Vital Surveillance

Reported Vector-Borne Diseases — China, 2018

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ABSTRACT

Introduction: Vector-borne diseases are an important type of infectious disease in China. This study aims to present a summary of vector-borne diseases reported in China in 2018 to provide information on their control and prevention.

Methods: A descriptive analysis was utilized to explore the epidemiological characteristics.

Results: A total of 51,599 cases with vector-borne diseases were reported in 2018 with an incidence rate of 3.69/100,000. Scrub typhus, hemorrhagic fever with renal syndrome (HFRS), and dengue contributed to 85.08% of all the cases. A total of 377 fatalities were included with a case fatality rate of 0.73%. Japanese encephalitis (JE), severe fever with thrombocytopenia syndrome (SFTS), and HFRS accounted for 95.76% of all fatalities. Different vector-borne diseases show disparities in gender, age groups, seasons, and regions.

Conclusions and Implications for Public Health Practice: In 2018, vector-borne diseases caused substantial morbidity and mortality in Mainland China with heterogeneity in populations affected and geography. Different regions should adopt targeted strategies and measures according to vulnerable populations and diseases.

INTRODUCTION

Vector-borne diseases are human illnesses caused by parasites, viruses, and bacteria that are transmitted by vectors such as mosquitoes, sandflies, triatomine bugs, ticks, and lice. They pose a serious threat to public health and cause a large global disease burden. It is reported that vector-borne diseases account for more than 17% of global infectious diseases causing more than 700,000 deaths annually (*1*).

Vector-borne diseases are an important component of infectious diseases in China. Of the 10 notifiable vector-borne diseases, filariasis has been eliminated since 2007 and indigenous malaria case has not been found since 2017 (*2*). This report summarizes detailed reported data for 2018 on the epidemic of the vector-borne diseases in Mainland China.

METHODS

There were 8 nationally notifiable vector-borne diseases because no cases of plague or filariasis were reported in 2018, and 3 non-notifiable infectious diseases were included in our study.* The date of illness onset was in 2018. Cases were reported to China CDC through the National Notifiable Disease Reported System (NNDS), using standard surveillance case definitions. Clinically-diagnosed and laboratory-confirmed cases were included. Probable cases were excluded.

A descriptive analysis was utilized to explore the epidemiological characteristics by IBM SPSS Statistics for Windows (version 20.0; IBM Corp., Armonk, NY, USA). A spatial mapping description was conducted to explore the geographic characteristics by ArcGIS (version 10.2, ESRI, Redlands, CA, USA). Cases were matched via the present residence address. Incidence rates were calculated using cases and the midyear demographic statistics 2018 (*3*).

RESULTS

A total of 51,599 cases with vector-borne diseases were reported in 2018 with an incidence rate of 3.69/100,000, including 31,935 clinically-diagnosed cases and 19,664 laboratory-confirmed cases. Scrub typhus, hemorrhagic fever with renal syndrome (HFRS), and dengue contributed to 85.08% of all the cases. A total of 377 fatalities were included to represent a case fatality rate (CFR) of 0.73%. Japanese encephalitis (JE), severe fever with thrombocytopenia

* Notifiable diseases: Class A (plague); Class B (hemorrhagic fever with renal syndrome, dengue, Japanese encephalitis, malaria, schistosomiasis, leptospirosis); Class C (typhus group rickettsiosis, kala-azar, filariasis). Non-notifiable dieases: severe fever with thrombocytopenia syndrome, scrub typhus, zika.

syndrome (SFTS), and HFRS accounted for 95.76% of all fatalities. Cases were reported from all provincial-level administration divisions (PLADs) with 2,280 counties in Mainland China, primarily in Guangdong (10,905 cases, 21.13% of the total) and Yunnan (10,393, 20.14%) (Figure 1).

A total of 11,739 (22.75% of all the cases) HFRS cases were reported from 1,319 counties of all the PLADs, including 95 deaths (Figure 2). The incidence rate was 0.84/100,000 (Table 1). The male-to-female ratio was 2.69. There were two seasonal peaks: the primary peak was in November and a smaller peak occurred in May (Figure 3). The median age of HFRS cases was 49 years (interquartile range [IQR]=37–60). The median age of death cases was 55 years (IQR=46–64). The morbidity was higher in Shaanxi (1,722 cases, 4.49/100,000), Heilongjiang (1,230, 3.25/100,000), Liaoning (1,116, 2.55/100,000), Jilin (573, 2.11/100,000), Hubei (907, 1.54/100,000), Jiangxi (671, 1.45/100,000), Shandong (1,199, 1.20/100,000), and Fujian (424, 1.08/100,000).

A total of 5,270 (10.21%) dengue cases were reported from 545 counties of 27 PLADs (Figure 2), including 1,292 imported cases. There was 1 fatality, and the case fatality rate was 0.02%. Of all the cases, 2,942 (55.83%) cases were individuals between 18 and 44 years (Table 1). Overall, 65.84% of all the cases had the illness onset between September and October (Figure 3). The median age of dengue cases was 37 years (IQR=27–50). The morbidity was higher in Guangdong (3,332, 2.98/100,000), and Yunnan (928, 1.93/100,000).

All 2,633 (5.10%) malaria cases were imported cases and reported from 996 counties of 30 PLADs (Figure 2). There were 7 fatalities with case fatality rate of 0.27%. Of all the cases, 2,441 (92.71%) cases were male cases and 2,530 (96.09%) cases were individuals between 18 and 59 years (Table 1). The median age of malaria cases was 40 years (IQR=30–48), and 2 cases were infected via blood transfusion.

A total of 1,804 (3.50%) JE cases were reported from 645 counties of 25 PLADs (Figure 2) including 152 fatalities. The incidence rate was 0.13/100,000 and the case fatality rate was 8.43%. Of all the cases, 1,722 (95.45%) cases had illness onset from July to September with a seasonal peak in August (Table 1, Figure 3). The median age of JE cases was 52 years (IQR=19–65). The morbidity was higher in Ningxia (162, 2.38/100,000) and Gansu (504, 1.92/100,000).

A total of 147 (0.28%) schistosomiasis cases were reported from 62 counties of 12 PLADs (Figure 2). The male-to-female ratio was 1.94. Most cases (81.63%) were individuals aged older than 44 years (Table 1). Of all the cases, 138 (93.29%) cases were chronic schistosomiasis and 9 (6.04%) cases were not classified. The median age of schistosomiasis cases was

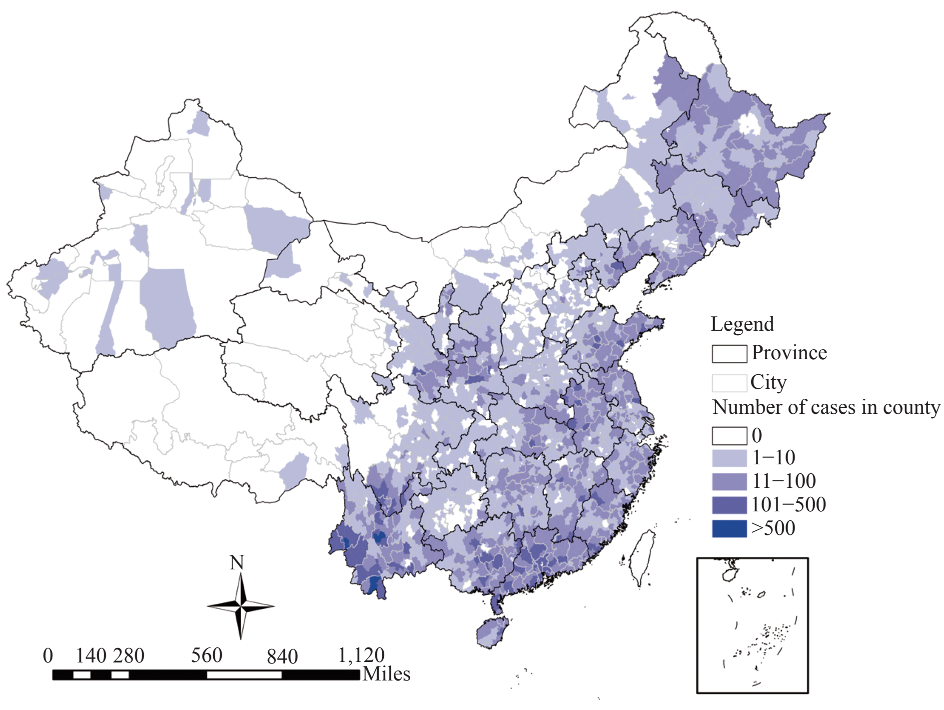

FIGURE 1. Spatial distribution of overall cases of vector-borne diseases in Mainland China, 2018.

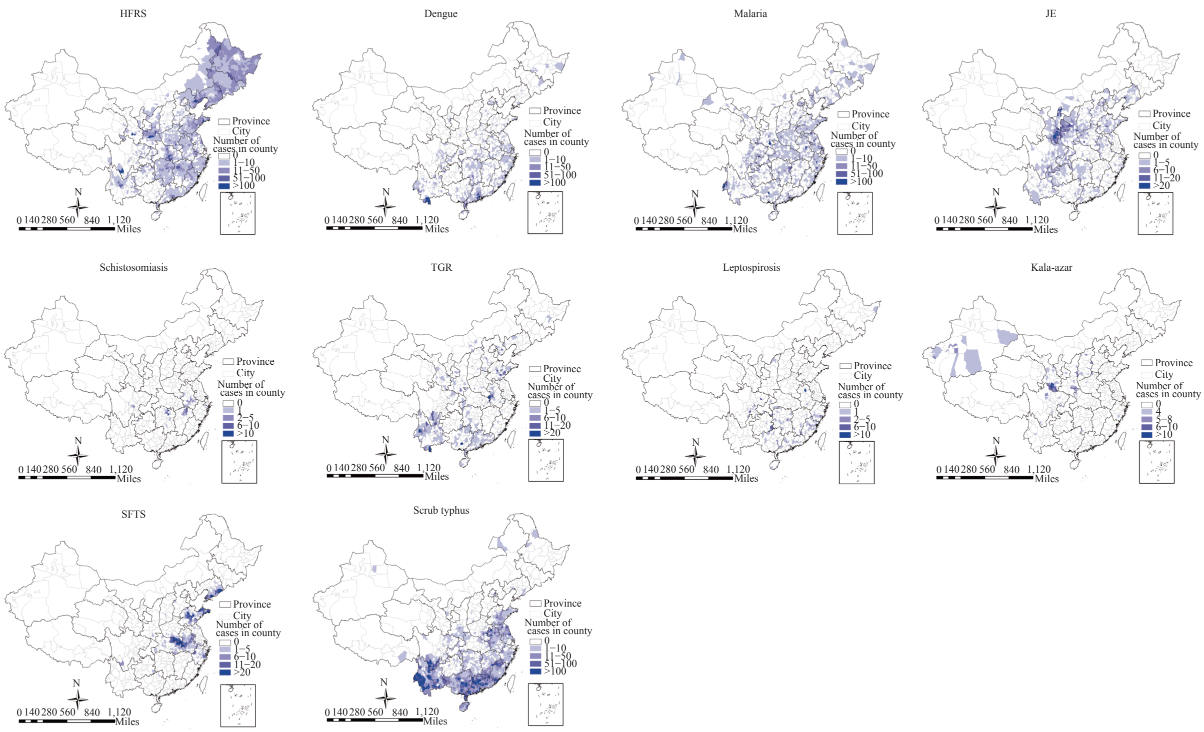

FIGURE 2. Spatial distribution of vector-borne diseases by type in Mainland China, 2018. HFRS=hemorrhagic fever with renal syndrome; JE=Japanese encephalitis; TGR=typhus group rickettsiosis; SFTS=severe fever with thrombocytopenia syndrome.

61 years (IQR=48–70). Schistosomiasis cases were mainly distributed in central (68.03%), and eastern (25.85%) China, including Hunan (47.62%), Jiangxi (19.05%), and Anhui (19.05%).

A total of 154 (0.30%) leptospirosis cases were reported from 106 counties of 16 PLADs (Figure 2), including 1 fatal case. Male cases were represented more than female cases. The male-to-female ratio was 4.31 (Table 1). An estimated 66.23% of the cases occurred from July to September with the seasonal peak in August (Figure 3). The median age of leptospirosis cases was 54.5 years (IQR=45.75–63.25).

A total of 962 (1.86%) typhus group rickettsiosis (TGR) cases were reported from 320 counties of 22 PLADs (Figure 2). Overall, 339 (35.24%) cases had the illness onset between July and September (Table 1), and 59% of TGR cases occurred from July to November. The median age of TGR cases was 48 years (IQR=27–62). TGR cases were mainly distributed in southwestern (36.17%), southern (21.62%) and eastern (20.45%) China, including Yunnan (26.09%), Guangdong (13.72%), Shandong (12.16%), and Sichuan (9.67%).

A total of 155 (0.30%) kala-azar cases were reported from 68 counties of 13 PLADs (Figure 2). The male-to-female ratio was 1.50. Individuals under the age of 18 years contributed to the most cases (41.94%). The median age of kala-azar cases was 32 years (IQR=3–47). Overall, 100 (64.52%) cases had the illness onset between January and June (Table 1). Kala-azar cases were mainly distributed in northwestern (61.94%), northern (20.65%), and southwestern (11.61%) China, including Gansu (38.06%), Shanxi (19.35%), Shaanxi (13.55%), Xinjiang (10.32%), and Sichuan (9.68%). No domestic cases were reported in eastern, northeastern, and southern China.

A total of 1,845 (3.58%) SFTS cases were reported from 231 counties of 17 PLADs (Figure 2), including 114 fatalities. The incidence rate was 0.13/100,000 and the case fatality rate was 6.18%. The median age of SFTS cases was 64 years (IQR=54–71). The illness onset peaked in May with 483 (26.18%) cases, and then decreased monthly (Figure 3). The morbidity was higher in Shandong (736, 0.74/100,000), Anhui (328, 0.52/100,000), Hubei (237, 0.40/100,000), Liaoning (123, 0.28/100,000), and Henan (272, 0.28/100,000).

A total of 26,889 (52.11%) scrub typhus cases were reported from 947 counties in 27 PLADs (Figure 2), including 7 fatalities. The incidence rate was 1.92/100,000 and the case fatality rate was 0.03%.

TABLE 1. Selected characteristics of reported cases of vector-borne diseases by type in Mainland China, 2018.

Item	HFRS (N=11,739) n (%)	DF (N=5,270) n (%)	Malaria (N=2,633) n (%)	JE (N=1,804) n (%)	Schistosomiasis (N=147) n (%)	TGR (N=962) n (%)	Leptospirosis (N=154) n (%)	Kala-azar (N=155) n (%)	SFTS (N=1,845) n (%)	ST (N=26,889) n (%)	Zika (N=1) n (%)	Total (N=51,599) n (%)
Age group												
<18	472 (4.02)	428 (8.12)	34 (1.29)	417 (23.12)	1 (0.68)	190 (19.75)	2 (1.30)	65 (41.94)	12 (0.66)	2,706 (10.06)	0 (0)	4,327 (8.39)
18–44	3,893 (33.16)	2,942 (55.83)	1,623 (61.64)	308 (17.07)	26 (17.69)	225 (23.39)	33 (21.43)	42 (27.10)	142 (7.70)	5633 (20.95)	0 (0)	14,867 (28.81)
45–59	4,338 (36.96)	1,175 (22.30)	907 (34.45)	404 (22.39)	44 (29.93)	262 (27.23)	66 (42.86)	33 (21.29)	514 (27.86)	9,011 (33.51)	1 (100)	16,755 (32.47)
≥60	3,026 (25.86)	725 (13.75)	69 (2.62)	675 (37.42)	76 (51.70)	285 (29.63)	53 (34.41)	15 (9.68)	1,177 (63.79)	9,539 (35.48)	0 (0)	15,650 (30.33)
Gender												
Male	8,558 (72.90)	2,970 (56.36)	2,441 (92.71)	938 (52.00)	97 (65.99)	468 (48.65)	125 (81.17)	93 (60.00)	885 (47.97)	12,478 (46.41)	1 (100)	29,054 (56.31)
Female	3,181 (27.10)	2,300 (43.64)	192 (7.29)	866 (48.00)	50 (34.01)	494 (51.35)	29 (18.83)	62 (40.00)	960 (52.03)	14,411 (53.59)	0 (0)	22,545 (43.69)
Period of onset												
January–March	2,397 (20.42)	55 (1.04)	673 (25.56)	2 (0.11)	36 (24.49)	97 (10.08)	8 (5.19)	48 (30.97)	24 (1.30)	649 (2.41)	0 (0)	3,989 (7.73)
April–June	3,247 (27.66)	240 (4.55)	681 (25.86)	52 (2.89)	38 (25.85)	255 (26.51)	25 (16.23)	52 (33.55)	985 (53.39)	4,596 (17.09)	0 (0)	10,171 (19.71)
July–September	1,536 (13.08)	2,552 (48.43)	706 (26.81)	1,722 (95.45)	45 (30.61)	339 (35.24)	102 (66.24)	27 (17.42)	670 (36.31)	13,556 (50.41)	0 (0)	21,255 (41.19)
October–December	4,559 (38.84)	2,422 (45.96)	573 (21.76)	28 (1.55)	28 (19.05)	271 (28.17)	19 (12.34)	28 (18.06)	166 (9.00)	8,088 (30.08)	1 (100)	16,183 (31.36)
Outcome												
Recovered	11,644 (99.19)	5,269 (99.98)	2,626 (99.73)	1,652 (91.57)	147 (100)	962 (100)	153 (99.35)	155 (100)	1,731 (93.82)	26,882 (99.97)	1 (100)	51,222 (99.27)
Death	95 (0.81)	1 (0.02)	7 (0.27)	152 (8.43)	0 (0)	0 (0)	1 (0.65)	0 (0)	114 (6.18)	7 (0.03)	0 (0)	377 (0.73)

Note: Date of onset missing for one case of dengue. Notifiable diseases: Class A (plague); Class B (hemorrhagic fever with renal syndrome, dengue, Japanese encephalitis, malaria, schistosomiasis, leptospirosis); Class C (typhus group rickettsiosis, kala-azar, filariasis). Non-notifiable dieases: severe fever with thrombocytopenia syndrome, scrub typhus, zika.

Abreviation: HFRS=hemorrhagic fever with renal syndrome; DF=dengue fever; JE=Japanese encephalitis; TGR=typhus group rickettsiosis; SFTS=severe fever with thrombocytopenia syndrome; ST=scrub typhus.

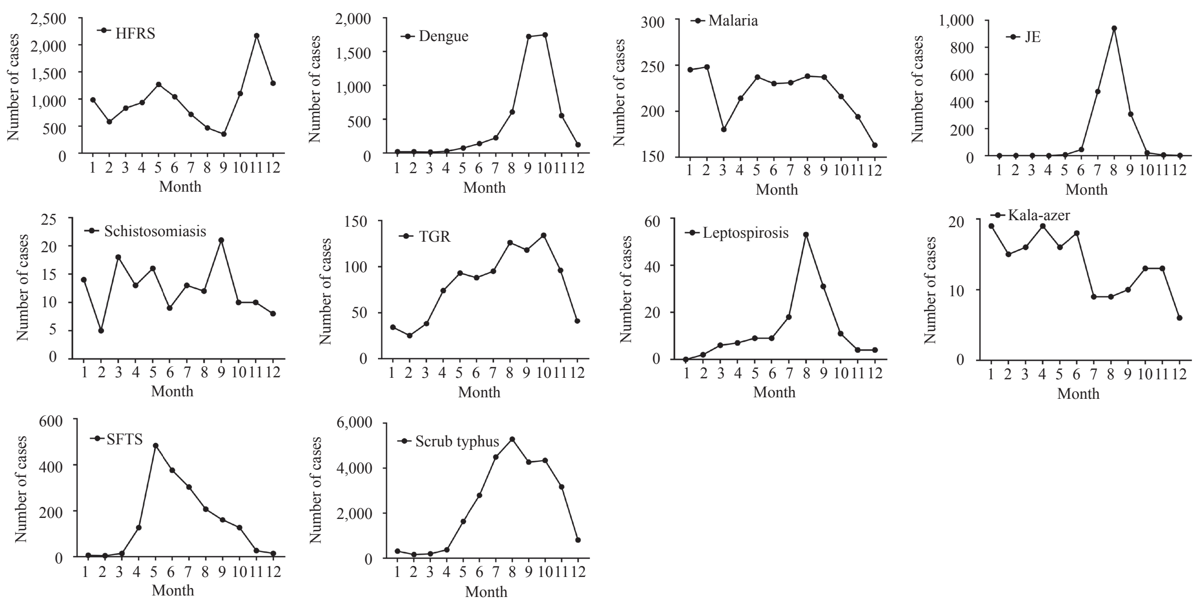

FIGURE 3. Time-series analyses of vector-borne diseases by type in Mainland China, 2018. HFRS=hemorrhagic fever with renal syndrome; JE=Japanese encephalitis; TGR=typhus group rickettsiosis; SFTS=severe fever with thrombocytopenia syndrome.

Overall, 18,392 (66.11%) cases had the illness onset during July to October. The median age of scrub typhus cases was 53 years (IQR=40–64). The morbidity was higher in Yunnan (8,672, 18.07/100,000), Guangxi (3,399, 6.96/100,000), Guangdong (6,775, 6.06%), Hainan (460, 4.97/100,000), and Fujian(1628, 4.16/100,000).

One case of zika was reported to be imported from the Maldives. The patient was a male aged 56 years. He lived in Yuexiu District, Guangdong Province.

DISCUSSION

Vector-borne diseases are an important component of infectious diseases in China. All malaria cases in 2018 were imported. Malaria was an ongoing concern for blood and tissue safety because two cases infected via blood transfusion were reported. In 2018, vector-borne diseases caused substantial morbidity in Mainland China, especially scrub typhus, HFRS, and dengue. The number of scrub typhus increased year by year and the figure in 2018 was 18.74% higher than that of 2017 (*4*). Although dengue morbidity was not significant high in 2018, dengue poses a growing threat in recent years because the distribution range has expanded significantly northward (*5*). High-risk areas and populations for dengue transmission are predicted to expand using representative concentration pathway scenarios in the future (*6*). Moreover, JE, SFTS, and HFRS caused significant mortality burdens. The characteristics of the JE epidemic have changed in recent years. Adults have experienced higher incidence and fatality rates than children, and northwestern China has become the new region of the JE epidemic (*7*). Fewer cases of SFTS were reported in 2018 than the figure in 2017. However, the number of cases reported was still higher than that in other years before 2017 (*8*). Given the higher case fatality rate, more attention and awareness should be paid by the governments, health care providers, and public. Cases with TGR, kala-azar, schistosomiasis, and leptospirosis were sporadic.

In addition, the epidemiology varied by season and geography. Different vector-borne diseases were prevalent through different spatiotemporal patterns. For example, JE and leptospirosis were prevalent from July to September with a peak in August. Overall, 79.12% of dengue, TGR, and scrub typhus cases occurred between July and November. In comparison, the seasonal peak of SFTS was in May, while the seasonal peak of HFRS was in November. On the other hand, the main threat for northeastern China was HFRS, while the main threats for northwestern China were HFRS and JE. Vector-borne diseases posed multiple threats to Guangdong and Yunnan, including TGR, HFRS, dengue, malaria, scrub typhus, and JE. Natural factors, such as climate, ecological environment, and land use, may influence the distribution of the host and vector (*9*).

Prevention and control of vector-borne diseases is very difficult because of emerging and reemerging vector-borne diseases, imported cases, and local outbreaks in China. It is crucial to monitor vector dynamics and disease outbreaks and inform public health prevention efforts promptly. For vaccine available vector-borne diseases, such as JE and HFRS, vaccination remains the most effective measure. While vaccines are not available, prevention depends on efforts to minimize alternative routes of transmission (*10*). Interventions, such as vector surveillance, sustainable vector management, environmental governance, and public health promotion will be necessary to implement.

The findings in this report are subject to three limitations. First, the data are obtained from a passive surveillance system. The actual number may be underreported. Second, epidemiological history is not detailed in the NNDS, so some important information may not be obtained, such as the detailed infection location and route. Third, the underreporting rate is different in notifiable and non-notifiable infectious diseases.

Understanding the epidemiology, seasonality, and geographic distribution is important for clinical recognition and personal protection. This report provides scientific information on spatiotemporal patterns of different vector-borne diseases in Mainland China, which is of great value for public health targeting priorities in different regions.

Conflict of interest: No conflicts of interest were reported.

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