

Determining the Level of Anti-Hepatitis B Surface Antibody in Nursing and Allied Nursing Students in Birjand University of Medical Sciences, 2013

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Abstract

Background: Hepatitis B infection is one of the common diseases worldwide and the most prevalent communicable virus transferred by blood to the healthcare personnel. Active immunity is the most effective measure to prevent hepatitis B infection. The present study aimed at determining hepatitis B surface antibody (HBsAb) in nursing students in Iran, 2013.

Methods: The present cross sectional study was conducted on 178 students of nursing, anesthesia, and operating room. They had been fully vaccinated against hepatitis B. HBsAb level was determined in blood samples by enzyme-linked Immunosorbent Assay (ELISA) and Dialab kit made in Italy. Independent t test, ANOVA, and the Tukey range test were used to analyze the data. The level of significance was < 0.05 .

Results: HBsAb level of 4 (2.2%) cases was below 10 mIU/L, 109 (61.3%) had an HBsAb level between 10 and 100 mIU/L, and in 65 (36.5%) cases, HBsAb level was above 100 mIU/L. Mean HBsAb level in the cases was 95.71 ± 61.4 mIU/L. There was no statistically significant difference among the means of HBsAb in terms of gender, time elapsed from the last vaccination, and time to attend training ($P < 0.05$).

Conclusions: In general, it can be concluded that due to high immunogenicity of hepatitis B vaccine, serological immune response assessment of vaccinated individuals is not necessary except for special and risky groups and, therefore, not recommended.

Keywords: HBsAb, Hepatitis B, Nursing Students

1. Introduction

In the third millennium, hepatitis B is still a major public health problem worldwide. Over 2 billion people are exposed to hepatitis B virus (HBV) (1), and around 20% of them are infected with chronic HBV infection (2). Prevalence of HBV varies in different parts of the world. In this regard, the world is divided into 3 regions: areas with low prevalence, areas with moderate prevalence, and areas with high prevalence. For example, 75% of the people are infected with HBV in Asian countries every year (3).

Custer et al. (2004) reviewed the prevalence of chronic HBV infection in the general population; it varied from from higher than 10% in some parts of Asian and Western Pacific to less than 0.5% in the United States and Northern Europe (4).

According to various studies, Iran is among countries with moderate prevalence of the disease. Of course, in Iran, the HBV infection is not equally distributed. For instance, in some provinces such as Fars, the prevalence is 1.7%, and

in some others, such as Sistan and Baluchistan, it is 5% (5). Thanks to the vaccination of neonates from 1993 and the decreased prevalence of the disease due to the National Health and Disease Plan; Iran has turned from a country with average prevalence to a country with low prevalence. Today, the disease mostly occurs among adolescents and adults (6). To assess the impact of prevention and control measures, including vaccination programs, and also update the estimates of disease burden, it is necessary to have good knowledge of HBV infection (7).

Despite improvements regarding prevention and treatment of chronic hepatitis B and C infections over the past decades, effective and permanent reduction of the infections still needs more comprehensive measures (8).

Healthcare workers and medical students are at increased risk of HBV infection through occupational exposure, because HBV is transmitted by infected blood and other body fluids (9). Infected needles and syringes, patients' sputa, and secretions are among the pathogens

to which health staff including nursing, surgical technology, and anesthesia apprentices are somehow exposed (10). Occupational sharp injuries usually result from inadequate staff, lack of experience, insufficient training, heavy workload, and fatigue (10). Preventive measures are needed to minimize occupational exposure to blood borne pathogens to protect both healthcare personnel and nursing students (3). Also, it is probable that HBV is transmitted to patients through hospital personnel (6).

Transmission of HBV to healthcare personnel is a high risk. Under the current European Union legislation, risk assessment to identify individuals exposed to HBV and also their vaccination should be performed by employers. To avoid contamination, vaccination program should be performed they as soon as start work (11).

After vaccination for hepatitis, level of hepatitis B surface antibody (HBsAb) decreases over time; hence, it is still unknown how long the vaccine can provide protection, but the anamnestic immune response can be measured indirectly to booster doses of the vaccine (12).

The current study aimed at determining the level of HBsAb in nursing and allied nursing students in Birjand University of Medical Sciences (BUMS), Iran, in 2013.

2. Methods

2.1. Participants

The current descriptive-analytical, cross sectional study was conducted on 178 nursing, surgical technology, and anesthesia students at BUMS in 2013. Participants included all the students of the above-mentioned majors at BUMS at the time of the study. The inclusion criteria were as follows:

- 1) Three times vaccination (a complete dose) against HBV
- 2) Long interval between the last doses of vaccine, from 2 months to 5 years.
- 3) No history of jaundice, hepatitis, surgery, dialysis, and blood transfusions.

The study aims were explained to the participants and accordingly they signed the informed consent. A questionnaire already developed by 10 faculty members of Nursing and Midwifery College was distributed among the study cases. The questionnaire consisted of 3 sections, demographic characteristics, vaccination history, and risk factors for exposure to blood and other body fluids.

2.2. Blood Samples

Trained nurses took 5 mL of blood from the participants, and the samples were sent to the reference laboratory. After separation of serum by enzyme-linked immunosorbent assay (ELISA), using Dialab kits made in Italy;

the samples were analyzed for HBsAb. The cases were categorized into 3 groups based on the level of HBsAb titer: negative or weak titer of less than 10 mIU/L; average titer between 10 and 100 mIU/L; and positive or strong titer above 100 mIU/L.

2.3. Statistical Analysis

Data were analyzed by SPSS software, version 15.0, using descriptive statistical tests including ANOVA, t test and the Tukeyrange test. The level of significance was < 0.05 .

2.4. Ethical Considerations

The study was approved by the ethics committee of BUMS, (registration code: IR.Bums-1392009023). The students were informed about the voluntary nature of participation in the study. Informed written consent was obtained from the participants. Besides, they were assured about the confidentiality of data, and the obtained blood sample would only be used to assess the level of HBsAb.

3. Results

A total number of 178 students vaccinated 3 times against hepatitis B participated in the study. Their age range was 18 to 26 years, with the mean of 21.3 \pm 1.5. Among them, 61.8% (110 cases) were female, 82.9% (147) unmarried; 71.9% (128) nursing, 19.1% (34) anesthesia, and 9% (16) surgical technology students. In addition, the mean body mass index (BMI) of the students was 22.1 \pm 3.2.

Out of the 178 cases, 89.9% (160) had accurately followed the proper injection lapse. Mean HBsAb of the students was estimated 95.7 ± 61.4 mIU/L; only 4 students (2.2%) had an antibody titer of less than 10 mIU/L (Table 1).

Table 1. Distribution of HBsAb in Nursing and Allied Nursing Students in Birjand University of Medical Sciences in 2013

| HBsAb Titer | No. (%) |
|---------------------|------------------|
| Less than 10 mIU/L | 4 (2.2) |
| 10 - 100 mIU/L | 109 (61.3) |
| More than 100 mIU/L | 65 (36.5) |
| Total | 178 (100) |

There was no significant difference in the mean HBsAb titers in terms of gender, time-lapse from the last vaccination, and duration of the internship. However, the difference between the mean HBsAb titer and field of study was statistically significant ($P < 0.05$). The Tukey range test revealed that the differences observed between nursing and surgical technology students ($P < 0.001$), and those of nursing and anesthesia students in terms of HBsAb titer were

statistically significant ($P < 0.001$); nursing students' HBsAb titer was less than that of the other 2 groups (Table 2) ($P < 0.05$).

Table 2. Comparing Means of HBsAb in Nursing and Allied Nursing Students in Birjand University of Medical Sciences in 2013

| HBsAb Titer Major | Frequency | X \pm SD, mIU/L | ANOVA Result |
|---------------------|-----------|-------------------|--------------|
| Nursing | 127 | 82.4 \pm 59.1 | < 0.001 |
| Anesthesia | 33 | 133.9 \pm 53 | |
| Surgical technology | 14 | 126.5 \pm 55.4 | |

4. Discussion

The results of the current study showed that only 4 students (2.2%) did not have enough antibodies. HBsAb titer in 109 cases (61.3%) was 10 - 100 mIU/L, and in 65 students (36.5%) the HBsAb level was above 100 mIU/L according to the literature, the standard to establish appropriate immunization antibody is 95% (range 80% to 100%) (13). According to the present study, immunity level of the students was in the optimum status. Various studies in Iran and other parts of the world reported that the immunity acquired through vaccination ranges from 71% to 95%. The higher immunity of the cases in the present study, compared to other studies, can be due to their younger age. A big number of studies indicated a decreased immunity as the age increases. It seems that conditions such as malnutrition, deficiency of blood supply, metabolic changes, and some drugs play a role in this regard (14).

According to Toheedast et al. HBsAb titer was more than 100 mIU/L in 86.9% of the cases, 10 to 100 mIU/L in 7.5%, and less than 10 mIU/L in 5.6% of the subjects (15). The percentage of the cases with weak HBsAb was consistent with the results of the present study. Sebzari in Birjand found that 7.6% of the medical students and staffs had HBsAb titer of less than 10 mIU/L, 10.5% 10 to 100 mIU/L, and 82% more than 100 mIU/L (16). Izadpanah revealed that HBsAb in 13 nurses (11.6%) was less than 10 mIU/L, in 14 (12.5%) was 11 to 100 mIU/L, and in 85 cases (75.9%) more than 100 mIU/L (17).

In the 2 studies conducted in Birjand, the number of the participants with weak HBsAb was more than that of the present study; this can be due to the difference in the target groups and also the difference in the age of the cases under study.

Mokhtarian found that 8.2% of the participants had an HBsAb of less than 10 mIU/L, 33% had 10 to 100 mIU/L, and 58.5% had over 100 mIU/L (18); a point that was similar to the results of the present study.

According to Rafizadeh, 29.5% of the participants had HBsAb titer of 0, in 22.5% it was less than 10 mIU/L, in 27.5% was 10 to 100 mIU/L, and in 20.5% higher than 100 mIU/L (19); something different from the results of the present study.

Based on the present study, there was a significant relationship between the titer of HBsAb in nursing students and their field of study. In other words, the mean HBsAb titer of surgical technology and anesthesia students of BUMS was significantly higher than that of nursing students. On the basis of Sebzari's study in Birjand, no statistical relationship was found between different groups regarding mean HBsAb and their HBsAb titer; a finding which was different from that of the current study (16).

Regarding the level of HBsAb in the students under study and demographic variables, no statistical relationship was found between variables such as age, BMI, length of internship, and the time-lapse between the last vaccination and this level. In the study by Izadpanah in Birjand, no significant relationship was found between HBsAb titer of nursing staff and age, gender, and the ward (17). Similarly, the study conducted by Toheedast et al. did not find a significant statistical relationship between underlying variables such as age, gender, lapse since the last vaccination, and HBsAb titer (15).

According to the study by Rafizadeh et al. in Zanjan, Iran, there was no significant difference in the HBsAb levels of the 2 genders (19).

However, Mokhtarian et al. found a significant relationship between HBsAb titer and the lapse since the last vaccination, medical history of the staff, and age (18). Of course, it did not correspond to the results of the present study.

4.1. Conclusions

In general, it can be concluded that due to high immunogenicity of hepatitis B vaccine, serological immune response (titration) assessment of vaccinated individuals is not necessary; except for special and risky groups (healthcare workers) and, therefore, not recommended.

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