

# Chronic Hepatitis B in Indian Americans: Lack of Screening and Poor Linkage to Care

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## Abstract

**Background:** Chronic hepatitis B (CHB) is a major cause of liver-related morbidity and mortality in the United States (US) and globally. CHB disproportionately affects Asian Americans and many other immigrant minority populations, primarily owing to the high prevalence of CHB in their countries of origin. India is a country with a medium-to-high prevalence of hepatitis B (HB) (>2%) and has over 40 million people infected with hepatitis B virus (HBV), with more than 115,000 deaths annually from HBV-related complications. Indian Americans are one of the largest immigrant populations in the US but remain underdiagnosed and poorly linked to clinical care. We, therefore, assessed the HBV prevalence and evaluated the linkage-to-care (LTC) among Indian Americans to develop strategic plans to reduce the impact of HBV in the US. **Methods:** Between April 2022 and January 2024, serologic screening and surveys were provided to 328 Indian American adults (age 20 - 80) in New York City. All participants were tested for a triple panel consisting of hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (anti-HBs), and hepatitis B core IgG antibody (anti-HBc). A survey was conducted on the subjects chronically infected with HBV regarding their histories of infection. Self-administered questionnaires were employed to evaluate demographic and epidemiologic characteristics. **Results:** Of 328 screened and evaluated (246 males and 82 females), 10 (3.0%) were HBV-infected, 222 (67.7%) were susceptible to HBV, and 96 (29.3%) were immune. The prevalence of chronic HBV varied between the age groups: 4.6% (age 20 - 40), 3.4% (age 41 - 60), and 1.7% (age 61 - 80). Of 10 chronically infected, only two subjects had been previously diagnosed but were not engaged in care. **Conclusion:** HBV disproportionately affects Asian Americans, primarily owing to

immigration from parts of the world where the disease is endemic. Indian Americans belong to an intermediate-risk group, with an HBV prevalence of >2%, but remain underdiagnosed and poorly linked to care. Our pilot study on Indian American populations, the first of its kind, demonstrates a 3% prevalence of CHB, none of whom are linked to care. In addition, this population has a high percentage of unimmune subjects, creating a large reservoir for future infection. With the growing population of Indian Americans, our findings can be used to develop community-based strategies for HBV screenings and LTC that target high-risk groups.

## Keywords

Hepatitis B Virus, Chronic Hepatitis B, Indian Americans, Health Disparity, Community-Based Screening, Linkage-to-Care

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## 1. Introduction

Viral hepatitis has been a serious global health issue for many years. Two of the leading causes of chronic liver diseases—hepatitis B virus (HBV) and hepatitis C virus (HCV)—have infected 354 million people worldwide. Around 84% of these individuals have HBV [1] [2]. Shockingly, fewer than 5% of those infected with either virus know their diagnoses [2]. If left untreated, these diseases can lead to cirrhosis and hepatocellular carcinoma (HCC) [3] [4]. By 2040, annual deaths from HBV and HCV are projected to be higher than those from HIV, tuberculosis, and malaria combined [5]. As part of the UN Sustainable Development Goals, the World Health Organization (WHO) aims to eliminate viral hepatitis as a public health threat by 2030 by reducing new hepatitis infections by 90% and deaths by 65% between 2016 and 2030 [1]. This seems unachievable given the enormous disease burden in many communities throughout the world.

In the US alone, there may be 2.4 million people infected with HBV [6]. A large majority of these HBV-infected people are immigrants from countries with intermediate to high-risk regions where the prevalence of HBV is greater than 2% [7] [8]. Many of these people are not aware of their infections. Even if they are, they are not linked to care. Despite the fact that we have highly effective antiviral therapy, only a tiny percentage of HBV-infected people are taking advantage of it [9] [10].

Further, numerous unidentified high-risk populations are susceptible to infection. We have had safe and effective vaccines since the early 1980s—yet many are not vaccinated [11] [12]. In the US, all infants and young children have long received the hepatitis B vaccine. As a result, the incidence of hepatitis B infections has declined, virtually eliminating the disease in children born in the US. While most developed nations have implemented similar vaccination programs, many others have not [13] [14]. Many young immigrants who have not been vaccinated in their countries of origin are at risk themselves and pose a potential risk

to others. We are far from eliminating CHB in the US, let alone the world.

The lack of awareness and poor LTC highlight the existence of barriers to screening, education, and treatment. These barriers are complex and can be attributed to various factors. Patient-related obstacles include a lack of awareness about the disease, socioeconomic factors, and language and cultural differences [15] [16]. Additionally, healthcare providers and systems in the United States need to understand better the importance of CHB and its long-term impact [17] [18]. Public health systems should be improved to meet the needs of diverse populations. There are also communication problems between healthcare providers and patients from different ethnic, racial, or cultural backgrounds [19] [20] [21]. As a result, there is a significant shortage of adequate health access for immigrant populations.

Sixty percent or more of the HBV-infected people in the US are Asian or Pacific Islanders [6] [22]. HBV screening and LTC are critical in the Asian American population. Not only are Asian Americans disproportionately affected by CHB, but they are also more likely than any other population group to develop cirrhosis and HCC [15] [23] [24]. Despite these grim statistics, more than two-thirds of Asian Americans do not know they are infected and at risk for potential complications of HBV, also exposing a large undiagnosed population to transmission [9] [10] [15].

Studies have assessed the prevalence of HBV in various Asian American groups, but research on Indian Americans is limited. The prevalence of HBV in India is 3% - 4.2%, and 40 million people are infected, contributing significantly to the global HBV burden [25] [26]. With a population of more than 4.8 million in the US, Indian Americans are among the largest groups of Asian Americans. Today, Indian immigrants account for approximately 6 percent of the US foreign-born population, making them the second-largest immigrant group after Mexicans [27] [28]. Metropolitan NY and Central Jersey are the largest and most diverse South Asian ethnic enclaves and cultural hubs in the US, with the highest concentration of Indian Americans [27]. With the continued surge of immigration from India, the burden of CHB is expected to increase unless adequate strategies are implemented.

Korean Community Services (KCS), a non-profit organization that focuses on education and public health, conducted outreach events to screen for HBV in the Indian American community over the past two years. Serologic screening and surveys were provided to 328 Indian American adults (mean age 53) throughout these events. All the participants were tested for HBsAg, anti-HBs, and anti-HBc. This study emphasizes the need to reach out to Indian American communities throughout the US. It also highlights the urgency of improving vaccination and LTC to prevent HBV-related complications in the same population.

## **2. Methods**

### **2.1. Study Design**

The community screening outreach project was organized by KCS, in collabora-

tion with several community organizations, including the United Sikhs. United Sikhs is a U.N.-affiliated human development and advocacy organization that aims to empower disadvantaged minority communities worldwide. KCS partnered with the Center for Viral Hepatitis (CVH), a non-profit organization devoted to promoting CHB screening and linkage to care in the Asian American community.

Between April 2022 and January 2024, hepatitis B screening and education activities were carried out at 19 community screening events at various locations throughout Queens, NY. A total of 328 Indian Americans were screened with blood tests. The sample size was determined based on the voluntary participation of community members, and study investigators did not influence their decision. All of the HBV-infected participants were referred to healthcare providers (HCPs) in the community, and those who were not immune were referred to community healthcare facilities or HCPs for vaccination.

## **2.2. Participant Characteristics**

All the participants were immigrants from India living in Queens or other parts of New York State. Their ages ranged from 20 to 80, with a mean age of 53. The vast majority of the participants reported having lived in the United States for at least ten years. More than 95% of the participants preferred Punjabi and Hindi to English for communication.

## **2.3. Serologic Screening and Survey**

Phlebotomists or registered nurses conducted the blood drawing and processing, and physicians reviewed all the results of the triple panel test. All the participants who had screening tests were contacted by telephone, email, and stamped mail. For instance, the participants who did not respond were tracked down and were successfully contacted through telephone calls and certified mail.

A self-administered survey questionnaire was employed to evaluate demographic characteristics and information on the participants' history of infection. At the time of the screening, participants completed a survey written in English, Punjabi, and Hindi, translated by individuals fluent in the pertinent language. The survey questionnaire was designed by the authors and has been utilized in our previous studies. Our survey has proven reliable and valid through previous studies over the past decade [29] [30] [31]. All participants provided written informed consent. The participants' demographic information, including sex, age, place of birth, and length of residence in the United States, was collected. They were asked the following survey questions: 1) Have you ever had a Hepatitis B screening? 2) Have you received a Hep-B vaccination before? 3) Are you currently infected with Hepatitis B virus? If yes, when were you first diagnosed? 4) Have you consulted a physician for hepatitis B care? 5) Are you currently taking antiviral medication? In this study, LTC was defined as at least one visit to a provider for hepatitis B care.

## 2.4. Data Analysis

All the data were anonymized before they were reviewed and analyzed. Analysis was performed to compute the numbers, percentages, and means. Exact binomial 95% confidence intervals (CIs) were calculated for the prevalence of HBsAg seropositivity, immune, and non-immune rates.

## 3. Results

### 3.1. Sample Demographics

Over a series of 19 screening events, 10 to 25 participants were screened at each. The age and sex distribution of the 328 participants are presented in **Table 1**. The mean age of the participants was 53 years; 75% were males. We divided the age groups into three categories: 20 - 40 (20%), 41 - 60 (44%), and 61 - 80 (36%).

### 3.2. Serologic Data

Of 328 participants, 10 (3.0%) were infected with HBV, 96 (29.3%) were immune, and 222 (67.7%) were susceptible to HBV infection (**Table 2**).

The prevalence of HBV infection varied among different age groups (**Table 3**). Additionally, males had a higher rate of HBsAg (3.23%) than females (2.38%).

**Table 1.** Distribution of the study sample by age and sex.

| Age Groups      | Male Participants | Female participants | Total Participants |
|-----------------|-------------------|---------------------|--------------------|
| 21 - 40         | 58                | 7                   | 65                 |
| 41 - 60         | 104               | 42                  | 146                |
| 61 - 80         | 84                | 33                  | 117                |
| Total (21 - 80) | 246               | 82                  | 328                |

**Table 2.** Hepatitis B status in an Indian American population.

| Hepatitis B Status    | %    | 95% CI (%)  |
|-----------------------|------|-------------|
| Chronically Infected  | 3.0  | 1.2 - 4.9   |
| Immune                | 29.3 | 24.3 - 34.2 |
| Susceptible (At risk) | 67.7 | 62.6 - 72.7 |

**Table 3.** Prevalence of HBsAg seropositivity by Age.

| Age Group | No. Participants | HBsAg seropositive | % HBsAg seropositive |
|-----------|------------------|--------------------|----------------------|
| 20 - 40   | 65               | 3                  | 4.6                  |
| 41 - 60   | 146              | 5                  | 3.4                  |
| 61 - 80   | 117              | 2                  | 1.7                  |

### 3.3. Acquisition of Immunity

Of 328 participants screened, 96 were immune, a 29.3% immunity rate (Table 4). We looked into the acquisition of immunity from vaccination versus past infection. Of the 96 immune participants, 52 developed immunity from vaccination and 44 from past infection. Notably, 5 of those 44 participants “recovered” from past infection were only HBcAb positive from the three-panel test, indicating isolated hepatitis B core antibody (anti-HBc).

The ratio of acquiring immunity from vaccination to acquiring immunity from past infection varied in different age groups. Most of the immunity came from vaccination in younger age groups (age 21 - 40), while the immunity came equally from previous infection and vaccination in older age groups (age 41 - 80).

### 3.4. Lack of Immunity in All Age Groups

Despite the availability of vaccines for some four decades now, many subjects were still not immune to HBV. Of 328 screened in this study, 222 participants (67.7%) lacked protective antibodies to HBV (Table 2). This lack of immunity was apparent in all age groups (Table 4).

### 3.5. History of HBV Infection in HBsAg Seropositive Subjects

Of ten individuals infected with HBV, only two knew that they had been infected, but neither was following up with an HCP. The remaining eight people found out for the first time, through this study, that they were infected. Unfortunately, none of these HBV-infected individuals was receiving any medical care, which reflects the poor LTC in the Indian American community evaluated in this study.

## 4. Discussion

In the current pilot study of our community-based hepatitis B screening in the Indian American community in Queens, New York, we report that the prevalence of CHB in Indian American adults is about 3.0%. Surprisingly, only two of the ten HBV-infected subjects had previously known of their infection status, and none had been linked to adequate care for monitoring and treatment. In addition, we found only 29.3% immune and 67.7% susceptible to HBV infection.

Given the lack of national hepatitis serologic data in India, comparing the

**Table 4.** Acquisition of immunity in all age groups. The percentage values represent the percentage of participants in each age group.

| Age Group | Recovered (%) | Vaccinated (%) | At Risk (%) |
|-----------|---------------|----------------|-------------|
| 20 - 40   | 4.8           | 33.9           | 61.3        |
| 41 - 60   | 14.9          | 14.2           | 70.9        |
| 61 - 80   | 17.4          | 9.6            | 73.0        |

current result with the HBV prevalence in India is difficult. India has a highly variable HBV prevalence across regions and belongs to the intermediate endemic zone with 40 million infected individuals [32] [33]. A recent analysis of 28 publications, comprising 45,608 participants from various regions of India, for instance, found a wide range of HBV prevalence, ranging from 0.87% to 21.4% of the population [34].

#### 4.1. A Vast Reservoir for Infection

In the study population, the immune rate was only 29.3%, and those who had developed protective antibodies from past infection were only 13.6%. Five participants from this “recovered” group had isolated anti-HBc (Table 4). Although isolated anti-HBc may indicate an undetectable level of HbsAg, it is more likely to represent a remote infection with a waning titer of HBsAb without viremia. The prevalence of isolated anti-HBc can increase with age, reaching up to 12% in endemic populations [29] [35].

Of the total immune rate of 29.3%, those who had developed protective antibodies from vaccination were only 15.9%. The HB vaccination rate in Indian Americans is significantly lower than the 27% - 30% HB vaccination rate in Korean and Chinese Americans [30] [31]. A recent report has shown that Indian Americans have a higher vaccination rate. However, this study was based on the National Health Interview Survey, which does not reflect whether those who received vaccines became immune as a direct result of vaccination [36]. Many of those who received vaccination may have had past infections, as vaccines were not administered after screening. If that occurred, it could overestimate the immunity from vaccination. Although our sample size is small, the vaccination rate obtained reflects those who have developed immunity from vaccination. The low HB vaccination rate from the current study may not be far off from the HB vaccination rate in India. While national data on adult HB vaccination in India are not available, the proportion of children with evidence of HB vaccination was highest in the southern region of the country (31.2%) and lowest in the northern (12.1%) and western (12.1%) regions. Overall, children residing in urban areas (20.6%) had a higher prevalence of anti-HBs on account of HB vaccination than those residing in rural areas (14.7%), suggesting that vaccination in rural areas lags behind those in cities [37]. In addition, 67.7% of the participants in the current study were at risk for infection. This high percentage of the at-risk population is also reflected in studies from India [37]. Given India’s large population, these data suggest the country may have a huge reservoir of infection there.

India introduced national-scale HB vaccination relatively late compared to many developed countries. HB vaccine started in India’s Universal Immunization Program on a pilot basis in 14 cities and 33 districts in 2002-2003, expanded to 10 states in 2007-2008 (Phase 1) and the entire country in 2011-2012 (Phase 2) [38]. Consequently, only a few extensive Indian studies are available, report-

ing the impact of HB vaccination in a limited geographical area [39] [40]. Thus, there is a lack of national data on the impact of introducing the hepatitis B vaccine in India, indicating the need for a serological survey representative of the entire nation [37] [40].

## 4.2. Community-Based Screening

Despite the small sample size, the current study reveals provocative observations about the HBV status of the Indian American community. It raises crucial points regarding how we may approach multi-ethnic populations in the US with significant HBV reservoirs of infection towards the goal of eliminating HB in the following decades.

Most importantly, this study is the first report on the prevalence of HBV among Indian immigrants in the US. Hence, no other studies are available for comparison. Given the high population of Indian immigrants with HBV prevalence of 2% - 4%, it is striking that there have been no prior studies of screening and LTC in this population at moderate risk. This pilot study calls for an urgent and more extensive evaluation of HBV prevalence in the Indian American community. The community outreach approaches are crucial and have been successful in some other Asian American communities. For example, in the Korean American and Chinese American populations, there have been many community-based efforts that generated positive impacts in reducing the HBV burden in the same communities [30] [31] [41].

Another noteworthy aspect of this study is the demonstration that most of the HBV-infected subjects found in the current study had been diagnosed for the first time. This is not unexpected since more than 95% of the participants had never been screened for HBV. The poor LTC of the HBV-infected and the high proportion of participants susceptible to infection suggest a severe lack of screening and education. Especially given the projected increase in the Indian immigrant population in the US [27] [28], the need for HB screening and education for the same population is rather urgent.

Other studies in Asian American communities have also reported a significant lack of LTC [30] [31] [42]. The challenges to furnishing LTC are most often related to finding qualified health professionals within the community, who can provide care in a linguistically and culturally sensitive manner. Improvements in patient education, counseling, and navigation efforts may also be an effective strategy to improve linkages from community-based testing sites to HBV-directed medical care. Because routine and ongoing monitoring is the foundation for effective HBV medical management, future efforts to improve outcomes among HBV-infected people should provide a greater emphasis on LTC.

## 4.3. Limitations

It is important to note that there are several limitations to consider in this study. Firstly, the participants of the study, who were Indian American residents of



Queens, NY, may not be representative of the entire Indian population in the United States. Secondly, the study's sample size is small, so we must be cautious when drawing conclusions from the results. Additionally, education level, income, and insurance status are important factors that can affect the prevalence of HBV, but it is unknown how these and other socioeconomic factors may have influenced the results of this study. Subjects' willingness to be screened can also vary widely. Thirdly, the sex and age distributions of the study population are not evenly distributed and may not represent the entire population. For example, the study may underrepresent younger age groups (age 21 - 40) relative to the older age groups. Finally, it is possible that differences in the screening settings could have affected the prevalence. The non-clinical community settings used in this study for screening may differ in pertinent respects from the hospital or academic settings.

## **5. Conclusion**

The current study on HBV in the Indian American community demonstrates a significant prevalence and lack of LTC. Additionally, a large percentage of the population is still susceptible to HBV, creating a vast reservoir for future infections. With the growing number of Indian Americans, these findings call for an urgent and more extensive epidemiologic evaluation of HBV in the Indian American population. Future comprehensive, community-based HBV screening and evaluation programs may help to facilitate LTC and reduce the HBV burden in the US.

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## **Authors' Contributions**

CSH and SK conceived of the study, participated in its design, and drafted the manuscript. SK, EL, and ML also participated in the study design and tabulated the data. MKS, JM, and DC participated in manuscript preparation. All authors read and approved the final manuscript.

## **Data Availability Statement**

The data used and/or analyzed in the current review are available from the references.

## **Ethics Approval**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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