

The effects of health education and promotion with regard to severe fever with thrombocytopenia syndrome (SFTS) in rural residents: A pilot study in China

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Summary

Severe fever with thrombocytopenia syndrome (SFTS) has spread throughout Asia, including China, South Korea, and Japan. In China, the main victims of SFTS were farmers. Measures to protect farmers were urgently needed but limited, and health education and promotion was proposed as an option. A pilot community trial was conducted to provide health education about SFTS in 2013 in Daishan County, Zhejiang Province, China, and results indicated that health education had promise. An educational campaign was conducted for three years. The incidence of SFTS decreased 0.3 per 1,000 person-years, and rural residents' awareness of SFTS increased substantially. Numerous habits or work practices that increased the likelihood of tick bites have also been changed. In the future, education could emphasize adopting healthy habits or work practices to reduce tick bites and thus reduce the incidence of SFTS, like regularly weeding around a house surrounded by shrubs, not sitting or lying on the ground when resting, and protecting one's self when doing farm work.

Keywords: Severe fever with thrombocytopenia syndrome, health education, China

1. Introduction

Severe fever with thrombocytopenia syndrome (SFTS) is an emerging infectious disease caused by a novel bunyavirus; SFTS was first reported in central China in 2009, and the virus that causes it was first discovered in 2011 (1,2). Since then, SFTS cases have been reported in many countries, like South Korea, Japan, and the US (3-5). Prior to 2013, there were as many as 10,000 SFTS cases worldwide (6). In China, SFTS was mainly found in Henan, Hubei, Shandong, Jiangsu, Zhejiang, and Liaoning, with an average case fatality rate of 12% that rose to 30% in some areas (7,8). In Zhejiang Province, SFTS was first discovered in 2011, and dozens of SFTS cases have been reported every year since (data not published). Without vaccines or specific drugs to prevent

or treat SFTS, the condition has become an increasingly concerning global health threat (1).

The risk factors for infection with SFTS are varied (9). SFTS is believed to be transmitted by ticks, and most SFTS cases have involved tick bites (2,10-13). Moreover, most cases involved farmers living in villages or working in the fields (1). In Zhejiang Province, farmers were reported to account for 92% of all SFTS cases between 2011 and 2013 (14). Most patients with SFTS had fed or come in contact with livestock like cows and sheep or animals like dogs (15-17). In other words, traditional farming practices in China are likely to involve contact with ticks, and some habits or work practices might lead Chinese farmers to be victims of SFTS. However, farmers in China usually have a low level of education, a limited range of activity, and limited ways to learn about protecting themselves from against SFTS. Thus, measures need to be taken to inform farmers know SFTS, how to protect themselves from tick bites, and how to prevent SFTS. Nonetheless, systematic health education and promotion for primary prevention of SFTS is rare in China, and the same holds true for evaluation of the effects of that health education.

Since 2013, a pilot health education and promotion

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program has been conducted to teach about SFTS in select towns west and south of Daishan County since SFTS cases were reported in that area. Health education and promotion was provided in Daishan every year and it mainly included specialized lectures, educational information (illustrated brochures) on SFTS, public notices on SFTS, posters, and messages in WeChat (a very popular social media app in China). Three years have passed, and the effects of that health education have not been determined. Thus, the current study randomly chose one village where the program was conducted and another village with comparable characteristics like geography, environment, and incidence of SFTS where the program has not been conducted. One aim of this study was to evaluate changes in knowledge of and attitudes towards SFTS and practices with regard to SFTS after 3 years of education. A second aim was to examine habits or work practices that could help to reduce tick bites and thus reduce the incidence of SFTS.

2. Study sites and survey methodology

This study was conducted in November 2016 (about two months after the last educational session) in Daishan county, Zhejiang Province, China. The Village of Gaoting Zhakouere (denoted here simply as Gaoting) where the educational program was conducted served as the study group, and the Village of Daidong Longtou (denoted here simply as Daidong) served as the control group. Gaoting is south of the City of Daishan and has a total population of 1,560, while Daidong is northeast of the city and has a population of 2,610. Both places are close to the hills. From January 2012 to December 2013, there were 3 SFTS cases in Gaoting and 3 in Daidong. Gaoting is at a latitude of 30°17'26.24", a longitude of 122°11'59.57", and an altitude of 2 meters; Daidong is at a latitude of 30°14'55.86", a longitude of 122°11'28.20", and an altitude of 3 meters. The density of ticks in Gaoting and Daidong was comparable from 2013 to 2016 (data not published). Since 2013, a total of 5,000 pieces of educational information were sent to residents, 10 lectures were conducted, 2 specials aired on TV, and 8 public notices and 12 posters were posted in Gaoting. Ten physicians were trained to provide professional advice when they were consulted. These physicians were stationed in three general hospitals in the City of Daishan and one community health service center in Gaoting.

A unified questionnaire was used in both Gaoting and Daidong and stratified random sampling was used. Both villages (Gaoting and Daidong) were quartered (east, south, west, and north). Forty families were randomly chosen from each quarter according to their address, and one family member (above the age of 12) in each chosen family was asked to consent to participate in this study. Thus, respondents were 320 families in total.

SFTS cases reported in the two villages between January 2014 and November 2016 were tallied.

Data were compiled and analyzed using the statistical software IBM SPSS 16.0 and MS Excel. Selected variables like sex, frequency of farming, location of the house, and occupation were compared between Gaoting and Daidong using chi-square tests of independence. Odds ratios were calculated to determine association, and 95% confidence intervals were calculated for these odds ratios. P values less than 0.05 were considered significant.

This study was approved by the Zhejiang Provincial Center for Disease Control and Prevention, China.

3. The effects of health education about SFTS

Differences in knowledge, attitudes, and practices (KAP) were analyzed using 306 questionnaires, representing a total response rate of 95.63% (306/320). In Gaoting, 150 families responded to the questionnaire, for a response rate of 93.75% (150/160), while the response rate was 97.50% (156/160) in Daidong. There were no significant differences in sex, age, or occupation of respondents in Gaoting and Daidong ($\chi^2 = 0.04$, $p = 0.84$, $t = 3.08$, $p = 0.20$, and Fisher's $p = 0.16$, respectively).

Results indicated that the educational campaign since 2013 had substantially increased the public's awareness of SFTS and it had changed many habits that increased susceptibility to tick bites. In Gaoting, 83.33% (125/150) of respondents knew about SFTS; 129 respondents thought ticks could transmit diseases, and 107 of those respondents were aware that SFTS could be transmitted by tick bites. In Daidong, 32.05% (50/156) of respondents knew about SFTS. Only 6 people were aware that SFTS could be transmitted by tick bites (Table 1).

Based on the current results, people in Gaoting were more likely to go to the hospital to receive routine treatment when they were bitten by a tick (57/150) than people in Daidong (25/156) ($\chi^2 = 18.82$, $p < 0.001$) (Table 1). In Gaoting, 14 families raised animals (including dogs, cats, livestock, and poultry), and 9 (64.29%) of those families raised them in pens. In Daidong, 60.34% (35/58) of families raised animals in pens. Of the families that raised animals, 34.72% (25/72) had seen ticks on animals. However, 78.57% (11/14) of families in Gaoting and 24.14% (14/58) in Daidong regularly killed ticks. Eighty-five-point-nine percent (97/114) of responding farmers in Gaoting and 17.56% (23/131) in Daidong responded that they take measures to protect themselves while farming ($\chi^2 = 111.2$, $p < 0.001$) (Table 1).

From January 2014 to November 2016, a total of 3 SFTS cases were confirmed, with an incidence density of 0.66 per 1,000 person-years. The incidence density before health education was 0.96 per 1,000 person-years, and the attributable risk (AR) was 0.30 per 1,000 person-years. Based on these findings, health education about SFTS reduced the incidence of SFTS 0.30 per 1,000 person-years.

4. Risk factors related to tick bites

SFTS is mainly transmitted by ticks. Tick bites are the intermediate link in SFTS transmission. Thus, blocking the route of transmission (avoiding being bitten by ticks) would effectively reduce the incidence of SFTS.

There were few SFTS cases in one small village, so tick bites were chosen as an outcome variable. The aim was to analyze which habits or work practices might be risk factors for tick bites that could lead to SFTS. Results indicated that 35.90% (56/156) of people in Daidong had been bitten by ticks. One hundred and fifty-one

Table 1. Comparison of knowledge about SFTS in Gaoting and Daidong

Items	<i>n</i>	Awareness rate (%)	<i>n</i>	Awareness rate (%)	<i>p</i> value
Knowledge					
Will people get ill if bitten by a tick?: yes	127	84.67	27	17.31	< 0.001
Can ticks transmit disease?: yes	129	86.00	18	11.54	< 0.001
Have you heard of SFTS?: yes	125	83.33	50	32.05	< 0.001
Which of these vectors can transmit SFTS? Ticks, fluids from patients (true)	107	71.33	6	3.85	< 0.001
Attitudes & practices					
What would you do if bitten by a tick? Go to the hospital for routine treatment and then be followed by medical personnel for two weeks (true)	57	38	25	16.03	< 0.001
Avoid contact with wild animals	23	15.33	21	13.46	0.64
Percentage of respondents who regularly weed around the house	–	85.92	–	62.07	0.014
Percentage of respondents who raise animals in pens	–	64.29	–	60.34	0.79
Percentage of respondents who regularly kill ticks on animals	–	78.57	–	24.14	< 0.001
Percentage of respondents who refrain from sitting or lying on the ground when resting	–	78.95	–	15.27	< 0.001
Percentage of respondents who use protection before doing farm work	–	85.09	–	17.56	< 0.001

Table 2. Risk factors related to tick bites

Items	Items	History of tick bites		OR	95% CI
		Ever been bitten	Never been bitten		
Occupation	farmer	49	78	1.53	0.59-3.95
	non-farmer	7	17		
Location of fields ^{a,*}	hillsides	7	6	2.00	0.63-6.35
	low lands	42	72		
Frequency of farm work ^{a,*}	≥ once a day	4	5	1.87	0.41-8.61
	< once a month	9	21		
	≥ once a week	27	40		
	< once a month	9	21		
	≥ once a month	40	57		
Will people get ill if bitten by a tick? ^{*,#}	< once a month	9	21	1.64	0.68-3.95
	yes	5	22		
Can ticks transmit diseases? ^{*,#}	no	8	6	0.17	0.04-0.72
	yes	4	13		
Location of your house [*]	no	6	8	0.41	0.09-1.92
	yes	4	13		
Are there any shrubs around your house? [*]	in the middle of the village	37	84	0.26	0.11-0.59
	on a hillside	19	11		
Do you regularly weed the shrubs around your house? ^{b,*}	yes	12	17	1.23	0.53-2.79
	no	44	76		
Do you regularly weed the shrubs around your house? ^{b,*}	yes	3	15	0.04	0.01-0.32
	no	9	2		
Do you raise animals?	yes	25	32	1.59	0.81-3.13
	no	31	63		
Do you regularly kill ticks? ^{c,*}	yes	4	9	0.44	0.12-1.70
	no	19	19		
What would you do if you saw a wild animal?	Stay away from it	4	17	0.35	0.11-1.11
	Catch or kill it	52	78		
What posture do you adopt when taking breaks from farm work? ^{a,*}	Stand	3	17	0.24	0.07-0.88
	Sit/lie on the ground	43	59		
	–	–	–		
Did you take measures to protect yourself before doing farm work? ^{a,*}	yes	4	19	0.28	0.09-0.87
	no	45	59		

*: Missing responses to this question were excluded. #: Respondents who answered "I don't remember/have no idea" to this question were excluded from analysis. ^a: The odds ratio was calculated based on 127 farmers. ^b: The odds ratio was calculated based on families whose houses were surrounded by shrubs. ^c: The odds ratio was calculated based on families who raised animals.

of the respondents in Daidong were divided into two groups depending on whether they had or had not been bitten by a tick during their lifetime. The remaining 5 respondents were excluded because of missing responses or because they were unable to recall if they had ever been bitten. As shown in Table 2, the risk factors related to tick bites were not knowing whether people would get sick if bitten by a tick, not regularly weeding around the house, resting on the ground while farming, and not taking measures to one's self while doing farm work. Knowing that people will get sick if bitten by a tick, regularly weeding around a house surrounded by shrubs, not sitting or lying on the ground when resting, and protecting one's self before doing farm work could significantly reduce the incidence of tick bites (Table 2).

5. Health education of rural residents as an effective way to help reduce the risk of SFTS

SFTS is a zoonotic disease transmitted by ticks. Elimination of its vectors (ticks) and changes in people's habits or work practices to avoid contact with ticks or patients are believed to be effective ways to prevent SFTS. Tick control has been a topic for almost half a century, and numerous problems with safety and resistance have occurred because of the use of chemical insecticides (18-22). Killing every tick is not feasible, but bad habits can be changed to avoid contact with ticks while controlling the density of ticks to an acceptable level. The current authors are devoted to discovering new environmentally friendly insecticides to control ticks, but before those discoveries are made the only effective way to help prevent SFTS is through health education.

Based on recent studies, health education about SFTS has promise as a way to improve rural residents' awareness of SFTS and to change habits or work practices to reduce the risk of SFTS. Health education has reduced the incidence of SFTS 0.3 per 1,000 person-years in Gaoting in the City of Daishan, China. The current study involved a case control study to examine habits or work practices that might be risk factors for tick bites. In this study, knowing that people will get sick if bitten by a tick, regularly weeding around a house surrounded by shrubs, not sitting or lying on the ground when resting, and protecting one's self before doing farm work were effective at reducing tick bites and thus to reducing the incidence of SFTS. However, this was a pilot study, and its sample size was limited. Further studies need to be conducted to confirm the value of these habits or work practices, which could then be stressed in future educational campaigns. In the future, improved forms of health education could be provided, like widespread health education in school that in turn results in "children teaching adults" about diseases like rabies or AIDS.

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