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Burden and Screening Yield of Hepatitis B, Hepatitis C, and Dengue in Western Rajasthan, India

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A B S T R A C T

Hepatitis B virus (HBV), Hepatitis C virus (HCV), and Dengue fever continue to pose major public health challenges in India. Rapid Diagnostic Tests (RDTs) are widely used due to their simplicity, rapid turnaround time, and suitability in resource-limited settings. Understanding positivity trends in large-scale screenings can inform public health strategies. A retrospective observational analysis was conducted on 8475 samples tested at Infectious Disease Institute (IDI), KNCH Hospital, Jodhpur (Rajasthan) from 1 January 2024 to 30 November 2024. A total of 4196 samples were tested for HBsAg, 4134 for HCV, and 145 for Dengue using standardized rapid card testing protocols. Positivity rates were calculated for each infection and interpreted in the context of existing epidemiological evidence. Among 4196 HBsAg samples, 428 were positive (10.2%). Out of 4134 HCV samples, 123 tested positive (3.0%). Dengue RDT showed 23 positive cases (15.9%) out of 145 samples. HBsAg positivity indicated a persistent burden of Hepatitis B infection. Dengue positivity reflected seasonal transmission dynamics, while HCV positivity remained comparatively lower. Rapid card tests demonstrate effective applicability for large-scale screening of HBV, HCV, and Dengue infections. The notable HBsAg positivity underscores the need for sustained vaccination and screening programs, while the high Dengue positivity during seasonal surges highlights the importance of timely diagnosis in outbreak settings. Integration of RDTs into routine diagnostic and surveillance strategies can significantly aid early detection and public health response.

Introduction

Hepatitis B virus (HBV), Hepatitis C virus (HCV), and Dengue fever continue to represent significant public health challenges globally, particularly in developing countries such as India. HBV remains a leading cause of chronic liver disease, cirrhosis, and hepatocellular carcinoma worldwide, despite the availability of vaccination programs and prevention strategies[2,7]. The World Health Organization (WHO) estimates that millions of individuals globally are living with chronic HBV infection, reinforcing the importance of early detection and screening initiatives[2]. Similarly, HCV infection contributes substantially to chronic hepatitis, cirrhosis, and liver-related mortality, with epidemiological data demonstrating widespread global

disease burden and genotype diversity[3,8]. In India, both HBV and HCV continue to be identified through screening programs including antenatal care and blood bank testing, with multiple studies reporting varying seroprevalence across regions[9–11].

Recognizing this burden, India has implemented the National Viral Hepatitis Control Program (NVHCP) to strengthen diagnostic and management strategies and to achieve elimination goals through structured surveillance and screening approaches[6].

Dengue fever, transmitted primarily by *Aedes* mosquitoes, has emerged as one of the most rapidly spreading mosquito-borne viral infections worldwide. Its expanding geographic distribution, recurrent outbreaks, and substantial morbidity underscore its growing epidemiological and clinical significance[4,12].

India experiences seasonal surges in Dengue incidence, and ongoing surveillance by national health authorities continues to document sustained transmission patterns and periodic outbreaks[5]. Global strategic frameworks emphasize early diagnosis, case detection, and timely clinical management as essential components in reducing disease burden and mortality[4,13].

Rapid Diagnostic Tests (RDTs) have become valuable tools in the detection of HBV, HCV, and Dengue due to their operational simplicity, minimal technical requirement, fast turnaround time, and suitability in resource-limited or high-throughput settings[1,14,15].

Their demonstrated diagnostic performance across diverse populations and biological samples highlights their relevance in large-scale screening programs, outbreak response, and routine clinical practice[1]. In this context, understanding positivity trends through RDT-based screening provides crucial insight into prevailing disease burden, helps identify high-risk populations, and supports informed public health decision-making.

The present study evaluates the positivity rates of HBsAg, HCV, and Dengue among individuals tested at a tertiary care center in Rajasthan using rapid card tests. By analyzing positivity trends, this study aims to contribute epidemiological evidence that supports ongoing surveillance programs, strengthens diagnostic strategies, and informs policy-aligned disease control initiatives relevant to both national and global infectious disease frameworks.

Materials and Methods

Study Design and Setting: This was a retrospective observational study conducted at the Infectious Disease Investigation (IDI) unit, KNCH Hospital, Jodhpur, Rajasthan. The study included data from routine screening samples received between 1 January 2024 and 30 November 2024. The study aimed to assess positivity trends for HBsAg, HCV, and Dengue infections using Rapid Diagnostic Tests (RDTs), which are widely recognized as effective screening modalities due to their rapid turnaround time, operational feasibility, and applicability in large-scale and resource-limited settings[1,14,15].

Study Population and Sample Size: A total of 8475 samples were included in the analysis:

HBsAg testing: 4196 samples
HCV testing: 4134 samples
Dengue testing: 145 samples

Samples were submitted from both outpatient and inpatient departments for screening or diagnostic purposes, consistent with national and global recommendations emphasizing early detection of hepatitis and dengue infections[2–4,6,12,13].

Testing Methodology: All samples were tested using commercially available rapid card-based immunochromatographic assays for:

HBsAg detection in serum samples
Anti-HCV antibodies in serum samples
Dengue NS1 antigen and/or IgM antibodies, depending on clinical request

RDTs were performed according to manufacturer instructions, ensuring adherence to quality testing standards. Rapid card testing has previously been validated in multiple studies for its diagnostic reliability and public health screening utility in both hepatitis and dengue surveillance frameworks [1,14,15].

Inclusion and Exclusion Criteria: All samples received for HBsAg, HCV, and Dengue testing during the study period were included. Incomplete records, hemolyzed samples, repeat samples from the same patient, or those with inadequate testing details were excluded to ensure analytical reliability.

Data Collection and Analysis: Laboratory registers and electronic records were reviewed and validated. Data were compiled in Microsoft Excel and analyzed for:

Total number of samples tested
Number of positive results
Percentage positivity

Positivity trends were interpreted in the context of existing national and global epidemiological observations and screening frameworks for hepatitis and dengue[2–8,12,13].

Ethical Considerations: This study involved secondary analysis of laboratory records without patient identifiers. Data confidentiality was strictly maintained. The study aligns with the broader national initiative under NVHCP and infectious disease control strategies promoting enhanced screening and surveillance[6].

Results and Discussion

A total of 8475 samples were analyzed during the study period, comprising 4196 samples for HBsAg testing, 4134 for HCV testing, and 145 for Dengue testing. Rapid Diagnostic Tests (RDTs) successfully identified positive cases in all three infectious diseases assessed, reaffirming their applicability in routine diagnostic screening and epidemiological assessment [1,14,15].

HBsAg showed the highest number of positive cases, demonstrating a significant burden of Hepatitis B in the screened population. HCV showed a comparatively lower positivity rate, whereas Dengue exhibited the highest proportional positivity, indicating strong seasonal clustering consistent with national and global trends[2,3,5,7,12,13.]

HBsAg Positivity: Out of 4196 samples, 428 tested positive (10.2%), signifying notable HBV prevalence in the tested group. These findings align with previous Indian and international epidemiological reports highlighting HBV as a sustained public health concern requiring continued screening and vaccination efforts[2,6–11].

HCV Positivity: Among 4134 samples, 123 were positive (3.0%), indicating comparatively lower circulation of HCV relative to HBV. This reflects epidemiological observations that HCV prevalence in India typically remains lower than HBV but still warrants attention due to chronic disease progression risks[3,6,8–11].

Dengue Positivity: Of 145 Dengue samples tested, 23 were positive (15.9%), demonstrating substantial detection during suspected clinical presentation periods. This trend is consistent with recognized seasonal Dengue surges and outbreak-linked diagnostic demand in endemic regions[4,5,12,13]. The role of RDTs in enabling rapid case identification during outbreaks remains well documented[14,15].

Role of Rapid Diagnostic Tests in Result Detection: All infections were detected using rapid card-based assays, which showed effective operational performance in large-scale screening, rapid case identification, and resource-efficient testing frameworks, supporting existing literature advocating RDT utility in hepatitis and dengue detection[1,14,15].

• HBsAg positivity remains significant, reflecting persistent viral hepatitis burden.

• HCV positivity remains comparatively lower.

• Dengue positivity is high proportionally, supporting seasonal transmission dynamics.

• Rapid card tests proved effective in mass screening and outbreak scenarios[1,14,15].

The present study demonstrates important positivity trends for HBsAg, HCV, and Dengue infections in a tertiary care hospital setting using Rapid Diagnostic Tests (RDTs). The observed HBsAg positivity of 10.2% reflects a substantial burden of Hepatitis B infection in the screened population, reinforcing the global and national epidemiological concern surrounding HBV[2,7]. These results align with international estimates highlighting persistent HBV prevalence worldwide, despite expanded vaccination programs and strengthening preventive initiatives[2,7]. Indian seroprevalence studies have similarly documented a notable burden of HBV in different cohorts, underscoring the continued need for systematic surveillance and screening strategies[9–11].

Table.1 Overall Positivity Trends

Parameter	Total Samples Tested	Positive Cases	Positivity Rate (%)
HBsAg	4196	428	10.2%
HCV	4134	123	3.0%
Dengue	145	23	15.9%

The findings of the present study therefore support ongoing national initiatives such as the National Viral Hepatitis Control Program (NVHCP), which emphasizes large-scale screening, early diagnosis, and linkage to care to reduce viral hepatitis morbidity and mortality in India[6].

The HCV positivity rate of 3.0% in this study demonstrates a comparatively lower circulation of HCV than HBV, a trend that is supported by existing epidemiological evidence indicating that HCV prevalence globally and in India, though variable, remains lower than HBV[3,8–11]. However, despite the lower proportion of detected HCV cases, the clinical implications remain significant due to the risk of chronic hepatitis, cirrhosis, and hepatocellular carcinoma associated with untreated infections[3,8]. The positivity trends observed in this study reaffirm the relevance of routine screening to identify asymptomatic or undiagnosed individuals, enabling timely intervention in line with national hepatitis elimination objectives[6].

Dengue positivity in the present study was 15.9%, which, although derived from a smaller testing cohort, reflects a substantial proportion of confirmed infections among clinically suspected cases.

These findings are consistent with global and national observations describing the increasing geographic expansion, recurrent outbreaks, and seasonal intensification of Dengue transmission[4,5,12,13]. The burden demonstrated in our data reinforces the importance of sustained surveillance and diagnostic readiness during peak transmission seasons, as emphasized in WHO and NCDC guidelines[4,5,13]. Rapid detection of Dengue facilitates timely clinical management and outbreak response, which are essential components of effective Dengue control strategies[4,13].

A key strength and novelty of this study lies in its combined analytical perspective across three major infectious diseases—HBV, HCV, and Dengue—within a single regional screening context. While many studies focus on individual infections, few provide an integrated evaluation of positivity trends across multiple high-priority infectious diseases within the same testing framework. This offers meaningful comparative insight into the concurrent burden of blood-borne viral infections and vector-borne viral infections in a real-world healthcare setting. Additionally, the study substantiates the utility of RDTs as reliable, rapid, and operationally efficient diagnostic tools, supporting previous reports demonstrating their diagnostic applicability in both viral hepatitis and Dengue detection[1,14,15]. Their performance in our setting highlights their continued role in large-scale screening, outbreak management, and resource-limited healthcare environments.

Furthermore, this study contributes region-specific evidence from Rajasthan, which remains valuable for strengthening local epidemiological understanding. Such contextual data are important for tailoring regional preventive programs, optimizing resource allocation, and reinforcing public health preparedness.

In conclusion, this study highlights significant positivity trends for HBsAg (10.2%), HCV (3.0%), and Dengue (15.9%) using Rapid Diagnostic Tests in a tertiary care hospital setting. The findings reaffirm the persistent burden of Hepatitis B, the continued relevance of HCV surveillance, and the strong seasonal clustering of Dengue infections. The demonstrated performance and practicality of RDTs support their essential role in large-scale screening programs, outbreak management, and public health surveillance frameworks[1,14,15].

The novelty of this study lies in its integrated evaluation of three major infectious diseases within a unified screening population, offering valuable comparative epidemiological insight. The data not only complement existing national and global literature[2–8,12,13] but also strengthen regional understanding, supporting initiatives such as NVHCP and national Dengue control efforts[5,6,13]. Continued emphasis on early detection, vaccination, surveillance strengthening, and timely clinical

intervention remains crucial to reducing the disease burden associated with these infections.

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Author Contributions

Jayant Ramawat: Investigation, formal analysis, writing—original draft. Deepak Kanjani: Validation, methodology, writing—reviewing. Amrin Khan:—Formal analysis, writing—review and editing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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