



Short Communication

Community-based comprehensive measures to prevent severe fever with thrombocytopenia syndrome, China



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ABSTRACT

Severe fever with thrombocytopenia syndrome (SFTS) is an emerging disease caused by the SFTS virus (SFTSV) of the family *Bunyaviridae*. Since the virus was first isolated in 2009, it has become widespread in China, with an increasing number of cases year on year. Although the disease has been researched extensively in past years, there are still no effective measures to suppress the epidemic situation. This article reports a pilot study of comprehensive measures, including health education and risk communication, weed removal, livestock management, and tick control, to prevent this emerging disease in an endemic region of China. The density of ticks decreased dramatically month by month after acaricides were sprayed in the areas surrounding recreational and agricultural settings. The number of SFTS cases and villages involved declined in the years after the integrated measures were applied. Comprehensive measures, especially community-based tick control, may be a promising means of preventing SFTS in endemic regions.

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Severe fever with thrombocytopenia syndrome (SFTS), an emerging high-fatality infectious disease caused by the novel bunyavirus SFTS virus (SFTSV), was first reported in rural areas of central China in 2009 (Yu et al., 2011). Since then, confirmed cases of SFTS have been reported in at least 20 provinces of mainland China, as well as in other countries such as Japan, South Korea, and the USA (Sun et al., 2017). During 2011–2016, a total of 5360 laboratory-confirmed SFTS cases were reported in China, and the annual number of cases increased year on year (Sun et al., 2017). Most cases of SFTS have involved elderly peasants living in the foothills or working in the fields. Although person-to-person

transmission of SFTSV through contact with infected blood or body fluids has been reported, it is generally believed that the virus is transmitted to humans by tick bites, most frequently by *Haemaphysalis longicornis* (Liu et al., 2012; Yun et al., 2014; Luo et al., 2015). Furthermore, this virus has also been isolated from or detected in domestic animals, including cattle, goats, dogs, chickens, cats, rodents, shrews, and reptiles (Niu et al., 2013).

In past years, the field of SFTS has been explored extensively, but successful measures to combat the epidemic situation have not been reported. Daishan County is an island located in Zhejiang Province on the eastern coast of China, which is an area at potential high risk of SFTS (Figure 1a) (Du et al., 2014). The first case of SFTS in Zhejiang Province was reported in Daishan County in 2011. As of 2015, the number of cases in this county has accounted for half of the cases in the entire province, and the number of cases annually has increased year on year. In 2016, a series of measures were implemented to prevent this emerging disease, as outlined below.

- (1) Risk communication and health education: Health education activities were initiated via the use of appropriate mass media, including radio, television programs, newspapers, and the

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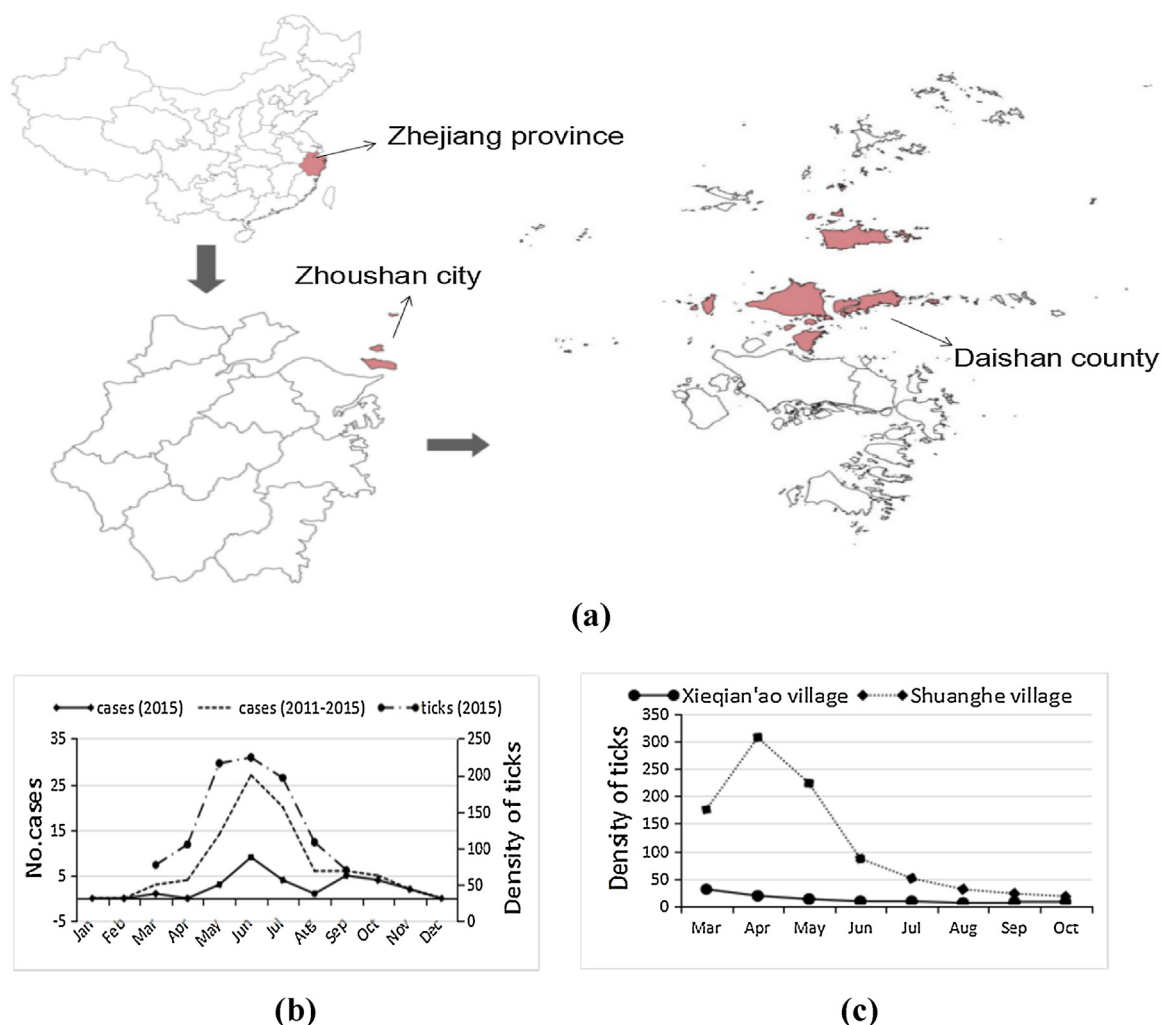


Figure 1. (a) The location of Daishan County, Zhejiang Province in China, where comprehensive measures for the prevention of severe fever with thrombocytopenia syndrome (SFTS) were employed during 2016–2017. (b) Distribution of SFTS cases and the density of ticks (number/man-hours) collected per month in Daishan County, China. (c) Density of ticks collected from two randomly sampled villages after area-wide acaricide application during 2016 in Daishan County, China.

Internet. Community health service institutions put up posters and banners reporting facts about SFTS in prominent places and distributed leaflets, as well as tick repellents and personal protective equipment to households. The residents were also organized to attend an education session intended to improve awareness of SFTS and encourage the widespread use of protective behaviors and equipment against SFTS when working in tick habitats, such as the application of tick repellents, wearing long trousers, tightening cuffs, and checking for attached ticks on the body after potential exposure. In addition, clinicians in the community were trained specifically to improve their diagnostic ability for SFTS.

- (2) **Removal of vegetation:** The residents were mobilized to remove weeds in the surroundings of their houses and on both sides of the road access to the mountains or agricultural working fields, forming a 0.5-meter width isolation zone on both sides of the roads and a 1-meter width belt between naturally tick-infested forested habitats and adjacent lawns on residential properties.
- (3) **Livestock management:** The villagers were guided to keep their livestock in captivity and control the scope of their activity, and also to perform a hygienic clean-up once a month to reduce the transmission of attached ticks to the residents' living areas.

- (4) **Tick control:** The tick populations in the settings closely related to resident activities were reduced, with the aim of decreasing the risk of tick exposure. Pest Control Operator (PCO) organizations were employed to decrease tick populations through area-wide broadcasts of acaricide (0.025% deltamethrin) to vegetation around the residents' properties and footpaths among the fields, especially at the interface between the foothill and the village, and the road to the mountains. Spraying was done during the period of sunrise when ticks display peak activity. Domestic animals (dogs, cats, sheep, cattle, etc.) were sprayed by the owners voluntarily. The pesticide had to be applied according to the manufacturer's instructions and its use was strictly controlled to avoid polluting vegetables and other important items and places. The frequency of intervention was once a month from March to August.

Ticks were monitored by flagging over the vegetation with a 1-m² flannel flag, as described previously (Luo et al., 2015). Tick collection was performed before spraying the acaricide each month between 10:00 a.m. and 12:00 p.m., as well as between 2:00 p.m. and 5:00 p.m. Tick species were identified morphologically under a microscope. Daily disease surveillance data of SFTS from

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