam *et al.* 2007). The number of male subjects in this study was small; therefore, studies with increased sample sizes that reflect cultural and national characteristics should be conducted in the future.

In this study, MERS-related knowledge was significantly correlated with preventive behaviours and risk perception. This finding was partially consistent with previous reports in which there was a significant positive correlation between MERS-related knowledge and risk perception (Gautret *et al.* 2013, Khan *et al.* 2014) and similar to a report in which SARS-related risk perception, knowledge and behaviour were correlated with one another (Brug *et al.* 2004). An enhancement of nursing students' MERS-related knowledge that considers their characteristics will sharpen their risk perception of the disease and effectively increase their preventive behaviour levels.

The Korean nursing education system does not cover the transmission mechanism of emerging infectious diseases like MERS or guidelines for infection prevention. The current curriculum only includes two to four hours of standard precautions theory and practice during a student's second year of the nursing programme (Choi & Yang 2010). This lack of education may also be a problem in other countries (Choi & Yang 2010, Mitchell *et al.* 2014). Outbreaks of emerging infectious diseases such as MERS can occur anytime; because of this, infection prevention guidelines should be included in the curriculum of nursing students who have clinical rotations in hospital settings. Practical education programs such as correct handwashing, masking and environmental decontamination methods for improving clinical practice should be included along with theory education that includes MERS transmission, treatment and diagnosis. These educational system changes should be preceded by nursing educators' efforts and reforms (Choi & Yang 2010). For increasing risk perception rates, study cases of MERS infection should be reviewed before hospital practice so that nursing students may be aware that healthcare workers can be infected by a minor mistake in hospital. If such specific and practical programmes were implemented, nursing students' preventive behaviours for MERS will be improved.

A limitation of this study was that only nursing students within a specific region were included, and the number of male subjects in this study was small; therefore, studies with increased sample sizes that reflect cultural and national nursing student characteristics should be conducted in the future. Another limitation is that preventive behaviours for MERS are surveyed through self-reporting in this study. Thus, performance may be assessed objectively by adding direct observation such as the survey of handwashing frequency and the survey of public facility use.

Finally, it is suggested to conduct studies of mixed method research design combining cross-sectional surveys and in-depth interviews for identifying factors influencing preventive behaviours for MERS.

Conclusion

Korean nursing students who engaged in clinical practice at hospitals may have been exposed to MERS infection during that country's recent MERS outbreak. In this study, the level of MERS-related knowledge was 84·4% among nursing students who had discontinued hospital practice due to that outbreak. The level of preventive behaviours was 44·5%, and risk perception was 2·4 out of 5. Receiving MERS education was a significant factor for increasing one's risk perception of the disease. Considering the low scores for items regarding knowledge and preventive behaviours, it is necessary to develop effective and systematic publicity and education programmes for nursing students. MERS-related knowledge, preventive behaviours and risk perception were positively correlated with one another. Therefore, enhancing MERS-related knowledge by considering cooperation between hospitals and universities will sharpen nursing students' risk perception of the disease and effectively increase their preventive behaviours. The results about such a new infectious disease are meaningful as basic information for improving nursing students' nursing education and nursing practice and may be reflected in clinical practice.

Relevance to clinical practice

MERS outbreaks may occur in other countries, like other emerging infectious diseases. This is the first study to survey MERS-related knowledge, preventive behaviours and risk perception in nursing students. Improvement of nursing students' knowledge, preventive behaviours and risk perception of MERS is necessary to insure future medical professionals are prepared for coping with emerging infectious diseases. The results will provide basic information for designing health education programmes for nursing students to prevent MERS infection and contribute to their compliance of infection prevention guidelines and health promotion.

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Contributions

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