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Abstract

Background: Although hepatitis B is vaccine-preventable, it remains a significant health problem. To the best of our knowledge, this is the first hepatitis B outbreak report from Türkiye.

Aims: To investigate the cause of hepatitis B outbreak in a nursing home for the disabled and make recommendations for prevention.

Methods: An outbreak of acute hepatitis B was declared in a nursing home for the disabled following the admission of 3 patients from the home in a hospital. Collaborative response was initiated with the Provincial Health Directorate through the Public Health Infectious Diseases Department. We began tracking the infection and monitoring active cases. Audits and controls were carried out to determine the source, establish protection and control measures, and prevent further transmission.

Results: Six of the 65 nursing home residents were diagnosed with acute hepatitis B. Four of them had diabetes and their blood glucose levels were monitored for at least 12 months. Two of the patients had received dental treatment in the last 6 months. The frequency of both variables, which may be an indication of the transmission route, was statistically significantly greater in the acute hepatitis B group. All the patients who could be sequenced were identified as genotype D. While 3 patients recovered fully, 2 were diagnosed with chronic hepatitis B and one died due to fulminant hepatitis.

Conclusion: Standard routine immunization should be implemented as a preventive measure for acute hepatitis B. Frequent supervision and training on hygiene practices and safety precautions should be conducted for care staff working in collective residential facilities.

Keywords: hepatitis, vaccine, immunization, prevention, disabled, nursing home, safety precaution, Türkiye

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Introduction

Although hepatitis B is a vaccine-preventable disease, according to the World Health Organization (WHO), 240 million hepatitis B virus (HBV) infections and

780 000 deaths due to hepatitis B are reported every year (1). Seroprevalence varies according to geographic region, and Türkiye is in the low-to-moderate endemic group (2). Seroprevalence of hepatitis B is higher in the Eastern Anatolia Region of Türkiye and lower in the western regions. Mean seroprevalence is reported as 2–8% for the country (3–5).

Hepatitis B vaccine was included in the routine childhood vaccination scheme in Türkiye in 1998. This led to a decrease in the number of cases of acute hepatitis B (AHB); the disease has now, however, been seen more frequently among people in the older age groups (6). Clinical presentation ranges from asymptomatic infection to fulminant hepatitis. While many factors play a role in this broad clinical outlook, it is established that the infection is primarily asymptomatic in children under one year old, and 30–80% symptomatic in the adult age group (2, 7).

In accordance with the WHO's 2030 goals, Türkiye has introduced hepatitis B prevention, immunization and awareness-raising activities (1, 8). However, despite the intensive measures initiated both in Türkiye and worldwide, there are difficulties in preventing the transmission of the disease, especially among high-risk groups. The virus is found in varying proportions in semen, saliva, cervical secretions and tears, but mainly in blood, and viability can be maintained for up to 7 days on fomites (9). At room temperature, it can remain stable for 3–4 weeks on surfaces, 4 hours at 60°C, 15 years at –20°C, and for at least 35 years at –70°C (10–12). Even in tiny amounts, it can be transmitted via secretions other than blood through skin tissue that has impaired integrity.

Transmission can occur, especially among children, in institutions that host people with developmental disabilities and in environments where there is long-term close personal contact (2). Nursing homes, dialysis units and outpatient clinics are frequently implicated in out-of-hospital health care-related transmission of HBV. In particular, before 2000, hepatitis B outbreaks were reported in shared accommodation such as nursing homes, hospitals and prisons. The recent publication of a hepatitis B outbreak due to acupuncture suggests that outbreaks could occur during cosmetic procedures (13).

In our study, AHB cases diagnosed in a nursing home for the disabled were examined to identify possible transmission routes and to initiate treatment and follow-up. The analysis aimed to identify the risk factors for AHB outbreaks, with the goal of improving compliance with infection control measures in places where living spaces are shared. By addressing these risk factors, we aim to prevent new outbreaks and reach wider populations through vaccination programmes

Methods

This case–control study was carried out between April and August 2021 after 3 patients diagnosed with HBV were admitted to our hospital from a nursing home for the disabled in a province in the Black Sea Region of Türkiye. After the diagnosis of these 3 cases over a relatively short period in an institution having only 65 residents, the possibility of an outbreak was considered and action was taken to address the situation. The staff of the home comprised 4 nurses and 27 other employees, who were also tested for HBV infection.

After contacting the Provincial Health Directorate, a collaborative study was conducted in cooperation with the infectious diseases department of the public health services. The study covered the 65 residents of the home. Contact tracing and active case detection were carried out during the investigation of the outbreak. Examination and control processes were employed to determine the source, implement proper protection and control measures, and prevent the occurrence of new cases.

The steps for outbreak analysis were systematically examined and applied (14). After the outbreak was detected, the case definition was constructed. Cases of AHB were detected systematically and information about them recorded. A hypothesis was developed for risky situations in terms of transmission. The hypotheses regarding the risk factors for AHB were evaluated using a basic form which we developed during the field work to gather demographic data and information on possible transmission routes. The relevant higher authority was informed about control, surveillance and prevention measures, and suggestions were made for managing these issues.

Pre-employment and annual examinations of the nursing home staff and routine inspection of all residents were conducted by the institution. Regular testing showed hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (anti-HBs) and antibody against hepatitis C (anti-HCV). Demographic data on the residents, such as sex, age, education status, marital status and other illnesses, were recorded. Considering the long incubation period, data on potential risk factors such as the admission date of the patient to the nursing home, suspicious sexual contact, hospitalization during the last 6 months, transfusion, dental intervention, intravenous drug use, surgical intervention, manicure/pedicure history, blood glucose monitoring, use of a razor, and nail cutting were recorded. The status of hepatitis B vaccination was evaluated.

Possible risk factors were assessed during visits to the nursing home and procedures that could facilitate/cause transmission were investigated. The residents were interviewed about routine

daily procedures and risky behaviours. Newly diagnosed hepatitis B patients were invited for follow-up for one year. Vaccination against HBV was administered to those who were HBV seronegative.

We used Cobas e 601 (Roche Diagnostic, Mannheim, Germany) with an Elecsys reactive kit to study HBsAg, anti-HBs, IgM and IgG antibodies (anti-HBc-IgM, anti-HBc-IgG), hepatitis B envelope antigen (HBeAg), and hepatitis B envelope antibody (anti-HBe) via electrochemiluminescence immunoassay (ECLIA). Quantitative real-time polymerase chain reaction (PCR) was used to study HBV DNA using the artus HBV QS-RGQ kit on the QIAsymphony platform (QIAGEN, Hilden, Germany). In addition, genotype/subgenotype analyses of HBV isolated from patients were carried out.

We used 2 different case definitions for AHB:

1. HbsAg-positive and anti-HBc-IgM-positive cases.
2. Previously HbsAg-negative cases who became HbsAg-positive within the last 6 months and had elevated alanine transaminase and aspartate aminotransferase.

These cases were considered patients within the outbreak.

HBsAg-negative residents, other than those with AHB and those with known chronic hepatitis B, were identified as the non-AHB group. Patients in the non-AHB group were included in the analysis as the control group.

Patients whose HBsAg positivity persisted for more than 6 months during their follow-up were defined as having chronic hepatitis B (2). These patients were not included in the control group. The staff working in the nursing home were not included in the control group either.

After 3 cases of AHB were detected in the same nursing home in a 55-day period, the first case of AHB, referred to as patient number 1 in our study, was defined as the index case.

The HBV genotype/subgenotype determination covered all known primary/compensatory resistance mutations, HBsAg protein, surface-(S) gene 111–227 aa. interval and HBV polymerase (pol) gene reverse transcriptase, RT region, 80–250 aa. The interval was analysed by sequencing (15).

For HBV pol gene amplification (742 bp), forward (F:5′-tcgtggacttctcaatt-3′) and reverse (R:5′-cgttgacagactttccaatcaatcaat-3′) primers were used. Sequencing was performed on the ABI PRISM 3130 platform (Applied Biosystems, Waltham, Massachusetts) according to the manufacturer's recommendations. The sequences obtained were analysed using Geno2pheno software (Center of Advanced European Studies and Research, Bonn). After comparison, the HBV pol gene was analysed for amino acids, primary drug resistance and compensatory mutations at positions 80, 84, 85, 91, 169, 173, 180, 181, 184, 191, 194, 202, 204, 214, 215, 233, 236–238 and 250 of the RT cycle (16). In addition, amino acids at positions 121, 135, 137, 139–149, 151–153, 155–157, 161, 164, 172, 173, 175, 176, 182, and 193–196 of the S gene region overlapping with the HBV RT cycle were analysed for the presence of mutations (17).

For the descriptive statistics, mean and standard deviation were used to summarize the continuous variables, while number, frequency and proportion were used to summarize the categorical variables. The chi-squared test or Fisher's exact test were used as appropriate for comparing categorical variables. The association between exposure and AHB case status was measured in univariable analysis by calculating the odds ratio and 95% confidence interval. Statistical significance was taken as P