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Hepatitis B infection among health workers in Uganda: Evidence of the need for health worker protection☆

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Abstract

Hepatitis B exposure was assessed in 311 health workers in Uganda, a highly endemic country. Health workers were selected by random sampling from a categorized list of health workers at district level, proportionate to the population of each district. Whereas 60.1% of health workers have evidence of hepatitis B infection, with 8.7% being chronic carriers and one (0.3%) acutely infected, 36.3% are still susceptible and could benefit from vaccination. Only 5.1% reported having had at least one dose of hepatitis B vaccine and 3.5% were apparently immune through vaccination. Needle stick injuries reported by 77% of health workers were the most common mode of exposure to blood and body fluids. Trends suggested duration of service as a predictor while age and history of blood transfusion remained significant independent risk factors for hepatitis B infection. 98% of health workers are willing to be vaccinated. These results confirm the need for protection and vaccination of health workers in Uganda against hepatitis B.

Keywords: Hepatitis B; Health workers; Vaccination; Uganda

1. Introduction

Hepatitis B infection remains a public health problem globally, causing 700,000 deaths annually [1,2] and a major occupational hazard for health care personnel [3–10]. Where hepatitis B infection is highly endemic and frequently occurs in early childhood, it is often asymptomatic and leads to the chronic carrier state in 50–90% of children [2]. Adults infected with hepatitis B virus usually recover, but 5–10% develop a chronic carrier state, resulting in chronic hepatitis, liver cirrhosis and hepatocellular carcinoma [2,11] with fulminant and usually fatal acute hepatitis in 1% on first infection [2,6,11]. Most infections still occur in highly endemic countries of Asia and sub-Saharan Africa [1], including Uganda [12,13], where more than 8% of the population are chronic carriers of the virus. In Uganda, it was recently shown that 52% of the adult population have serological evidence of previous hepatitis B exposure and 10% are chronic carriers [14].

Health care personnel have an increased risk of hepatitis B infection compared to the general population [7,8], and transmission from health workers to patients has been documented [9,15,16]. Occupational exposure to hepatitis B can result from percutaneous injury (needle stick or other sharps injury), mucocutaneous contact (splash of blood or other body fluids into the eyes, nose or mouth) or blood contact with non-intact skin [4,6,15]. Vaccination against hepatitis B induces immunity in 95% of healthy recipients [1], and protection of health workers through immunisation, use of protective equipment and post-exposure management is critical [7,9,15]. Nationally appropriate policy decisions

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on vaccination of health workers in Uganda should be based on information on hepatitis B exposure in this group.

A survey was conducted to assess the exposure of health workers in Uganda to hepatitis B, measles and rubella infections. The objectives with respect to hepatitis B were to determine the prevalence of hepatitis B serological markers among health workers; to document the risk factors associated with positive hepatitis B serology; and to determine health worker willingness to take up vaccination against hepatitis B. Findings for measles and rubella exposure are reported elsewhere [17].

2. Methods

2.1. Study design, subjects and data collection

A cross-sectional serological and questionnaire survey was conducted among health personnel in 48 of 56 districts in Uganda, excluding 8 insecure districts (Gulu, Kitgum, Pader, Kotido, Moroto, Nakapiripirit, Soroti and Katakwi).

A sample size of 289 health workers was determined with participants stratified into three risk categories, to allow comparison of outcomes for these groups, with a 95% level of confidence, statistical power of 80% and precision of 5% [18]. Sample size was determined assuming a measles antibody prevalence of 80% [17]. Health workers were randomly selected from government public health facilities, the number per district proportional to the population of the district. In case of refusal, an alternate health worker was selected from the same health unit. Health units from which participants were selected included hospitals (national referral, regional referral, and district levels), health centers IV, III and II (catering for populations of approximately 100,000, 20,000 and 5000, respectively), and the office of the district director of health services.

A health worker was defined as any individual employed in a health care setting and in contact with patients or patients' body fluids. To ensure representation of different occupational groups prior to sampling, health workers were allocated to one of three categories, defined according to their assumed level of exposure to patients' blood or body fluids [15,16]. One category who typically undertake invasive procedures included surgeons, obstetricians, gynecologists, laboratory technicians and assistants, midwives, medical officers, interns, dentists and dental assistants; a second category of clinicians included physicians, pediatricians, clinical officers, nurses, nursing assistants and aides, and anesthetic officers; the third category assumed to be at low risk included pharmacists, dispensers, pharmaceutical assistants, theatre attendants, district health teams and support staff (such as records assistants, vaccinators and cleaners).

The survey collected information by questionnaire on age, duration of service as a health worker, immunization status (any dose of hepatitis B vaccine), and history of liver disease (defined as including fatigue, loss of appetite, jaundice, abdominal pain, or enlargement and tenderness of the liver). Exposure history obtained included: accidental needle prick while handling patients' blood or other body fluids, ever having had a blood transfusion, any sexual partners who had symptoms of hepatitis B, and body scarification.

Research assistants visited each district, obtained a comprehensive registry of health personnel, randomly selected health workers from each of the three risk categories, sought their informed consent, and administered a pre-tested questionnaire to obtain information on demographic characteristics and risk factors.

Ethics approval was obtained from the Science and Ethics Committee of the Uganda Virus Research Institute and the Uganda National Council of Science and Technology.

2.2. Serological assays

Blood specimens (3–5 ml) were obtained from each consenting participant and centrifuged at the district laboratory at 1500 rpm for 5 min, where possible, or left to stand for about 1 h to allow for separation of serum from blood cells. The separated serum was divided into two aliquots in serum tubes, stored at 0–8 °C, and transported to the Expanded Programme on Immunisation laboratory in a specimen carrier with icepacks. Prior to testing, specimens were stored at −20 °C. Specimens were delinked from the participants' identity to ensure confidentiality and blinding of the laboratory staff.

Sera were tested for hepatitis B surface antigen (HBsAg) and antibody (Anti-HBs), and core antibody (Anti-HBc IgG and Anti-HBc IgM), using commercial enzyme immunoassay kits (Abbott Murex, Dartford, UK). Quality control references provided in the test kits were used to standardize the laboratory testing. An antibody level greater than or equal to 10 MIU per ml was considered protective against HBV infection and indicated acquired immunity. For HBsAg, specimens with an optical density equal to or greater than the cut-off value provided in the kit were considered reactive in the assay. Findings were interpreted according to the test results as outlined in Table 1.

Health worker status was defined according to the serological findings (Table 1) as (1) not infected, grouping those susceptible (no evidence of hepatitis B infection) and vaccinated (likely immune due to hepatitis B vaccination) and (2) currently or previously infected (acute and chronic infection, immunity due to natural infection and indeterminate status). Indeterminate specimens were considered infected as three of the four interpretations for the positive hepatitis B core antibody (Anti-HBc) refer to previous infection [19]. The fourth possible interpretation refers to a susceptible state with a false positive Anti-HBc, which is unlikely in Uganda due to the high specificity of the test (99.7%, Murex Anti-HBc enzyme immuno assay) and the high prevalence of infection in the population tested [14,20].