

Serological Survey of Prevalent Viral Infections among Suspected Cases from Northwest Districts of Punjab, India

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ABSTRACT

Introduction: Diseases caused by viruses have assumed great public health significance in the recent past. Viruses infect multiple hosts, including animal reservoirs, mutate rapidly and reassort or recombine, emerging and re-emerging to pose repeated threats to the human population. The present study was conducted to diagnose the various occurrences and outbreaks of viral diseases in Amritsar and neighboring districts of Punjab.

Material and Methods: Whole blood sera samples from a total of 5173 patients suspected of various viral diseases were received at Viral Research and Diagnostics Laboratory from January 2017 to December 2017. All the samples were tested by Enzyme linked immunosorbant assay (ELISA) for the detection of virus infections.

Results: A total of 5173 subjects suspected for various viral infections have been tested and out of these 1983 (38.3%) cases have been reported to be positive and among them, the Hepatitis C virus is predominant followed by Dengue Virus, Hepatitis E Virus, Hepatitis B virus, Herpes simplex virus, Cytomegalovirus, Hepatitis A virus, Rubella virus and Chikungunya virus.

Conclusion: Issue of emerging and reemerging infectious diseases, especially those related to viruses, has become an increasingly important area of concern in public health. Timely identification of an epidemic occurrence and appropriate strategies for treatment require accurate diagnosis and prevention of viral diseases.

Keywords: Viral infections, Seroprevalence, Dengue Virus, Hepatitis Virus.

mutation and antigenic change, along with rapid adaptation to newer ecosystems, makes them efficient at infecting new hosts including man, thus creating local or global health threats. Diagnosis is one of the prime requirements in disease management and definitive diagnosis of viral diseases is essential for recognising the occurrence of epidemics and for instituting appropriate treatment.⁵ The present study was conducted to diagnose the various occurrences and outbreaks of viral diseases in Amritsar and neighboring districts of Punjab.

MATERIAL AND METHODS

Whole blood sera samples from a total of 5173 patients suspected of various viral diseases included dengue, chikungunya, hepatitis A, hepatitis B, hepatitis C, hepatitis E, herpes simplex, cytomegalovirus and rubella were received at Viral Research and Diagnostics Laboratory (VRDL) located at tertiary care hospital for a period from January 2017 to December 2017. All the samples were accompanied with demographic and geographical details of the patients. The samples were tested by Enzyme linked immunosorbant assay (ELISA) for the detection of IgM antibodies of chikungunya virus, IgM antibodies and NS-1 antigen of dengue virus, IgM antibodies of hepatitis A virus and hepatitis E virus, anti-HCV antibodies of hepatitis C virus, surface antigen of hepatitis B virus, IgG and IgM antibodies for cytomegalovirus, herpes Simplex and rubella virus. All the tests were carried out following the manufacturer's instructions.

RESULTS

In the present study a total of 5173 subjects suspected for various viral infections have been tested and out of these 1983 (38.3%) cases have been reported to be positive for one

INTRODUCTION

Infectious diseases are a major area of concern in human health and affect a large number of people worldwide. A majority of microbes exist in the immediate environment surrounding man, often maintained within other species, without causing human disease. However, due to various disturbances affecting the ecological balance, these microbes can, from time to time, emerge or re-emerge in human populations and cause sporadic disease or outbreaks.¹

The emerging infectious diseases account for nearly 30% of annual deaths worldwide and the morbidity and mortality associated with infectious diseases far more exceeds in developing countries.² The issue of emerging and reemerging infectious diseases, especially those related to viruses, has become an increasingly important area of concern in public health. It has been well documented that 37% of emerging and re-emerging pathogens are viruses.^{3,4} High rates of

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How to cite this article: Shailpreet K. Sidhu, Kanwardeep Singh, Pushpa Devi, Maninder Kaur, Manpreet Kaur, Nacchatarjit Singh, Sita Malhotra. Serological survey of prevalent viral infections among suspected cases from northwest districts of Punjab, India. International Journal of Contemporary Medical Research 2018;5(7):G10-G13.

DOI: <http://dx.doi.org/10.21276/ijcmr.2018.5.7.20>

Virus	Assay	Total samples tested	Total Positive Samples (%)
Dengue Virus	IgM ELISA	373	136 (36.5%)
Dengue Virus	NS-1 Ag ELISA	559	265 (47.4%)
Chikungunya Virus	IgM ELISA	32	01(3.1%)
Hepatitis C Virus	Anti-HCV ELISA	2422	1340 (55.3%)
Hepatitis B Virus	HBsAg ELISA	1057	62 (5.9%)
Hepatitis A Virus	IgM ELISA	268	28 (10.4%)
Hepatitis E Virus	IgM ELISA	264	74 (28.0%)
Herpes Simplex Virus (1 and 2)	IgM ELISA	80	11 (13.7%)
Herpes Simplex Virus (1 and 2)	IgG ELISA	11	9 (81.8%)
Cytomegalovirus	IgM ELISA	39	06 (15.4%)
Cytomegalovirus	IgG ELISA	40	26 (65%)
Rubella Virus	IgM ELISA	14	04 (28.5%)
Rubella Virus	IgG ELISA	13	09 (69.2%)
Measles Virus	IgM ELISA	01	0

Table-1: Various serological assays to diagnose viral infections

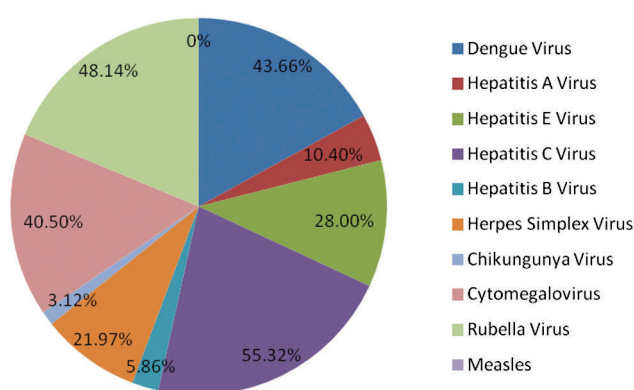


Figure-1: Pie Chart presenting percentage of cases tested positive for each of the studied viral Infection

or more of these viral infections. It is noteworthy that among the positive cases, the Hepatitis C virus is predominant (1340/2422) followed by Dengue Virus (407/932, Hepatitis E Virus(74/264), Hepatitis B virus (62/1057), Herpes simplex virus (20/91), Cytomegalovirus (32/79), Hepatitis A virus (28/268), Rubella virus (13/27), Chikungunya (1/32) and Measles (0/1). (Fig.1)

The present study reports a total of 05 outbreaks comprising of Dengue virus, Hepatitis A virus and Hepatitis E virus epidemics in the studied population. The largest outbreak encompassing 211 DenV cases (as multiple outbreaks), diagnosed from the Amritsar district followed by another outbreaks in Gurdaspur and pathankot, reported 53 cases each. HEV outbreak were also reported from Amritsar (3 out of 6 suspected patients) and from Jalandhar (10 out of 11 suspected cases) during the study period (figure 1, table 1).

DISCUSSION

Viruses are one of the deadliest organisms known to cause large epidemics and pandemics in various parts of the world. In recent decades, diseases caused by viruses have assumed great public health significance.⁶ Out of the 20 emerging/re-emerging infections all over the world, 14 are of viral origin.⁷ The concepts of public health have experienced a new paradigm as a consequence of these emerging viruses. Besides health, the viruses have also influenced the social

and economic fabric of India.⁸ High rates of mutation and antigenic change along with rapid adaptation to newer ecosystems makes them efficient at infecting new hosts including man, thus creating local or global health threats. Viruses are continuously changing as a result of genetic selection and undergo subtle genetic changes through mutation and major genetic changes through recombination This is especially true of viruses that contain Ribonucleic Acid (RNA), as these mutate rapidly and ability to genetically reassort (when their genome is segmented or recombine).¹

In the period from January 2017 to December 2017, the present study reports the number of patients visiting the hospital with suspected viral infections including dengue, chikungunya, hepatitis, herpes simplex, cytomegalovirus and rubella. It is noteworthy that among the positive cases, the Hepatitis C virus is predominant (55.3%) followed by Dengue Virus (43.6%), Cytomegalovirus (40.5%), Herpes simplex virus (21.9%), Hepatitis E Virus(20.0%), Hepatitis B virus (5.86%), Hepatitis A virus (10.5%), Rubella virus (48.14%), Chikungunya (3.12%) and Measles(0)from district Amritsar (Fig 1).

Dengue in India has dramatically expanded and the last decade experienced the dengue infection in pan- India proportions, with rapidly changing epidemiology. Multiple outbreaks and mortality have been recorded from all over India extending from Punjab, Haryana and Uttar Pradesh in the north till Andhra Pradesh, Tamil Nadu and Karnataka in the south; also from Gujarat and Rajasthan in the west till West Bengal in the east.⁹ The present results show that the overall seropositivity of dengue suspected cases is 43.6% (1335 out of 2709) from district Amritsar. This is relatively lower in comparison to the earlier studies^{2,7} done in the same institute. This could be due to the active preventive measures taken by the district health authorities. Other studies, Ukey PM et al., reported 31.3% patients to be serologically positive for dengue infection from Central India.¹⁰ and Tamil Nadu based study reported 32.1% seropositivity.¹¹ Our study reported maximum cases in the months of September and October. This is due to increased vector transmission in the monsoon and post-monsoon periods. A similar study

conducted by Bandyopadhyay et al. and Nasreen et al also showed that a maximum number of cases are reported from 1st week of September to almost mid- October.^{12,13} Another important vector borne disease Chikungunya is no stranger to the Indian subcontinent. Since its first isolation in Kolkata in 1963, Recently CHIKV resurfaced in India affecting more than 1.3 million people estimated to be affected across 150 districts of 8 states in India.¹⁴ Despite the number estimated, the actual disease burden was thought to be much higher due to potential underestimation from lack of accurate reporting.¹⁵ In the Present study, Chikungunya IgM positivity was found to be only 3.1% which is very less when compare to the other studies reported from various parts of the country.^{16,17} This could be due to the underreporting probably because dengue and chikungunya have similar clinical presentations and commonly co-circulate in the same geographical area difficult differentiation clinically.

Hepatitis B virus (HBV) and Hepatitis C virus (HCV) are the most common cause of chronic liver disease worldwide which can lead to grave complications including cirrhosis of liver and hepatocellular carcinoma. In India, HBV accounts for approximately 40 million carriers and approximately 10 million people are infected with HCV.¹⁸ HBV is reported to be responsible for 70% of cases of chronic hepatitis and 80% of cases of cirrhosis of the liver.¹⁹ In India, the prevalence of HBsAg is reported to be 3-4.2%.²⁰ The current study shows 5.9% seroprevalence of HBV among suspected cases visiting the hospital. The frequency of HBV seropositivity has been found to be higher than that reported in the same institute earlier and in other studies.^{2,7,21} In India, general prevalence of HCV was 0.5% to 1% and there are about 15 million HCV carriers.²² Prevalence of anti-HCV in blood donors in developed countries range from 0.4-2%.²³ In the present study, anti-HCV antibodies were detected in 55.3% of patients. The reason for such high prevalence could be due to the free drug initiative by Punjab government under "Mukh Mantri Punjab Hepatitis-C Relief Fund Scheme (MMPHRF)" which probably led to a sudden rise in the number of cases being diagnosed with anti-HCV antibodies, although the true positive new cases would be far less than this.

Hepatitis A virus (HAV) and Hepatitis E virus (HEV) are predominantly enterically transmitted pathogens and are responsible to cause both sporadic infections and epidemics of acute viral hepatitis (AVH). The incidence of HAV and HEV infections is higher in individuals inhabiting crowded living conditions and in areas of low socioeconomic development. These two types of hepatitis are maintained in a population by serial transmission from subclinically infected persons to susceptible persons and contamination of water. Hepatitis A virus is widely spread and has inverse relationship with socioeconomic status, affecting mostly the areas with poor sanitation conditions. Punjab is generally considered an area of low endemicity for hepatitis A in comparison to other Indian states.²⁴ In the current study the seroprevalence of HAV is 10.4% (28 out of 268 suspected cases). The seroprevalence of HEV is quite high as it was observed in 72 out of 264 suspected cases (28.0%). Similar study done in

the same institute reported seroprevalence of 47%.⁷ In India, HEV is responsible for 50-70% of all cases of sporadic acute viral hepatitis and also, is responsible for large outbreaks with source of infection mainly being contaminated water supplies.^{25,26} The occurrence of large epidemics of HEV in disease-endemic areas, as it is the case in the present study, suggests the possibility of doubtful protection from the antibody, gradual decline in the protective level of the antibody or infection from divergent strains of the virus.²⁵ Cytomegalovirus is one of the most frequently encountered opportunistic viral pathogens in immunocompromised individuals.²⁷ It is endemic throughout the world affecting most of the population where the seroprevalence of CMV IgG antibodies varies greatly with a variety of epidemiological factors such as age, geographical distribution, socioeconomic status, marital status and parity. Primary CMV infections are usually asymptomatic however, the incidence and spectrum of disease in immunocompromised people establish this virus as an important human pathogen.²⁸ This study showed seropositive rate of 15.4% for the CMV specific IgM antibodies and 65.0% for CMV IgG antibodies. Previous study from the same institute in 2016 showed seropositive rate of 52.9% for the CMV specific IgM antibodies, thus indicating a higher prevalence in and around Amritsar.²

Herpes simplex viruses (HSV) are among the most widespread causative agents of human viral infections. HSV-2 is one of the commonest causes of genital disease, however, recent changes in HSV epidemiology showed an increase in genital and neonatal herpes particularly caused by HSV-1 simplex viruses. Worldwide, 90% of people have one or both viruses. HSV-1 is the more prevalent virus, with 65% of persons in the United States having antibodies to HSV-1.²⁹ HSV-2 infections are markedly less frequent than HSV-1 infections, with 15%–80% of people in various populations infected.³⁰ In the current study HSV has been detected in 41.5% of suspected cases. Maximum number (59.3%) of cases was received from dermatology department. But the Elisa kit we used was not able to differentiate between HSV1 and HSV-2. Rubella is another contagious viral infection in pregnant women that leads to the infection of a developing fetus, causing fetal death or congenital rubella syndrome.³¹ In the present study, Rubella virus has been detected in 48.1% of suspected cases, of which 61.5% were found to be pregnant females.

This study provided a picture of common viruses prevalent in the region. Viral research and diagnostic laboratory has become instrumental in detection of emerging and re-emerging viral diseases including outbreak investigation of communicable diseases.

CONCLUSION

Many of the diseases that have emerged or re-emerged in India are caused by viruses. Considering the present scenario of viral infections, enhanced surveillance is recommended so as to accurately monitor the trends of various viral diseases prevalent in the country. Integrated and combined efforts from various sectors, making of policies and preventive strategies

must be intensified to control further disease transmission and to find out the yet undiagnosed viral infections.

Source of support: DHR/ICMR

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 04-06-2018; **Accepted:** 06-07-2018; **Published:** 09-08-2018