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Original Article

Hepatitis-C Virus Infection and Exposure to Blood and Body Fluids among Nurses and Paramedical Personnel at the Alexandria University Hospitals, Egypt

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ABSTRACT

Background: Worldwide, prevalence of anti-HCV positivity in health care workers (HCWs) ranges from 0% to 9.7%. The current study was conducted to calculate prevalence of HCV infection, frequency and characteristics of blood and body fluid (BBF) exposure among HCW at the Alexandria University Hospitals.
Methods: Hospital-based cross-sectional approach was adopted. At the Hospitals, 62.2% of available nurses and paramedical personnel voluntarily participated (n = 499), and were interviewed, screened for HCV antibodies. Quantitative estimation of HCV-RNA was done to seropositive cases.
Results: Prevalence of anti-HCV antibodies and HCV infection was 8.6%, and 4.4% respectively. The frequency of BBF exposures was 66.7%. Blood/blood products were mainly involved (92.1%). More than half of exposed HCWs reported not wearing personal protective devices. Anatomical site of exposure was mainly right hand palm (36.2%). Regarding needle-stick injuries, two thirds of injured HCWs were the original user of sharp item which was contaminated in 79.7% of injuries. In 70.2% of injuries, disposable syringes were involved and occurred during item disposal. About 61% of injuries were superficial.
Conclusion: Prevalence of HCV infection among HCWs is similar to that among general population in the country. Nurses and housekeepers are frequently exposed to BBF. Adherence to infection control measures according to the National Guidelines is crucial to reduce HCV transmission.

1. Introduction

Globally, according to the World Health Organization (WHO), there is a variation in Hepatitis-C Virus (HCV) epidemiology; some countries are considered to have a low endemicity, with less than 1.5% of HCV chronic carriers, while others have a moderate endemicity, with 1.5–3.5% of subjects carrying HCV infection. In some regions such as the Middle East and Northern Africa, HCV endemicity is high; more than 3.5% of the population having chronic HCV infection.[1] The global prevalence of anti-HCV was estimated at 2% and the viraemic prevalence was 1.4% among adults.[2]

Egypt has one of the highest global burdens of HCV.[3] According to Egypt Health Survey 2015, 6.3% of population aged 1–59 years have HCV antibodies, and 4.4% have HCV RNA compared with 3.6% and 2.4% respectively, in our city.[4] The Country Health Issues Survey 2015, showed that HCV PCR positive adults decreased by 30% compared to the Country Demographic and Health Survey 2008. The decline mostly reflects the aging out of the population tested of individuals aged 53–59 on 2008.[4]

HCV infection progresses to chronicity in 70% of cases. If left untreated, 14% to 45% of patients develop liver cirrhosis 20 years after acquisition of disease, and 1–5% will develop liver cancer.[3] Worldwide, approximately 27% of chronic liver cirrhosis and 25% of hepatocellular carcinoma can be attributed to hepatitis C.[5]

Occupational exposure of health care workers (HCWs) to HCV infection occurs through percutaneous exposure (75%) or mucosal-cutaneous exposure (25%) to patient's infected blood, blood derivative, or body fluids.[6] Worldwide, the prevalence of anti-HCV positivity in HCWs ranges from 0% to 9.7%.[7]

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The WHO states that among the 35 million HCWs worldwide, about 3 million receive percutaneous exposures to bloodborne pathogens each year; 0.9 million of those are exposed to HCV.[8] In percutaneous exposure, HCW receive an injury with a sharp contaminated object.[9] Needlestick and sharp injuries (NSSIs) are considered as a part of "Unsafe injections".[10] Nurses generally are the occupational group with the highest risk of NSSIs.[11] The estimated risk of transmission of HCV infection from an infected patient to the HCW following a NSSI is 0.8–3%.[12] An average of 4 NSSIs per year per HCW was found in Eastern Mediterranean Region.[13]

The rate of transmission of HCV infection among HCWs can be five times higher in percutaneous than in mucosal-cutaneous exposure. Highest rates of HCV transmission follow exposure to blood or its products, compared with ascitic or cerebrospinal fluid. The extent and depth of the cutaneous or mucosal wound and the volume of blood transferred greatly affect the rate of HCV transmission.[14]

Lack of infection control (IC) measures is an essential risk factor for HCV in our country. In 2002, the Ministry of Health and Population (MOHP) developed a national plan to establish an IC program structure, develop IC guidelines, and promote occupational safety.[15] In 2008, those IC guidelines were revised by the WHO. In 2011, the program underwent an International Health Regulations assessment, which concluded that the program had substantially decreased iatrogenic transmission of HCV.[16]

In 2012, the MOHP in our country, developed the "Plan of action for the prevention, care and treatment of viral hepatitis" (POA), which focuses on the seven main components of viral hepatitis prevention and control: surveillance, IC, blood safety, hepatitis B virus vaccination, care and treatment, communication and research.[17]

The current study was conducted at the Alexandria University Hospitals (AUHs) to: (1) calculate the prevalence of HCV infection among nurses and paramedical personnel (PP); (2) study the frequency and characteristics of NSSIs and blood and body fluid (BBF) exposures among nurses and PP during 6 months period; and (3) assess post-exposure management (PEM) adopted at the UHs.

2. Material and methods

Hospital-based cross sectional approach was adopted. The study was conducted in different departments at the AUHs; Main University Hospital, Pediatrics Hospital, gynecology/obstetrics Hospital and Orthopedics Hospital. The fieldwork of the study started on first of October 2015 throughout end of March 2016.

All nurses and PP were invited to participate in the research. Initially, 582 responded and had willingness to participate. The response rate was 72.6%. However, 83 were excluded because their activities did not include contact with patients or with BBF from patients, thus, didn't have the potential for exposure to NSSIs as well as infectious materials. Those excluded subjects worked as medical records technicians and radiology technicians. Those who were included in the research (n = 499) represented 62.2% of the overall number of nurses and PP who were available and in charge at time of study. It comprised: nurses (n = 372); laboratory technicians (n = 14); workers providing housekeeping and laundry services (n = 94); and PP at sterilization and central supply units (n = 19).

2.1. Study tools

2.1.1. An interview questionnaire[18–20]

HCWs (nurses and PP) were interviewed to collect information about: (a) *sociodemographic and occupational characteristics*; (b) *frequency of accidental exposure to NSSIs, and BBF* during 6 months prior to the study to get more reliable answers as such information is 'memory dependent'; (c) *Characteristics of the last NSSI and BBF exposure* experienced by the injured HCW, regarding the type of device causing the injury; mechanism, site and depth of injury, and use of gloves at time of exposure; and (d) *PEM* including reporting and blood test for the source patient as well as injured HCW for HCV infection.

2.1.2. Collection of blood sample to test for HCV infection status

Serum blood samples were collected from nurses and PP (n = 499) to be screened for the presence of HCV antibodies by chemiluminescent enzyme immunoassay (Siemens Healthcare Diagnostics, USA) for qualitative detection of IgG antibodies to HCV.[21] The test employed two recombinant HCV antigens of NS3, NS4, NS5 regions (c200 and NS5) and synthetic peptide of the core (c22). The chemiluminescent reaction was directly proportional to the amount of anti-HCV present in the sample. The results were expressed as an Index. Samples with an index value <0.8 were considered negative. Samples with an index value $\geq$0.8 and <1 were considered equivocal. Samples with an index value >1 were considered positive.

Plasma was collected from seropositive cases (n = 43) for quantitative estimation of HCV-RNA in serum: HCV RNA in plasma was detected by automated extraction/real-time RT-PCR based assay for quantification of HCV RNA (COBAS Ampliprep™/COBAS TaqMan™, "CAP/CTM" Roche Molecular Systems, Pleasanton, CA, USA).[22] The assay lower detection limit was 15 IU/ml and upper detection limit was 6.9×10^7 IU/ml using primers located in the highly conserved 5′ non translated region (NTR).

Blood samples were analyzed at the Central Laboratories at the Alexandria Faculty of Medicine.

2.2. Statistical analysis of the data

The collected data were coded and typed onto computer files using SPSS software program version 20.0.[23] Descriptive statistics included, frequency, percentages, median and inter-quartile range were used.

2.3. Ethical clearance

The study was approved by the Research Ethics Committee at the Alexandria Faculty of Medicine. Objectives of the study, procedures, types of information to be obtained, and publication were explained to participants. An informed written consent was obtained from each participant. Collected data were confidentially kept.

3. Results

3.1. Sociodemographic and occupational characteristics

Males constituted 22% of the interviewed HCWs. The median age of HCWs was 39.0 years old. The majority had nursing diploma (62.0%). The median duration of employment was 17.0 years (Table 1).

3.2. Prevalence of HCV infection among HCWs

Screening of HCWs (n = 499) for HCV antibodies, revealed 43 seropositive cases (8.6%). Plasma was collected from seropositive cases for quantitative estimation HCV RNA in serum. According to the results, 22 HCWs had HCV infection (4.4%), five of them knew that they were infected and they were on treatment. The