

Prevalence of emerging infectious diseases in the Northern region of India

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Abstracts: Emerging infectious diseases (EIDs) are continuously affecting a large population day by day, which is a serious issue for human health, well-being, economy, and sustainable development goals. In India, cholera, pneumonia, and dengue are the few examples of EIDs that affects every level of human setup. The current study aimed to evaluate current status and hospitalization due to EIDs in a Northern India. All infections showed different trend of occurrence throughout the study period and maximum EIDs were found in summer and rainy season while no *Shigella* was found in suspected subjects. This study finally concluded that the incidence of some EIDs are shown decreasing trend of occurrence after the COVID-19 pandemic. However, the trend of infection is remains same for most of the EIDs as per previous studies. This study indicates that there might be several loopholes in the sanitization and hygiene related activities in India. Hence, there is an urgent need of awareness and medical camps to eradicate existing EIDs.

1. Introduction

“Emerging infectious diseases (EID)” are defined as the infections that affect a large population for first time and then there existence increases day by day (World Health Organization, 2005; Dikid et al., 2013; Mukherjee, 2017). According to the 10th International Conference on EID, approximately 15% of the all human pathogens are considered as emerging infections (McArthur, 2019) and it also regarded as a serious health issue which affects human health and well-being, economy, and sustainable development goals (Ambat & Vyas, 2020). Several interlaced and synergistic factors including demographic trends and high-density urbanization, modernization favoring high mobility of people by all modes of transportation, large gatherings, altered human behaviors, environmental changes with modification of ecosystems and inadequate global public health mechanisms have accelerated both the emergence and spread of animal viruses as existential human threats (Excler et al., 2021). In India malaria, dengue, cholera, pneumonia, and leprosy are the major examples of EIDs (Chakravarti et al., 2012; Iyer et al., 2014, Mourya et al., 2019). EIDs continue to be the main contributors to human morbidity and mortality, thus significantly increases healthcare costs in India. The main factors causing the outbreak of EIDs in India are lack of elementary household services and communal hygiene. The etiologies of EIDs in North India have not been documented during past few years and the current study aimed to assess the status and hospitalization due to major EIDs in Northern India.

2. Methodology

All suspected patients who visited the OPD or ER of SSB Heart and Multispecialty Hospital, Faridabad, Haryana, India, between during the period from January 2022 through December 2022 were enrolled in the study. In the laboratory assessment, respective pathological samples were collected and evaluated for the detection of dengue, typhoid, cholera, hepatitis A and E, leptospirosis, malaria, chikungunya and *Shigella*.

3. Results

3.1. Dengue

During the defined period, 3432 patient blood samples were analyzed for dengue to find out dengue positive subjects in the tertiary care center. Figure 1 shows an increasing trend of suspected dengue patients being analyzed onwards of August as well as increasing trend of dengue positive patients with 21, 47 and 57 in September, October and November'22 and a decline was seen in December'22. This co-relates to the monsoon and post- monsoon season in the region of the tertiary care center, which explains the rising trend of dengue and a fall as winter started.

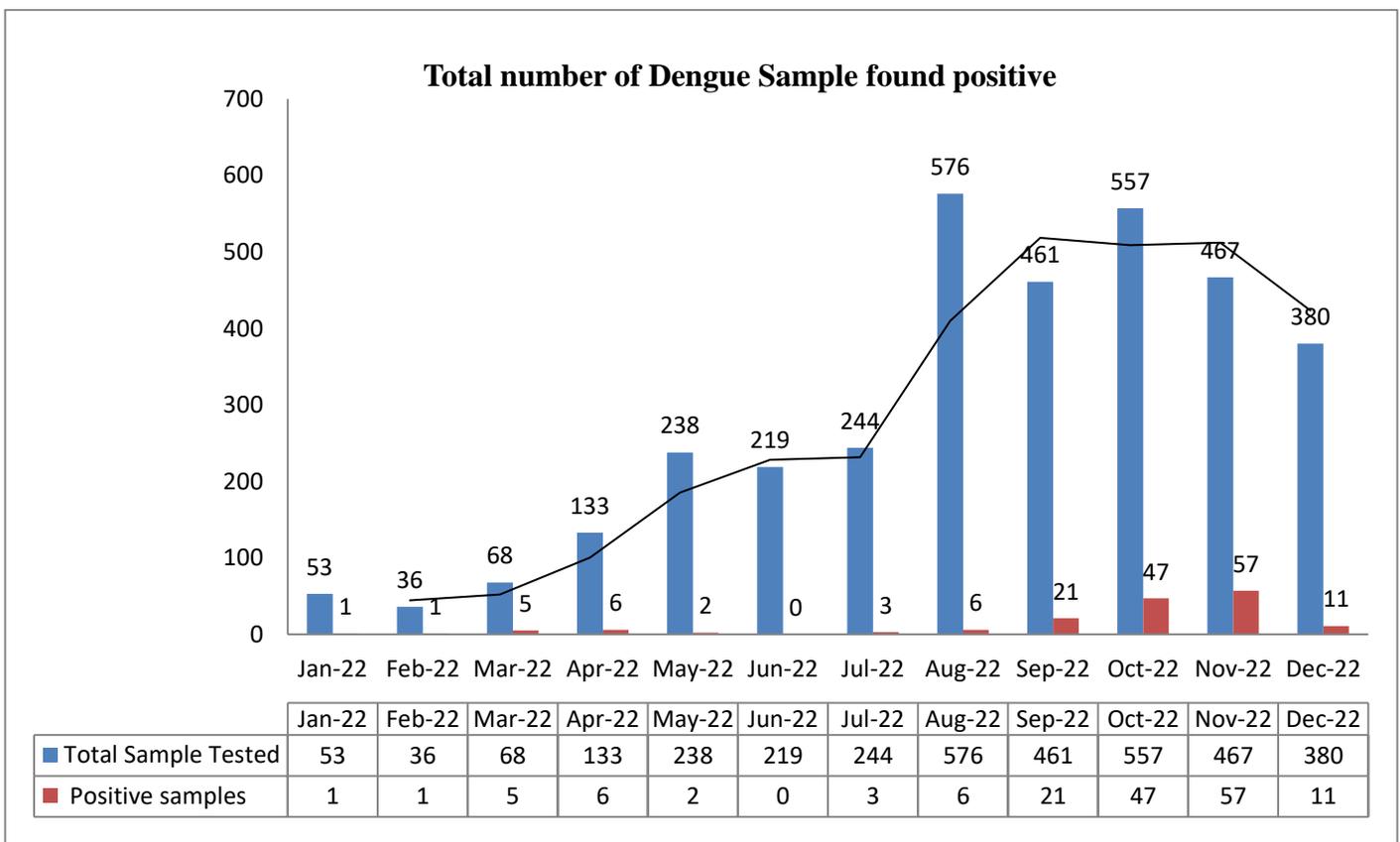


Figure 1. Prevalence of dengue in tertiary care unit located in Northern region of India

3.2. Typhoid Fever

A total of 2932 test were carried out for the detection of typhoid positive cases during the year 2022. A sudden increasing positive sample were found May'22 onwards reaching a peak in July'22 when 36 samples came positive for typhoid, out of the 247 that were analysed and 30 came positive from the 463 samples analysed in month of August'2022. This co-relates to the peak summer and starting of monsoon period. A gradual decrease was seen in the winter months (Fig 2).

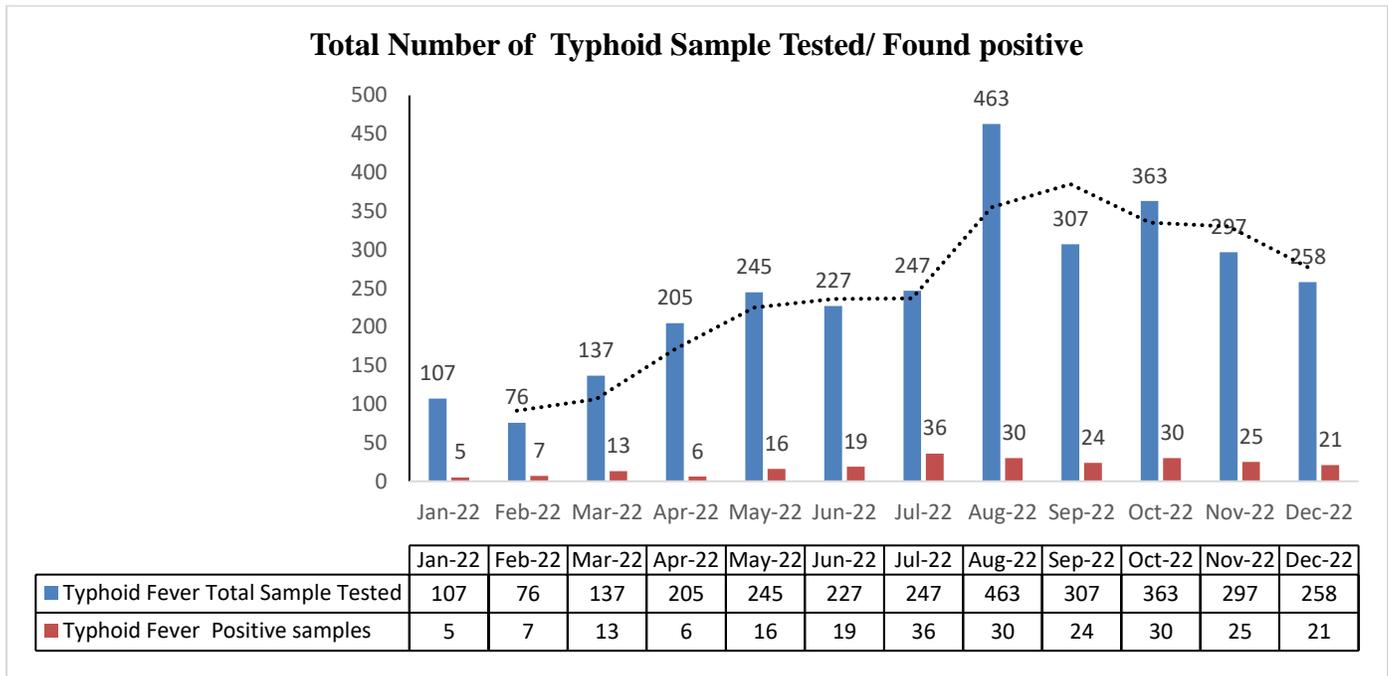


Figure 2. Prevalence of typhoid fever in tertiary care unit located in Northern region of India

3.3. Cholera

Only 151 suspected cases were subjected for microbial analysis for cholera infection. Out of which maximum samples (30) were analysed in the month of August followed by October, May and July (Fig 3). In terms of positive cases, only one case each were recorded in June, September and October while no case was recorded in rest of the month. This indicates that cholera is not a very common disease in the population of the area that the hospital caters to.

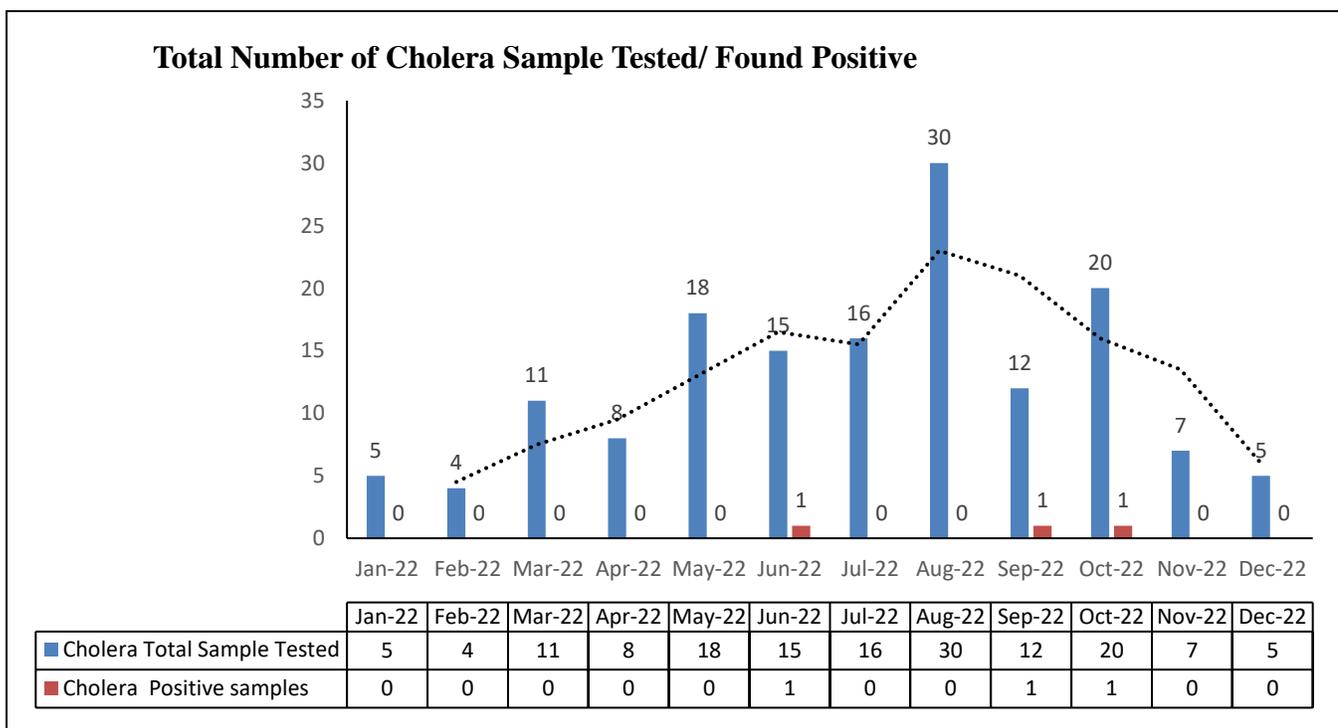


Figure 3. Prevalence of Cholera in tertiary care unit located in Northern region of India

3.4. Hepatitis A

In case of Hepatitis A infection, a total of 133 samples were analyzed during the study period of one year in 2022, out of which only 41 samples were found positive (Fig 4). Maximum positive cases (8) were recorded during May i.e. in summer season, another peak was in november'22 with 6 positive cases while a decline was seen on onset of winters as no sample was found positive in peak winter month i.e. January 2022.

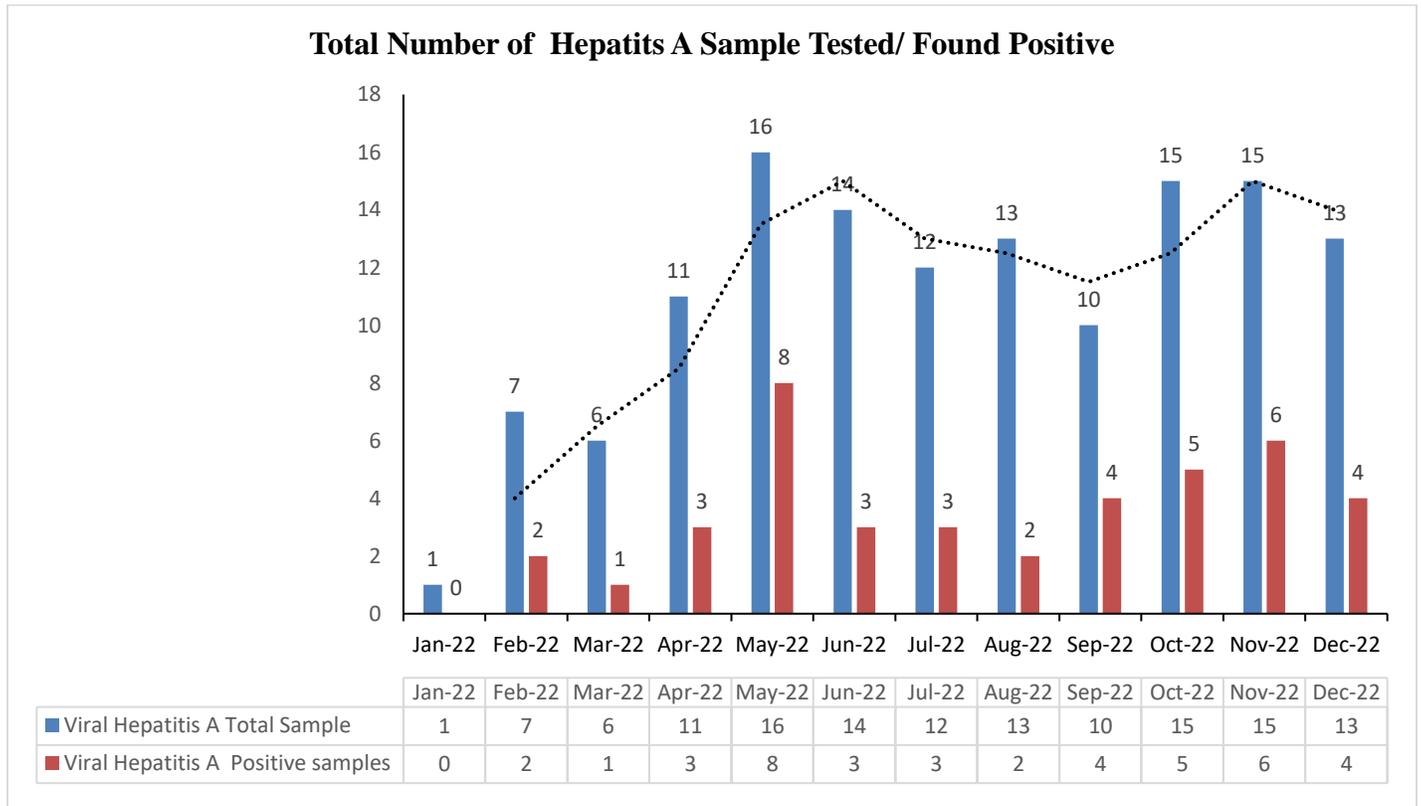


Figure 4. Prevalence of Hepatitis A in tertiary care unit located in Northern region of India

3.5. Hepatitis E

Another hand, only 129 sample were subjected for the identification of Hepatitis E during the study tenure. Among of them maximum test were performed in summer and monsoon season (May to November). Moreover, no positive case was recorded in winter season (i.e. January to April) while highest number of positive cases i.e. 3 were found In September 2022 followed by August and May (Fig 5).

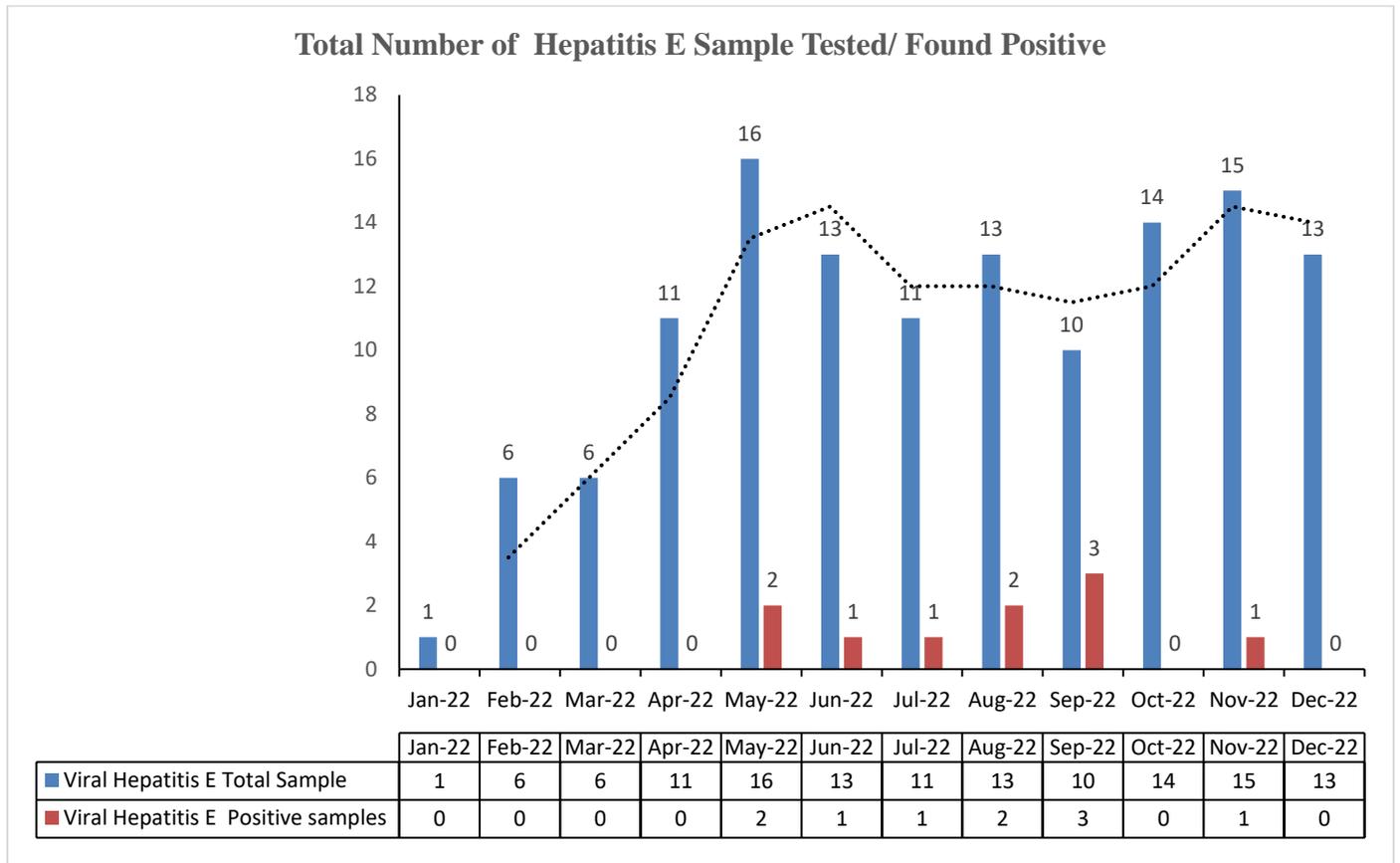


Figure 5. Prevalence of hepatitis E in tertiary care unit located in Northern region of India

3.6. Leptospirosis

In case of leptospirosis, a total of 207 samples were analysed during January to December 2022 out of which only 45 samples were found positive. Maximum positive cases (15) were recorded during May’22 while no sample was found positive in March 2022 (Fig 6). Leptospirosis was maximally tested during summer and monsoon seasons, with second peaks of 6 patients each in April’22 and August’22.

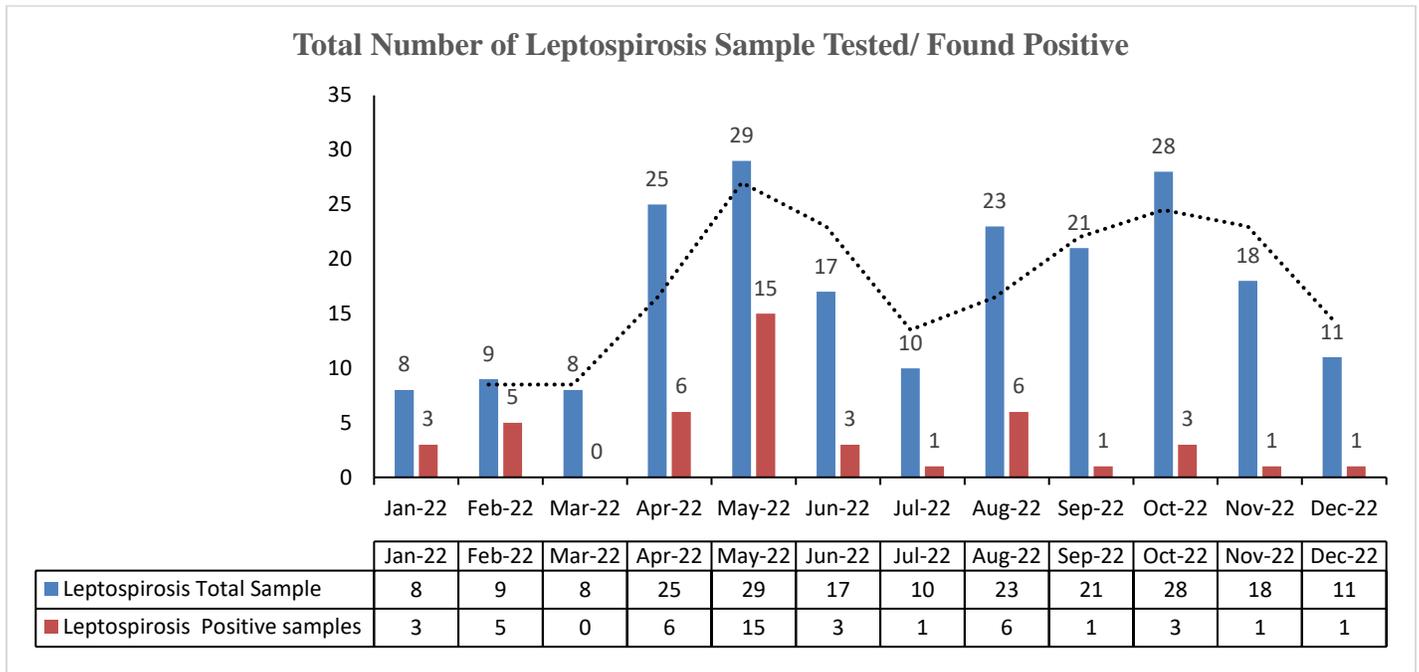


Figure 6. Prevalence of leptospirosis in tertiary care unit located in Northern region of India

3.7. Malaria

A total of 245 cases were subjected for the identification of malaria infection in the tertiary care center in the year of 2022. Among of them maximum samples i.e. 34 were examined in May and August 2022. In case of positive subjects, only 2 patients were found infected in February and September 2022 while no case of malaria was recorded in rest of the months (Fig 7).

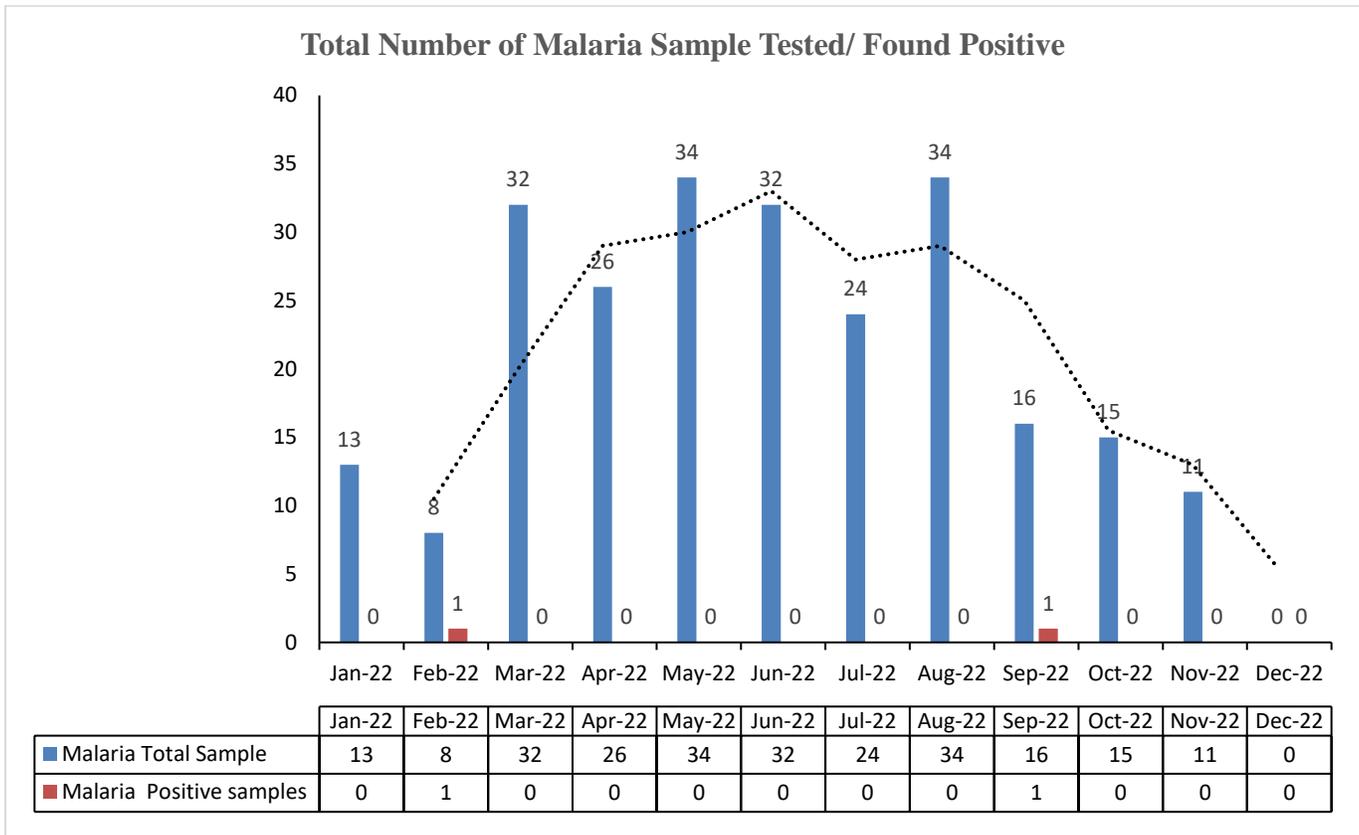


Figure 7. Prevalence of malaria in tertiary care unit located in Northern region of India

3.8. Other medical conditions

In the whole study tenure only 03 cases were subjected for the diagnosis of Chikungunya while no case was found positive. Similarly, 447 sample were analysed for *Shigella Dysentery* infection and no positive case were recorded in the tertiary care centre.

4. Discussion

The findings this study showed that the pattern of EIDs have been changed over the years. Furthermore, with increase in international and domestic travel, it is very tough task to assess the travel history of all subjects during the specific season which exert the negative impact on the assessment of disease severity. In case of dengue, it is a major public health issue in India. According to some studies, the observed increase in dengue burden across India may be due to an epidemiological shift in dengue viruses and climate change. (Halasa et al., 2011; Mutheneni et al., 2017). Previously, a number of studies focused on various epidemiological and climatic factors (Mutheneni et al., 2017). There was no community-based epidemiological study reporting the incidence of dengue fever. Our analysis revealed that among the clinically suspected dengue fever patients, most of the positive patients were detected between September to November 2022 which corresponds with the monsoon and post-monsoon season. Similar, findings was also observed in previously conducted study in that focused on the status of dengue in India (Ganeshkumar et al., 2018).

In case of typhoid fever, higher incidence of typhoid fever is recorded in North and Southwestern states of India (Cao et al., 2021) and current study revealed that the most of the incidence were found between July to October 2022. Similar season for the high prevalence of typhoid fever were recorded from various Asian countries (Saad et al., 2018). This might be due to the increasing water and food contamination in monsoon season. Cholera was seen to be a less common cause of EIDs in this population. To overcome the

EIDs, the targeted use of vaccines, disinfection, chlorination of drinking water sources, filtration of water, use of oral rehydration salts (ORS), antibiotics and bleaching powder must be done. Satisfactory sanitation, personal hygiene, education and awareness campaigns safe food handling, proper sewage disposal, avoiding collection of stagnant water, construction of drainage water away from the water pipelines, and long-term disease surveillance is also required at large extent (Muzembo et al., 2022).

In India, viral hepatitis is a major cause of health-care burden and now is regarded as a threat comparable to the "big three" communicable diseases such as malaria, HIV/AIDS and tuberculosis. Hepatitis A and E viruses are predominantly endemically transmitted pathogens that cause both sporadic infections and epidemics of acute viral hepatitis (Satsangi & Chawla, 2016). In case of hepatitis A and E, the positive subjects were recorded throughout the year but maximum positive in summer and monsoon season. Similar trend and peak season were also reported previously (Al-Naaimi et al., 2012; Fares, 2015, Kumar et al., 2015). These findings might be due to the poor hygiene, food habits, contamination of eatables, high travelling; swimming activity and poor environmental sanitation is found in summer and monsoon season (Fares, 2015). Furthermore, another EID i.e. leptospirosis, a disease which presents similar to dengue fever, affects people across the world but has high prevalence in tropical regions. This bacterial disease spreads via contamination of food and water by the urine of infected animals. In order to spread, a moist environment is necessary for the bacteria to survive. Incidence of leptospirosis was also found throughout of the year with highest prevalence in May'22. Similar season were also reported in a number of studies (Hirschauer et al., 2009; Desvars et al., 2011). In India, it is might be due to the maximum population comes in contact with contaminated and stagnant water in summer and monsoon season.

In case of malaria, only few cases were recorded in February and September while long-term rainfall in the state usually encourages malaria transmission, which peaks seasonally from April to September, when the monsoon season is in full swing (Lauderdale et al., 2014; Ahmed et al., 2022). In terms of Chikungunya and Shingella Dysentery- no positive cases were found. This low incidence of certain EIDs like dysentery and cholera might be due to the increasing awareness related to hygiene especially hand washing after COVID-19 pandemic situation and due to other virus like rotavirus and typhoid being the most common cause. (Madhavan et al., 2001).

Conclusion:

This study finally concluded that the incidence of some EIDs are shown decreasing trend after the COVID-19 pandemic. However, the trend of infection remains same for most of the EIDs as per previous studies. This study indicated that there are several loop holes in the sanitization and hygiene related activities in near by cities. Hence, there is an urgent need of awareness and medical camps to eradicate these existing EIDs.

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