

2022년 중증열성혈소판감소증후군 환자 및 사망자의 역학적 특성

최지현, 황지혜, 이현수, 황경원*

질병관리청 감염병정책국 인수공통감염병관리과

초 록

중증열성혈소판감소증후군(severe fever with thrombocytopenia syndrome, SFTS)은 진드기를 매개로 전파되는 매개체 감염병(vector-borne disease)이며, 사람-동물 간 전파가 가능한 인수공통감염병(zoonosis)이다. 우리나라에서는 「감염병의 예방 및 관리에 관한 법률」에 따라 3급 법정 감염병으로 지정하여 관리하고 있다. 본 연구는 2022년에 발생한 SFTS 환자 및 사망자의 역학적 특성을 분석하여, 중점적으로 관리해야 할 변수 등을 파악하고, 이를 토대로 SFTS에 대한 예방 및 관리방안을 고도화하는 것을 목적으로 수행되었다. 환자의 발생시기는 4월부터 11월까지였으며, 위험요인으로는 농작업, 임산물 채취, 등산·산책·캠핑 등의 순으로 나타났다. 주요 증상은 발열, 피로감, 소화기계 증상 등이었으며, 기저질환이 있는 경우 사망 위험이 증가하는 것으로 분석되었다. SFTS는 치명률이 높은 감염병(2013-2022년 국내 누적 18.7%)이지만 백신이나 치료제가 없으므로 진드기에 노출되지 않도록 예방수칙을 준수해야 한다. 특히 최근 발생 양상을 고려할 때, 잘 알려진 위험군인 농업인뿐만 아니라 등산·산책·캠핑 등의 야외 활동이 빈번한 인구까지 포함한 예방·홍보 사업이 필요할 것으로 판단된다. 또한, 기후 변화와 SFTS 발생 간의 상관관계, 고위험군에 해당하는 기저질환의 범위 및 발생기전 등에 관해서 추가적인 연구가 필요하다.

주요 검색어: 중증열성혈소판감소증후군; 진드기; 진드기 매개 감염병; 벡터매개 질병

서 론

중증열성혈소판감소증후군(severe fever with thrombocytopenia syndrome, SFTS)은 SFTS 바이러스에 의한 열성 출혈 질환으로 진드기 매개에 의해 발생하는 인수공통감염병이다[1]. 참진드기(Ixodidae)는 전 세계에 분포하고 약 700 종이 있으며 국내 SFTS의 주요 매개체는 작은소참진드기(*Haemaphysalis longicornis*)이다[2]. SFTS 바이러스에 감염된

진드기가 흡혈하는 동안 진드기의 침샘을 통하여 숙주 동물이나 인체에 전파되는 것으로 알려져 있다[3]. 또한 SFTS 환자의 혈액이나 체액에 노출되어 감염되는 사람 간 전파사례와 감염된 동물을 통한 전파사례도 보고되고 있다[1,4].

SFTS는 2011년 중국에서 처음으로 보고되었으며 현재 일본, 대만, 베트남 등에서도 감염사례들이 보고되었다[1]. 국내에서 2013년 첫 환자보고 이후 2022년까지 1,697명의 환자가 발생하였으며, 317명이 사망하여 누적 치명률은 18.7%이

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*Corresponding author: 황경원, Tel: +82-43-719-7160, E-mail: kirk99@korea.kr

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핵심 요약

① 이전에 알려진 내용은?

SFTS는 진드기 매개로 발생하는 인수공통감염병으로 3급 법정 감염병으로 지정하여 관리되고 있다. 치명률이 높은 감염병이지만 백신이나 치료제가 없으므로 진드기에 노출되지 않도록 예방수칙을 준수해야 한다.

② 새로이 알게 된 내용은?

역학조사 결과 환자들이 SFTS의 기존 위험요인으로 알려진 농작업 외의 야외 활동(임산물 채취, 등산·산책·캠핑 등)에도 다수 노출된 것으로 확인되었다. 또한 기저질환이 있는 경우 사망 위험이 증가하는 것으로 분석되었다.

③ 시사점은?

농업인을 대상으로 예방 교육을 지속하는 한편 야외 활동 인구가 늘어나고 있으므로 향후 야외 활동 인구를 겨냥한 예방수칙 홍보를 검토할 필요가 있다. 또한 고령이거나 기저질환이 있는 경우 사망 위험이 증가하므로 야외 활동 후 14일 이내 발열, 소화기계 증상 등이 나타나면 의료기관을 방문하여 진단검사를 받고 초기에 치료를 받을 것을 권고한다.

다. 노출 후 잠복기는 5-14일이며 고열, 혈소판감소증 외에 소화기계 증상, 출혈 경향 등의 증상이 나타나며[5,6], 중증의 경우 다발성 장기부전이 동반할 수 있으며 사망까지 이를 수 있다[5]. 이에 국내에서는 2013년 9월 23일 제4군 법정 감염병으로 관리하였으며, 2020년 감염병 예방에 관한 법률 개정에 따라 제3급 법정 감염병으로 지정하여 감시 및 관리를 수행하고 있다.

본 원고에서는 2022년 SFTS 신고자료 및 역학조사 자료를 분석하여 SFTS 환자 및 사망자의 발생 양상, 역학적 특성, 임상적 특성을 파악하여 향후 SFTS 예방 및 관리 방안을 모색하고자 한다.

방 법

본 조사는 감염병예방법에 따른 법정 감염병 감시체계를

통하여 2022년 1월 1일에서 12월 31일까지 신고되어 통계에 반영된 SFTS 환자(확진 환자 190명, 의사 환자 3명) 총 193명의 신고자료를 월별, 지역별로 신고일 기준으로 기술하였다. 또한 해당 환자들의 역학조사서를 통하여 성별, 연령, 직업, 노출 위험요인, 증상, 기저질환을 기술하고 단변량 및 다변량 로지스틱 회귀분석(binomial logistic regression)을 이용하여 임상증상 및 기저질환에 따른 사망 위험요인을 분석하였다.

분석은 EXCEL 2016 (Microsoft office professional plus 2016; Microsoft), QGIS 3.22.9, R version 4.1.2 program을 사용하였고, p-value는 0.05 미만을 유의한 값으로 하였다.

결 과

1. 2022년 SFTS 환자 현황(월별, 지역별)

2022년 1월 1일부터 12월 31일까지 총 193명의 SFTS 환자가 신고되었으며, 40명의 환자가 사망하여 2022년 SFTS 치명률은 20.7%였다. 환자는 주로 4월부터 11월 사이에 발생하였고, 10월에 가장 많은 환자(45명, 23.3%)와 사망자(12명, 30.0%)가 발생하였다(그림 1).

지역별 인구 10만 명당 발생률은 전국 0.38명이며, 지역

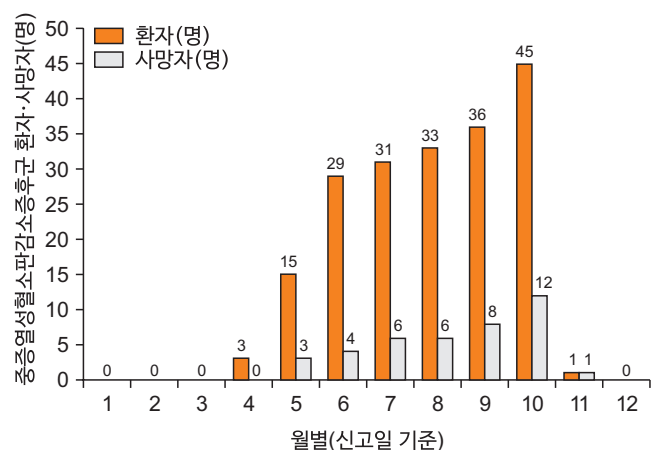


그림 1. 2022년 월별 국내 중증열성혈소판감소증후군 환자 및 사망자 현황

중 경상북도 영덕군(11.3명), 강원도 양양군(10.8명), 강원도 인제군(9.3명), 전라북도 순창군(7.5명), 경상북도 영양군(6.1명) 순이었다(그림 2).

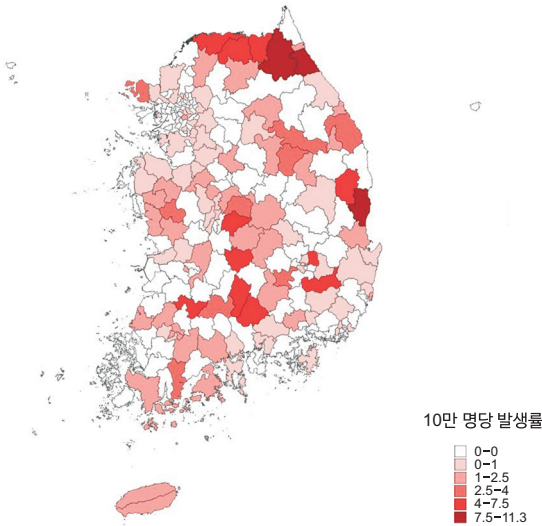


그림 2. 2022년 지역별 국내 중증열성혈소판감소증후군 환자 현황

2. 2022년 SFTS 환자의 역학적 특성

환자의 일반적 특성 중 성별은 남자 104명(53.9%), 여자 89명(46.1%)으로 큰 차이가 없었으나, 그중 사망자는 남자 27명(67.5%), 여자 13명(32.5%)으로 남성이 더 많았다. 환자의 연령은 20-39세 5명(2.6%), 40-59세 38명(19.7%), 60-69세 53명(27.5%), 70세 이상이 97명(50.3%)이었으며 사망자 또한 40-59세 4명(10.0%), 60-69세 12명(30.0%), 70세 이상 24명(60.0%)으로 환자와 사망자 모두 70세 이상이 가장 많았다. 직업은 농업종사자 61명(31.6%), 무직 61명(31.6%), 주부 22명(11.4%), 사무직 12명(6.2%), 그 외 직업 37명(19.2%) 순이었다.

한편 노출 위험요인으로 크게 농업 활동 및 텃밭 작업을 포함하는 농작업과 그 외 행위, 불명으로 분류하였으며(농작업과 그 외 행위는 중복 선택이 가능하였다), 농작업을 한 환자는 96명(49.7%), 그 외 행위를 한 환자는 87명(45.1%)이었다. 그 외 행위에는 임신물 채취(18명), 등산·산책·캠핑(16

표 1. 2022년 국내 중증열성혈소판감소증후군 환자 및 사망자의 역학적 특성

구분	전체(n=193)	생존(n=153)	사망(n=40)
성별			
남자	104 (53.9)	77 (50.3)	27 (67.5)
여자	89 (46.1)	76 (49.7)	13 (32.5)
연령(세)			
20-39	5 (2.6)	5 (3.3)	0 (0.0)
40-59	38 (19.7)	34 (22.2)	4 (10.0)
60-69	53 (27.5)	41 (26.8)	12 (30.0)
≥70	97 (50.3)	73 (47.7)	24 (60.0)
직업			
농업종사자	61 (31.6)	47 (30.7)	14 (35.0)
무직	61 (31.6)	47 (30.7)	14 (35.0)
주부	22 (11.4)	16 (10.5)	6 (15.0)
사무직	12 (6.2)	11 (7.2)	1 (2.5)
그 외	37 (19.2)	32 (20.9)	5 (12.5)
위험 요인 ^{a)}			
농작업 ^{b)}	96 (49.7)	77 (50.3)	19 (47.5)
그 외 행위	87 (45.1)	69 (45.1)	18 (45.0)
불명	19 (9.8)	15 (9.8)	4 (10.0)

단위: 명(%). ^{a)}농작업과 그 외 행위는 중복 선택 가능. ^{b)}농작업은 농업 활동과 텃밭작업을 포함함.

명), 제초작업(12명), 성묘 및 벌초(11명) 등으로 확인되었다 (표 1).

3. 2022년 SFTS 환자의 임상적 특성 및 기저질환

임상증상은 중복 선택이 가능하였고, 환자에게 발생한 임상증상 중 전신 증상에서 발열이 나타난 환자는 169명 (87.6%), 피로감은 122명(63.2%)이었다. 소화기계 증상 중 설사를 호소한 환자는 64명(33.2%), 복통 42명(21.8%)이었다. 신경계 증상 중 의식 저하가 나타난 환자는 46명(23.8%), 말 어눌함 27명(14.0%)이었고, 출혈 증상 중 혈뇨가 나타난 환자는 7명(3.6%), 잇몸출혈 7명(3.6%)이었다.

사망자의 경우 전신 증상 중 발열이 나타난 환자는 35명

(87.5%), 피로감 26명(65.0%)이었으며, 소화기계 증상 중 설사 16명(40.0%), 복통 10명(25.0%)이었다. 호흡기계 증상은 기침 4명(10.0%)만 있었으며, 신경계 증상 중 의식 저하 11명(27.5%), 말 어눌함 7명(17.5%)이었다. 출혈 증상 중 혈뇨 5명(12.5%)이었으며, 혈변, 잇몸출혈 각각 3명(7.5%)이었다. 임상증상에 따른 사망 위험을 확인하기 위하여 단변량 분석을 시행한 결과 혈뇨의 경우 통계적으로 유의하였다(adjusted odds ratio [aOR], 10.8; 95% confidence interval [CI], 2.01-57.9) (표 2).

환자 중 기저질환이 있는 환자는 107명(55.4%)이었으며, 그중 고혈압을 비롯한 심뇌혈관질환이 있는 환자 83명 (43.0%), 당뇨병 45명(23.3%), 암 9명(4.7%), 간질환 5명

표 2. 2022년 국내 중증열성혈소판감소증후군 환자 및 사망자의 임상적 특성

증상 ^{a)}	환자(n=193)	생존자(n=153)	사망자(n=40)	p-value	Odds ratio	95% confidence interval
전신 증상						
발열	169 (87.6)	134 (87.6)	35 (87.5)	0.99	0.99	0.35-2.85
피로감	122 (63.2)	96 (62.7)	26 (65.0)	0.79	1.10	0.53-2.28
근육통	76 (39.4)	61 (39.9)	15 (37.5)	0.79	0.91	0.44-1.85
두통	57 (29.5)	47 (30.7)	10 (25.0)	0.48	0.75	0.34-1.66
관절통	22 (11.4)	19 (12.4)	3 (7.5)	0.39	0.57	0.16-2.04
림프절병증	4 (2.1)	3 (2.0)	1 (2.5)	0.83	1.28	0.13-12.7
소화기계 증상						
설사	64 (33.2)	48 (31.4)	16 (40.0)	0.30	1.46	0.71-2.99
복통	42 (21.8)	32 (20.9)	10 (25.0)	0.58	1.26	0.56-2.85
오심	30 (15.5)	23 (15.0)	7 (17.5)	0.70	1.20	0.47-3.03
구토	27 (14.0)	24 (15.7)	3 (7.5)	0.28	0.44	0.12-1.53
황달	9 (4.7)	9 (5.9)	0 (0.0)	0.99	-	0.00-Inf
호흡기계 증상						
기침	14 (7.3)	10 (6.5)	4 (10.0)	0.46	1.59	0.47-5.36
가래	2 (1.0)	2 (1.3)	0 (0.0)	0.99	-	0.00-Inf
신경계 증상						
의식저하	46 (23.8)	35 (22.9)	11 (27.5)	0.54	1.28	0.58-2.82
말 어눌함	27 (14.0)	20 (13.1)	7 (17.5)	0.47	1.41	0.55-3.62
경련	14 (7.3)	11 (7.2)	3 (7.5)	0.95	1.68	0.28-3.95
출혈 경향						
혈뇨	7 (3.6)	2 (1.3)	5 (12.5)	0.006	10.8	2.01-57.9
잇몸출혈	7 (3.6)	4 (2.6)	3 (7.5)	0.16	3.02	0.65-14.1
혈변	6 (3.1)	3 (2.0)	3 (7.5)	0.09	4.05	0.79-20.9

단위: 명(%). ^{a)}중복 응답 가능. Inf=infinite.

표 3. 2022년 국내 증증열성혈소판감소증후군 환자 및 사망자의 기저질환

기저질환 ^{a)}	환자(n=193)	생존자(n=153)	사망자(n=40)	p-value	Odds ratio	95% confidence interval
보유	107 (55.4)	77 (50.3)	30 (75.0)	0.007	2.96	1.35-6.48
심뇌혈관질환	83 (43.0)	62 (40.5)	21 (52.5)	0.58	1.25	0.57-2.75
당뇨병	45 (23.3)	28 (18.3)	17 (42.5)	0.018	2.75	1.19-6.37
암	9 (4.7)	5 (3.3)	4 (10.0)	0.43	2.20	0.31-15.7
간질환	5 (2.6)	3 (2.0)	2 (5.0)	0.58	1.77	0.24-13.2

단위: 명(%). ^{a)}중복 응답 가능.

(2.6%)이었다. 사망자의 경우 기저질환이 있는 환자는 30명(75.0%)이었으며, 심뇌혈관질환 21명(52.5%), 당뇨병 17명(42.5%), 암 4명(10.0%), 간질환 2명(5.0%)이었다. 기저질환에 따른 사망 위험을 확인하기 위하여 단변량 분석을 시행한 결과 통계적으로 유의하였다(aOR, 2.96; 95% CI, 1.35-6.48). 또한 기저질환들이 사망에 미치는 영향을 확인하기 위하여 기저질환 중 심혈관질환, 당뇨병, 암, 간질환의 변수들을 대상으로 다변량 로지스틱 회귀분석을 시행한 결과 당뇨병이 통계적으로 유의한 것으로 나타났다(aOR, 2.75; 95% CI, 1.19-6.37) (표 3).

결론

본 원고에서는 2022년 SFTS 신고자료 및 역학조사 자료를 분석하여 환자 및 사망자의 역학적·임상적 특성을 확인하였다. 2022년 월별 발생 현황을 확인한 결과 첫 환자 발생이 4월이었다. 2013-2015년에는 첫 환자 발생 시기가 5월이지만, 2016년 이후로는 2017년을 제외하고 4월에 발생하였으며 2023년은 4월 5일에 환자가 발생하였다[7]. 기후요인과 SFTS 월별 발생률이 상관관계가 있다는 기존 연구가 있으며 기후 변화로 인한 감염병 추이가 달라질 수 있으므로 후속 연구가 필요할 것으로 판단된다[8].

연령별 치명률을 보면 40세 이하의 사망자는 없었으며 40-59세 10.5%, 60-69세 22.6%, 70세 이상은 24.7%였다. 특히 60세 이상이 사망자의 90.0%를 차지하였으므로 연령이

증가할수록 사망 위험이 증가한다는 기존 연구와 일치하였다 [5].

직업의 경우 무직을 제외하고 농업종사자(31.6%)가 가장 많으며 노출 위험요인으로 농작업(49.7%)이 가장 높은 것으로 보아 농업종사자가 고위험군이라는 기존 연구와 일치하는 결과이며 고령의 농업종사자에 대한 지속적인 교육의 필요성을 시사한다[9]. 다만 직업 중 상당수가 무직으로 나타나는데 연령별 무직 비율을 보면 40-59세 21.1%, 60-69세 26.4%, 70세 이상은 40.2%이다. 이는 고령에 따른 무직이 많은 것으로 추정되며, 또한 역학조사서 입력 과정에서 편의상 작성한 것인지에 대해 분석이 필요할 것으로 생각된다. 따라서 보다 정확한 직업군 분류 및 분석 강화를 위한 역학조사서 개편 등 고민이 필요하다.

추가로 농작업 외에도 등산·산책·캠핑이 중요한 노출 위험요인으로 확인되고 있다. 확진자의 노출 요인 중 등산·산책·캠핑을 한 사례는 2021년에는 17건, 2022년에는 16건으로 지속해서 발생하고 있으므로 해당 야외 활동 인구를 겨냥하여 진드기를 예방하기 위한 홍보 등을 검토할 계획이다.

임상증상 중 혈뇨 증상이 있는 경우 사망 위험이 유의하게 높았으나 사례가 적으므로 추가적인 연구가 필요한 한편, 다수의 환자가 발열, 피로감, 소화기계 증상, 신경계 증상이 있었으므로 의료기관에서는 해당 임상증상을 호소하며 야외 활동력이 있을 시 SFTS를 의심하고 진료할 필요가 있다.

기저질환이 있는 환자군이 기저질환이 없는 환자군에 비해 사망 위험이 2.96배(95% CI, 1.35-6.48) 높았으며 이는

기존의 연구와 일치하였다[10]. 이 중 당뇨병이 있는 환자군은 2.75배(95% CI, 1.19-6.37) 높았으며, 당뇨병과 같은 기저질환과 SFTS 동시 감염이 산화 스트레스를 증가시켜 환자의 예후를 악화시킨다는 기존의 연구와 일치하였다[11,12]. 향후 고위험군에 해당하는 기저질환의 범위 및 발생기전 등에 관해서도 추가적인 연구가 필요하다.

끝으로 SFTS는 동물로부터 사람에게 전파된 사례가 국외에서 보고되었고[1,4] 전파 위험성이 있으므로 원헬스적 접근이 필요하다. 이에 SFTS 사람-동물 간 감시체계를 구축하여 운영하고 있으며 지속하여 추진하고 관리할 계획이다.

SFTS는 치명률이 높은 감염병이지만 현재까지 백신이나 치료제가 없으므로 진드기에 노출되지 않도록 주의가 필요하다. 이번 연구에서 살펴본 바와 같이 SFTS가 발생하는 4월부터 11월까지 고령의 농업종사자를 비롯하여 야외 활동이 많은 개인의 경우 고위험군으로 분류되므로 적절한 작업복 착용 및 진드기 기피제 사용을 권고한다. 야외 활동 후에는 목욕이나 샤워를 하고 몸에 참진드기가 없는지 꼼꼼히 확인하고 야외 활동 후 14일 이내 발열, 소화기계 증상이 나타날 시 의료기관을 방문하여 진단검사를 받고 조기에 치료를 받는 것이 중요하다.

Declarations

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HL, KH. Visualization: JC. Writing - original draft: JC. Writing - review & editing: HL, KH.

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Epidemiological Characteristics of Cases and Deaths of Severe Fever with Thrombocytopenia Syndrome (SFTS), 2022

Jihyun Choi, Ji-hye Hwang, Hyeonsu Lee, Kyungwon Hwang*

Division of Control for Zoonotic and Vector borne Disease, Bureau of Infectious Disease Policy, Korea Disease Control and Prevention Agency, Cheongju, Korea

ABSTRACT

Severe fever with thrombocytopenia syndrome (SFTS) is a vector-borne and zoonotic diseases caused by ticks. It has been classified as a third-class legal communicable disease and is managed in the Republic of Korea (ROK). In this study, the purpose of this study was to analyze the epidemiological characteristics of SFTS patients and deaths in 2022 in order to identify variables that require intensive management and enhance prevention and management measures based on these findings. In 2022, cases were reported between April and November. Around 49.7% of the patients were engaged in farming activities, while 45.1% were involved in other outdoor activities such as collecting forest products, hiking, walking, and camping. Patients visited the hospital due to symptoms such as fever, fatigue, and digestive system. It was observed that patients with underlying diseases faced a higher risk of death. SFTS is an infectious disease with a high mortality rate (18.7% in the ROK from 2013 to 2022), yet no vaccine or treatment exists. Therefore, preventive measures should be followed to avoid tick exposure. Especially considering the pattern of occurrence, prevention and promotion projects are needed, including not only farmers, who are known to be high-risk groups, but also populations with frequent outdoor activities such as hiking, walking, and camping. Additionally, further research is necessary to investigate the correlation between climate change and SFTS occurrence, as well as the scope and mechanisms of underlying diseases that correspond to high-risk groups.

Key words: Severe fever with thrombocytopenia syndrome; Ticks; Ticks-borne disease; Vector-borne disease

*Corresponding author: Kyungwon Hwang, Tel: +82-43-719-7160, E-mail: kirk99@korea.kr

Introduction

Severe fever with thrombocytopenia syndrome (SFTS) is a recessive hemorrhagic disease caused by the SFTS virus, which is tick-borne [1]. The Ixodidae family of ticks comprises approximately 700 species and is distributed globally. The main vector of domestic SFTS is *Haemaphysalis longicornis* [2]. It is

known that the virus is transmitted from ticks infected with the SFTS virus to the host animal or human body through the salivary gland of the ticks while they suck blood [3]. Human-to-human transmission cases in which an individual is infected, owing to exposure to the blood or bodily fluids of patients with SFTS and transmissions from infected animals, have also been reported [1,4].

Key messages

① What is known previously?

SFTS is an infectious disease with a high mortality rate; however, currently, there is no vaccine or treatment available.

② What new information is presented?

It has been established that patients were exposed to outdoor activities apart from farming, which is a known risk factor for SFTS. Additionally, the presence of underlying diseases increases the risk of mortality.

③ What are implications?

It is necessary to consider promoting tick prevention measures aimed at the population engaging in outdoor activities in the future. The risk of death increases if patient is elderly or has an underlying disease. Therefore, if symptoms manifest within 14 days of participating in outdoor activities, it is recommended to seek medical attention at a hospital.

SFTS was first reported in China in 2011, and cases have also been reported in Japan, Taiwan, and Vietnam. Since the first report of a patient in 2013 in the Republic of Korea (ROK), 1,697 cases were reported until 2022. Of these patients, 317 died and the cumulative mortality rate was 18.7%. The latency period after exposure is 5 to 14 days. In addition to high fever and thrombocytopenia, digestive and bleeding symptoms develop [5,6]. In severe cases, multiple organ dysfunction or even death may occur [5]. Accordingly, the ROK has classified as a class 4 legal communicable disease since September 23, 2013, and is currently monitoring and classified it as a class 3 legal communicable disease according to the amendment of the Infectious Disease Prevention Act of 2020.

The aim of this investigation was to analyze the 2022 SFTS report and epidemiological survey data to determine the

incidence patterns, epidemiological characteristics, and clinical characteristics of patients with SFTS and the associated deaths to explore future prevention and management measures.

Methods

Overall, 193 cases of patients with SFTS (190 confirmed patients and 3 SFTS-like illness) reported through the statutory infectious disease monitoring system under the Infectious Disease Control and Prevention Act from January 1 to December 31, 2022, and reflected in the statistics were analyzed according to the month, region, and report date. The patients' sex, age, occupation, exposure risk factors, symptoms, and underlying diseases were obtained through an epidemiological survey, and risk factors for mortality according to clinical symptoms and underlying diseases were analyzed using univariate analysis and binomial logistic regression. Excel 2016 (Microsoft Office Professional Plus 2016; Microsoft), QGIS 3.22.9, and R version 4.1.2 were used for the analysis. A p-value of <0.05 was considered significant.

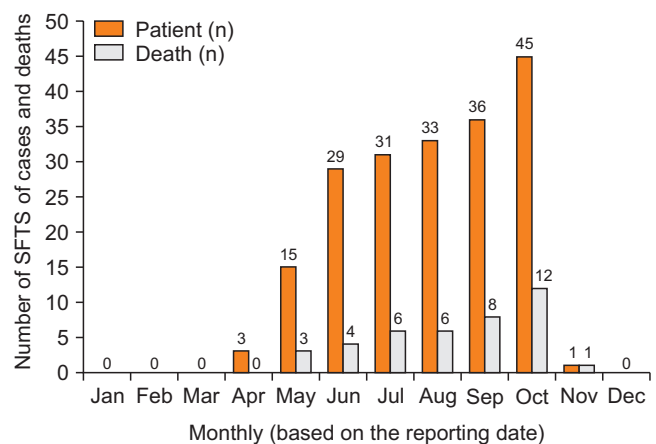


Figure 1. Monthly distribution of cases and deaths with severe fever with thrombocytopenia syndrome (SFTS) in the Republic of Korea, 2022

Results

1. Patients in SFTS by Month and Region in 2022

Overall, SFTS was reported in 193 patients between January 1 and December 31, 2022, with 40 deaths, resulting in 20.7% SFTS mortality rate in 2022. Most infections occurred between April and November, with the highest number of patients (n=45, 23.3%) and deaths (n=12, 30.0%) reported in October (Figure 1).

The nationwide incidence of SFTS per 100,000 population was 0.38. According to regions, the most of the infections occurred in Yeongdeok-gun, Gyeongsangbuk-do (n=11.3); followed by Yangyang-gun, Gangwon-do (n=10.8); Inje-gun, Gangwon-do (n=9.3); Soonchang-gun, Jeollabuk-do (n=7.5); and Yeongyang-gun, Gyeongsangbuk-do (n=6.1, Figure 2).

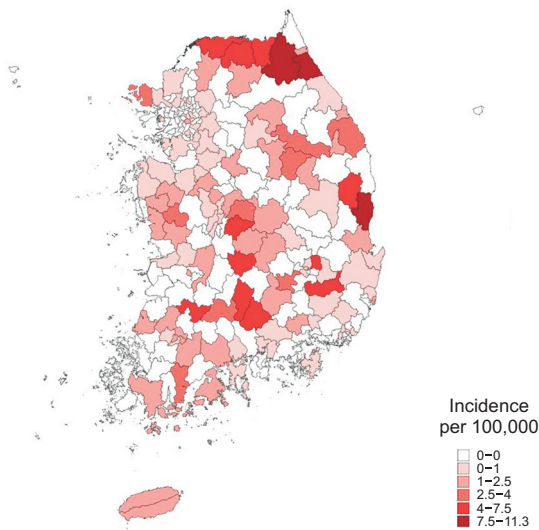


Figure 2. Geographical distribution of cases with severe fever with thrombocytopenia syndrome in the Republic of Korea, 2022

2. Epidemiological Characteristics of Patients with SFTS in 2022

Regarding the general characteristics of the patients, there were no significant differences between the sexes, with 104 male patients (53.9%) and 89 female patients (46.1%). However, there were more deaths among male patients (n=27, 67.5%) than that in female patients (n=13, 32.5%). Five, 38, 53, and 97 patients were aged 20 to 39 years (2.6%), 40 to 59 years (19.7%), 60 to 69 years (27.5%), and 70 years or higher (50.3%), respectively. The highest number of deaths due to SFTS were in the aged 70 years and older (n=24, 60%), followed by those aged 60 to 69 years (n=12, 30.0%) and 40 to 59 years (n=4, 10.0%). The most common occupation were agricultural workers (n=61, 31.6%), followed by clerical workers (n=12, 6.2%) and other (n=37, 19.2%); 61 patients were unemployed (31.6%) and 22 were homemakers (11.4%).

The exposure risk factors were categorized as agricultural work, including farming and garden work, other activities, and unknown activities (duplicate selection was available for agricultural work and other activities). Ninety-six patients were engaged in agricultural work (49.7%) and 87 in other activities (45.1%). The other activities were identified as collecting forest products (n=18); hiking, walking, and camping (n=16); weeding (n=12); and visiting graves and mowing (n=11, Table 1).

3. Clinical Characteristics and Underlying Diseases of Patients with SFTS in 2022

Regarding systemic clinical symptoms, 169 patients had a fever (87.6%) and 122 experienced fatigue (63.2%). With respect to digestive system symptoms, 64 patients complained of diarrhea (33.2%) and 42 had abdominal pain (21.8%). Regarding neurological symptoms, 46 patients reported loss of

Table 1. Epidemiological characteristics of cases and deaths with severe fever with thrombocytopenia syndrome in the Republic of Korea, 2022

Variable	Total (n=193)	Survival (n=153)	Death (n=40)
Sex			
Male	104 (53.9)	77 (50.3)	27 (67.5)
Female	89 (46.1)	76 (49.7)	13 (32.5)
Age			
20–39	5 (2.6)	5 (3.3)	0 (0.0)
40–59	38 (19.7)	34 (22.2)	4 (10.0)
60–69	53 (27.5)	41 (26.8)	12 (30.0)
≥70	97 (50.3)	73 (47.7)	24 (60.0)
Occupation			
Farm-worker	61 (31.6)	47 (30.7)	14 (35.0)
Un-employed	61 (31.6)	47 (30.7)	14 (35.0)
Housewife	22 (11.4)	16 (10.5)	6 (15.0)
Office worker	12 (6.2)	11 (7.2)	1 (2.5)
Others	37 (19.2)	32 (20.9)	5 (12.5)
Risk factor^{a)}			
Farmworks ^{b)}	96 (49.7)	77 (50.3)	19 (47.5)
Other activities except farmworks	87 (45.1)	69 (45.1)	18 (45.0)
Unknown	19 (9.8)	15 (9.8)	4 (10.0)

Values are presented as number (%). ^{a)}Farmworks and other activities can be duplicated. ^{b)}Farmworks included farming and gardening.

consciousness (23.8%) and 27 complained of slurred speech (14.0%). Regarding bleeding symptoms, seven reported hematuria (3.6%) and seven complained of bleeding from the gums (3.6%).

In the case of the deceased, 35 patients had a fever (87.5%) and 26 experienced fatigue (65.0%) regarding systemic symptoms. With respect to digestive system symptoms, 16 reported diarrhea (40.0%) and 10 complained of abdominal pain (25.0%). Only four experienced coughing (10.0%). In terms of neurological symptoms, 11 had loss of consciousness (27.5%), and seven complained of slurred speech (17.5%). Regarding bleeding symptoms, five had hematuria (12.5%), three reported bloody stool (7.5%), and three complained of bleeding from the gums (7.5%). Univariate analysis to confirm the risk of death according to clinical symptoms showed a significant

prevalence of hematuria (adjusted odds ratio [aOR], 10.8; 95% confidence interval [CI], 2.01–57.9) (Table 2).

One hundred and seven patients had underlying conditions (55.4%); 83 had cardiovascular diseases (43.0%), including hypertension; 45 had diabetes (23.3%); 9 had cancer (4.7%), and 5 had liver diseases (2.6%). Among the deceased, 30 had underlying conditions (75.0%), 21 had cerebro-cardiovascular diseases (52.5%), 17 had diabetes (42.5%), 4 had cancer (10.0%), and 2 had liver diseases (5.0%). Univariate analysis confirmed a significant risk of death in accordance with underlying diseases (aOR, 2.96; 95% CI, 1.35–6.48). Binomial logistic regression analysis was also performed for variables including cerebro-cardiovascular diseases, diabetes, cancer, and liver diseases to confirm the effect of underlying diseases on mortality, and diabetes was found to have a significant effect (aOR,

Table 2. Clinical characteristics of cases and deaths with severe fever with thrombocytopenia syndrome in the Republic of Korea, 2022

Symptoms ^{a)}	Case (n=193)	Survival (n=153)	Death (n=40)	p-value	Odds ratio	95% confidence interval
General symptoms						
Fever	169 (87.6)	134 (87.6)	35 (87.5)	0.99	0.99	0.35–2.85
Fatigue	122 (63.2)	96 (62.7)	26 (65.0)	0.79	1.10	0.53–2.28
Muscle pain	76 (39.4)	61 (39.9)	15 (37.5)	0.79	0.91	0.44–1.85
Headache	57 (29.5)	47 (30.7)	10 (25.0)	0.48	0.75	0.34–1.66
Joint pains	22 (11.4)	19 (12.4)	3 (7.5)	0.39	0.57	0.16–2.04
Lymph node enlargement	4 (2.1)	3 (2.0)	1 (2.5)	0.83	1.28	0.13–12.7
Gastrointestinal symptoms						
Diarrhea	64 (33.2)	48 (31.4)	16 (40.0)	0.30	1.46	0.71–2.99
Abdominal pain	42 (21.8)	32 (20.9)	10 (25.0)	0.58	1.26	0.56–2.85
Nausea	30 (15.5)	23 (15.0)	7 (17.5)	0.70	1.20	0.47–3.03
Vomiting	27 (14.0)	24 (15.7)	3 (7.5)	0.28	0.44	0.12–1.53
Jaundice	9 (4.7)	9 (5.9)	0 (0.0)	0.99	-	0.00–Inf
Respiratory symptoms						
Cough	14 (7.3)	10 (6.5)	4 (10.0)	0.46	1.59	0.47–5.36
Sputum	2 (1.0)	2 (1.3)	0 (0.0)	0.99	-	0.00–Inf
Neurologic symptoms						
Decreased level of consciousness	46 (23.8)	35 (22.9)	11 (27.5)	0.54	1.28	0.58–2.82
Slurred speech	27 (14.0)	20 (13.1)	7 (17.5)	0.47	1.41	0.55–3.62
Convulsions	14 (7.3)	11 (7.2)	3 (7.5)	0.95	1.68	0.28–3.95
Bleeding tendency						
Hematuria	7 (3.6)	2 (1.3)	5 (12.5)	0.006	10.8	2.01–57.9
Bleeding gums	7 (3.6)	4 (2.6)	3 (7.5)	0.16	3.02	0.65–14.1
Melena	6 (3.1)	3 (2.0)	3 (7.5)	0.09	4.05	0.79–20.9

Values are presented as number (%). ^{a)}Multiple choices. Inf=infinite.

2.75; 95% CI, 1.19–6.37) (Table 3).

Conclusion

In this investigation, the 2022 SFTS report and epidemiological survey data were analyzed to identify epidemiological and clinical characteristics of the affected patients and deaths. The review of the monthly incidence of SFTS in 2022 showed that the first case emerged in April. From 2013 to 2015, the first case emerged in April. From 2016 to 2022, the

first case emerged in April, except for that in 2017, and in 2023, the first case was reported on April 5th [7]. Climate factors and the monthly incidence of SFTS have been reported to be correlated, and follow-up studies will be necessary because the trend of infectious diseases caused by climate change may vary [8].

There were no deaths among patients younger than 40 years of age, and the mortality rates were 10.5% for those between the ages of 40 and 59 years, 22.6% for those between the ages of 60 to 69 years, and 24.7% for those aged 70 years

Table 3. Underlying disease of cases and deaths with severe fever with thrombocytopenia syndrome in the Republic of Korea, 2022

Underlying diseases ^{a)}	Case (n=193)	Survival (n=153)	Death (n=40)	p-value	Odds ratio	95% confidence interval
Yes	107 (55.4)	77 (50.3)	30 (75.0)	0.007	2.96	1.35–6.48
Cardiovascular disease	83 (43.0)	62 (40.5)	21 (52.5)	0.58	1.25	0.57–2.75
Diabetes	45 (23.3)	28 (18.3)	17 (42.5)	0.018	2.75	1.19–6.37
Cancer	9 (4.7)	5 (3.3)	4 (10.0)	0.43	2.20	0.31–15.7
Liver disease	5 (2.6)	3 (2.0)	2 (5.0)	0.58	1.77	0.24–13.2

Values are presented as number (%). ^{a)}Multiple choices.

or higher. This finding was consistent with those of previous studies showing that 90.0% of deaths were among those aged 60 years or higher and that the risk of death increases with age [5].

Excluding those who were unemployed, most patients were engaged in agricultural work (31.6%), which was associated with the highest risk for exposure (49.7%). These results are consistent with those of previous research, which showed that agricultural workers are at high risk and suggested the need for continuing education for older agricultural workers [9]. Many patients appeared to be unemployed, with the rate of unemployment by age ranging from 21.1% among those aged 40 to 59 years, 26.4% for those aged 60 to 69 years, and 40.2% among those aged 70 years or higher. Many of the older patients were estimated to be unemployed, and it should be investigated whether such reports were made for convenience during the input process of the epidemiological survey. It is also necessary to consider revising the epidemiological survey for more accurate job group classification and analysis.

In addition to agricultural work, hiking, walking, and camping were identified as significant risk factors for exposure. In terms of exposure in confirmed cases, 17 cases were attributed to exposure due to hiking, walking, and camping in 2021.

Similar findings were reported for 16 cases in 2022; therefore, a review of publicity materials is planned to prevent tick-borne diseases among individuals engaging in outdoor activities.

Although the risk of death was significantly higher if a patient experienced hematuria, additional studies are needed to confirm this because there were only few such cases. Since many patients report a fever, fatigue, digestive system symptoms, and neurological symptoms, medical institutions should consider SFTS and administer treatment accordingly if a patient has engaged in outdoor activities and complains of the above clinical symptoms.

Patients with underlying diseases had a 2.96-fold higher risk of death (95% CI, 1.35–6.48) than those without underlying conditions; this finding was consistent with those of previous studies [10]. The risk of death in patients with diabetes was 2.75-fold higher (95% CI, 1.19–6.37); this finding was consistent with those of previous studies showing that SFTS infection along with underlying diseases such as diabetes increases oxidative stress, worsening the prognosis [11,12]. Further research is needed on the extent and developmental mechanisms of underlying conditions corresponding to high-risk groups.

Finally, SFTS management requires a ‘One Health’ approach, because cases of transmission from animals to humans

have been reported abroad [1,4], and there is a risk of transmission. To this end, the human-animal SFTS monitoring system has been established and operational, and there are plans for it to be continuously pursued and managed.

Since SFTS is an infectious disease with a high mortality rate without vaccines or treatment to date, it is necessary to avoid exposure to ticks. As shown in this study, older agricultural workers and individuals engaging in outdoor activities from April to November, when SFTS occurs, are at high risk, and they are recommended to wear appropriate work attire and use tick repellents. After outdoor activities, it is crucial to take a bath or shower and thoroughly check that there is no Ixodidae on the body. It is also essential to visit a medical institution for diagnostic tests and early treatment when fever and digestive system symptoms appear within 14 days of outdoor activities.

Declarations

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