

Epidemiological characteristics and influential factors of hand, foot, and mouth disease reinfection in Guangzhou city, 2012–2017

ZHONG Xuan¹, WANG Hui², CHEN Chun², ZOU Xiaoni³, LI Tiegang²*

1 Department of Epidemiology and Biostatistics, School of Public Health, Guangdong Pharmaceutical University, Guangzhou, China; 2 Department of Infectious Disease Control, Guangzhou Center for Disease Control and Prevention, Guangzhou, China; 3 Department of Hospital Infection Management, Guangdong Women and Children Hospital, Guangzhou, China

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Hand, foot, and mouth disease (HFMD) is a childhood infectious disease caused by a variety of intestinal viruses. HFMD reinfection is not uncommon because of the limited cross-protection from infections of different enterovirus serotypes. However, there are currently insufficient studies on reinfection. This study was to investigate the epidemiological characteristics and its influential factors of HFMD reinfection in Guangzhou.





Data on HFMD patients aged ≤ 5 between January 2012 and December 2017 Of 369054 HFMD patients, 11321 patients were classified as

were extracted from Surveillance System. Reinfection was defined as patients who had been infected at least twice, while non-reinfection was defined as patients who had been infected only once. Descriptive epidemiology method was adopted to analyze the characteristics of population and onset time. Chi-Square Test or Fisher's test were used to compare the differences. Influential factors of reinfection were assessed using the logistic regression model.

Table 1 General characteristics of HFMD reinfection patients and the results from multivariable model depicting the risk of HFMD reinfection

Characteristics	Total (N)	Reinfection n (%)	Single infection n (%)	χ ²	Р	Adjusted OR (95%CI)
All cases	369054	11321 (3.07)	357733 (96.93)	n n-fice		n de la nation de la des
Gender				60.11	< 0.001	
Male	226053	7330 (3.24)	218723 (96.76)			1.19 (1.14~1.23)
Female	143001	3991 (2.79)	139010 (97.21)			1.00
Age (years)				1442.33	< 0.001	
≤ 1	177781	6866 (3.86)	170915 (96.14)	37.37°	<0.001°	20.69 (14.49~29.54)
2	74491	2500 (3.36)	71991 (96.64)			17.96 (12.58~25.66)
3	65459	1563 (2.39)	63896 (97.61)			12.65 (8.86~18.07)
4	35071	361 (1.03)	34710 (98.97)			5.40 (3.74~7.80)
5	16252	31 (0.19)	16221 (99.81)			1.00
Occupational type				514.75	< 0.001	
Scattered children	298345	10086 (3.38)	288259 (96.62)			1.48 (0.55~3.99)
Nursery care children	70218	1231 (1.75)	68987 (98.25)			1.47 (0.54~3.96)
School students/Others	491	4 (0.81)	487 (99.19)			1.00
Clinical manifestation ^b					>0.05ª	
Mild	368897	11312 (3.07)	357585 (96.93)			
Severe	28	0 (0.00)	28 (100.00)			
Case classification				560.22	< 0.001	
Laboratory confirmed	19526	1154 (5.91)	18372 (94.09)			2.06 (1.94~2.20)
Clinically diagnosed	349528	10167 (2.91)	339361 (97.09)			1.00
Laboratory results ^d				17.94	< 0.001	
EV71	3741	168 (4.49)	3573 (95.51)			
CoxA16	3594	211 (5.87)	3383 (94.13)			
Other enteroviruses	12191	775 (6.36)	11416 (93.64)			

reinfection, corresponding to a rate of 3.07%. The rate of reinfection in male is higher than in female. The rate of reinfection in patients aged ≤ 1 year was 3.86%, which showed a downward trend with age. The highest rate in the scattered children (3.38%), followed by nursery care children and others. Besides, higher risk of reinfection was detected among those who were males, aged ≤ 4 years, scattered children and other enteroviruses infection compared with their respective counterparts (Table1). Seasonality is illustrated according to the rate of reinfection peaked from April to July (Figure1). Time intervals curves revealed the number of reinfection sharply increased after 13 months from the initial infection (Figure2).

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a Fisher's exact test; b 129 patients were missing clinical manifestation information; c The Cochran Armitage trend test was used to correlate the age with the incidence rate of reinfection; d Of 11321 reinfection patients, only 1154 were laboratory-confirmed. Thus, the laboratory results variable was not included in multivariable analysis because it has much missing values.





1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 **Figure 2.** Time intervals (months) between initial and secondary infections in different age groups



These results indicated that male ≤ 4 years old, especially those live scattered and infected with other enteroviruses were more likely to be reinfection. Parents should be alert to signs of HFMD, even if their children were previously infected.

Interventions should be imposed on these high-risk children in



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