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2023년 비브리오패혈증 환자 및 사망자의 역학적 특성 분석

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초 록

비브리오패혈증은 비브리오패혈균(*Vibrio vulnificus*)에 감염되어 발생하는 질환으로 패혈증으로 진행될 수 있으며 「감염병의 예방 및 관리에 관한 법률」에 따라 제3급 감염병으로 지정되어 있다. 최근 국내 5년(2018-2022년) 평균 발생은 51.4명, 치명률 약 38.6%로 나타났으며, 2023년 비브리오패혈증 (의사)환자는 69명, 사망자는 27명으로 치명률은 39.1%이다. 2023년에는 최근 5년 평균 대비 환자 수가 약 1.3배 증가하였고, 신고 건수의 91.3%가 8-10월에 집중되는 양상을 보였다. 역학조사서를 분석한 결과 확진 환자의 주요 추정 감염경로는 해산물 섭취가 42명(61.8%)으로 가장 많았으며, 상처 난 피부가 해수에 노출된 후 감염된 것으로 추정되는 사례도 5명(7.4%) 있었다. 또한, 사망자의 92.6%는 간질환, 당뇨병, 알코올 의존증 등의 기저질환을 가지고 있는 것으로 나타났다. 2023년 비브리오패혈증 환자 수는 전년 대비 약 1.5배 증가하였으나, 확진 환자의 인구학적, 역학적 특성은 기존에 알려진 바와 유사하였다. 매년 수행하고 있는 감시 사업을 통한 환자의 역학적 특성, 감염경로 분석 등의 결과는 향후 비브리오패혈증의 예방 및 관리의 근거자료가 될 것으로 기대한다.

주요 검색어: 비브리오패혈증; 비브리오패혈균; 해산물 섭취; 기저질환

서 론

비브리오패혈증은 비브리오패혈균(*Vibrio vulnificus*)에 감염되어 발생하는 질환으로 패혈증으로 진행될 수 있으며, 국내에서는 제3급 감염병으로 지정되어 있어 전수감시 대상이다[1]. 비브리오패혈균은 해수온도가 18℃ 이상일 때 증식한다고 알려져 있으며, 호염성 세균으로 적절한 염분을 필요로 하기 때문에 주로 해수, 해하수, 갯벌 등 광범위한 해양환경에서 자유롭게 서식한다. 비브리오패혈증의 주요 감염경로는 오염된 해산물을 날로 먹거나 덜 익혀서 먹은 경우 또는 상처 난 피부가 오염된 바닷물에 접촉한 경우 감염되며, 비브리오패혈균에 감염된 사람 간 전파는 일어나지 않는 것으로 알려져 있다. 만성간질환, 당뇨병 등 기저질환을 가지고 있거나, 알코올 의존증, 면역저하자 등은 비브리오패혈균 감염 위험이 높다[1-4].

따라서 본 연구에서는 2023년 국내 비브리오패혈증 확진자와 사망자의 역학적 특성을 분석하여 비브리오패혈증 감염경로와 위험 요인의 변화 특성을 파악하고, 향후 비브리오패

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핵심요약

① 이전에 알려진 내용은?

비브리오패혈증은 여름철에 대부분 발생하며, 치명률이 약 40%로 높은 질환이다. 주요 감염경로는 오염된 해산물 및 어패류를 섭취하거나 해수에 피부 상처가 노출되어 비브리오패혈균에 감염되는 것으로 알려져 있다.

② 새로이 알게 된 내용은?

2023년 비브리오패혈증 환자의 91.3%가 8-10월에 집중하여 발생하였다.

③ 시사점은?

비브리오패혈증의 발생 시기는 계절적 영향이 뚜렷하나, 2023년에는 유행 시기가 길어지는 특성이 나타났다. 비브리오패혈증 감염 예방을 위해서는 균에 오염된 해산물을 섭취하지 않도록 하며, 간질환 등 기저질환을 가진 사람의 경우 특히 주의할 필요가 있다.

혈증 예방 및 관리 대책의 근거자료로 활용하고자 한다.

방 법

1. 분석 대상

2023년 질병보건통합시스템(https://is.kdca.go.kr/)에 신고된 비브리오패혈증 (의사)환자 총 69명(환자 68명, 의사환자 1명)의 인구학적 특성을 분석하였으며, 역학적 특성 분석은 확진 환자 68명을 대상으로 시행하였다. 사망자는 질병보건통합시스템에 신고된 사망자 중 역학조사 및 환자 주치의의 판단에 근거하여 관련 사망으로 분류된 사망자 27명을 대상으로 분석을 시행하였다.

2. 자료 수집 및 분석

2023년 환자 정보는 질병보건통합시스템에 등록된 역학조사서를 통해 수집하였으며, 연도별 발생추이는 감염병포털에서 관련 정보를 수집하였다. 수집된 정보는 엑셀 프로그램(Microsoft Excel 2016)을 이용하여 분석하였다.

결 과

1. 발생 특성

2023년에는 68명의 비브리오패혈증 확진 환자와 1명의 의사환자가 발생하였으며, 최근 5년(2018-2022년) 평균 51.4명 대비 환자가 약 1.3배 증가하였다. 2023년 월별 발생 분석 결과 1-8월은 최근 5년 평균 대비 0.8배 낮게 발생하였으나, 9월 1.6배, 10월 2.7배 높게 발생하였다. 최근 5년 9-10월에 43.6%의 환자가 발생한 것과 대비하여 2023년에는 동 기간에 69.1%의 환자가 발생한 특성을 보였다(그림 1).

2023년 비브리오패혈증 환자 연령은 평균 66.0세(33-92세)로 최근 5년 평균 62.1세에 비해 평균 연령이 높았다. 2023년 50대, 60대, 70세 이상 연령층에서 최근 5년 평균 대비 각각 1.1배, 1.4배, 1.7배 높게 발생하였고, 70세 이상, 60대, 50대 순으로 많이 발생하였다(그림 2). 성별은 2023년 남자 52명, 여자 17명으로 남성이 여성보다 3.1배 많이 발생하였으며, 최근 5년 평균 대비 각각 1.3배, 1.5배 증가하였다(그림 2).

비브리오패혈증 환자의 주민등록 주소지 기준 지역별 발생은 전라남도 13명, 서울특별시 · 경상남도 각 9명, 인천광역시 8명 순으로 많이 발생하였다. 인구 10만 명당 환자 발생률은 전국 0.13명이며, 지역별로는 전라남도 0.71명, 경상남도,

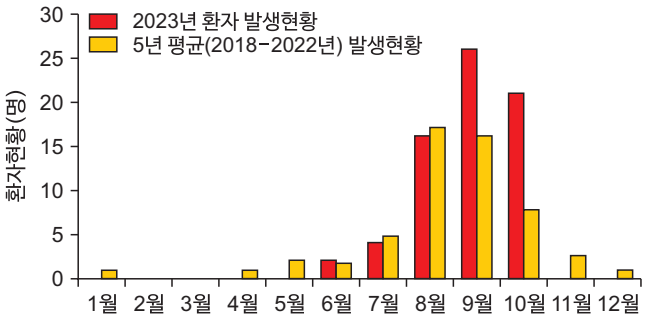

그림 1. 최근 5년 평균 및 2023년 월별 비브리오패혈증 발생현황

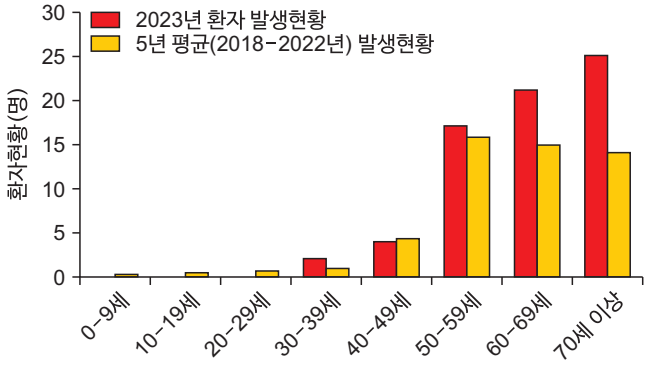

그림 2. 최근 5년 평균 및 2023년 연령대별 비브리오패혈증 발생현황

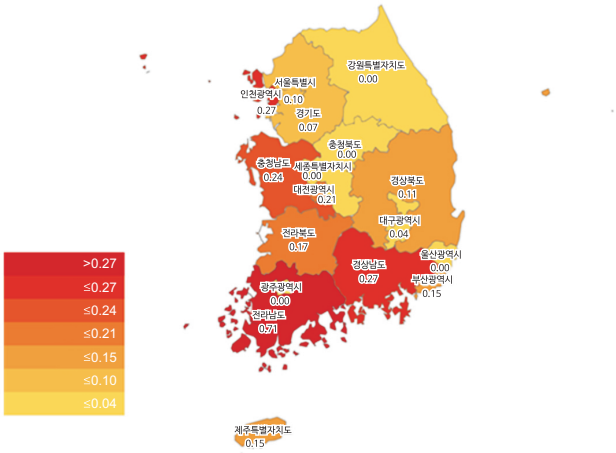

그림 3. 2023년 지역별 인구 10만 명당 비브리오패혈증 발생현황

인천광역시 각각 0.27명, 충청남도 0.24명 순으로 발생하였다(그림 3).

2. 역학적 특성 분석

비브리오패혈증 환자의 주요증상은 발열이 43명(63.2%)으로 가장 많았으며, 기타 증상을 제외하고 근육통 20명(29.4%), 피부증상 19명(27.9%), 쇼크 17명(25.0%) 순이었다.

확진 환자의 추정 감염경로는 해산물 섭취가 42명(61.8%)으로 가장 많았으며, 해산물을 날 것으로 섭취했다고 확인된 환자는 36명(52.9%)이었고, 이 중 생선을 날로 섭취한 환자가 27명(39.7%)으로 가장 많았다. 상처를 통해 해수에 접촉하여 감염이 추정되는 사례는 5명(7.4%)이었으며, 1명은 알레르기성 피부질환자가 해수에 노출된 경우, 4명은 업무(어업 등) 중 상처를 통해 해수에 노출된 경우로 파악되었다. 환자 중 사망 또는 의식 소실로 역학조사 시 추정감염원을 파악하지 못한 사례는 21명이었다. 확진 환자 중 기저질환이 있는 것으로 확인된 사례는 53명(77.9%)이었으며, 간질환이 33명(48.5%)으로 가장 많았고, 그 다음으로는 당뇨병, 알코올 의존증, 신장질환 순으로 많았다(표 1).

3. 사망자 특성 분석

2023년 비브리오패혈증 확진 환자 중 최종적으로 역학조사 및 환자 주치의의 판단에 따라 비브리오패혈증 관련 사망으로 집계된 사망자는 총 27명으로 치명률 39.1%를 나타냈다. 사망자의 성별, 연령별 분포는 표 2와 같다. 사망자는 남성이 23명으로 여성보다 약 5.8배 많이 발생하였으며, 연령별로는 50대 8명, 60대 7명, 70대 이상 7명 순으로 나타났다. 사망자의 주요증상은 발열 14명, 쇼크 12명, 근육통 10명 순으로 나타났다. 사망자 중 25명(92.6%)은 기저질환이 있었으며, 2명은 기저질환이 확인되지 않았다. 기저질환 중 B형 간염, 알코올성 간질환, 간경변 등을 포함하는 간질환이 18명(72.0%)으로 가장 많았으며, 당뇨병과 알코올 의존증은 각각 6명(24.0%)이었다. 사망자의 감염경로는 해산물을 섭취한 경우가 15명(55.6%)으로 가장 많았으며, 날 것으로 섭취한 경우가 11명(40.7%), 그 중 생선 섭취가 8명(29.6%)으로 가장 많았다. 환자가 사망하여 추정감염원을 파악하지 못한 사례는 11명이었다(표 3).

논 의

본 원고는 2023년 질병보건통합시스템으로 신고된 비브리오패혈증 신고 자료 및 역학조사 자료를 이용하여 확진 환자 및 사망자의 역학적 특성을 분석한 결과이다. 환자 발생은

표 1. 2023년 비브리오패혈증 확진자 분석 결과

항목	확진자 수
임상증상	
소계	68[a),b)]
발열	43 (63.2)
근육통	20 (29.4)
피부증상(구진, 궤양, 수포)	19 (27.9)
쇼크	17 (25.0)
설사	14 (20.6)
수양성	11 (16.2)
혈액성	1 (1.5)
봉와직염	14 (20.6)
복통	14 (20.6)
오심	11 (16.2)
구토	11 (16.2)
두통	6 (8.8)
기타(오한, 호흡곤란, 부종 등)	24 (35.3)
추정 감염경로	
소계	68[a)]
해산물 섭취(날 것)	36 (52.9)
생선	27 (39.7)
게	2 (2.9)
새우	6 (8.8)
굴	1 (1.5)
해산물 섭취(익힌 것)	6 (8.8)
생선	3 (4.4)
새우	2 (2.9)
기타 갑각류	1 (1.5)
상처를 통한 감염	5 (7.4)
불명[c)]	21 (30.9)
기저질환	
소계	68[a)]
간질환	33 (48.5)
간경변	24 (35.3)
알코올성 간질환	12 (17.6)
B형 간염	6 (8.8)
C형 간염	1 (1.5)
기타 간질환	3 (4.4)
당뇨병	13 (19.1)
고혈압	3 (4.4)
기타 암	6 (8.8)
혈액질환	4 (5.9)
신장질환	9 (13.2)
알코올 의존증	10 (14.7)
피부질환(찰과상, 괴사성근막염)	6 (8.8)
기저질환 없음	13 (19.1)
기저질환 모름	2 (2.9)

단위: 명(%). [a)]중복응답 포함. [b)]의식소실 또는 사망하여 설사의 양상을 구체적으로 확인할 수 없는 사례 2건 포함. [c)]환자 의식소실 또는 사망 등으로 확인 불가.

표 2. 2023년 비브리오패혈증 사망자 인구학적 특성

항목	사망자 수(n=27)
성별	
남자	23 (85.2)
여자	4 (14.8)
연령대	
30-39세	2 (7.4)
40-49세	3 (11.1)
50-59세	8 (29.6)
60-69세	7 (25.9)
70세 이상	7 (25.9)
확진 시기	
6월	1 (3.7)
7월	2 (7.4)
8월	5 (18.5)
9월	11 (40.7)
10월	8 (29.6)

단위: 명(%).

69명(확진 68명, 의사환자 1명)으로 최근 5년 평균 51.4명 대비 약 1.3배 증가했으나, 치명률은 39.1%로 전년과 유사한 수준으로 나타났다.

확진자 성별은 남성이 여성보다 약 3배 많았고, 이는 다른 연구 결과와도 유사하게 나타났으나 아직까지 비브리오패혈증의 성별에 대한 감수성 차이는 불분명한 것으로 알려져 있다[5]. 확진자는 모두 30세 이상의 연령에서 나타났으며, 평균 연령은 최근 5년 평균에 비해 높아진 특징을 보였다. 외국의 발생 사례에서도 대부분 연령대는 50-70세로 나타나고 있으며, 2023년 7-8월 미국 비브리오패혈증 확진자 11명의 연령 중앙값은 70세(37-84세)로 나타났다[5-9]. 국내에서는 전라남도 지역에서 가장 높은 발생을 보였으며, 주로 해안가 주변에서 발생하는 것을 확인할 수 있었는데(그림 3) 이는 국외 사례에서도 유사하게 나타나는 경향을 보인다[6,9].

임상증상의 경우 확진 환자는 발열, 근육통, 피부증상 순으로, 사망자는 발열, 쇼크, 근육통 순으로 나타났는데, 이는 비브리오패혈증 환자의 대부분이 발열과 오한을 겪으며 패혈증이 시작되면 혈압이 60-70% 떨어진다는 기존의 연구 결과

표 3. 2023년 비브리오패혈증 사망자 분석 결과

항목	사망자 수
임상증상	
소계	27[a),b)]
발열	14 (51.9)
쇼크	12 (44.4)
근육통	10 (37.0)
피부증상(구진, 궤양, 수포)	8 (29.6)
복통	6 (22.2)
설사	5 (18.5)
수양성	4 (14.8)
구토	5 (18.5)
봉와직염	4 (14.8)
오심	3 (11.1)
두통	2 (7.4)
기타(의식저하, 부종 등)	14 (51.9)
추정 감염경로	
소계	27[a)]
해산물 섭취(날 것)	11 (40.7)
생선	8 (29.6)
게	1 (3.7)
기타 갑각류	2 (7.4)
해산물 섭취(익힌 것)	4 (14.8)
생선	3 (11.1)
기타 갑각류	1 (3.7)
상처유입	1 (3.7)
불명[c)]	11 (40.7)
기저질환 여부	
소계	25[a),d)]
간질환	18 (72.0)
알코올성 간질환	11 (44.0)
간경변	12 (48.0)
B형 간염	4 (16.0)
C형 간염	1 (4.0)
당뇨병	6 (24.0)
고혈압	2 (8.0)
기타 암	4 (16.0)
혈액질환	1 (4.0)
신장질환	4 (16.0)
알코올 의존증	6 (24.0)
피부질환(찰과상, 괴사성근막염)	2 (8.0)

단위: 명(%). [a)]중복응답 포함. [b)]사망하여 설사의 양상을 구체적으로 확인할 수 없는 사례 1건 포함. [c)]환자 의식소실 또는 사망 등으로 확인 불가. [d)]기저질환 미확인 2명 제외.

와 비슷한 양상으로 설명될 수 있다[7].

기저질환은 비브리오패혈증의 감염과 사망 위험을 높이는 주요한 위험 요인이다. 2023년 역학조사 결과 확진자 중 77.9%는 기저질환이 있었으며, 특히 사망자의 92.6%가 기저질환을 가지고 있었던 것으로 확인되었다. 주요 기저질환은 알코올성 간질환, B형 간염, C형 간염 등의 간질환이었는데, 이는 해당 기저질환으로 인해 면역이 저하되면서 비브리오균에 노출되었을 경우 감염 위험이 높아졌기 때문으로 해석되며, 따라서 기저질환을 가지고 있는 사람들은 특히 비브리오패혈증 예방수칙을 준수하는 것이 매우 중요하다[2-10].

비브리오패혈증 환자 중 42명은 어패류를 섭취(날 것, 익힌 것)한 후 증상이 나타났는데, 대부분 어류를 날 것으로 섭취하였고, 오염된 해산물을 섭취한 후 증상이 나타났다. 이는 2020년 역학 보고서에서도 기술되었듯이 해산물 섭취가 비브리오패혈증과 역학적 연관성이 있음을 추정할 수 있다[2]. 여전히 비브리오패혈균에 오염된 어패류 섭취가 주요 위험 요인으로 여겨지지만, 최근 해외에서 해산물 손질 중 피부에 상처로 감염된 사례가 보고된 바 있고[9], 2023년 국내 확진자 중에서도 어업 종사자의 피부 상처가 해수에 노출되어 확진된 사례가 있어 이에 대한 각별한 주의가 필요하다.

2023년에는 비브리오패혈증 환자의 91.3%가 8-10월에 집중적으로 발생하였고, 10월에는 최근 5년 평균 대비 약 2.7배의 환자가 발생하였다. 기존 연구에서 비브리오패혈증 환자 발생이 해수온도에 따라 뚜렷한 계절성을 보였으며[6], 해수의 온도가 25℃ 이상일 때 최대로 증식할 수 있다는 연구결과가 보고된 바 있다[11]. 최근 한반도 주변 해역의 수온이 8-9월에 25℃ 이상으로 상승하는 추세인데[12], 향후 기후변화에 따라 비브리오패혈증 환자 발생이 증가할 가능성이 있어 지속적인 감시가 필요하다. 세계보건기구(World Health Organization)와 Food and Agriculture Organization of the United Nation 보고서에서도 기후변화로 인해 해수의 온도가 상승함에 따라 비브리오패혈균이 성장하기 좋은 환경이 조성

되고 있어, 비브리오패혈균의 증식 변화를 예측하고, 비브리오패혈증 감염 예방을 위한 대응 방안이 지속되어야 함을 강조하고 있다[10].

본 연구에서의 환자 발생 증가 이유를 해수온도 등과 같은 기후요인과 연관 지어 해석하기에는 아직 제한점이 있으나, 장기적으로는 질병관리청에서 수행하는 「비브리오 넷(Vibrio-Net) 사업(해양환경 내 병원성 비브리오균 감시 사업)」 결과와 연계하여 환경요인에 따른 비브리오패혈증의 환자 발생 추이를 분석하는 연구를 수행해야 할 것이다.

2023년 비브리오패혈증 확진자의 인구학적 특성이나 역학적 특성에 유의미한 변화는 없었으며, 기존에 알려진 바와 같이 간질환 등의 기저질환, 오염된 해산물 섭취가 주요한 위험 요인으로 확인되었다. 따라서, 간질환 환자, 당뇨병 등 면역력이 저하될 수 있는 기저질환을 가지고 있는 사람들은 특히 6–10월에 해산물 섭취에 주의해야 하며, 상처 있는 피부가 해수에 노출되지 않도록 각별하게 유의할 필요가 있다. 또한, 발열, 근육통, 피부증상 등의 임상증상이 의심될 경우 즉시 의료기관을 방문하여 적극적인 치료를 받아야 한다.

질병관리청에서는 지속적으로 비브리오패혈증 환자 발생을 모니터링하여 역학적 특성을 분석하고, 감염을 사전에 예방할 수 있도록 적극적인 예방 홍보 및 관리 정책을 추진할 예정이다.

Declarations

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Author Contributions: Conceptualization: SKP, SYP. Data curation: SKP. Formal analysis: SKP. Investigation: SKP, HJK. Methodology: HJK, JSY. Project administration: SYP, JSY. Resources: SKP. Supervision: SYP. Visualization: SCY. Writing – original draft: SKP. Writing – review & editing: SYP, SCY, HJK, JSW.

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Epidemiological Characteristics of Cases and Deaths of *Vibrio vulnificus* Sepsis, 2023

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ABSTRACT

Vibrio vulnificus sepsis is acute septicemia caused by *V. vulnificus* and it is a class 3 infectious disease designated under the Infectious Disease Control and Prevention Act. The mean number of cases over the years 2018 to 2022, in the Republic of Korea, was 51.4, with a fatality rate of 38.6%. In 2023, there were 69 patients with *V. vulnificus* sepsis (patients or probable patients) and 27 deaths, with a fatality rate of 39.1%. In 2023, the number of patients increased approximately 1.3 times compared to the mean of the previous five years, and 91.3% of the reported cases were concentrated in August, September, and October. Based on an analysis of epidemiological survey reports, the main presumed infection route for confirmed patients was seafood consumption. It was the most common (42 [61.8%]) and there were also five (7.4%) cases presumed to have been infected after wounded skin was exposed to seawater. Additionally, 92.6% of the deceased had underlying diseases, such as liver disease, diabetes, and alcoholism. The number of patients with *V. vulnificus* sepsis in 2023 increased by approximately 1.5 times compared to the previous year, but the demographic and epidemiological characteristics of the confirmed patients were similar to those previously reported. The results of an annual surveillance project, including patient epidemiological characteristics and infection route analysis, is expected to serve as a basis for the prevention and management of *V. vulnificus* sepsis in the future.

Key words: *Vibrio vulnificus* infection; *Vibrio vulnificus*; Consumption of seafood; Underlying diseases

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Introduction

Vibrio vulnificus sepsis is a disease caused by *V. vulnificus* that can progress to sepsis, and it is designated as a class 3 infectious disease subject to comprehensive surveillance in the Republic of Korea (ROK) [1]. As a halophilic bacterium, *V. vulnificus* primarily inhabits various marine environments such as seawater, estuaries, and tidal flats owing to its requirement for appropriate salinity. It proliferates when the seawater temperature is above 18℃. The main routes of infection for *V. vulnificus* sepsis include the consumption of raw or undercooked contaminated seafood or contact of open wounds on the skin with contaminated seawater. It is known that person-to-person transmission of *V. vulnificus* does not occur. Individuals with underlying conditions such as chronic liver disease, diabetes, alcoholism, and immunodeficiency disorders

Key messages

① What is known previously?

Vibrio vulnificus sepsis mainly occurs during the summer and has a high fatality rate of approximately 40%. The main routes of infection include consumption of contaminated seafood or shellfish and exposure of skin wounds to seawater.

② What new information is presented?

In 2023, the incidence of *V. vulnificus* sepsis increased significantly, with a notable occurrence during August, September, and October, comprising approximately 91.3% of cases.

③ What are implications?

While *V. vulnificus* sepsis is known to occur predominantly during summer. A trend towards prolonged epidemic periods was observed. Therefore, it is crucial to avoid consumption of contaminated seafood and shellfish, particularly people with underlying diseases, such as liver disease, diabetes and alcoholism.

are at higher risk of *V. vulnificus* infection [1-4]. Therefore, in this study, we aimed to analyze the epidemiological characteristics of confirmed cases of and deaths due to *V. vulnificus* sepsis in the ROK in 2023. Through this analysis, we sought to identify changes in infection routes and risk factors of *V. vulnificus* sepsis, with the goal of using this information as evidence for future prevention and management strategies for *V. vulnificus* sepsis.

Methods

1. Participants

The demographic characteristics of 69 patients (including 68 confirmed patients and 1 suspected patient) with *V. vulnificus* sepsis reported in the Disease and Health Integrated Management System (https://is.kdca.go.kr/) in 2023 were analyzed. The epidemiological characteristic analysis was conducted for the 68 patients with confirmed disease among them. Regarding the cases of death, the analysis was conducted for 27 individuals classified as having died due to *V. vulnificus* sepsis according to epidemiological investigations and the judgment of attending physicians from among the deaths reported in the Disease and Health Integrated Management System.

2. Data Collection and Analysis

The data on patients in 2023 were collected through the epidemiological survey registered in the Disease and Health Integrated Management System, and those on the annual incidence trend were collected from the Infectious Disease Portal. The information collected was analyzed using Microsoft Excel 2016.

Results

1. Incidence Characteristics

In 2023, there were 68 confirmed cases and 1 suspected case of *V. vulnificus* sepsis, showing an approximately 1.3-fold increase when compared with the 5-year average of 51.4 cases from 2018 to 2022. The analysis of incidence by month in 2023 revealed that from January to August, the incidence was 0.8 times lower than the average for the previous 5 years. However, the incidences in September and October were 1.6 and 2.7 times higher than the average for the previous 5 years. Compared with the previous 5-year period during which 43.6% of cases were reported from September to October, there was an increase in 2023, with 69.1% of cases reported

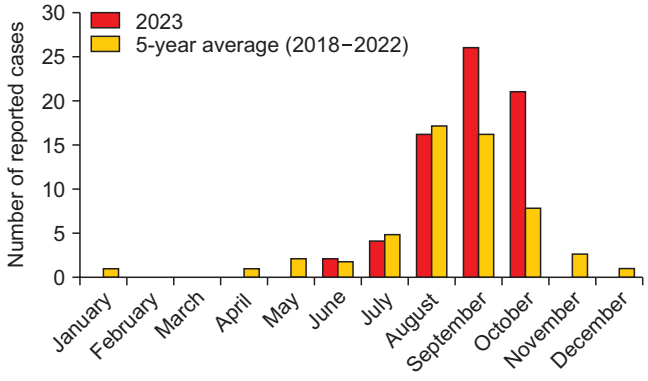

Figure 1. Number of reported cases with *Vibrio vulnificus* sepsis by month, 2023

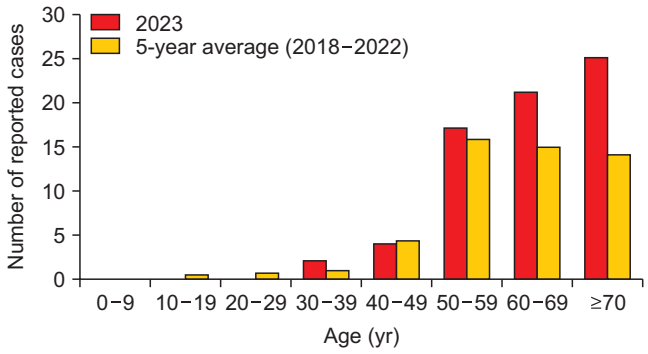

Figure 2. Number of reported cases with *Vibrio vulnificus* sepsis by age, 2023

during the corresponding period (Figure 1).

In 2023, the average age of the patients with *V. vulnificus* sepsis was 66.0 years (range, 33–92 years), which was higher than the average for the previous 5-year period (62.1 years). Compared with the previous 5-year average, in 2023, there was a 1.1-, 1.4-, and 1.7-fold increase in the incidence of *V. vulnificus* sepsis in the age groups of 50–59, 60–69, and ≥70 years, respectively; additionally, the incidence was the highest in the age group of ≥70 years, followed by the age groups of 60–69 and 50–59 years (Figure 2). In terms of the sex of the individuals affected in 2023, there were 52 male and 17 female patients, with the incidence in the former group being 3.1 times that in the latter group. Further, in 2023, there was a 1.3- and 1.5-fold increase in the incidence among male and female

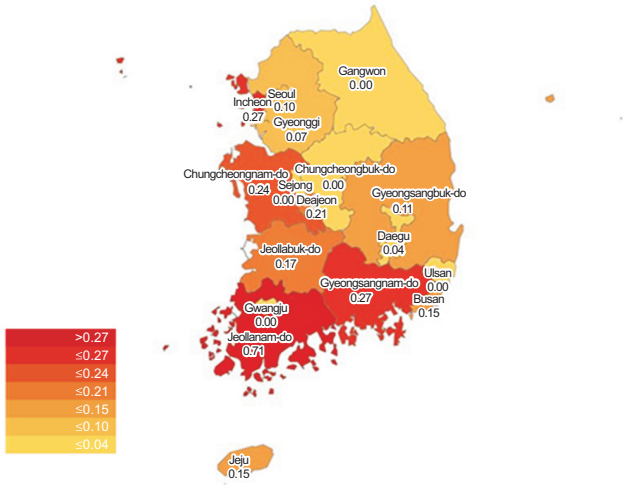

Figure 3. Regional crude incidence rate of *Vibrio vulnificus* sepsis per 100,000 population by patientby registrated address

patients, respectively, compared with the corresponding averages in the previous 5-year period (Figure 2).

In terms of residence areas, the number of cases of *V. vulnificus* sepsis was the highest in Jeollanam-do (13 cases), followed by Seoul and Gyeongsangnam-do (9 cases each) and Incheon (8 cases). The incidence rate per 100,000 population nationwide was 0.13 cases, while by region, Jeollanam-do had the highest incidence rate (0.71), followed by Gyeongsangnam-do and Incheon (0.27 each) and Chungcheongnam-do (0.24; Figure 3).

2. Analysis of Epidemiological Characteristics

The main symptoms of *V. vulnificus* sepsis were fever (43 cases, 63.2%), followed by myalgia (20 cases, 29.4%), skin symptoms (19 cases, 27.9%), and shock (17 cases, 25.0%). The most common presumptive route of infection among confirmed patients was seafood consumption (42 patients, 61.8%). Thirty-six affected individuals (52.9%) were confirmed to have consumed raw seafood, with raw fish being the most common cause (27 cases, 39.7%). Five patients (7.4%)

were presumed to have been infected by contact with seawater through wounds: one was found to be a person with an allergic skin disease who was exposed to seawater and four were found to have been exposed to seawater through wounds during work (e.g., fishing). Among the patients, there were 21 cases in which the presumptive source of infection could not be identified during the epidemiological investigation owing to death or loss of consciousness. Among the confirmed patients, 53 (77.9%) were confirmed to have underlying medical conditions. Liver disease was the most prevalent comorbidity, observed in 33 patients (48.5%), followed by diabetes, alcohol dependence, and kidney disease (Table 1).

3. Analysis of Death Characteristics

Among the confirmed cases of *V. vulnificus* sepsis in 2023, a total of 27 deaths were attributed to *V. vulnificus* sepsis, based on epidemiological investigations and the judgment of attending physicians, resulting in a fatality rate of 39.1%. The distribution of the deaths by sex and age is shown in Table 2. In male patients, there were 23 deaths, approximately 5.8 times higher than that among female patients. With regard to age, 8, 7, and 7 of the patients who died were in their 50s, 60s, and

Table 1. Epidemiological characteristics of the confrimed cases of the *Vibrio vulnificus* sepsis

Classification	Confirmed cases
Clinical symptoms and signs	
Sub total	68[a),b)]
Fever	43 (63.2)
Myalgia	20 (29.4)
Skin lesion (papule, ulcer, bullae)	19 (27.9)
Shock	17 (25.0)
Diarrhoea	14 (20.6)
Watery diarrhoea	11 (16.2)
Bloody diarrhoea	1 (1.5)
Cellulitis	14 (20.6)
Stomach pain	14 (20.6)
Nausea	11 (16.2)
Vomiting	11 (16.2)
Headache	6 (8.8)
Others (chilling, mental deterioration, edema, etc.)	24 (35.3)
Known exposures to infection	
Sub total	68[a)]
Consuming sea food (raw food)	36 (52.9)
Fish	27 (39.7)
Crab	2 (2.9)
Shrimp	6 (8.8)
Oyster	1 (1.5)
Consuming sea food (cooked food)	6 (8.8)
Fish	3 (4.4)
Shrimp	2 (2.9)
Other types of shellfish	1 (1.5)
Exposure to the seawater through skin lesion	5 (7.4)
Unknown[c)]	21 (30.9)
Underlying disease	
Sub total	68[a)]
Liver disease	33 (48.5)
Liver cirrhosis	24 (35.3)
Alcoholic liver disease	12 (17.6)
Hepatitis B	6 (8.8)
Hepatitis C	1 (1.5)
Other liver disease	3 (4.4)
Diabetes	13 (19.1)
Hypertension	3 (4.4)
Other cancer	6 (8.8)
Any types of hematological disease	4 (5.9)
Any types of renal disorder	9 (13.2)
Alcholism	10 (14.7)
Skin injury	6 (8.8)
No underlying disease	13 (19.1)
Unknown underlying disease	2 (2.9)

Unit: person (%). [a)]Multiple responses were allowed. [b)]Including 2 cases in which the pattern of diarrhea could not be confirmed due to patient loss of consciouness or death. [c)]Unable to confirm due to patient loss of consciouness or death.

Table 2. Demographic characteristics of the deaths of the *Vibrio vulnificus* sepsis

Classification	Deaths (n=27)
Sex	
Male	23 (85.2)
Female	4 (14.8)
Age (yr)	
30–39	2 (7.4)
40–49	3 (11.1)
50–59	8 (29.6)
60–69	7 (25.9)
≥70	7 (25.9)
Confirmed month	
June	1 (3.7)
July	2 (7.4)
August	5 (18.5)
September	11 (40.7)
October	8 (29.6)

Unit: person (%).

≥70 years, respectively. The main symptoms of the deceased were fever (14 patients), shock (12 patients), and muscle pain (10 patients). Of those who died, 25 (92.6%) had underlying conditions and two had no confirmed underlying health conditions. Among the underlying diseases, liver disease, including hepatitis B, alcoholic hepatitis, and cirrhosis, was the most common (18 patients, 72.0%), followed by diabetes and alcoholism in 6 patients each (24.0%). The most common routes of infection among the deceased were seafood consumption (15 cases, 55.6%), followed by raw food consumption (11 cases, 40.7%) and fish consumption (8 cases, 29.6%). There were 11 cases of death in which the presumptive routes of infection could not be determined (Table 3).

Discussion

This report presents the results of an analysis of the epidemiological characteristics of confirmed cases of and deaths due

Table 3. Epidemiological characteristics of the deaths of the *Vibrio vulnificus* sepsis

Classification	Deaths
Clinical symptoms and signs	
Sub total	27[a),b)]
Fever	14 (51.9)
Shock	12 (44.4)
Myalgia	10 (37.0)
Skin lesion (papule, ulcer, bullae)	8 (29.6)
Stomach pain	6 (22.2)
Diarrhoea	5 (18.5)
Watery diarrhoea	4 (14.8)
Vomiting	5 (18.5)
Cellulitis	4 (14.8)
Nausea	3 (11.1)
Headache	2 (7.4)
Others (mental deterioration, edema, etc.)	14 (51.9)
Known exposures to infection	
Sub total	27[a)]
Consuming sea food (raw food)	11 (40.7)
Fish	8 (29.6)
Crab	1 (3.7)
Other types of shellfish	2 (7.4)
Consuming sea food (cooked food)	4 (14.8)
Fish	3 (11.1)
Other types of shellfish	1 (3.7)
Exposure to the seawater through skin lesion	1 (3.7)
Unknown[c)]	11 (40.7)
Underlying disease	
Sub total	25[a),d)]
Liver disease	18 (72.0)
Alcoholic liver disease	11 (44.0)
Liver cirrhosis	12 (48.0)
Hepatitis B	4 (16.0)
Hepatitis C	1 (4.0)
Diabetes	6 (24.0)
Hypertension	2 (8.0)
Other cancer	4 (16.0)
Any types of hematological disease	1 (4.0)
Any types of renal disorder	4 (16.0)
Alcholism	6 (24.0)
Skin injury	2 (8.0)

Unit: person (%). [a)]Multiple responses were allowed. [b)]Including 1 case in which the pattern of diarrhea could not be confirmed. [c)]Unable to confirm due to patient loss of consciouness or death. [d)]Excluding 2 deaths with unconfirmed underlying disease.

to *V. vulnificus* sepsis. The analysis was performed using data recorded in the Disease and Health Integrated Management System in 2023, along with epidemiological investigation data. The number of cases of *V. vulnificus* sepsis was 69 (68 confirmed cases and 1 suspected case), which was approximately 1.3 times higher than the average of 51.4 in the last 5 years. However, the fatality rate in 2023 was 39.1%, similar to that in the previous year.

The number of confirmed cases was approximately three times higher in male patients than in female patients, which was consistent with other research findings. However, the *V. vulnificus* sepsis susceptibility difference between the sexes remains unclear [5]. All confirmed cases were in people older than 30 years, and the average age of the affected individuals in 2023 was higher than the average for the last 5 years. In most foreign cases, the predominantly affected age group was 50–70 years. In July and August 2023, the median age of 11 confirmed patients in the United States was 70 years (range, 37–84 years) [5-9]. In the ROK, the highest incidence was found in the Jeollanam-do, and it was confirmed the affected patients mainly lived near the coast (Figure 3), which is similar to the findings reported overseas [6,9].

In terms of clinical symptoms, the most common ones among the confirmed patients were fever, followed by myalgia and skin symptoms, and among those who died, the most common symptoms were fever, shock, and myalgia, in that order. This can be explained by the findings of a previous study that reported that most patients with *V. vulnificus* sepsis experienced fever and chills and that when sepsis developed, the patients' blood pressure decreased by 60–70% [7].

Underlying conditions are significant risk factors that increase the risk of *V. vulnificus* sepsis and associated mortality. The 2023 epidemiological investigation results showed that 77.9% of the confirmed patients had underlying conditions, and notably, 92.6% of the deceased had underlying conditions. The main underlying conditions included liver diseases such as alcoholic liver disease, hepatitis B, and hepatitis C. This can be interpreted as an increased risk of infection with *V. vulnificus* owing to the immune suppression caused by these underlying conditions. Therefore, it is especially important for people with underlying conditions to strictly adhere to preventive measures for *V. vulnificus* sepsis [2-10].

Among the patients with *V. vulnificus* sepsis, 42 developed symptoms after consuming seafood (raw or cooked), with the majority consuming raw seafood. Symptoms also developed among those who had consumed contaminated seafood. This suggests an epidemiological association between consuming seafood and *V. vulnificus* sepsis, as described in the 2020 epidemiological report [2]. While consuming seafood contaminated with *V. vulnificus* remains a significant risk factor, recent reports from other countries have highlighted cases of infection through skin wounds during seafood handling [9]. Additionally, in 2023, cases were reported where individuals, particularly those involved in fishing, were infected through skin wounds exposed to seawater in the ROK. Therefore, special attention should be paid to this aspect.

In 2023, 91.3% of *V. vulnificus* sepsis cases occurred between August and October, and the number of patients in October was approximately 2.7 times higher than the average in the previous 5 years. Previous studies have shown that the incidence of *V. vulnificus* sepsis is clearly seasonal, influenced by sea temperatures [6], and the bacterium can proliferate maximally when the seawater temperature is above 25℃ [11]. Recently, the temperature of the seawater surrounding

the Korean Peninsula has been increasing, reaching 25℃ or higher in August and September [12]. Considering future climate change, there is a possibility of an increase in *V. vulnificus* sepsis cases, indicating the need for continuous monitoring. Reports from the World Health Organization and the Food and Agriculture Organization of the United Nations also emphasized that climate change is resulting in a favorable environment for the growth of *V. vulnificus* as the temperature of seawater increases. Hence, it is necessary to predict changes in the proliferation of *V. vulnificus* and to continue implementing countermeasures to prevent *V. vulnificus* sepsis [10].

There are still limitations in interpreting the causes for the increase in the incidence of patients in this study in relation to climate factors such as sea temperature. Hence, in the long term, it is necessary to analyze the incidence trend of *V. vulnificus* sepsis due to environmental factors, in conjunction with the results of the Vibrio-Net project (Surveillance project for Pathogenic *V. vulnificus* in Marine Environments) conducted by the Korea Disease Control and Prevention Agency.

There was no significant change in the demographic or epidemiological characteristics of *V. vulnificus* sepsis cases in 2023, and as previously known, underlying conditions such as liver disease and consumption of contaminated seafood were major risk factors. Therefore, individuals with underlying conditions that may reduce immunity, such as liver disease and diabetes, should be particularly cautious about consuming seafood from June to October. Additionally, individuals with open wounds need to take extra precautions to avoid exposure to seawater. In addition, if there is a suspicion of clinical symptoms such as fever, muscle pain, and skin symptoms, it is necessary to immediately visit a medical institution for active treatment.

The Korea Disease Control and Prevention Agency will continue to monitor the incidence of *V. vulnificus* sepsis, analyze epidemiological characteristics, and promote active prevention and control policies to prevent infection with *V. vulnificus* in advance.

Declarations

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