

2024년 신종·재출현 감염병 위기관리 대응훈련 실시 결과

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초 록

목적: 본 원고에서는 2024년도의 신종·재출현 감염병 위기관리 대응훈련 실시 결과를 분석하여 훈련의 개선 방안을 제시하고자 하였다.**방법:** 훈련 평가는 시·도(광역자치단체)별 기관평가, 훈련생의 개인평가와 만족도 조사로 구성했다.**결과:** 2024년도에는 시·도 중심으로 훈련을 수행하였다. 훈련 결과로는 총 16개 시·도에서 훈련을 실시하여 480여 개 기관 1,334명이 훈련에 참여하였다.**결론:** 2024년도 훈련 결과를 토대로 평가지표 등 훈련 운영의 간소화를 통하여 훈련의 효율을 높일 필요가 있다.**주요 검색어:** 신종감염병; 재출현감염병; 지자체 훈련; 위기관리 대응훈련

서 론

질병관리청은 지자체(광역·기초) 및 유관기관(재난 관련 부서, 소방본부, 지방경찰청, 군, 지방교육청, 의료기관, 보건 환경연구원, 검역소 등)을 대상으로 신종·재출현 감염병에 의한 공중보건 위기 상황에 대비 및 대응 능력 향상을 위해 매년 훈련을 실시하고 있다. 이 훈련은 가상 시나리오를 활용한 모의훈련으로 지자체 위기관리 체계를 점검하고 초동대응요원의 역량 강화를 목적으로 한다.

본 훈련은 2004년도 1차 신종전염병 위기관리 훈련으로 시작하였다.

2009년도 신종인플루엔자 유행 이후 또 다른 공중보건 위

기 상황 발생에 대한 우려와 국내 유입 가능성을 배제할 수 없어, 위기 상황 발생 시 일선기관 담당자들의 대응 역량 강화를 위해 2010년부터 보건 인력과 유관기관 관계자들을 대상으로 시·도 신종감염병 위기대응 훈련을 실시하고 있다[1]. 이는 현재와 같은 형태로 17개 시·도(광역자치단체)를 중심으로 유관기관이 모여서 훈련을 실시하게 되었다. 2020년도와 2021년도에는 코로나바이러스감염증-19 대응으로 인하여 훈련을 유예하였고, 2022년도에는 기존과 동일한 수준으로 실시하였다. 2023년부터는 훈련 예산이 반영되지 않아 질병관리청에서 집합교육을 실시하였으며, 2024년도는 시·도를 중심으로 훈련하였다.

훈련을 실시한 최근 5개년(2017, 2018, 2019, 2022,

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KDCA

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핵심요약**① 이전에 알려진 내용은?**

질병관리청은 2010년부터 신종·재출현 감염병 위기관리 대응훈련 사업을 수행하고 있다.

② 새로이 알게 된 내용은?

지자체의 공중보건 위기 상황에 대비하기 위해, 2024년도에 480여 개 기관, 1,334명이 참여하여 교육을 실시하였다.

③ 시사점은?

2024년도 훈련 결과를 토대로 평가지표 등 훈련 운영의 간소화를 통하여 훈련의 효율을 높일 필요가 있다.

2023년) 기준으로 훈련 주제는 매년 차이는 있지만 주로 중동호흡기증후군(Middle East respiratory syndrome), 조류인플루엔자 인체감염증(avian influenza), 에볼라바이러스병(Ebola virus disease)을 실시하였다. 훈련은 실행 훈련과 토론 훈련 등으로 나누어서 실시하고, 세부 상황을 구성하여 훈련하였다. 평가지표 약 4개 항목, 만족도 조사 약 10개 문항을 사용하고 있다(표 1). 훈련 주제 등 상세한 내용은 아래 방법에서 다루고자 한다.

이 원고는 「2024년 신종·재출현 감염병 위기관리 대응 훈련 결과보고서」를 바탕으로 작성되었다[2].

방 법**1. 훈련 참여기관 및 역할**

질병관리청은 훈련 사업을 총괄하며, 훈련 운영 안내서, 실행 기반 훈련 시나리오와 토론 기반 훈련 시나리오 및 평가지표를 기획·제작하여 시·도에 배포하였다. 질병관리청 권역별 질병대응센터는 권역 소관 지자체 훈련 사업에 대한 기술을 지원하며, 지자체 훈련 시나리오 개발 지원, 지자체 훈련 담당자 대상 교육 실시, 지자체별 훈련 계획 및 현장 컨설팅

팅, 훈련 평가를 실시하였다. 시·도는 훈련 주체로서 훈련 계획을 수립하고 운영하며, 질병관리청에 훈련 결과를 보고하였다. 시·도 감염병관리지원단은 지자체 훈련 운영 실무 및 인력 지원 등을 수행했고, 보건소(기초자치단체)와 유관기관(부서)은 훈련 참여를 하였다.

2. 훈련 주제

훈련 주제는 신종·재출현 감염병 중 발생 가능성 및 사회·경제적 파급력 등을 고려하여 제작한 3종 매뉴얼을 사용하였다. 매뉴얼은 중동호흡기증후군, 조류인플루엔자 인체감염증, 에볼라바이러스병이다. 질병관리청에서는 사전에 제시한 3종 신종감염병 훈련 매뉴얼 중 각 시·도가 자체적으로 1개를 선정하여 계획을 수립하고 훈련을 실시하도록 하였다. 각 시·도의 대응 여건을 고려하여 시나리오를 각색하여 활용할 수 있도록 하였다.

3. 훈련 구성

훈련은 감염병 관련 교육 강연, 실행 기반 훈련, 토론 기반 훈련, 개인보호구 착용·탈의 훈련, 총평 및 폐회로 구성되었다. 훈련은 교육 강의로 시작하는데, 훈련 주제에 해당하는 감염병의 역학적 특성 및 지침 교육을 실시하였다. 실행 기반 훈련은 의심 환자 초동대응 훈련으로 위험 국가 입국자 신고 및 대응, 역학조사 실시, 의심 환자 조치, 접촉자 관리에 관한 O/X 퀴즈 및 역할극의 형태로 실시되었다. 토론 기반 훈련은 위기상황의 대응 방안 도출을 위한 내용으로 환자 발생 상황, 추가 확진 사례 발생, 상황 종료 후 조치 사항 등으로 구성되었다. 실습 훈련인 개인보호구 착용 및 탈의 수업은 훈련 주제 감염병에 맞는 개인보호구(Level C 또는 Level D) 강의 또는 시연을 하고, 실습을 진행하였다.

4. 훈련 평가

훈련 평가는 시·도(광역시자치단체)별 기관평가, 훈련생의

표 1. 최근 5개년 신종·재출현 위기관리 대응훈련 개요

구분		2017년도	2018년도	2019년도	2022년도	2023년도
훈련 시·도		• 16개 시·도(세종: 충북과 동반 훈련)	• 16개 시·도(세종: 충남과 동반 훈련)	• 17개 시·도	• 16개 시·도(세종: 충남과 동반 훈련)	• 중앙(17개 시·도 및 시·군·구 대상 집체 교육)
시나리오	훈련 주제	• 중동호흡기증후군 • 에볼라바이러스병	• 중동호흡기증후군 • 에볼라바이러스병 • 조류인플루엔자 인체감염증	• 중동호흡기증후군 • 에볼라바이러스병 • 조류인플루엔자 인체감염증	• 코로나19-중동호흡기증후군 동시 대응 • 코로나19 • 원숭이 두창 • 에볼라바이러스병 • 조류인플루엔자 인체감염증	• 조류인플루엔자 인체감염증
	상황 (문항) 수	• 중동호흡기증후군 - 실행 훈련: 표준 시나리오, 돌발 상황 1-3 - 토론 훈련: 상황별 시나리오 1-5 • 에볼라바이러스병 - 실행 훈련: 표준 시나리오, 돌발 상황 1-4 - 토론 훈련: 상황별 시나리오 1-5	• 중동호흡기증후군 - 실행 훈련: 5개 상황, 10개 세부 상황 - 토론 훈련: 질문 8개 • 에볼라바이러스병 - 실행 훈련: 4개 상황, 9개 세부 상황 • 조류인플루엔자 - 실행 훈련: 4개 상황, 10개 세부 상황 - 토론 훈련: 질문 9개	• 중동호흡기증후군 - 실행 훈련: 5개 상황, 10개 세부 상황 - 토론 훈련: 질문 8개 • 에볼라바이러스병 - 실행 훈련: 4개 상황, 9개 세부 상황 • 조류인플루엔자 인체감염증 - 실행 훈련: 4개 상황, 10개 세부 상황 - 토론 훈련: 질문 9개	• 코로나19-중동호흡기증후군 동시 대응 - 실행 훈련: 5개 상황, 10개 세부 상황 - 토론 훈련: 질문 8개 • 코로나19 - 실행 훈련: 2개 상황, 4개 세부 상황 - 토론 훈련: 질문 4개 • 원숭이 두창 - 토론 훈련: 4개 상황, 14개 세부 상황 • 에볼라바이러스병 - 실행 훈련: 4개 상황, 9개 세부 상황 - 토론 훈련: 질문 8개 • 조류인플루엔자 인체감염증 - 실행 훈련: 4개 상황, 10개 세부 상황 - 토론 훈련: 질문 9개	• 조류인플루엔자 인체감염증 - 실행 훈련: 4개 상황, 10개 세부 상황 - 토론 훈련: 질문 13개
평가 지표	평가 항목 구성	• 평가지: 4항목(훈련 기획, 훈련 설계, 훈련 실시, 훈련 평가 환류) • 가감점: 8항목 (가점 최대 10점, 감점 최대 -10점)	• 평가지: 4항목(훈련 기획, 훈련 설계, 훈련 실시, 훈련 평가 환류) • 가감점: 8항목 (가점 최대 10점, 감점 최대 -10점)	• 평가지: 4항목(훈련 기획, 훈련 설계, 훈련 실시, 훈련 평가 환류) • 가감점: 8항목 (가점 최대 10점, 감점 최대 -10점)	• 평가지: 4항목(훈련 기획, 훈련 설계, 훈련 실시, 훈련 평가 환류) • 가감점: 8항목 (가점 최대 10점, 감점 최대 -10점)	• 평가지: 3항목(훈련 기획 및 설계, 훈련 실시, 훈련 평가 환류) • 가감점: 5항목 (가점 최대 5점, 감점 최대 -5점)
만족도 조사	설문지 구성	• 4항목으로 구성 (사전 강의 및 훈련 안내, 현장 훈련, 도상 훈련, 훈련 환경)	• 10문항으로 구성 (사전·사후 지식 확인, 사전·사후 태도 확인, 훈련 만족도 확인, 인구통계학적 정보)	• 10문항으로 구성 (사전·사후 지식 확인, 사전·사후 태도 확인, 훈련 만족도 확인, 인구통계학적 정보)	• 10문항으로 구성 (사전·사후 지식 확인, 사전·사후 태도 확인, 훈련 만족도 확인, 인구통계학적 정보)	• 9문항으로 구성 (사전·사후 지식 확인, 사전·사후 태도 확인, 훈련 만족도 확인, 인구통계학적 정보)

코로나19=코로나바이러스감염증-19.

개인평가와 만족도 조사로 구성했다. 시·도의 훈련 기획·설계의 적정성 및 충실성, 훈련 실시(참여도·적정성·홍보), 훈련 평가·환류에 대한 시·도별 평가, 훈련생 훈련 전·후 역량 지식도 향상 및 훈련에 대한 태도 변화 개인평가, 훈련생의 훈련 전반에 대한 만족도 조사이다. 그중, 개인평가는 훈련 전(사전)과 훈련 후(사후)에 참가자 개인단위로 설문조사를 실시하였다.

결 과

2024년도 훈련은 7월부터 9월 중 시·도의 자체 일정으로 실시하였고, 훈련은 16개 시·도(광역시자치단체)에서 시행하였다. 2024년도 훈련은 중앙에서의 예산 지원 없이 처음으로 실시한 훈련이었다.

1. 훈련 주제

중증호흡기증후군은 3개 시·도, 조류인플루엔자 인체감염증은 11개 시·도에서, 에볼라바이러스병은 2개 시·도에서 훈련을 실시하였다.

2. 훈련생 구성

480여 개 기관 1,334명이 훈련에 참여, 참관하였다. 참여기관으로는 지자체(광역시·기초), 시·도 감염병관리지원단, 감염병 유관기관 및 부서(검역소, 보건환경연구원, 농림축산검역본부, 소방, 경찰, 군, 법무부, 교육청, 의료기관 등)가 참여하였으며, 훈련 평가로는 질병관리청 신종감염병대응과 및 각 질병관리청 권역별 질병대응센터가 참여하였다.

사전, 사후 설문지를 모두 평가한 훈련생은 총 759명으로 592명(78.0%)이 여성, 30대가 287명(37.8%), 40대(27.9%), 50대(21.2%) 순으로 많았다(표 2). 직종으로는 시·도 및 보건소 담당자 475명(62.6%), 교육(3.4%), 진단검사 및 소방(3.0%), 경찰(2.4%) 등으로 확인되었으며, 기타 직종(22.4%)

표 2. 2024년도 훈련생의 일반적 특성

구분	계(명) (n=759)	비율(%)
성별		
남	167	22.0
여	592	78.0
연령(세)		
19-29	97	12.8
30-39	287	37.8
40-49	212	27.9
50-59	161	21.2
60+	2	0.3
직종		
감염병 대응 (시·도, 보건소)	475	62.6
진단검사	23	3.0
검역	15	2.0
교육	26	3.4
소방	23	3.0
경찰	18	2.4
군	9	1.2
기타 ^{a)}	170	22.4

^{a)}의료기관, 가축방역부서, 재난부서, 행정부서, 출입국관리부서 등.

참여자(의료기관, 가축방역부서, 재난부서, 행정부서, 출입국관리부서 담당자가 참여한 것으로 확인되었다(표 2).

전체 업무 경력으로는 2년 이하가 479명(63%), 감염병 근무 경력으로는 2년 이하가 623명(82.1%)으로 다수를 차지하는 한편, 본 훈련이 처음인 경우 또한 445명(58.6%)으로 확인되었다(표 3).

3. 훈련생 지식도 향상을 평가

훈련생 지식습득 평가로는 시나리오 3종 주제에 부합하는 감염병 지식 등 오지선다형 질문지 10개를 제시하고, 훈련 전과 후 동일한 질문지에 응답하여 지식도 향상률을 확인하였다. 전체 훈련생의 지식도 향상률은 14.1%이며, 감염병별로는 각각 중증호흡기증후군 10.9%, 조류인플루엔자 인체감염증 11.1%, 에볼라바이러스병 37.0%로 확인되어 훈련 후에 각 주제에 대한 감염병 지식도가 향상되었음을 확인되었다(표 4).

4. 훈련생 훈련 만족도 평가

5점 척도인 훈련생 평가의 평균은 4.5점으로, 전반적으로 만족도가 우수한 편으로 확인되었다.

5. 시·도(광역자치단체)별 훈련 평가

최고점수는 울산광역시로 104점, 최저점수는 대전광역시 2차 훈련으로 60점으로 평가되었다. 16개 시·도 평균은 93.2점으로 평가되었으나, 훈련 평가자가 동일하지 않고, 평가자 인원수도 달라서 시·도별 점수의 직접적인 비교는 적절하지 않은 관계로 참고용으로만 활용되었다.

6. 훈련 개선 의견

훈련 참여자의 의견으로는 훈련 일정 확대, 훈련 예산 지원 요청, 유관기관용 시나리오 개발 및 감염병 대응 경험 공유 시간 편성 요청 등의 개선 의견을 제시하였다. 훈련 평가자의 의견으로는 토론 훈련 시간 확대, 설문조사 참여율 제고 방안 마련, 조장 역량 향상 방안 마련 필요, 유관기관 이해도 향상에 필요한 강의 및 시나리오 재구성, 지속적인 시·도 역량 강화 필요 등의 의견이 있었다.

논 의

신종·재출현 감염병 위기관리 대응훈련은 해당 지자체(광역·기초)에서 발생하는 공중보건 위기 상황에 대응하는 능력을 향상시키기 위한 훈련이다. 또한 해당 지자체와 시·도내 감염병 담당 유관기관의 역할을 확인 및 공유하며, 기관 간에 협력을 굳건하게 하기 위한 목적도 있다. 2024년도 훈련은 중앙의 예산 지원 없이 시·도를 중심으로 처음 실시한 훈련이며, 대체적으로 훈련에 참여하여 본래의 목적을 달성하였으나, 다음과 같은 시사점이 있었다.

1. 신종·재출현 감염병 위기관리 대응훈련의 매년 안정적이고 지속적인 운영의 필요성

신종·재출현 감염병 위기관리 대응훈련은 2024년 기준, 480여 개 기관 1,334명이 참여하는 훈련으로, 지자체를 대상으로 하는 신종·재출현 감염병 대응 훈련으로는 유일한 훈련

표 3. 2024년도 훈련생의 업무 경력

구분	계(명) (n=759)	비율(%)
현 기관 업무 경력(년)		
<1	147	19.3
1-2	332	43.7
3-5	106	14.0
6-10	75	9.9
11-15	32	4.2
16-20	27	3.6
21+	40	5.3
감염병 근무 경력(년)		
없음	95	12.5
<1	205	27.0
1-2	323	42.6
3-5	85	11.2
6-10	41	5.4
11-15	3	0.4
16-20	7	0.9
21+	0	0.0

표 4. 2024년도 훈련생의 지식도 향상률 평가

구분	계(명)	평균점수 ^{a)}		향상률(%) ^{b)}	p값
		사전	사후		
전체	759	7.2±2.1	8.3±1.6	14.1	<0.001
중등호흡기증후군	127	7.4±2.1	8.3±1.4	10.9	<0.001
조류인플루엔자 인체감염증	525	7.6±2.0	8.4±1.6	11.1	<0.001
에볼라바이러스병	107	5.4±1.7	7.4±1.6	37.0	<0.001

^{a)}평균점수±표준편차. ^{b)}향상률(%): {(사후-사전)/사전 평균점수}×100.

이다.

2024년도 훈련을 통해 담당자의 감염병 근무 경력이 2년 미만인 경우(82.1%)와 본 훈련이 처음인 경우(58.6%)가 높은 비율로 확인되었다. 그러므로 낮은 근무 연수와 잦은 담당자 변경 가능성에 대비하여 매년 훈련을 통한 꾸준한 대응 역량 유지가 필요하다.

또한 교육과정은 현재 시행하고 있는 감염병 이론 교육 강연, 지침에 따른 절차를 익히는 실행 기반 훈련, 유관기관과 의견을 조율하는 토론 기반 훈련, 실전을 위한 개인보호구 착용·탈의 교육은 지속적으로 유지될 필요가 있다.

2. 2024년 결과 기반 다음 훈련 개선 방안

일선의 지속적인 역량 강화가 필요한 만큼 훈련 예산 마련이 필요하나, 2025년도에도 중앙정부의 예산 지원이 어려울 경우에 대비할 필요가 있다. 따라서 훈련의 효율화를 통한 평가 항목의 선택적 적용으로 훈련에 대한 지자체의 부담을 경감시킬 필요가 있다.

이를 위해서 먼저 평가 항목의 단순화가 필요하다. 현재 지표의 평가 항목 개수는 총 16개이나, 평가 항목별 각각의 세부 항목이 다소 상세하게 구성되어 있다. 평가를 위한 훈련이 아니라 평가의 초점을 오직 훈련 당일에 수행하는 것에 대해서만 평가하는 방향으로 설정하는 등, 시·도 훈련 담당자가 훈련 준비를 효율적으로 할 수 있는 방안도 고려되어야 할 것이다.

또한 훈련 개선 요청 의견처럼 충분한 토론 시간 확보를 통한 기관 간 소통 확대가 필요하다. 훈련에 많은 유관기관 담당자가 참여하는 만큼 유관기관의 참여 비중을 높일 수 있는 시나리오 개발이 필요하며, 기존 신종 감염병 대응의 주체인 보건소의 역할뿐만 아니라 유관기관 대응 시에 예상되는 문제점을 함께 논의할 수 있는 시간이 필요하다.

토론 기반 훈련 시간을 단축하고 문항 수를 조정하는 등 방안 마련을 통해 유관기관 협력을 강화하여야 한다. 8개의

문항을 약 90분간 토론하여 방안을 도출하게 되어 있는 것을 문항 수를 6개로 축소하고, 토론 시간은 약 60분 전후로 조정하여 집중도 있는 토론 훈련 시간으로 개선하고자 한다.

신종 감염병은 발생 시 여러 유관기관의 대응과 협조가 필요하다. 따라서 신종·재출현 감염병 위기관리 대응훈련의 지속적인 수행 및 개선 방안 도출을 통해 지자체의 대응 역량을 강화해 나갈 계획이다. 또한, 이러한 훈련의 수행, 개선 의견·방안 도출, 결과 환류, 훈련 문제, 취약성 등을 반영한 차년도 훈련 계획을 추진하도록 지속적으로 독려할 계획이다.

Declarations

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References

1. Lee SD, Lee HY. Exercise and evaluation of emerging infectious disease crisis response on local government. Korea Centers for Disease Control and Prevention; 2012.
2. Korea Disease Control and Prevention Agency (KDCA). 2024 report on the crisis management response training for emerging and re-emerging infectious disease. KDCA; 2024.

Results of the 2024 Emerging and Re-emerging Infectious Disease Crisis Management Response Training

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ABSTRACT

Objectives: This study analyzes the results of the 2024 Emerging and Re-Emerging Infectious Disease Crisis Management Response Training program and proposes improvements for future training.

Methods: Training evaluation consisted of institutional assessments by metropolitan and provincial governments, individual assessments of trainees, and a satisfaction survey.

Results: In 2024, the training was conducted with a focus on the metropolitan and provincial governments. Sixteen regions, including 480 institutions and 1,334 participants, participated in the training program.

Conclusions: Based on the training results for 2024, it is necessary to enhance training efficiency by simplifying the evaluation criteria and streamlining training operations.

Key words: Emerging infectious diseases; Re-emerging infectious diseases; Local government training; Crisis management response training

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Introduction

The Korea Disease Control and Prevention Agency (KDCA) conducts annual training exercises for local governments (metropolitan and basic) and related organizations (disaster-related departments, fire departments, regional police agencies, military, local education offices, medical institutions, public health and environmental research institutes, quarantine stations, etc.) to enhance preparedness and response capabilities for public health emergencies caused by emerging and re-emerging infectious diseases. These simulation-based exercises,

utilizing virtual scenarios, aim to assess the crisis management systems of local governments and strengthen the capabilities of first responders.

The training program began in 2004 as the first crisis management exercise for emerging infectious diseases.

Following the 2009 H1N1 influenza pandemic, concerns over the emergence of new public health crises and potential for their introduction into the country led to the establishment of crisis response training programs. Since 2010, these exercises have been conducted for public health personnel and relevant institutions at provincial and municipal levels to

Key messages

① What is known previously?

Since 2010, the Korea Disease Control and Prevention Agency has implemented crisis management training programs for emerging and re-emerging infectious diseases.

② What new information is presented?

To prepare for public health crisis situations in local governments, training was conducted in 2024 with the participation of approximately 480 institutions and 1,334 individuals.

③ What are implications?

Based on the results of the 2024 training, it is necessary to enhance training efficiency by streamlining operations, including evaluation indicators.

strengthen the response capabilities of frontline officials in crisis situations [1]. Currently, this training is carried out in its present form across 17 metropolitan and provincial governments, where relevant agencies gather to conduct joint exercises. The training programs for 2020 and 2021 were postponed owing to response efforts for coronavirus disease. The program resumed in 2022 at the same level as in previous years. However, in 2023, owing to budget constraints, the KDCA conducted centralized training sessions. In 2024, training was once again conducted at the provincial and municipal levels.

Over the past 5 years during which the training was conducted (2017, 2018, 2019, 2022, and 2023), the specific training themes varied annually but primarily focused on Middle East respiratory syndrome (MERS), avian influenza (AI), and Ebola virus disease (EVD). The training program was divided into practical exercises and discussion-based exercises, with detailed scenarios designed for each session. The

evaluation metrics included four key indicators, along with a satisfaction survey consisting of ten questions (Table 1). Detailed information on the training themes and methodologies is provided in the following sections.

This manuscript is based on the “2024 Report on the Crisis Management Response Training for Emerging and Re-emerging Infectious Disease” [2].

Methods

1. Participating Organizations and Their Roles

The KDCA oversaw the training program by developing and distributing training operation guidelines, exercise-based training scenarios, discussion-based training scenarios, and evaluation indicators to metropolitan municipalities. The Regional Disease Response Centers under the KDCA provided technical support for training programs within their respective jurisdictions. Their responsibilities included supporting the development of municipal training scenarios, conducting training for municipal training coordinators, reviewing municipal training plans, offering on-site consultations, and conducting training evaluations. As the primary entities responsible for training, the metropolitan municipalities developed and executed training plans and submitted the training results to the KDCA. The Regional Centers for Infectious Disease Control and Prevention supported the practical operations and manpower needs of the municipal training programs. Public health centers (at the basic municipal level) and related organizations (departments) participated in the training sessions.

2. Training Themes

The training themes were selected based on the likelihood

Table 1. Overview of Emerging and Re-emerging Infectious Disease Crisis Management Response Training in the past five years

Category		Year 2017	Year 2018	Year 2019	Year 2022	Year 2023
Training provinces and cities		• 16 provinces and cities (Sejong: joint training with Chungbuk)	• 16 provinces and cities (Sejong: joint training with Chungnam)	• 17 provinces and cities	• 16 provinces and cities (Sejong: joint training with Chungnam)	• Central (group training for 17 provinces and cities, including municipal and county governments)
Scenario	Training topics	• Middle East respiratory syndrome • Ebola virus disease	• Middle East respiratory syndrome • Ebola virus disease • Avian influenza	• Middle East respiratory syndrome • Ebola virus disease • Avian influenza	• Simultaneous response to COVID-19 and Middle East respiratory syndrome • COVID-19 • Monkeypox • Ebola virus disease • Avian influenza	• Avian influenza
	Number of situations (questions)	• Middle East respiratory syndrome - Practical training: standard scenario, 1-3 unexpected situations - Discussion-based training: scenario-based situations 1-5 • Ebola virus disease - Practical training: standard scenario, 1-4 unexpected situations - Discussion-based training: scenario-based situations 1-5	• Middle East respiratory syndrome - Practical training: 5 situations, 10 detailed scenarios - Discussion-based training: 8 questions • Ebola virus disease - Practical training: 4 situations, 9 detailed scenarios - Discussion-based training: 8 questions • Avian influenza - Practical training: 4 situations, 10 detailed scenarios - Discussion-based training: 9 questions	• Middle East respiratory syndrome - Practical training: 5 situations, 10 detailed scenarios - Discussion-based training: 8 questions • Ebola virus disease - Practical training: 4 situations, 9 detailed scenarios - Discussion-based training: 8 questions • Avian influenza - Practical training: 4 situations, 10 detailed scenarios - Discussion-based training: 9 questions	• Simultaneous response to COVID-19 and Middle East respiratory syndrome - Practical training: 5 situations, 10 detailed scenarios - Discussion-based training: 8 questions • COVID-19 - Practical training: 2 situations, 4 detailed scenarios - Discussion-based training: 4 questions • Monkeypox - Discussion-based training: 4 situations, 14 detailed scenarios • Ebola virus disease - Practical training: 4 situations, 9 detailed scenarios - Discussion-based training: 8 questions • Avian influenza - Practical training: 4 situations, 10 detailed scenarios - Discussion-based training: 9 questions	- Practical training: 4 situations, 10 detailed scenarios - Discussion-based training: 13 questions

Table 1. Continued

Category		Year 2017	Year 2018	Year 2019	Year 2022	Year 2023
Evaluation criteria	Composition of evaluation items	• Evaluation sheet: 4 items (training planning, training design, training implementation, training evaluation & feedback) • Additional/deduction points: 8 items (maximum bonus points: 10, maximum deduction points: -10)	• Evaluation sheet: 4 items (training planning, training design, training implementation, training evaluation & feedback) • Additional/deduction points: 8 items (maximum bonus points: 10, maximum deduction points: -10)	• Evaluation sheet: 4 items (training planning, training design, training implementation, training evaluation & feedback) • Additional/deduction points: 8 items (maximum bonus points: 10, maximum deduction points: -10)	• Evaluation sheet: 4 items (training planning, training design, training implementation, training evaluation & feedback) • Additional/deduction points: 8 items (maximum bonus points: 10, maximum deduction points: -10)	• Evaluation sheet: 3 items (training planning, training design, training implementation, training evaluation & feedback) • Additional/deduction points: 5 items (maximum bonus points: 5, maximum deduction points: -5)
Satisfaction survey	Questionnaire composition	• Composed of 4 items (pre-training lecture & training guidance, on-site training, tabletop training, training environment)	• Composed of 10 questions (pre- and post-training knowledge assessment, pre- and post-training attitude assessment, training satisfaction assessment, demographic information)	• Composed of 10 questions (pre- and post-training knowledge assessment, pre- and post-training attitude assessment, training satisfaction assessment, demographic information)	• Composed of 10 questions (pre- and post-training knowledge assessment, pre- and post-training attitude assessment, training satisfaction assessment, demographic information)	• Composed of 9 questions (pre- and post-training knowledge assessment, pre- and post-training attitude assessment, training satisfaction assessment, demographic information)

COVID-19=coronavirus disease 2019.

of occurrence, social impact, and economic consequences of emerging and re-emerging infectious diseases. The training utilized three standardized manuals covering the MERS, AI, and EVD. The KDCA provided these three infectious disease training manuals in advance. Each provincial or municipal government selected one of the three manuals based on its specific circumstances and developed a corresponding training plan. Additionally, scenarios were adapted to reflect the local response conditions of each region to enhance the relevance and effectiveness of the exercises.

3. Training Components

The training program consisted of five main components: educational lectures on infectious diseases; exercise-based training; discussion-based training; practical training

on donning and doffing personal protective equipment (PPE); and a comprehensive review, followed by a closing session. The training began with educational lectures that covered epidemiological characteristics and guidelines related to the infectious disease topics of the sessions. Exercise-based training focused on the initial responses to suspected cases. Activities included reporting and responding to travelers from high-risk countries, conducting epidemiological investigations, managing suspected patients, and handling contacts. These activities were conducted using O/X quizzes and role-playing exercises. Discussion-based training was designed to develop response strategies for crises. It covered scenarios such as the patient occurrences, additional confirmed cases, and post-situation measures. The practical training session on donning and doffing PPE involved lectures or demonstrations tailored to the

infectious disease being addressed (Level C or Level D PPE), followed by hands-on practice.

4. Training Evaluation

The training evaluation comprised three main components: an institutional assessment of each provincial and municipal government, an individual assessment of trainees, and a satisfaction survey. The institutional evaluation examined the adequacy and thoroughness of the training planning and design by each regional government. It also assessed the level of participation, appropriateness of training implementation, publicity efforts, and effectiveness of the evaluation and feedback processes. Individual evaluations measured the extent to which trainees improved their knowledge and response capabilities before and after the training, as well as any changes in their attitudes toward crisis response. The satisfaction survey collected feedback from the trainees on their overall experience with the training program. For individual assessment, participants completed surveys before and after the training to measure their progress and evaluate the effectiveness of the training in enhancing their knowledge and preparedness.

Results

The 2024 training was conducted between July and September, following the individual schedules set by each provincial and municipal government. Sixteen metropolitan and provincial governments participated in the program. Notably, this was the first time training was conducted without financial support from the central government.

1. Training Topics

MERS training was conducted in three metropolitan municipalities, AI training in 11 metropolitan municipalities, and EVD training in two metropolitan municipalities.

2. Composition of Trainees

In total, 1,334 individuals from approximately 480 institutions participated in the training. Participating organizations included local governments (metropolitan and basic municipalities), regional infectious disease management centers, and related institutions and departments, such as quarantine stations, public health laboratories, the Animal and Plant Quarantine Agency, fire services, police, military, the Ministry of Justice, education offices, and medical institutions. The training evaluation involved the Emerging Infectious Disease Response Division of the KDCA and its Regional Disease Response Centers.

Of all the trainees, 759 completed both the pre- and post-training surveys, and 592 (78.0%) were women. Participants in their 30s accounted for the largest group 287 (37.8%), followed by those in their 40s (27.9%) and 50s (21.2%) (Table 2). By occupation, 475 (62.6%) trainees were staff from metropolitan municipalities and public health centers, followed by education (3.4%), diagnostic testing and firefighting (3.0%), and police service (2.4%). Participants from other occupations (22.4%) included personnel from medical institutions, animal quarantine, disaster management, and administrative and immigration departments (Table 2).

In terms of overall work experience, 479 participants (63%) had less than 2 years of experience, while 623 (82.1%) had less than 2 years of experience working in infectious diseases. In addition, 445 participants (58.6%) participated in this type of

Table 2. General characteristics of 2024 trainees

Category	Total (n=759)	Percentage (%)
Sex		
Male	167	22.0
Female	592	78.0
Age (yr)		
19–29	97	12.8
30–39	287	37.8
40–49	212	27.9
50–59	161	21.2
60+	2	0.3
Occupation		
Infectious disease response (city/province, health center)	475	62.6
Diagnostic testing	23	3.0
Quarantine	15	2.0
Education	26	3.4
Firefighting	23	3.0
Police	18	2.4
Military	9	1.2
Others ^{a)}	170	22.4

^{a)}Others include medical institutions, animal quarantine departments, disaster response departments, administrative departments, and immigration management departments.

training for the first time (Table 3).

3. Evaluation of Trainees' Knowledge Improvement Rate

To assess the trainees' knowledge acquisition, a multiple-choice questionnaire consisting of 10 questions, covering key concepts related to the three training scenarios on infectious diseases, was employed. Trainees responded to the same set of questions before and after the training to measure improvements in their knowledge. The overall knowledge improvement rate among all the trainees was 14.1%. When analyzed according to disease category, improvement rates were 10.9% for MERS, 11.1% for AI, and 37.0% for EVD. These results indicate that the trainees' understanding of each infectious

Table 3. Work experience of 2024 trainees

Category	Total (n=759)	Percentage (%)
Work experience at current institution (yr)		
<1	147	19.3
1–2	332	43.7
3–5	106	14.0
6–10	75	9.9
11–15	32	4.2
16–20	27	3.6
21+	40	5.3
Experience in infectious disease-related work (yr)		
None	95	12.5
<1	205	27.0
1–2	323	42.6
3–5	85	11.2
6–10	41	5.4
11–15	3	0.4
16–20	7	0.9
21+	0	0.0

disease topic improved after training (Table 4).

4. Evaluation of Trainee Satisfaction

Based on a 5-point scale, the average trainee satisfaction score was 4.5, indicating a high overall level of satisfaction with the training program.

5. Training Evaluation according to Metropolitan Municipality

The highest total score was recorded in Ulsan Metropolitan City with 104 points, whereas Daejeon Metropolitan City scored the lowest score in the second training session (60 points). The average score across 16 metropolitan municipalities was 93.2 points. However, as the evaluators and number of evaluators varied between municipalities, direct comparisons of scores among municipalities were not appropriate. Therefore, these scores were used for purposes only.

Table 4. Knowledge improvement rate assessment of 2024 trainees

Category	Total (n)	Average ^{a)}		Improvement rate (%) ^{b)}	p-value
		Pre-training	Post-training		
Overall	759	7.2±2.1	8.3±1.6	14.1	<0.001
Middle East respiratory syndrome	127	7.4±2.1	8.3±1.4	10.9	<0.001
Avian influenza	525	7.6±2.0	8.4±1.6	11.1	<0.001
Ebola virus disease	107	5.4±1.7	7.4±1.6	37.0	<0.001

^{a)}Mean score±standard deviation. ^{b)}Improvement rate (%): $\{(\text{post-training score} - \text{pre-training score}) / \text{pre-training score}\} \times 100$.

6. Suggestions for Training Improvement

The participants suggested several improvements, including extending the training schedule, providing budget support for training, developing scenarios tailored to related organizations, and allocating time to share experiences in the infectious disease response.

The evaluators provided additional feedback, such as the need to extend the time allocated for discussion-based training, improve strategies to increase survey participation rates, enhance the capabilities of team leaders, restructure lectures and scenarios to improve understanding among related organizations, and strengthen the ongoing capacity of metropolitan municipalities.

Discussion

Emerging and Re-emerging Infectious Disease Crisis Management Response Training is designed to enhance the ability of local governments (both metropolitan and municipal) to respond to public health emergencies. Additionally, the training serves as an opportunity to clarify and share the roles of relevant infectious disease response agencies within each province and municipality while also strengthening inter-agency cooperation.

The 2024 training program was the first to be conducted at

the provincial and municipal levels without any financial support from the central government. Overall, the training was successfully conducted and achieved the intended objectives. Several key insights and considerations emerged from this program.

1. Necessity for Stable and Continuous Annual Operation of the Emerging and Re-emerging Infectious Disease Crisis Management Training

By 2024, Emerging and Re-emerging Infectious Disease Crisis Management Training comprised 1,334 participants from approximately 480 institutions. This remains the only training program specifically designed to enhance the infectious disease response capabilities of local governments.

The 2024 training revealed that a high proportion of participants (82.1%) had less than 2 years of experience working in infectious disease-related roles, and 58.6% were participating in this training for the first time. Given the prevalence of low levels of work experience and the likelihood of frequent staff changes, it is essential to maintain consistent response capabilities through annual training sessions.

Furthermore, the current training curriculum, which includes lectures on infectious disease theory, exercise-based training to practice procedures based on guidelines, discussion-based training to coordinate with related organizations, and

practical sessions on donning and doffing PPE, must be continuously sustained to ensure preparedness.

2. Improvement Plans for Future Training Based on 2024 Results

As continuous capacity building at the frontline level is essential, securing a dedicated training budget is a prerequisite. However, as central government funding may not be available by 2025, it is crucial to prepare alternative measures. To alleviate the burden on local governments, training efficiency should be improved by selectively applying the evaluation criteria.

A key area for improvement is the simplification of the evaluation criteria. Currently, there are 16 main evaluation categories, each with detailed subitems. Rather than designing training primarily for evaluation purposes, the focus should shift toward assessing only the actual execution of training on the designated day. This approach would allow provincial and municipal training coordinators to streamline their preparation processes and focus more effectively on implementing practical training programs.

Furthermore, as highlighted in the feedback, it is essential to improve the training, allocate sufficient discussion time, and ensure effective interagency communication. Given the participation of numerous relevant institutions, new training scenarios should be developed to increase involvement. In addition to public health centers, which traditionally take the lead in responding to emerging infectious diseases, training should provide time for relevant agencies to discuss the anticipated challenges in their response efforts.

To strengthen interagency cooperation, changes should be made to the program to optimize discussion-based training sessions. Currently, participants engage in discussions on eight

key questions over approximately 90 minutes to develop response strategies. To enhance focus and engagement, the number of discussion points was reduced to six and discussion duration was adjusted to approximately 60 minutes. This change was aimed at creating a more structured and concentrated discussion format, allowing for more productive and in-depth exchanges between agencies.

Emerging infectious diseases require coordinated responses and collaboration among multiple relevant agencies. Therefore, the continuous implementation and improvement of Emerging and Re-Emerging Infectious Disease Crisis Management Response Training program is essential for strengthening the response capabilities of local governments. Moving forward, efforts will continue to ensure that training implementation, feedback collection, and the identification of vulnerabilities will contribute to refining future training programs. Additionally, local governments should be encouraged to actively reflect on training outcomes, incorporate identified weaknesses, and apply these insights to enhance the design and execution of the next year's training program.

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References

1. Lee SD, Lee HY. Exercise and evaluation of emerging infectious disease crisis response on local government. Korea Centers for Disease Control and Prevention; 2012.
2. Korea Disease Control and Prevention Agency (KDCA). 2024 report on the crisis management response training for emerging and re-emerging infectious disease. KDCA; 2024.