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Epidemiological Trends of Hepatitis Viral Infections: A Retrospective Study Utilizing Serological Data from a Tertiary Laboratory in Jordan

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Introduction

Hepatitis is a significant global health issue, primarily caused by viral infections that lead to severe liver complications. In Jordan, the sero-prevalence of Hepatitis A Virus (HAV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) remains uncertain. This study aims to determine the prevalence of these viral infections utilizing serological data.

Methods

A retrospective study was conducted, analyzing serological test results for HAV, HBV, and HCV from patients at MedLabs Laboratories, a network of more than 50 branches across Jordan, from 2017 to 2022. Data were analyzed using Microsoft Excel and SPSS version 26.

Results

A total of 35,018 hepatitis tests were included. The overall sero-prevalence of HAV-IgM was 18.9%, HBsAg was 5.4%, and HCV-TAB was 5.9%. Sero-prevalence of HAV-IgM fluctuated from 4.1% to 31.3%, with the highest rate in 2021 (31.3%) and it was significantly higher (47.0%) among individuals aged 20 years or younger. The sero-prevalence of HBsAg remained low, ranging from 3.9% to 6.8%. Males had a higher sero-prevalence (8.5%) compared to females (7.3%), with the highest sero-prevalence (8.7%) in those aged 20 years or younger. The sero-prevalence of HCV Total Antibodies varied from 0% to 13.5%, peaking in 2019, with the highest sero-prevalence (9.7%) observed in individuals aged 41 to 60 years.

Conclusion

The sero-prevalence data provide valuable insights into Jordan's current epidemiological landscape for hepatitis. The findings emphasize the need for sustained surveillance, vaccination efforts, and targeted public health strategies to manage and reduce the burden of viral hepatitis in the region.

INTRODUCTION

Hepatitis is a global health problem characterized by inflammation of the liver tissue, which can lead to severe complications such as fibrosis, cirrhosis, and hepatocellular carcinoma.¹ Viral infections are the leading cause of hepatitis globally. Viral hepatitis can be diagnosed using

serology tests or molecular diagnostics. The latter provides a more accurate diagnosis, but it is also more expensive. Thus, most epidemiology studies use serology tests. Five viruses are responsible for most cases of viral hepatitis. These are the hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV), hepatitis D virus (HDV), and hepatitis E virus (HEV).¹

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The current prevalence of hepatitis within the general population of Jordan remains uncertain. Conducting a comprehensive study on the various types of hepatitis can serve to address this research void and offer significant insights for the purposes of public health planning and decision-making.

This study aims to determine the sero-prevalence of HAV, HBV, and HCV in Jordan, using serological markers to estimate overall exposure within the population, including asymptomatic cases that might otherwise be underreported. By focusing on sero-prevalence, this study seeks to present a clearer picture of HAV, HBV, and HCV exposure rates in Jordan. Updated prevalence data will significantly contribute to the existing literature, aiding public health planning and guiding decisions on prevention and management strategies for these infections.

METHODS

STUDY POPULATION

This retrospective study included patients who underwent serological testing for HAV, HBV, and HCV at MedLabs Laboratories from 2017 to 2022. Established in 1993, MedLabs Laboratories is a tertiary healthcare facility with more than 50 branches distributed throughout Jordan.

DATA COLLECTION

Serological test results for HAV (IgM and IgG anti-HAV), HBV (HBsAg, HBeAg, anti-HBs, and IgM anti-HBc, anti-HBe), and total anti-HCV were obtained from the laboratory database.

DATA ANALYSIS

The collected data were cleaned and organized using Microsoft Excel software. Antibody titers were categorized as Positive (Reactive) or Negative (Nonreactive) based on the cutoff points provided by MedLabs for each specific test. Categorical variables, including the prevalence of positive test results, were reported as Count (N %) for each virus. Chi-square test was employed to compare the prevalence of each virus among different demographic groups, including gender, age groups, and years of data collection. Statistical analysis was conducted using SPSS version 26, with a significance threshold set at a P-value of 0.05.

ETHICAL CONSIDERATIONS

Ethical approval for the study was obtained from the MedLabs institutional review board and ethics committee.

RESULTS

INCLUDED DATA

A total of 35,018 hepatitis tests were conducted between 2017 and 2020 were included in our analysis. Among the 5,791 individuals tested for HAV-IgM, the sero-prevalence

was 18.9%. For the 209,991 individuals tested for HBsAg, the sero-prevalence was 5.4%. Among the 524 individuals tested for HCV-TAB, the sero-prevalence was 5.9% (Supplementary table 1).

HEPATITIS A VIRUS

The sero-prevalence of HAV-IgM fluctuated over the past six years, ranging from 4.1% to 31.3%. In 2020, the sero-prevalence increased to 25.9%, peaked at 31.3% in 2021, and then dropped to 4.1% in 2022. While no significant gender differences were observed, sero-prevalence was notably higher (47.0%) among individuals aged 20 years or younger (Supplementary table 2).

HEPATITIS B VIRUS

The sero-prevalence of HBsAg remained low over the past six years, varying from 3.9% to 6.8%: 4.4% in 2017, 3.9% in 2018, 5.8% in 2019, 4.8% in 2020, 6.8% in 2021, and 4.8% in 2022. Males had a higher sero-prevalence (8.5%) compared to females (7.3%), with the highest prevalence (8.7%) in individuals aged 20 years or younger. HBsAb seropositivity ranged from 58.5% to 64.8%, peaking in 2022. Females had a higher sero-prevalence (64%) compared to males (59.4%). The sero-prevalence of HBeAg was consistently low, peaking at 7.4% in 2020, and was highest among individuals aged 20 years or younger (23.8%). HBeAb seroprevalence varied: 42.5% in 2017, 32.9% in 2018, 28.8% in 2019, 42.5% in 2020, 34.3% in 2021, and 33.8% in 2022, with the highest sero-prevalence (80%) among those aged 20 years or younger (Supplementary table 3).

HEPATITIS C VIRUS

The sero-prevalence of HCV Total Antibodies ranged from 0% to 13.5% over six years: 0% in 2017, 3.3% in 2018, 13.5% in 2019, 7.4% in 2020, 1.9% in 2021, and 4.2% in 2022. The sero-prevalence was slightly higher among males and was highest (9.7%) among individuals aged 41 to 60 years (Supplementary table 4).

DISCUSSION

This study reveals critical trends in the sero-prevalence of HAV, HBV, and HCV in Jordan, offering insights into demographic patterns and the impact of public health interventions.

The fluctuations in HAV-IgM sero-prevalence peaking at 31.3% in 2021 and declining sharply to 4.1% in 2022, align with findings from a tertiary hospital in Jordan, which reported a similarly high prevalence rate of 38.3%.² The subsequent decline could be attributed to the introduction and widespread adoption of the HAV vaccine,³ as well as improvements in public health interventions and hygiene practices.⁴ Notably, individuals aged 20 years or younger exhibited a significantly higher prevalence (47.0%), underscoring the vulnerability of this age group and the need for targeted vaccination and educational campaigns.

The study's HBsAg findings, showing a relatively low sero-prevalence of 3.9%-6.8% over six years, align with previous reports estimating national HBV prevalence in Jordan at around 2.4%.⁵ This study reported a sero-prevalence of HBsAg of 4.4% in 2017, 3.9% in 2018, 5.8% in 2019, 4.8% in 2020, 6.8% in 2021, and 2.8% in 2022, reflecting a decline from 9.9% in the pre-vaccination.⁶ Other studies focusing on specific populations in Jordan, such as pregnant women, hemodialysis patients, and blood donors, reported a prevalence of 4.3%, 5.9%, and 0.52% respectively.⁷⁻⁹ Gender-based differences were statistically significant, with higher rates among males (8.5%), potentially influenced by hormonal factors.¹⁰ Additionally, the high prevalence of HBsAb, peaking at 64.8% in 2022, indicates robust immunity within the population, likely due to successful vaccination programs.⁵ Similar reductions in HBV endemicity have been reported in countries like China, Italy, and Australia following the implementation of universal vaccination programs.¹¹ Public awareness campaigns are crucial to enhancing understanding of HBV transmission and prevention, particularly among vulnerable groups.¹²

The study also identified a peak in HCV antibody sero-prevalence in 2019 (13.5%), with fluctuations in subsequent years. These findings are consistent with previous research in Jordan, which reports an HCV prevalence of around 5%.¹³ High sero-prevalence among individuals aged 41 to 60 years highlights age-related risk factors, which have been similarly reported in other studies.¹³ A study on hemodialysis patients in southern Jordan revealed a notably high prevalence of HCV (28%).¹⁴ These findings underscore the importance of targeted screening and treatment initiatives, particularly among high-risk populations.

In conclusion, the sero-prevalence data for HAV, HBV, and HCV reveal distinct epidemiological patterns within Jordan. These findings underscore the importance of continued surveillance, sustained vaccination efforts, and targeted intervention strategies to mitigate transmission, reduce disease burden, and improve public health outcomes

in the region. The dynamic nature of hepatitis prevalence rates indicates an evolving epidemiological landscape, potentially influenced by changing risk factors, health initiatives, and healthcare access.

LIMITATIONS

The study is retrospective in nature, relying on existing laboratory data, which may be subject to inherent biases and limitations. As the analysis is confined to patients who received serological testing at MedLabs Laboratory, findings may not fully represent Jordan's entire population. Interpretation of results should account for potential confounding factors and limitations intrinsic to retrospective studies. Although MedLabs has branches throughout Jordan, variations in patient demographics may occur based on healthcare coverage, geographic accessibility, and insurance affiliations. Additionally, the decrease in testing numbers during 2019 and 2020 may reflect COVID-19-related restrictions and limited healthcare access, potentially influencing prevalence data. These limitations indicate the need for further research with more comprehensive data to clarify infection dynamics, especially during the pandemic period.

CONFLICT OF INTEREST

None.

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SUPPLEMENTARY MATERIALS

Supplementary tables

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