

EPIDEMIOLOGICAL CHARACTERISTICS AND VIRAL EVOLUTION OF HFMD OUTBREAK IN KULIM DISTRICT FROM 2022-2024

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Introduction

Hand, foot, and mouth disease (HFMD) is a contagious illness primarily affecting children under five, caused by enteroviruses. HFMD is transmitted through direct contact with fluids from the body of an infected person, such as saliva and blister fluid, as well as through the faecal-oral route. While the disease is typically self-limiting and lasts less than a week, with skin rashes on the hands, feet, or buttocks and mouth ulcers, delays in diagnosis and treatment can result in severe complications like meningitis, encephalitis, and polio-like paralysis, which may be fatal. The dynamic nature of HFMD's aetiology, with its evolving viral strains, contributes to the challenge of controlling outbreaks. This study aims to address this gap by providing a comprehensive analysis of the epidemiological characteristics—specifically the distribution of HFMD outbreaks by time, place, and person—as well as the patterns of viral evolution in Kulim District.

Methods

This cross-sectional study was conducted using notified HFMD data from CDCIS E-Notification and Line listing of HFMD outbreaks from 2022 to 2024. Descriptive analysis was employed to describe the epidemiological trends and viral evolution of the outbreaks by using R software (version 4.4.3). HFMD cases were defined as clinical case definition and laboratory criteria for diagnosis. The HFMD outbreak is defined as the occurrence of two or more cases in the same locality within the incubation period of 6 days. All notified 2,870 confirmed HFMD cases recorded between 2022 and 2024 were included in the analysis. Cases were selected based on strict inclusion and exclusion criteria.

Results

From 2022 to 2024, a total of 20 HFMD outbreaks were reported in Kulim District, accounting for 121 outbreak cases, with the number of outbreaks increasing each year, from 6 in 2022 to 8 in 2024. Outbreaks primarily affected younger children, particularly those under 5, showing a clear increasing trend. Malay individuals consistently dominated the outbreaks, and males accounted for a higher proportion of cases. Kulim consistently had the highest number of outbreaks, with kindergartens being the most affected facilities. A shift in viral strains was observed, with Enterovirus 71 being the most prevalent in 2022, followed by a shift to Coxsackie A16 and Pan Enterovirus in 2024 as shown in Figure 1.

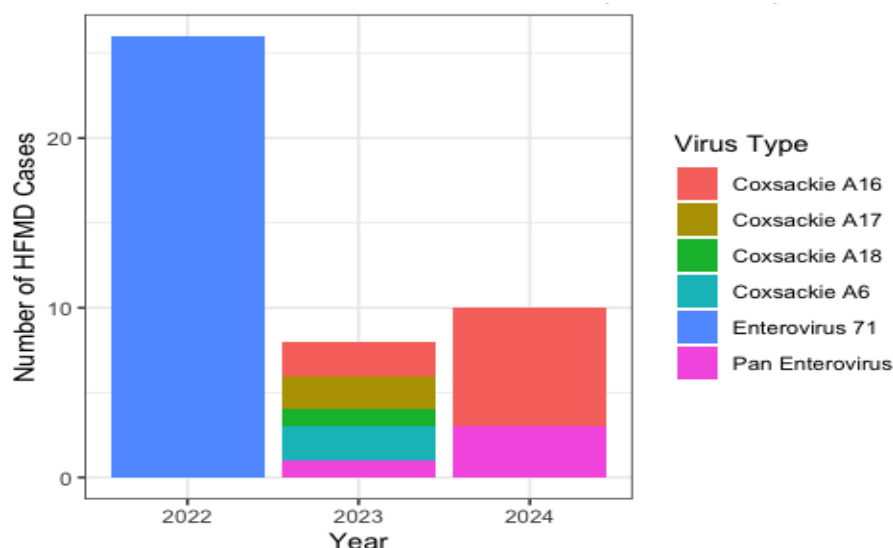


Figure 1. Viral Evolution of HFMD Outbreak from 2022-2024

Discussion

The HFMD outbreak trends from 2022 to 2024 reveal that social events like Hari Raya and school holidays create conditions that facilitate the spread of the virus, with increased social interactions and mobility contributing to outbreaks. The study also found that the HFMD infections was higher in Kulim subdistrict. The subdistrict of Kulim is characterized by significant industrial zones and densely populated settlements. Overall, a significant change in the dominant viral strains causing HFMD outbreaks over the three years, with Enterovirus 71 being the most prevalent in 2022, followed by a shift to various Coxsackieviruses in 2023, and a continued presence of Coxsackie A16 and Pan Enterovirus in 2024. These cyclical patterns can be driven by changes in the pathogen's antigenicity, variations in the immunity of the host population, and environmental factors. Additionally, new outbreaks are often accompanied by shifts in the virus's genotype, contributing to the emergence of different viral strains. These findings emphasize the need for targeted prevention in high-risk groups, especially young children and those in kindergartens. Regular viral monitoring of circulating enteroviruses is crucial to identify new strains and adjust control strategies effectively.

Keywords: HFMD, outbreak, epidemiology, viral evolution, Kulim District