A Study of Prevalence of Occult Hepatitis B Virus Infection, Knowledge and Preventive Practices Against Hepatitis B Virus in Barbers Serving the Armed Forces

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Objective: Hepatitis B virus (HBV) infection is a major health problem in the world. Barbers deal with frequent abrasions/lacerations due to sharp equipment, making them a high-risk group. Determination of HBsAg positive status excludes most reservoirs of transmission in the population. However, Occult Hepatitis B continues to be a source of transmission. The aim of this study was to study the prevalence of occult HBV infection in barbers serving the armed forces clientele and evaluate their knowledge and preventive practices against HBV transmission. Methods: Seventy-nine HBsAg negative barbers were included in this study and interviewed for the status of immunisation and preventive practices. Anti-HBc total and HBV DNA levels were measured along with a complete haemogram, LFT, PT INR, ultrasound abdomen and Fibroscan of the liver. Results: The prevalence of occult Hepatitis B status was 3.79%. Among barbers who were anti-HBc total positive, 100% were found to have replicative HBV DNA status. All barbers (100%) were unaware of the existence and modes of HBV transmission and were never screened for HBV; 98.73% of barbers followed improper disinfection practices and were never immunised. Conclusion: The prevalence of occult HBV infection in barbers, absence of immunisation, unawareness and improper disinfection practices are significantly at risk for transmission to the unaware clients. It is important to educate barbers, establish a universal disinfection procedure and implement a system of compulsory Hepatitis B vaccination before the commencement of their trade work. (J Clin Exp Hepatol 2021;11:668–673)

Hepatitis B infection is a common blood-borne infection with a prevalence of 2–7% in India with an average of 4%. Hepatitis B Virus (HBV) transmission can be through bodily secretions such as blood, blood products, serum, semen, vaginal fluid and perinatal transmission. Several studies, however, have also implicated body fluids like sweat, tears and urine as a potential source for HBV transmission. Hepatitis B Infection by HBV can cause serious mortality and morbidity, and its chronic infection can lead to carcinoma liver, chronic active hepatitis and cirrhosis in a significant number of people harbouring the infection. A positive test for surface antigen (HBsAg) indicates a current infection and the ability of the person to infect others. Such persons can be screened by carrying out a test for the surface antigen. However, hepatitis B virus can also be transmitted by people who are negative for HBsAg and usually have an active HBV DNA replicating status with the presence of antibodies against HBeAg (anti-HBe), known as individuals with occult HBV infection. Infected people may not be aware of their HBV status and are not clinically ill but are a source of infection to others, which makes HBV infection a serious health problem.

Barbers, by virtue of their trade, handle sharp equipment and may be accidentally exposed to the blood and bodily fluids of their customers. Apart from sharp equipment, instruments like comb can get exposed to blood from micro-abrasions while brushing in contact with the scalp due to friction, the risk increasing if conditions like psoriasis and dermatitis are present in the scalp. Improper disinfection of the equipment used may also lead to transmission between customers. Barbers, as tradesmen, have been an integral part of the Indian Armed Forces and their clientele include recruits, cadets and soldiers. Unawareness among these barbers, improper disinfection techniques and unknown HBV status poses a risk for client-tradesman-client and client–client transmission of HBV. However, despite this high occupational hazard

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Abbreviations: ALT: Alanine Transaminase; anti-HBc: Antibodies to Hepatitis B core antigen; anti-HBs: Antibodies to Hepatitis B surface antigen; HBcAg: Hepatitis B core antigen; HBeAg: Hepatitis B envelope antigen; HBsAg: Hepatitis B surface antigen; HBV: Hepatitis B Virus; HBV DNA: Hepatitis B Virus Deoxyribonucleic acid; INR: International Normalised Ratio; IU/ml: International Units/millilitre; kPa: KiloPascal; PT: Prothrombin Time

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posed to barbers, several studies have reported a low level of knowledge on HBV among barbers in developing countries.7,8

HBsAg positive status excludes most reservoirs of transmission in the population. Once HBsAg positivity is detected, the tradesman can be excluded from performing trade activities. However, Occult Hepatitis B continues to be a source of transmission of HBV infection. Occult Hepatitis B infection is characterised by serum negative HBsAg along with positive antibodies to HBeAg (anti-HBc) and presence of (but not always) HBV DNA in the serum or the liver (intrahepatic and is a feature of the natural history of chronic HBV infection.9,10 Isolated anti-HBc has been implicated to have a significant serological marker for occult HBV infection recently and as an emerging laboratory assay that identifies occult hepatitis B infection.11 The detection of HBV DNA in the liver tissue (intrahepatic DNA) is the current-gold standard for confirming occult hepatitis B infection.12 However, due to logistic and facility constraints, several studies utilise serum detection of anti-HBc and HBV DNA for their studies.9,10,12

Occult Hepatitis B is considered a status with multiple conditions and situations like reactivation of the infection and development of HBV-related liver disease, the possibility of transmission of the “occult” virus through blood-borne route, development and progression of chronic liver disease and a significant role in hepatocarcinogenesis.11 The viral load in occult HBV is usually low, less than 10,000 IU/mL.13 It is difficult to detect these tradesmen on the basis of much common HBsAg test, and hence, they escape the routine screening and continue to be a source of transmission. This study aims to study the prevalence of occult HBV infection in barbers serving the Indian Armed Forces clientele, their knowledge, trade practices and preventive measures carried out against transmission of the virus.

MATERIALS AND METHODS

Participant population

The study was conducted among barbers serving the Indian Armed Forces clientele at Dehradun. For the purpose of this study, occult Hepatitis B infection was defined by serum negative HBsAg along with positive antibodies to HBeAg (anti-HBc) and the presence of (but not mandatory) HBV DNA in the serum. The detection of HBV DNA in the liver tissue (intrahepatic DNA), which is the current gold standard for confirming occult hepatitis B infection, was not done due to logistic and facility constraints. The participants enrolled in the study included a total of 79 barbers who were HBsAg negative. The sample size was calculated, ensuring a minimum number of participants needed to be a representative sample for the whole population of the armed forces. Based on the prevalence values of occult hepatitis B in previous studies, margin of error 5% and confidence interval (CI) of 95%, the minimum sample size calculated was 60. The barbers were selected randomly from units deployed in an army cantonment.

Inclusion and exclusion criteria

All barbers serving the armed forces clientele in Dehradun were included in the study. Barbers who were detected to be HBsAg positive were excluded. Diagnosis of occult Hepatitis B infection was made when the individual exhibited a negative HBsAg with HBV DNA detection in serum with a serological marker of previous viral exposure. Hence, HBsAg positive barbers were excluded from analysing the prevalence of occult Hepatitis B infection.

METHODOLOGY

The cross-sectional study was conducted during the period May 2019 to December 2019 at Dehradun. For the purpose of this study, data was collected from barbers serving the armed forces clientele in the city. All barbers were interviewed for knowledge, attitude, trade practices, lifestyle, exposure history, immunisation status, current and past symptoms. They were also examined for signs of liver involvement. They underwent investigations, including complete haemogram, liver function tests, PT, INR, ultrasound abdomen, fibroscan, HBsAg and anti-HBC total. A fibroscan value of 5.8 ± 1.8 kPa was taken to be suggestive of F1 fibrosis in case of HBV infection.14

Individuals were tested for Hepatitis B surface antigen to ensure only HBsAg negative individuals were included in the study. The test was conducted on serum samples of the participants by Enzyme-Linked Immunosorbent Assay (ELISA) technique, with the limit of detection being 0.1 IU/ml. Samples having an index value less than the cut-off index of 0.9 were considered negative and included in the study. Antibodies against Hepatitis B core antigen (anti-HBc) were measured by Enzyme-Linked Immunosorbent Assay (ELISA) technique in the serum of the individuals, with the limit of detection being 0.5 IU/ml. Samples having an index value equal to or greater than the cutoff index 1.0 were considered positive. Barbers who were detected to have antibodies against Hepatitis B Virus core antigen (positive anti HBc total) were subjected to HBV DNA test to find the replication status of the virus. HBV DNA was performed on their blood samples by real-time Polymerase Chain Reaction (Quantitative) with a fully automated extraction system, which involved the selective amplification of target DNA sequence while monitoring the progress of amplification in real-time. The detection limit for the Real Time PCR technique was 20 IU/ml.
The barbers were counselled, both at predetection and postdetection, on their status and were suitably advised for further management.

Statistical methods
The sample size was calculated based on the population proportion of occult Hepatitis B cases in similar studies conducted among barbers and the general population, considering a confidence level of 95% and applicable to a large/unlimited population. For analysis of data, statistical software Epi Info 7.0 was used. Statistical tests of significance for the difference between proportions and Fisher exact chi-square test was used to present results considering a P-value of less than 0.05 as statistically significant.

RESULTS
Demography
The mean age of barbers included in the study ranged from 22 years to 43 years, with a mean age ± S. D of 29.3 ± 5.43%. The barbers belonged to various states from the country; 34.1%, 30.3%, 15.1% and 20.2% barbers belonged from northern, western, southern and eastern parts of India.

Laboratory investigations
A total of three barbers were found to have antibodies against Hepatitis B core antigen with negative HBsAg. They were found to have HBV DNA in serum as well (88.86 IU/ml, 541 IU/ml and 558.86 IU/ml), rendering them as cases of occult HBV infection. The prevalence of occult Hepatitis B infection was hence 3.79%.

Liver function tests, haemogram, PT, INR, BT, CT and ultrasonography abdomen were found to be normal in all barbers. Four barbers were found to have an abnormal fibroscan suggestive of F2 stage fibrosis. None of these barbers had evidence of Hepatitis B infection, although a history of significant consumption of alcohol was found in them. The barbers with occult hepatitis B infection, however, reflected F1 stage fibrosis (Table 1). Clinical profiles of all barbers were apparently normal.

Awareness of hepatitis B transmission
All (100%) barbers did not know the existence of Hepatitis B disease and its mode of transmission and risk involved in the trade as a barber. None of the barbers were aware that HBV could survive up to 7 days on instrument surfaces; however, all barbers were aware that disinfection practices are required in general to avoid transmission of pathogens, and all the barbers confirmed that minor abrasions and lacerations were a part of their trade.

Disinfection practices
Disinfection of metallic and nonmetallic instruments by disinfectants was carried out by 72 (91.13%) barbers on a daily basis at the end of the day, 6 (7.59%) barbers on twice a week basis and 1 (1.26%) barber on a weekly basis (Table 2). None (0%) of the barbers were disinfecting instruments between clients, and 78 (98.73%) barbers practiced dipping of instruments overnight in diluted cetrimide (Savlon) as a disinfection measure. Boiling of metallic instruments was done for 8–10 min once a week by 100% barbers. One (1.26%) barber used Glutaraldehyde as a disinfectant at the end of the day. However, all barbers used a fresh blade for each customer. The final disposal of blades included open dumping by all barbers and without prior disinfection. None (0%) of the barbers did a scalp and facial skin evaluation before the commencement of hair-cutting and shaving.

Immunisation status of barbers
No barber was investigated/screened for Hepatitis B before the commencement of their trade. Only one barber was immunised against Hepatitis B, but it was not as a part of preventive measure against the trade work.

DISCUSSION
Occult hepatitis B infection in various populations
The prevalence of occult hepatitis B in barbers was found to be 3.79% in this study. A study conducted among HBsAg negative individuals in Burkina Faso, West Africa, for occult hepatitis B showed a prevalence of 7.3%. The difference in prevalence between the studies can be due to differences in the type of population, endemicity and existing high-risk behaviours and practices in the different regions. A study for prevalence of occult hepatitis B virus in Europe showed a prevalence of 1.59% among blood donors who

| Table 1 Parameters Detected Among Barbers Having Occult Hepatitis B Infection. |
|---------------------------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| **Barbers** | **Age** | **Region** | **anti-HBc** | **HBsAg** | **HBV DNA** | **Fibroscan** | **Liver biochemistry** | **Haematology** |
| Barber 1 | 37 | Northern | Present | Negative | 88.86 IU/ml | 5.7 kPa | Normal | Normal |
| Barber 2 | 41 | Northern | Present | Negative | 541 IU/ml | 5.6 kPa | Normal | Normal |
| Barber 3 | 33 | Eastern | Present | Negative | 558.86 IU/ml | 4.3 kPa | Normal | Normal |
were HBsAg negative and anti HBe positive. The difference in prevalence from the current study (3.79%) is not significant at CI 95% and two-tailed alpha error 5% (Z = 1.11 and p (0.262) > 0.05).

A study for the prevalence of occult hepatitis B among blood donors in a tertiary care centre in India showed a prevalence of 4.71%. The difference in prevalence from the current study (3.79%) is not significant at CI 95% and two-tailed alpha error 5% (Z = 0.37 and p (0.703) > 0.05). Another study conducted for the presence of occult HBV infection amongst blood donors, patients of alcohol dependence syndrome, alcoholic cirrhosis, hepatitis C virus/cryptogenic cirrhotics, end-stage renal disease, malignancies before chemotherapy and Human Immune-Deficiency Virus positivity in a tertiary care hospital in India revealed a an overall prevalence of 16.2%.

**Armed forces scenario**

The prevalence of HBV infection among the Indian Armed Forces population was 1.25%, according to a study carried out among troops of the armed forces; however, there has been limited information on the prevalence of occult hepatitis B among barbers due to lack of studies on the subject in the armed forces. The current study does not bring out any significant difference in the prevalence of occult hepatitis B in the barbers serving the armed forces clientele and the general population. However, considering the trade practices of the barbers, their profession can be a means of transmission of the virus to the clientele if disinfection methods are inadequate. Hence, the disinfection methods used by them were observed in person, and a detailed interview was taken on their knowledge and practices.

The barbers with occult HBV infection had fibroscan values (5.7 kPa, 5.6 kPa and 4.3 kPa) suggestive of F1 fibrosis. All three barbers had no history of heavy alcohol consumption, hepatotoxic medications, exposure to hepatotoxic substances or features suggestive of metabolic syndrome. Fibrotic changes in the liver is a gradual process over a period of time. Also, in the natural history of HBV infection, two stages are characterised by a positive anti-HBc total. Occult HBV infection, which is defined as detection of HBV DNA in serum with a negative HBsAg and positive antibodies to HBeAg (anti-HBc total antibody), is although not considered as a phase of Chronic Hepatitis B classically in some studies, the stage mostly occurs after progressive disappearance of HBsAg in the years after infection. Most frequently, occult HBV infection with a positive anti-HBc total follows the resolution of acute hepatitis and continues indefinitely after clearance of HBsAg and biochemical improvement in liver function. It can also occur after years of chronic HBsAg-positive infection. This suggests a possible long-standing infection in the barbers, and hence, a greater period of infective ability. Also, the presence of an otherwise apparently clinical profile in barbers with occult HBV infection supports the fact that how such a population can go unnoticed and stay as a hidden reservoir for spreading the infection for a long period of time.

All barbers did not know the existence of HBV transmission and their high-risk group status. They were unaware of their profession being a means for transmission of HBV between clients or to and from the client if disinfection procedures are carried out ineffectively. This shows a high level of unawareness among the barbers. They also were unaware of vaccination against Hepatitis B as a means to prevent the infection; 98.73% of barbers were never immunised against HBV, and no screening for HBV infection was carried out for all barbers before the commencement of their trade. The absence of a system to screen and immunise barbers before the commencement of their trade poses a risk for transmission of the virus and getting infected by it.

Only 1 out of 79 (1.26%) barbers had received education and training by paramedical staff on disinfectants and their practices and used 2% glutaraldehyde as a disinfectant which is an effective method to kill most viruses; 78 (98.73%) barbers who did not receive such training and practiced disinfection by Cetrimide diluted in water in different proportions which is a highly ineffective method. The association between knowledge on disinfectants and

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**Table 2 Disinfection Practices by Barbers Enrolled in the Study and Serving the Armed Forces Clientele.**

<table>
<thead>
<tr>
<th>Method of disinfection</th>
<th>Noneffective method</th>
<th>Effective methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cetrimide/Savlon diluted in water</td>
<td>2% Glutaraldehyde</td>
</tr>
<tr>
<td>Type of instrument disinfected</td>
<td>Metallic and nonmetallic</td>
<td>Metallic and nonmetallic</td>
</tr>
<tr>
<td>Numbers</td>
<td>78</td>
<td>1</td>
</tr>
<tr>
<td>Percentage</td>
<td>98.73%</td>
<td>1.26%</td>
</tr>
<tr>
<td>Frequency (numbers)</td>
<td>Daily (71) Twice a week (6) Once a week (1)</td>
<td>Daily (1) Weekly (79)</td>
</tr>
<tr>
<td>Disinfection between clients with frequency</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
practices was significant at $P < 0.05$ (Fisher exact $\chi^2 = 0.0127$). The following disinfectants have been recommended for disinfection against Hepatitis B for equipment exposed to HBV: ethylene oxide gas, 2% alkalinised glutaraldehyde, 5% succinic dialdehyde, and iodophors with 5000 ppm available iodine. Studies have indicated the use of 2% glutaraldehyde against HBV for effective inactivation. HBV ideally needs a virucidal for complete inactivation, hence requiring a high-level disinfectant. Quaternary Ammonium Compounds are low-level disinfectants and are not considered to have virucidal properties. Boiling at a temperature of at least 98°C for 2 min has been recommended to destroy HBV. However, the practice of boiling was followed once a week only on Tuesdays. Also, nonmetallic instruments were not amenable to be disinfected by boiling, and hence, combs and similar equipment escaped heat disinfection. There was no disinfection carried out by barbers between clients. There is a need for improvement of disinfection practices and awareness among barbers in the backdrop of the presence of occult hepatitis B infection, which can go undetected in routine screening methods.

**Limitations of the study**

The study is based on the detection of anti-HBc and HBV DNA in serum, which is, although an established methodology to define occult HBV infection; however, detection of intrahepatic DNA is considered the gold standard. Studies based on histology and using intrahepatic DNA as the gold standard for occult hepatitis B infection detection are recommended. Also, further studies with a larger sample size comparing status of barbers from among the various regions in the country are recommended.

The prevalence of occult hepatitis B among barbers in the armed forces is comparable to that of the general population. However, the prevalence of HBV infection in the barbers in this study is higher than the prevalence in the clientele, thus making them a high-risk group as compared to the clientele served by them. HBsAg status is the most commonly done test for detection of HBV infection. HBsAg status, if detected to be positive, excludes most reservoirs of transmission in the population if a procedure to screen and relieve the barbers from their duties is followed. However, occult hepatitis B infection will continue to be a factor for transmission of the virus. In addition, the high level of unawareness of the existence of HBV infection, its transmission, survival properties of the virus, lack of screening and immunisation of barbers with improper disinfection practices can lead to transmission of infection between customers, as well as from the barber to the customer and vice versa. The risk of transmission, however, will be low as compared to other routes of transmission like unsafe sexual contact, bloodborne route and body fluids like semen, vaginal fluid and serum. It is recommended that a screening protocol for all barbers be incorporated in the system to detect infection by HBV, including occult infections, as well as immunising barbers with HBV vaccine before the commencement of their trade. This should additionally incorporate methods for awareness of barbers on the transmission of all pathogens possible in their trade, including HBV. A standard procedure for disinfection needs to be followed at all salons, including a virucidal disinfectant like 2% alkaline glutaraldehyde in which the equipment can be dipped for an appropriate time (20 min for 2% alkaline glutaraldehyde) after cleaning. Disinfection by diluted cetrimide should be discouraged, and disinfection between clients be incorporated in the standard procedure. Rotation of equipment may be used to avoid waiting time between clients.

**CREDIT AUTHORSHIP CONTRIBUTION STATEMENT**


**CONFLICTS OF INTEREST**

All authors have none to declare.

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**REFERENCES**


