Frequency and Level of Exposure of Health Care Workers to Hospitalized Crimean-Congo Hemorrhagic Fever Cases and Their Management: A Descriptive Study from a Tertiary Care Hospital

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ABSTRACT

Background
Crimean-Congo hemorrhagic fever (CCHF) is a life threatening zoonotic infection. The virus is transmitted either by tick bite or through contact with infected blood or body fluid. Nosocomial transmission and outbreaks in health care is widely reported. Health care workers (HCWs) are at a higher risk of exposure to CCHF.

Methods
It is a descriptive study conducted from January 2015-September 2017 at Aga Khan University Hospital. The study aims to estimate the frequency of exposure of HCWs to confirm cases of CCHF and the efficacy of Ribavirin for prophylaxis use. Demographics, level of exposure, efficacy of Ribavirin prophylaxis and clinical outcome were studied.

Results
During January 2015 till September 2017, 9 cases of CCHF were admitted at our hospital. A total of 65 HCWs were exposed to CCHF cases amongst which there were 18 doctors, 33 nurses and 14 other supportive staff. Nine HCWs had a high-risk of exposure and were given Ribavirin prophylaxis. All of these exposures remained clinically asymptomatic for CCHF.

Conclusion
Hospitalized cases of CCHF virus pose a significant risk of exposure to HCWs which can be prevented by strict adherence to infection control practices. Although efficacy of Ribavirin for prophylaxis is not definitive and very little data exists on its prophylactic use, but since none of our high-risk exposures developed symptomatic infection after Ribavirin prophylaxis, our study supports its role in prevention.

Key words
CCHF; HCWs; Exposure; Ribavirin prophylaxis

Objective
The objective of this study was to calculate the frequency, level of exposure amongst HCWs exposed to the cases of CCHF and to assess the role of Ribavirin in post exposure prophylaxis (PEP).

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Background
Crimean-Congo hemorrhagic fever virus [CCHFV] belongs to the family *Bunyaviridae*, which can cause deadly viral hemorrhagic fever (VHF). It was first described in Crimea in the Soviet Union in 1944.[1] In Pakistan, it was first reported in 1976, when a laparotomy was performed on a patient with symptoms of gastrointestinal bleed at a general hospital in Rawalpindi.[2] Since then it has become endemic in Pakistan with sporadic outbreaks. Humans can get the infection either by the tick bites or through contact with the blood or body fluids of the infected animals or human. CCHF incubation period varies from one to nine days.[3]

CCHF cases pose a high risk of transmission to HCW and because of the disease high case fatality rate (10-50%), it remains a major public health concern and challenge for hospital Infection Control. In this study, we have evaluated the frequency and risk of HCWs exposure during providing care to cases of CCHF.

Methods

Hospital Setting and Patients
The study was conducted as a descriptive study on nine index cases of CCHF with sixty five HCWs that were exposed at the Aga Khan University Hospital (AKUH). AKUH is a 600-bed tertiary care referral hospital located in Karachi, Pakistan. All HCWs who were exposed to confirmed cases of CCHF from January 2015–September 2017 were enrolled in the study.

Clinical Data Collection and Definitions
Demographic data including age, gender, profession, date and type of exposure, location of unit where exposure occurred, Ribavirin prophylaxis, its side effects and outcomes of exposed HCWs were collected using data collection forms.

High-risk exposure comprised of HCWs who had direct skin or mucosal contact with contaminated blood or body fluids, those participated in CPR and without adequate precautions and were exposed to needle stick injury or blood or body fluids spill. **Moderate -risk exposure** included HCWs who performed

high risk procedures with adequate PPE, hence had no direct contact with contaminated blood or body fluids.

Low-risk exposure included HCWs who were involved in the patients care but had no direct contact with the patient or did not get closer than 1 meter to the patient.

Analysis

The collected data was analyzed to report results in frequencies and percentages. To preserve confidentiality, we coded each exposed HCW and removed their original identifications.

Results

In the two years of study 2015 till 2017, 65 HCWs were exposed to 9 confirmed cases of CCHF. Nine exposures were reported from 2 patients (14%) in 2015, 38 exposures from 4 patients (58%) in 2016 and 18exposures from 3 patients (28%) in 2017, till the month of September. Therefore, the number of exposures per patient per year were4.5, 9.5 and 6 in 2015, 2016 and 2017 respectively. The median age of exposed HCW was 29.53 (23-45) years of which 43 (66%) were males. Amongst the 65 HCWs exposed 18 (28%) were doctors, 33 (51%) were registered nurses while 14 (22%) were other health care associates. Most of the exposures occurred in the Emergency Department. Table 1 describes the professional role of health care workers exposed to index cases.

Amongst the 65 HCWs exposed, 9 (14%) had high-risk exposure, 35 (54%) had moderate-risk exposure while low-risk exposure was seen in 21 (32%). In the high-risk exposure group, 4 (44%) were doctors,4 (44%) were nurses and 1 (11%) was a health care associate. In the moderate-risk exposure group 8 (22.8%),18 (51%) and 9 (25%) were doctors, nurses and health care associated respectively. Among low-risk exposure 6 (29%) were doctors, 11 (52%) were nurses and 4 (19%) were health care associates, Table 2. In the high-risk exposure group one had needle stick injury whereas other exposures included blood spill during central line Cannulation, exposure to blood or body fluid without gloves and extubation without personal protective equipment. The HCWs with high-risk exposure were offered Ribavirin prophylaxis whereas those with moderate-risk exposure were kept under close surveillance for monitoring of symptoms of CCHF for up to 14 days. HCWs with low-level exposure were neither offered treatment nor follow up. None of the exposed HCWs developed clinical symptoms of CCHF.

In the high-risk exposure group only one physician developed jaundice after consuming 4 doses of Ribavirin due to which Ribavirin had to be discontinued and the exposed HCW was counseled for strict surveillance of clinical symptoms of CCHF.

Table 1. Role of health care workers exposed to 9 CCHF cases

Index CCHF Cases	Physicians	Nurses	Support Staff*	Total n (%)
Index Case 1	0	4	2	6 (9)
Index Case 2	1	2	0	3 (5)
Index Case 3	11	9	3	23 (35)
Index Case 4	0	1	2	3 (5)
Index Case 5	3	5	3	11 (17)
Index Case 6	0	1	0	1 (2)
Index Case 7	0	7	4	11(17)
Index Case 8	2	1	0	3 (5)
Index Case 9	1	3	0	4 (6)
Total n (%)	18 (28)	33 (51)	14 (22)	65 (100)

*Support staff: stretcher-bearer, nurse's aid, cleaning staff, security agent

Table 2. Role of health care worker and the level of risk of exposure

Role of Health Care Worker	Level of risk associated with exposure		
	High (%)	Moderate (%)	Low (%)
Physicians (n=18)	4 (22)	8 (44)	6 (33)
Nurses (n=33)	4 (12)	18 (55)	11 (33)
Support staff (n=14)	1 (7)	9 (64)	4 (29)
Total n=65	9 (14)	35 (54)	21 (32)

n: number of contacts, %: percentage

Discussion

The study shows a significant risk of exposure for HCWs to the cases CCHF. All the exposures could have been prevented by adhering to the Standard Precautions. Registered Nurses were more commonly exposed to the cases of CCHF, thus emphasizing the need for education, reinforcement and reminders for adopting Standard Precautions for this group of HCWs. The study showed that about a quarter of exposures were low risk that could have been prevented by staff education and by restricting the movement of HCW in the designated area for CCHF cases.

The health care workers in the high risk exposure group did not take adequate precautions nor used required Personal Protective Equipment (PPE) when performing procedure that mandate barrier precautions. Education on PPE usage and ensuring their availability can prevent future exposures. Nurses and physicians had the most of the high-risk exposures that could be justified as they perform many emergency interventions that could lead to high risk exposure. Regardless, all the HCW exposures in our study were due to breach in following standard

practices for Infection Control, although Nurses and Physicians being the most aware class of HCW are expected to be most responsible.

There were three index CCHF cases which had the longest hospital stay and despite having prolonged stay had interestingly contributed to the least number of HCW exposures. This advocates that prolong hospital stay may not be a risk factor for CCHF exposure. Most of the exposures of HCWs occurred before the confirmation of CCHF diagnosis in suspected patients except in index case 3 in which it was found that majority of exposures occurred after the confirmation of diagnosis of CCHF and all these exposures were secondary to breach in the infection control practices which is a concern.

During our study period we did not identify any case of Nosocomial transmission of CCHFV from CCHF patients to HCWs, although cases of transmission of CCHFV from infected patient to other patients and to HCWs have been reported from numerous other countries.[6, 7]

There is a growing concern regarding the effectiveness of Ribavirin in prophylaxis among CCHF exposures. All our high-risk exposures were treated with Ribavirin and remained clinically asymptomatic for CCHF which supports its use in PEP as also suggested by Guner *et al* a finding which requires further advocacy.[8]

Conclusion

From this study we have concluded that hospitalized CCHF cases pose a significant risk of exposure to HCWs which can entirely be prevented by strict adherence to Standard and Transmission Based Precautions. There is a higher level of exposure amongst the Emergency Unit staff where the patient is initially managed without a confirmed diagnosis. Therefore, HCWs should be educated, trained and monitored regarding the adherence to Standard and Transmission Based Precautions with proper use of PPE especially when performing high risk procedures. The role of Ribavirin for PEP is supportive in our study but needs further study to warrant effectiveness.

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