Are nurses at Swedish Departments of Infectious diseases prepared to care for patients with African viral haemorrhagic fever?

- A survey study

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ABSTRACT

Background: The African viral haemorrhagic fevers have in recent years been causing large outbreaks with high mortality rates and elevated risks of global spread. These outbreaks puts the Departments of Infectious diseases, both national and international, on high demand when caring for this patient group, in a patient- and staff-safe manner. The aim of the study was to describe nurses perceived ability and knowledge about caring for patients with suspected or verified African viral haemorrhagic fever at Departments of Infectious diseases in Sweden.

Method: A web survey was conducted to collect data. The results are presented through a descriptive design. Participants were registered nurses working in infectious diseases clinics; 216 survey results were registered.

Results: Registered Nurses in Swedish Departments of Infectious diseases clinics witnessed about having limited knowledge about the African haemorrhagic fevers. They were also experiencing limited or very limited knowledge about some practical procedures, like drawing blood samples to confirm the infection. The majority of the participants had not been given theoretical education, nor had been given the opportunity to sufficiently practice using personal protective equipment at their place of work. The nurses witnessed about fear for their own safety while caring for this group of patients.

Conclusion: The participants perceived about fear, both limited theoretical and practical knowledge and training about caring for patients with African haemorrhagic fever, even though they had worked with infectious diseases for several years. There is a need for implementation of measures
to ensure the healthcare professionals’ safety and to prevent them from being infected with potentially lethal infections. It also poses a risk for the patient in the absence of specific nursing care, which can lead to an increased critical disease state.

**Key words:** Ebola, Haemorrhagic Fever, Personal Protective Equipment, Nursing, Nurse, survey, infectious diseases.
**Background**

Globalization leads to natural gains in economics and social benefits, but also demand consciousness and knowledge about its consequences [1]. In the infectious diseases healthcare, globalization is seen in various ways. Tropical diseases find their way to previously unknown territory, like Sweden, in ways through global traveling and immigration [2]. Climate change does also change the common areas for tropical pathogens spread [2].

The African viral haemorrhagic fevers are a group of diseases caused by RNA-viruses and are severe but uncommon in Europe [3]. The group includes Ebola, Marburg, Lassa fever, Crimean-Congo and Rift-Valley. The pathogens attack various cells of the body causing major damage, for example on the endothelial cells. The Ebola virus also attacks the hepatocytes and these malfunctions of the cells causes symptoms like coagulation defects [3].

World Health Organization (WHO) has stated in their guidelines for regarding personal protective equipment (PPE) that the health and wellbeing of the healthcare professionals is in the hands of the employer responsibility [4]. WHO also states that it is in the healthcare professionals' own interest and responsibility to stay informed about recent science and routines knowledge about the diseases. Recommended PPE should be provided by the employer, including responsibility for educating the staff in using PPE [4].

Since the large Ebola outbreak in West Africa throughout the years of 2014 to 2016, which caused the death of more than 10 000 people [5], countries have been forced to be more prepared and create a structure on through how to cope with diseases whom are not that common but have high mortality [6]. A large outbreak of Lassa fever has been ongoing in Nigeria since 2016 and several patients has been cared for, both suspected and verified infection, in Swedish Departments of infectious diseases.
through this outbreak [7]. WHO reports that among the group of Lassa fever infected patients are a number of caregivers included [7].

Currently, Europe is struck hard by the Covid-19 pandemic [8]. All over the world, healthcare workers struggle to get hold of PPE and other necessaries to care for the patients. In Europe, Sweden was one of the countries who hospitalized and cared for a lot of patients diagnosed with Covid-19 [8]. WHO stated that employers and managers in health care are responsible of making sure to take all measures to provide a safe and risk-free working environment [9]. The employers are also responsible of providing education and training in working with PPE – and provide for this equipment [9]. The responsibilities for both employers and employees are similar, both regarding the Covid-19 and the African Haemorrhagic fevers [4].

The amount of research regarding Swedish nurses working at Swedish Departments of infectious diseases and their knowledge and experiences regarding caring for patients with either suspected or confirmed African viral haemorrhagic fever, is non existing known to the authors. International studies have shown that there are shortcomings concerning the caring for this group of patients [10, 11]. To conclude, the health care professionals globally witness about having an insufficient level of knowledge about the diseases and there is uncertainty about how to build caring structures around these patients. As shown by earlier studies, there is a need for clear guidelines and procedures and higher level of knowledge about the diseases amongst the healthcare professionals [10, 11].

**Methods**

The aim of this study was to describe the Swedish nurses perceived ability and knowledge about caring for patients with suspected or verified African viral haemorrhagic fever at Departments of Infectious diseases in Sweden.
Design

The study was conducted as a quantitative study with a deductive approach. This was an opportunity to see if there were trends in data collection and to describe the extent to which the various phenomena occurred, for example routines and training opportunities. The web survey was chosen as method of data collection. The method, which has the advantage to reach a larger population, is self-administered and the participants are also given the possibility to remain completely anonymous [12].

Participants

Eligible participants were all nurses employed within Departments of Infectious diseases in Sweden. The inclusion criteria for the participants was that they were registered nurses (RN) and worked at the Departments of Infectious diseases clinics, both in- and outpatient departments. In Sweden there are 28 Departments of Infectious diseases, 26 of them met the inclusion criteria, which was that there was a possibility that a patient with haemorrhagic fever could be admitted to the ward. Two of them were excluded, one because they were specialized in highly contagious diseases and one because they did not care for this patient group at all. Of these 26 departments, 18 Departments of Infectious diseases chose to participate. Eight departments chose to refrain from participating. In total 603 nurses were asked to participate, this was the number of nurses working in those departments. Of these 603 nurses there were 216 nurses that participated in the study.

Data collection

The study was conducted as a web survey. The data was collected between September 16 through October 21 2019. The head of the departments of the included Departments of Infectious diseases were contacted through email and were asked to forward the web survey by email to their employees. The study project plan and the aim of the study were attached in the email. The heads of the departments received reminders twice about participating in the study. They also received reminders
which they forwarded to the employees about answering the study. These reminders contained information about that the respondents could ignore the reminders if they had already answered the web survey.

The web survey

The authors chose a web survey with closed-ended questions as the data collection method [12]. A survey in the participants’ native language, Swedish, felt necessary to get as high response rate as possible. The authors could not find any pre-designed survey within the topic. Therefore, the web survey was developed by the authors themselves. To assembling a self-report instrument is challenging and the researchers had to analyse the research requirements and take into account all the details [12]. The questions were designed based on literature, the authors experiences and in collaboration with experienced colleagues. The survey was pilot tested on an expert group who have provided feedback about for example clarity and risk of bias from the authors [12]. To avoid bias is an important consideration when assembling a self-created instrument [12]. The expert group consisted of five registered nurses (RN) with varying backgrounds. The nurses included was working in intensive care, anaesthesia, surgery and infection and had varying ages, work experience and gender. The expert group's opinion was that the survey fell out well and that it was understandable. The first questions concerned demographic information and was described in a nominal scale and ratio scale. Thereafter the questions were closed survey questions in a Likert scale with a 5-point scale; “Strongly disagree, Disagree, Undecided, Agree, Strongly Agree” [12]. The survey was distributed by esMaker [13].

Data analysis

The result was analysed through descriptive statistics, which was appropriate when the authors wanted to describe the participants' views on a particular situation. To describe the results of the survey, the same software was used in which the survey was designed. The software used for this study was esMaker [13]. By using esMaker, every single question has been processed and statistically
analysed. Demographic data is reported in nominal scale and descriptive data regarding age and work experience are described according to quota scale. The issues that described a perceived level of knowledge and security were analysed and reported according to ordinal scale [14]. Collected data has been typed in as quantitative data in numerical form [12].

**Ethical considerations**

The study was conducted within Specialist Nursing Programme in Infectious Diseases Care as master degree project and approved by the Swedish red Cross University College. According to the Swedish Ethics Review Act, no further approval was needed [15]. Ethical considerations have also been taken with regard to the Helsinki Declaration [16]. The participants in this study answered the questions anonymously, which was of great value when questions regarding perceived levels of knowledge and fears were asked. This could be assured by forwarding the web survey from the head of operations or the unit. For research questionnaires that may expose participants' weaknesses, this should be addressed in a way that does not put the participants in a position of being exposed through their participation [12].

The study participants have been informed about the purpose of the study, their anonymity and that they can choose to abandon the study or cancel it if they wish. The participants of the study answered voluntarily, and the answers could not be linked to any specific individual. This is required to assure the participants anonymity when participating in the study and also ensure that their data is held confidential [12]. This has been done by using the esMaker survey program which does not register IP addresses or e-mail addresses. EsMaker encodes the participants' respective survey responses and indicates only the date and time the survey is completed. In this way, it has been impossible for the authors to be able to identify the participants. This has also meant that a written consent was not possible to obtain.
The research has followed the ethical considerations given for presenting a clinical research [17]. This through informing about consent, choosing a relevant subject regarding the group of participants and leading up to content that is useful for further studies and education.

**Results**

In total 18 Swedish Departments of Infectious diseases located throughout Sweden participated in the study. Departments from both regional- and university hospitals were included. From these departments, 216 (36 % of all nurses working at these 18 Departments of Infectious diseases) participated in the study by answering the web survey. The majority of the participants were female, 90.3% (n=195) (figure 1). The largest group were in the ages between 20-30 (40.3 %, n=87), but all age groups are represented in the study (figure 2). The participants had several years of working experience in the field of infectious diseases, 32.9 % (n=71) had worked in the field for more than 10 years (figure 3).

The result of this study show that the participants had low levels of knowledge regarding the African viral haemorrhagic fevers. They had not been given theoretical- or practical education from their employers on an adequate level and felt unsafe when caring for this group of patients. They were also concerned of their own safety while caring for patients whom may be infected by an African Haemorrhagic fever.

The result is presented in three categories. These categories were included; *Experienced level of knowledge, Conditions given by employers and Perceived personal security.*
Figure 1: Demographic data: Gender of participants. (n=216)

Figure 2: Demographic data: Ages of participants. (n=216)
Figure 3: Demographic data: Years of working experience in the infectious diseases field. (n=216)

Experienced level of knowledge

The dimension contained questions about the participants’ experienced level of knowledge regarding the African viral haemorrhagic fevers, like “I have good knowledge about the different African viral haemorrhagic fevers, such as Ebola, Lassa fever, Rift-Valley fever, Crimean-Congo and Marburg” and also more detailed questions – for example “I have good knowledge of how the different African viral hemorrhagic fever, e.g. Ebola and Lassa fever, transmits”. The questionnaire also included questions about knowledge about PPE and how to screen patients suspected carrying the viruses.

Generally, the participants graded themselves low in the Likert scale, witnessing about low degree of knowledge. The largest number of answers to the question about “… having good knowledge about the different haemorrhagic fevers”, was mostly negative (61.6 %, n=133) (figure 4).
Figure 4: Percentage distribution regarding the statement “I have good knowledge of the different African viral hemorrhagic fever Ebola, Lassa fever, Rift-Valley fever, Crimean-Congo and Marburg”. (n=216)

About the question regarding “I have good knowledge of how the different African viral haemorrhagic fever, e.g. Ebola and Lassa fever, transmit”, the participants answers were scattered. The largest group of answers was the ones of "agree" (35.6 %, n=77) followed by participants who answered "disagree" (25.5 %, n=55) (figure 5).
Figure 5: Percentage distribution regarding the statement “I have good knowledge of how the different African viral haemorrhagic fever, e.g. Ebola and Lassa fever, transmit.” (n = 216)

Regarding diagnosing the patients in a correct and safe way, questions with the statement for example “I have good knowledge about how to test patients regarding African viral haemorrhagic fevers” were asked. The majority stated that they “strongly disagree” (40.7%, n=88) or “disagree” (21.3%, n=46) to the statement (figure 6).
Figure 6: Percentage distribution regarding the statement “I have good knowledge of how to test patients regarding African viral haemorrhagic fever”. (n = 216)

Figure 7: Percentage distribution regarding the statement “I have practiced PPE (personal protective equipment = protective equipment / protective clothing) enough to feel safe in caring for patients with suspected African viral hemorrhagic fever”. (n = 216)

Conditions given by employers

The web survey contained questions about how cooperative the employers were to enhance the level of knowledge about the haemorrhagic fevers among the healthcare professionals. One of the questions were regarding if the participant had been given chances to practice PPE enough to feel safe caring for patients with haemorrhagic fevers. 43.1 % (n=93), which is also the largest group of participants, answered "disagree" (figure 7). The majority of the participants has also answered negative about been given theoretical education from their employers. 7.4 % answered "strongly agree" (figure 8).
Figure 8: Percentage distribution regarding the statement “Through my employer or other instance funded by the employer, I have received theoretical training in African viral hemorrhagic fever and the care of patients affected by this.” (n = 215)
Perceived personal security

The web survey contained questions for the participants concerning perceived security due to caring for this group of patients. The majority of the participants' answered “strongly disagree” (31.2 %, n=67) or “disagree” (21.9 %, n=47) about the question “I am/would feel safe about my own security if I care for patients with African viral haemorrhagic fever”. Only 9.3 % (n=20) responded “strongly agree” (figure 9).

Figure 9: Percentage distribution regarding the statement “I am/would feel safe about my own security if I care for patients with African viral haemorrhagic fever”. (n=215)

Discussion

The demographic data that were collected from the participants did in some ways reflect the demographics of Swedish nurses. The dividing of genders was accurate to the general nursing staff in Sweden [18]. Concerning age, 40 % of the participants where younger than 30 years, which in the general group of nurses in Sweden is 11 % [19]. This could mean that the participants had limited
years of working experience, but 32% of the participants' reply practicing in the specialised field of infectious diseases for at least 10 years. 67% of the participants had been working in the field for more than 3 years. The authors are concerned because of the fact that the nurses experienced limited knowledge concerning several topics in the web survey, even though the nurses had worked with infectious diseases for several years.

The results of this study states that nurses that perceived having inadequate theoretical- and practical practice felt insecure and had less knowledge about the haemorrhagic fevers. Almost half (45%) of the participants responded that they did not agree, nor disagree, on the claim that they had good knowledge of the haemorrhagic fever. Similar results have previously been described, among others [10, 11]. The result is in direct contrast to the requirements that the Swedish Public Health Authority requires in preparation to maintain high infection protection, including the requirements that the Swedish Infectious Diseases Association puts on the national departments [20, 21]. The same applies to the negative responses' participants have provided regarding knowledge of sampling and packaging and transport of samples. WHO describes that the responsibility lies with each employee to seek their own knowledge of the subject and make sure that they are updated in the event of any situations in their working field [4]. The individual responsibility for knowledge in professional practice is also described in International Council of Nurses Code of Ethics [22]. This also applies to the responsibility for proper professional practice. The nurses should work grounded in evidence-based knowledge [23]. This is likely to fail according to this study.

The result showed that in some ways, the participants were not able to, even though they had extensive working experience, live up to the standards put up by WHO and International Council of Nurses (ICN) [4, 22]. The majority of the nurses who participated in the survey did not receive theoretical training on the haemorrhagic fever, nor did they practice PPE sufficiently to feel confident in their work caring for patients. Several studies has shown that it is precisely the practical training
combined with increased theoretical knowledge that is the foundation for being able to safely care for patients with high risk infection [10, 24, 25]. This has also been shown in other studies regarding several other nursing fields [26-29]. As a practitioner having a specific knowledge regarding a specific patient group leads to a higher clinical expectation and understanding of changes in the patient's health [30]. It also means that the observation capacity is enhanced [30]. Since almost half of the participants responded negatively to the claim that they have "... good knowledge about the haemorrhagic fevers ..." it could mean that they have difficulty reaching a higher level of nursing practice. That some experienced nurses could feel like being on a novice level can be related to Benner who described different levels from novice to expert [28]. This could occur in a clinical environment where the nursing of the patient is unfamiliar. For example, more than half of the participants of this study answered negative to the statement that they were sure of how to screen patients for African viral haemorrhagic fevers. These nurses could then be perceived as novice, even though they had several years of experience working in the nursing field [31].

This study showed that more preparation is needed to take care of patients with infectious diseases in order to feel safe in the situation as caregivers. The fact that participants experienced such insecurity about caring for this patient group was not unexpected, it has been shown numerous times in other studies [10, 11, 24]. It was shown that the nurses felt more secure through learning how to handle the risks they were exposed to through practical experiences [24]. The WHO guidelines for PPE regarding African viral haemorrhagic fever clearly describe that the employer must provide both information and education as well as materials [4]. WHO also describes that healthcare workers have the right to receive repetitive training on infection prevention and control (IPC) and PPE related to Coronavirus disease (COVID-19) outbreak [9]. Regarding clinical implementation of this matter, one possible way could be through simulation training. The use of simulation training for qualified nurses has shown that it makes it possible to give them experiences that is close to real life [29]. Simulation training for nurses gives benefits such as increased knowledge and skills and contributes to perceived readiness [29]. When comparing simulation training and standard training with cardiopulmonary
resuscitation (CPR) with medical students, it has been shown that simulation training is superior [32].

Nursing students in a Norwegian study experienced simulation as both realistic and effective in handling anaphylaxis during vaccination [33]. Simulation develops the competence to act in a concrete situation [33].

Even though the participants had worked with infectious diseases for several years, they felt unsafe when responding to the questionnaire regarding caring for this special group of patients. This phenomena has also been described in other studies [34]. Hunter and Cook showed in their study that the senior colleagues were important for the more unexperienced colleagues. The fact that nurses, despite long experience in a specific area, can experience themselves as novices means that they need established routines that guide them in their clinical nursing practice. The responsibility of making these routines and guidelines rest in the hands of the managerial field. These could be performed and established by specialized nurses and other experienced healthcare professionals in the Infectious diseases field.

Continuing professional education as a nurse involves learning about concrete and practical conditions in clinical situations [30]. Practical exercise with PPE to treat patients with haemorrhagic fever is a prerequisite for being able to act correctly and feel safe if such a situation occurs [30]. This can also be linked to the covid-19 pandemic which has affected the whole world [9]. This pandemic showed that many governments and healthcare institutions were not prepared for the consequences of a global spread of an infectious disease like this, neither guarantee the patients safety whilst caring for these large numbers of patients infected [9]. The large demand on PPE, necessary treatments for intensive care and biological tests created a shortage of these supplies and also illuminated challenges in a pandemic situation [8].
Limitation and strengths

The authors would have preferred to use a pre-designed validated survey, but since the study's research area is to a level unexplored, there are no accepted measuring instruments [12]. For this reason, the authors constructed questions that answered the purpose. The comprehensibility of the web survey was evaluated by having an expert group read and answer the actual questionnaire. The response options were designed, in addition to the demographic questions, with the response options "Strongly disagree", "Disagree", "Undecided", "Agree" and "Strongly agree". This is according to the Likert scale, which is a validated response scale where the participant indicates the degree to which they agree with a statement. However, there is a risk when the same answer alternative repeats throughout the survey that the participant's response becomes routine [12].

Strengths throughout the study has been the use of an expert group, who could confirm that the survey contained questions relevant and fit for the purpose [35]. The expert groups variation of experience and specific knowledge contributed to broad expertise when interpreting the questions. Also, this study is presumed to contribute to a highly current issue.

Conclusion

The participants perceived about fear, limited theoretical and practical knowledge and training about caring for patients with African haemorrhagic fever, even though they had worked with infectious diseases for several years. There is a need for implementation of measures, managerial and educational interventions to ensure the healthcare professionals' safety and to prevent them from being infected with possible lethal infections. It also poses a risk for the patient in the absence of specific nursing care, which can lead to an increased critical disease state. Future studies are needed to increase knowledge about the nursing care regarding these patients. There is also a need to study the future level of implementation of practical and theoretical education in this nursing field.
Declaration

Ethics approval and consent to participate

The study was conducted within Specialist Nursing Programme in Infectious Disease Care at the Swedish Red Cross University College and according to the Swedish Ethics Review Act, no further approval was needed [15].

Consent for publication

Not applicable.

Availability of data and material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SJB and SG developed the study concept and its design, planned the study and analyzed the data. All authors (SJB, SG and KM) contributed to drafting and revision of the article. All authors have approved the final draft of the paper.

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Abbreviations

WHO = World Health Organization

PPE = Personal Protective Equipment

RN = Registered Nurse

ICN = International Council of Nurses

IPC = Infection Prevention and Control

CPR = Cardiopulmonary resuscitation
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