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Research Article

Analysis of Google Trends for Viral Hepatitis A, B, C, D, and E

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Abstract

Aim: Our main objective in this study was to rigorously measure global interest and awareness of viral hepatitis through a systematic evaluation of data collected from Google Trends.

Material and Methods: We compiled and categorized the Search Volume Index (SVI), a quantitative measure covering the global regional distribution associated with the search terms "Hepatitis A", "Hepatitis B", "Hepatitis C", "Hepatitis D" and "Hepatitis E" over a period of approximately ten years from 2013 to 2022.

Results: According to our analysis, there has been a noticeable increase in interest in Hepatitis A and B, while interest in Hepatitis C has declined after peaking in 2015. Meanwhile, interest in Hepatitis D and E continued to show a very low profile. Our rigorous research found that Guatemala recorded the highest rate of interest for Hepatitis A, Ghana for Hepatitis B, Pakistan for Hepatitis C, Kyrgyzstan for Hepatitis D and Namibia for Hepatitis E.

Conclusions: This study highlights the potential for using tools such as Google Trends in organizing public health monitoring and awareness campaigns.

Keywords: Viral hepatitis, trend analysis, public health

INTRODUCTION

Infectious diseases are among the diseases that affect many people worldwide at the same time. Among infectious diseases, viral diseases remain on the agenda due to the ease of transmission routes and difficulties in diagnosis. Among the viral diseases affecting the liver, viral hepatitis is still common in the world and continues to infect people through various transmission routes. Among the viral hepatitis agents, Hepatitis A, B, C, D and E viruses come to the forefront and have their own transmission routes, clinical signs and symptoms and different epidemiological characteristics as in other viral agents (1).

Hepatitis A and Hepatitis E viruses, which are mostly spread by the faecal-oral route, are more prevalent in underdeveloped nations where access to clean, safe water, food sources, and sewerage systems is poor (1). The Hepatitis A and E viruses often cause an acute infection with or without jaundice and do not develop a chronic form in the liver. The main method of transmission for Hepatitis B, C, and D is exposure to blood and bodily fluids, and these infections frequently progress to chronic liver disease. Cirrhosis, hepatocellular carcinoma (HCC), and chronic liver disease are all life-threatening illnesses brought on by these viruses (2).

The widespread use of the Internet has made it easier to access information and to find in-depth information about many diseases. An online tool called Google Trends shows the most popular search terms and tracks interest in related searches over time. Various studies have used Google Trends data analysis to evaluate various diseases and public health issues (3). The purpose of this study is to examine the terms Hepatitis A, B, C, D, and E in a Google search to identify interest in these diseases and raise awareness of the public and health officials in the appropriate field.

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MATERIAL AND METHOD

Between 1 January 2013 and 31 December 2022, we collected search volume data for worldwide Google searches for each of the terms "Hepatitis A", "hepatitis B", "Hepatitis C", "Hepatitis D" and "Hepatitis E" and classified them into worldwide regional distributions. The classified data were further classified into ranges. We also performed time-series analysis of search volumes by examining local regional distributions of search volumes to identify regions of greater interest for each hepatitis type. Local regional distributions of search volumes were also analysed to identify regions of greater interest for each hepatitis type.

RESULTS

Figure 1 visually represents the same data shown in Table 1. This figure clearly shows the change in research for each type of liver disease over the years. It is clear from the graph that interest in Hepatitis A and B generally increased, while interest in Hepatitis C fell after peaking in 2015. Interest in Hepatitis D and Hepatitis E remained rare during the study period. This representation supports the observations in the analysis in Table 1, allowing for easy comparison of study-period subjects for different types of liver disease.

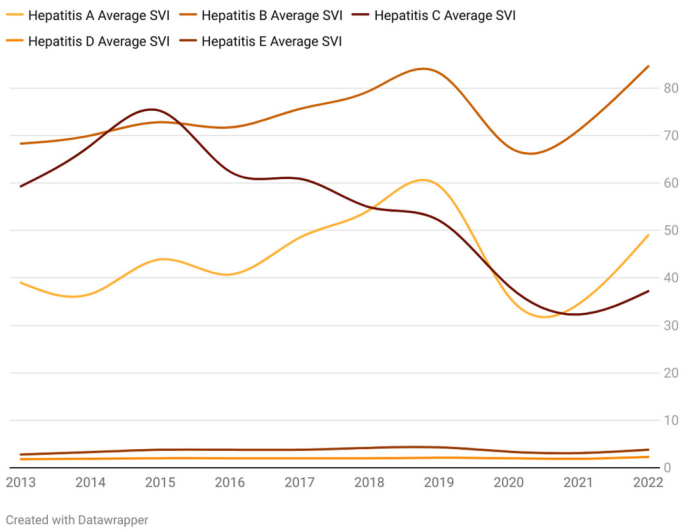

Figure 1. Trends in Average Search Volume Index (SVI) for Hepatitis A, B, C, D, and E from 2013 to 2022

Table 1 shows the average Search Volume Index (SVI) values for each type of liver disease (A, B, C, D, and E) from 2013 to 2022. Overall, SVI values were increased in addition to Hepatitis A. and the effect of Hepatitis B, Hepatitis C appeared after 2015. Find out if SVI values for Hepatitis D and E are low and stable over time.

Table 1. Average SVI values for Hepatitis A, B, C, D, and E by year

Years	Hepatitis A Average SVI	Hepatitis B Average SVI	Hepatitis C Average SVI	Hepatitis D Average SVI	Hepatitis E Average SVI
2013	39.0	68.3	59.3	1.8	2.8
2014	36.6	70.0	67.9	1.9	3.3
2015	43.9	72.8	75.2	2.0	3.8
2016	40.7	71.7	62.4	2.0	3.8
2017	48.5	75.6	60.9	2.0	3.8
2018	54.3	79.4	54.9	2.0	4.2
2019	59.4	83.2	52.1	2.1	4.3
2020	36.1	67.6	38.3	2.0	3.4
2021	34.5	71.1	32.3	1.9	3.1
2022	49.0	84.6	37.2	2.3	3.8

Table 2 shows the ranking of the top 10 countries with the highest SVI values for each viral hepatitis agent separately. Guatemala has the highest SVI for Hepatitis A, while Ghana has the highest SVI for Hepatitis B. Pakistan has the highest SVI for hepatitis C, Kyrgyzstan for Hepatitis D and Namibia for Hepatitis E.

The highest search interest for Hepatitis A is predominantly in Central and South America with Guatemala leading, for Hepatitis B it's concentrated in Africa with Ghana at the forefront, for Hepatitis C it's diverse globally with Pakistan showing the highest SVI, for Hepatitis D it's noted across Asia, Africa, and the Americas with Kyrgyzstan leading, and for Hepatitis E, Namibia in Africa records the highest interest, followed by countries in Asia and Europe (Figure 2).

Based on the Google Trends data, the highest search volume index (SVI) for Hepatitis A comes primarily from the Americas, particularly from Central and South America. Guatemala leads the list, followed by Venezuela, Peru, Honduras, Bolivia, Ecuador, Mexico, Costa Rica, and Puerto Rico. This interest could be associated with the region's efforts to improve sanitation and vaccination against hepatitis A or outbreaks that may have occurred (Figure 3).

Table 2. Top 10 countries with the highest SVI values for Hepatitis A, B, C, D, and E

Ranking	Hepatitis A (SVI)	Hepatitis B (SVI)	Hepatitis C (SVI)	Hepatitis D (SVI)	Hepatitis E (SVI)
1	Guatemala (100)	Ghana (100)	Pakistan (100)	Kyrgyzstan (100)	Namibia (100)
2	Venezuela (96)	Uganda (54)	Puerto Rico (85)	Nigeria (95)	Pakistan (12)
3	Ghana (92)	Nigeria (49)	United States (69)	Bolivia (85)	Nepal (11)
4	Peru (86)	Ethiopia (37)	Dominican Republic (59)	Pakistan (76)	Germany (9)
5	Honduras (84)	Zambia (34)	Nigeria (57)	Nepal (74)	Ghana (8)
6	Bolivia (83)	Cameroon (30)	Ghana (54)	Venezuela (71)	Uganda (8)
7	Ecuador (76)	Kenya (21)	Serbia (47)	Dominican Republic (65)	Kyrgyzstan (6)
8	Mexico (72)	Tanzania (21)	Bosnia and Herzegovina (46)	Ecuador (57)	Bolivia (6)
9	Costa Rica (69)	Dominican Republic (18)	Spain (44)	Peru (52)	Netherlands (5)
10	Puerto Rico (66)	Nepal (18)	Austria (43)	Mexico (52)	Dominican Republic (5)

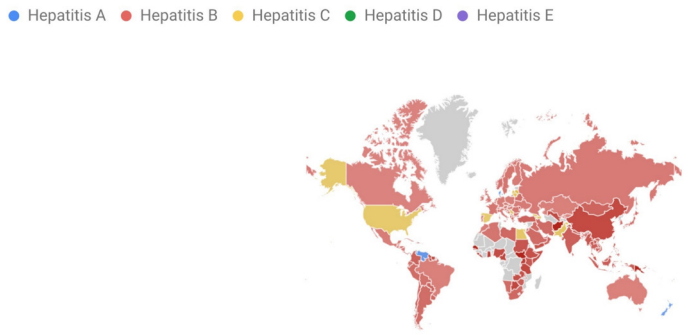

Figure 2. Worldwide search intensity for the terms Hepatitis A, B, C, D and E (Colour intensity represents percentage of searches)

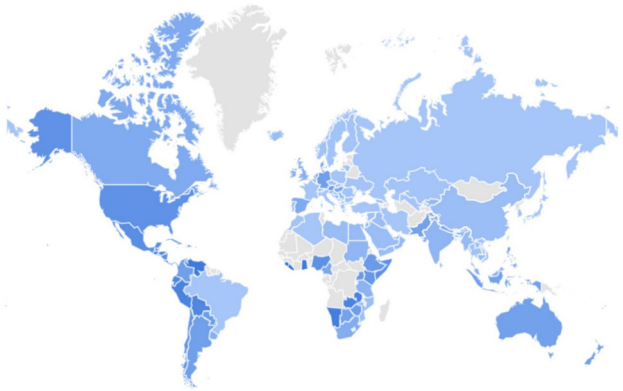

Figure 3. Search intensity of the term Hepatitis A worldwide (Colour intensity represents percentage of searches)

The search interest for Hepatitis B is remarkable in Africa, with Ghana having the highest SVI for hepatitis B among African countries. Other African countries such as Uganda, Nigeria, Ethiopia, Zambia, Cameroon, Kenya and Tanzania are also showing high search interest. This indicates that hepatitis B is still a major public health problem in these regions (Figure 4).

The search interest for Hepatitis C is diverse and spread across multiple continents. Pakistan exhibits the highest SVI, followed by Puerto Rico in the Americas, the United States, and the Dominican Republic. European countries like Serbia, Spain, Bosnia-Herzegovina, and Austria also show substantial search interest. This could be reflective of the global distribution of Hepatitis C, which is commonly associated with injected drug use in many developed countries and unsafe medical practices in developing countries (Figure 5).

The highest SVI for Hepatitis D comes from Kyrgyzstan, followed by Nigeria, Bolivia, Pakistan, Nepal, Venezuela, the Dominican Republic, Ecuador, Peru, and Mexico. This suggests a higher search interest in Asia, Africa, and the Americas. Hepatitis D, being a defective virus requiring Hepatitis B for its replication, tends to be searched in regions where Hepatitis B is also prevalent (Figure 6).

Interestingly, the highest SVI for Hepatitis E comes from Namibia, a country in Africa, followed by Pakistan and Nepal in Asia. The search interest then drops significantly with Germany in Europe, and then back to Africa with Ghana and Uganda. This may reflect the epidemiology of Hepatitis E, which is often associated with large outbreaks in developing countries, particularly in regions with poor sanitation, but is less common in developed countries (Figure 7).

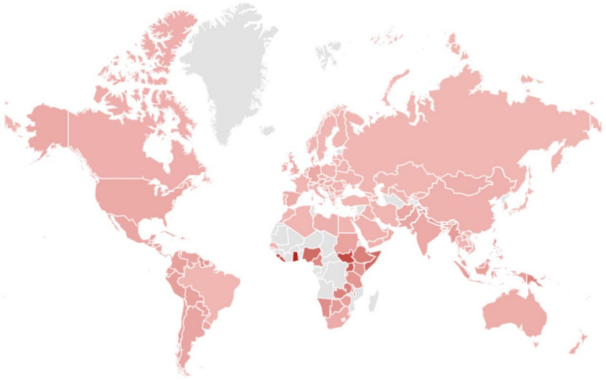

Figure 4. Search intensity of the term Hepatitis B worldwide (Colour intensity represents percentage of searches)

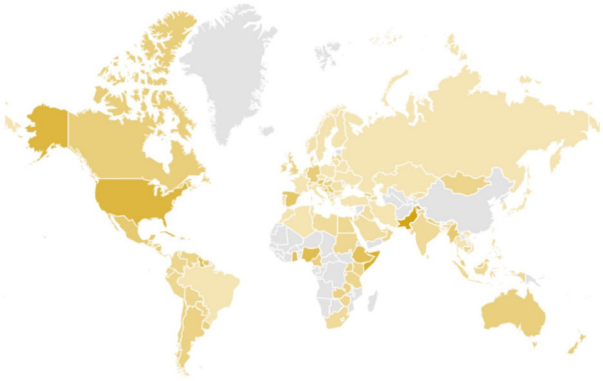

Figure 5. Search intensity of the term Hepatitis C worldwide (Colour intensity represents percentage of searches)

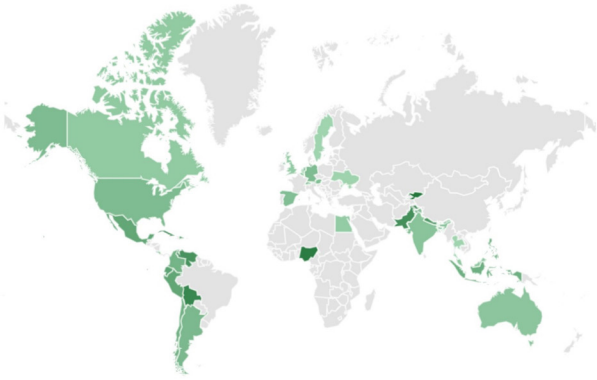

Figure 6. Search intensity of the term Hepatitis D (Colour intensity represents percentage of searches)

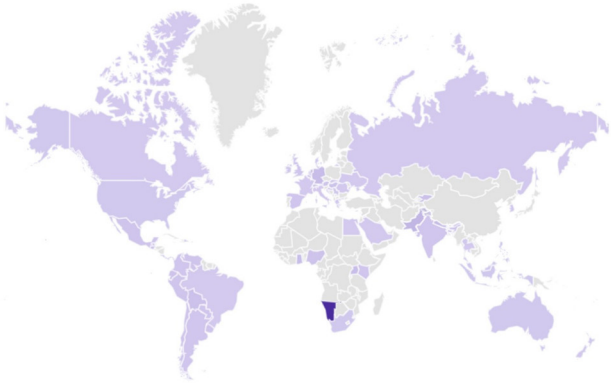

Figure 7. Search intensity of the term Hepatitis E (Colour intensity represents percentage of searches)

DISCUSSION

The analysis of Google Trends data in this study offers critical insights into the global awareness and perceived relevance of different types of hepatitis - A, B, C, D, and E. The geographical diversity and variance in the Search Volume Index (SVI) suggest a correlation with the regional prevalence of these diseases, public health interventions, disease outbreak responses, or general health literacy.

The high SVI values for Hepatitis A searches predominantly originating from Central and South America can be correlated with the region's significant efforts to improve sanitation and promote vaccination, key preventive measures against Hepatitis A. The World Health Organization (WHO) data supports this observation, indicating high endemicity of Hepatitis A in these regions (4). However, it is also crucial to consider the impact of socioeconomic factors and accessibility to digital infrastructure influencing these results (5).

For Hepatitis B, the elevated search interest from Africa aligns with the high prevalence rates of this disease in the region. Despite global efforts to increase Hepatitis B vaccination, the disease remains a significant public health concern in Africa (6). Therefore, the high SVI values could reflect the need for information about the disease, prevention methods, and available treatments. This finding calls for more proactive public health initiatives and vaccination programs in these regions (7).

Hepatitis C shows a diverse geographical distribution in search interest, which can be reflective of its global prevalence. The highest SVI comes from Pakistan, followed by countries from the Americas and Europe. The diversity in countries and continents shows the global scale of Hepatitis C, which is linked to unsafe medical practices, drug use, and transfusion of unscreened blood and blood products (5). This diverse interest underscores the necessity of universal prevention strategies, including harm reduction services for people who inject drugs and ensuring safe blood supply and safe healthcare procedures (8,9).

The highest SVI for Hepatitis D is observed in Kyrgyzstan, followed by countries in Africa and the Americas. Given that Hepatitis D is a defective virus requiring Hepatitis B for its replication, the data underscores the link between the two diseases (10). The high search interest in regions where Hepatitis B is also prevalent suggests a potential co-infection scenario, emphasizing the need for integrated strategies to combat Hepatitis B and D (11).

The highest search interest for Hepatitis E comes from Namibia, followed by countries in Asia. Hepatitis E is typically associated with large-scale outbreaks in developing countries and regions with poor sanitation (12). However, the lower search interest from developed countries could reflect the lower incidence of Hepatitis E in these regions (13).

While this study provides a unique perspective on global

awareness about different types of hepatitis, some limitations must be acknowledged. The SVI values are relative to the total number of Google searches conducted over time, and thus, they do not reflect the absolute search volume. Also, factors such as internet penetration, digital literacy, language preference, and age distribution can significantly influence these values.

CONCLUSION

In conclusion, this study illustrates the potential of using Google Trends as a tool for gauging public interest and awareness about different types of hepatitis worldwide. The insights obtained from this analysis could help guide public health authorities in tailoring disease awareness and prevention strategies to align with the information-seeking behavior of the population.

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Conflict of Interest: *The authors have no conflicts of interest to declare.*

Ethical approval: *Ethical approval was not required for this study as it solely involves the analysis of publicly available Google Trends data without any direct involvement of human subjects or identifiable personal data.*

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