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2024년 충청남도 감염병 예방 교육 참여 초등학생의 감염병 교육 후 손씻기 인식 및 태도 변화

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초 록

목적: 충청남도감염병관리지원단은 지난 2024년 충청남도(충남) 내 초등학교 학생을 대상으로 감염병 예방 교육(사업명: 꿈나무 감염병 안심학교)을 수행하였다. 학교는 단체 생활로 감염병 유입 시 단시간 내 집단 발병할 수 있어 체계적인 감염병 예방·관리가 필요하다. 또한 백일해, 성홍열과 같은 호흡기 전파 감염병이 영유아 및 학령기 소아·청소년을 중심으로 크게 증가하고 있어 학생들에 대한 상시적인 감염병 예방 교육이 필요함에 따라 본 사업을 수행하게 되었다.

방법: 감염병 예방 교육은 2024년 5월부터 11월까지 약 7개월간 충남 내 초등학교 중 보건교사 미배치 학교이면서 전교생 50명 미만인 학교를 대상으로 교육참가 신청을 받아 총 15개 학교(학생 353명)가 참여하였다. 교육은 손씻기 및 기침예절 교육 및 학교 선택에 따라 감염병 전파 이해, 어린이 다빈도 감염병, 감염병 예방 퀴즈 중 1개를 선택하여 약 60분간 수행하였고 교육 성과를 파악하기 위해 학교별로 교육 전, 교육 후, 교육 3개월 후 손씻기 인식 및 태도를 파악하는 설문조사를 실시하였다.

결과: 조사결과 교육에 참여한 학생들의 손씻기 인식 및 태도(각각 0-100점)는 모두 교육 전(353명, 각각 85.7±17.3점, 85.2±21.2점)에 비해 교육 후 상승 추이를 보였고(353명, 각각 93.5±12.4점, 91.7±17.8점) 손씻기 인식은 교육전에 비해 교육 3개월 후(89.7±15.7점)에도 높은 추이를 보였다. 손씻기 인식은 태도에 비해 교육 후에 높은 추이를 보였다. 손씻기 인식과 태도는 성별, 학년에 따라 차이가 있었는데 손씻기 인식은 교육 전·후 여학생에서 남학생보다, 교육 후 고학년(4-6학년)이 저학년(1-3학년)보다 높았고 손씻기 태도는 교육 후 고학년(4-6학년)이 저학년(1-3학년)보다 높았다.

결론: 향후 초등학생 감염병 예방 교육은 성별, 학년 등 대상의 특성을 고려하여 정기적으로 수행되기를 기대한다.

주요 검색어: 감염병; 교육; 손위생; 학교

서 론

학교는 단체 생활로 감염병 유입 시 단시간 내 집단 발병할 수 있어 체계적인 감염병 예방·관리가 필요하다. 또한 백일해, 성홍열과 같은 호흡기 전파 감염병이 영유아 및 학령기 소아·청소년을 중심으로 크게 증가하고 있어[1] 학생들에 대

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핵심요약

① 이전에 알려진 내용은?

학교는 감염병 유입 시 단시간 내 집단 발병할 수 있고 백일해, 성홍열 같은 호흡기 전파 감염병이 영유아 및 학령기 소아·청소년을 중심으로 크게 증가하고 있어 학생 대상의 감염병 예방 교육이 필요하다.

② 새로이 알게 된 내용은?

2024년 충남 감염병 예방 교육에 참여한 초등학생들의 손씻기 인식 및 태도(각각 0–100점)는 교육 전에 비해 교육 후 상승하는 추이를 보였고 손씻기 인식은 교육 3개월 후에도 높았다. 손씻기 인식은 태도에 비해 교육 후에 높았다. 손씻기 인식과 태도는 성별, 학년에 따라 차이가 있었다.

③ 시사점은?

초등학생 대상 감염병 예방 교육은 손씻기 인식 및 태도를 개선하며 감염병 예방 교육은 대상의 특성을 고려하여 정기적으로 수행되어야 한다.

한 상시적인 감염병 예방 교육이 필요함에 따라 본 사업을 수행하게 되었다. 충청남도감염병관리지원단은 지난 2024년 충청남도(충남) 내 보건교사 미배치 학교(학교보건법 제15조 제2항에 따라 학생들의 보건교육과 학생들의 건강관리를 담당하는 보건교사를 두어야 하나 일정 규모 이하의 학교에는 순회 보건교사를 둘 수 있다.)이면서 학생 50인 이내 소규모 초등학교 학생을 대상으로 감염병 예방 교육(사업명: 꿈나무 감염병 안심학교)을 수행하였다. 이에 본 원고에서는 감염병 예방 교육 결과를 제시하고 결과 활용방안을 제안하였다.

방 법

1. 대상기관 선정

감염병 예방 교육은 2024년 5월부터 11월까지 약 7개월간 충남 내 초등학교 413개(2024년 3월 기준, 충남 교육청 자료 제공) 중 보건교사가 미배치된 학교 93개(22.5%) 중에서 전교생 50명 미만인 74개(17.9%) 학교를 대상으로 하였다[2]. 대상 학교에 사업소개 및 참여 요청 공문을 보내 참여를 희망한 15개 학교를 최종 대상기관으로 선정하였다.

2. 교육 프로그램 및 교육 효과 평가

1) 교육 프로그램

교육은 손씻기 및 기침예절 교육을 필수교육으로 하여 손씻기 교육 동영상 시청 및 아데노신 삼인산(adenosine triphosphate, ATP) 표면 검사 실습(3M Clean-Trace ATP 측정기를 이용하여 책상, 의자 등 환경 및 교육 참여 초등학생의 손 미생물 오염도 측정), 형광 로션을 이용한 손씻기 실습을 진행하였고, 선택 교육으로 감염병 전파 이해(호흡기 감염병, 수인성 및 식품 매개 감염병), 어린이 다빈도 감염병(수두, 유행성이하선염, 성홍열), 감염병 예방퀴즈 중 1건을 선택하여 60분 이내로 진행하였다. 교육은 전교생이 50인 미만이어서 강당 또는 교실에 전 학년이 모여 함께 진행하였다.

2) 손씻기 교육 효과 평가

교육 성과를 파악하기 위해 교육 참여 학생들에게 교육 전, 교육 후, 교육 3개월 후에 손씻기 인식(10개 문항) 및 태도(5개 문항) 설문조사를 수행하였다. 손씻기 인식 및 태도 설문 문항은 '감염병 예방을 위한 손씻기 실태조사 및 실천율 향상 전략개발' 연구용역과제(2013년 질병관리본부)에서 사용한 '손씻기 실태 및 대국민 인식도 조사(학생용)' 설문 문항 중 인식과 태도 문항(각각 16개, 6개 문항)을 간소화하여(각각 10개, 5개 문항) 작성하였다. 설문 응답은 '그렇다' 또는 '아니다'의 이분형(binary)으로 구성했다[3]. 설문은 각 학생이 자가기입하는 것으로 하였고, 저학년(1–3학년)의 경우 필요시 설문 문항을 읽어 주고 응답하게 하였다. 교육 전과 교육 후 손씻기 설문조사는 조사 참여 학교와 학생 전체에게 진행하였고 교육 3개월 후 손씻기 설문조사는 교육 참여 학교 중 참여를 희망하는 학교를 대상으로 손 모양 배지를 이용한 손 오염

균 확인 체험 교재를 제공하여 자체 운영하게 한 후 진행하였다. 설문도구의 내적 일관성을 확인하기 위해 교육 전 자료를 이용하여 Cronbach's alpha를 산출하였다. 분석한 결과, 손씻기 인식 문항(10문항)의 Cronbach's α는 0.72, 태도 문항(5문항)은 0.56이었다.

3. 통계 분석

통계 분석은 엑셀(Microsoft)과 통계프로그램 R (version 4.5.2; R Foundation for Statistical Computing)을 이용하였다. 교육 참여 초등학교와 초등학생 빈도(수, %)는 시·군, 충남 5개 권역별(천안권, 홍성권, 서산권, 공주권, 논산권)과 성별 및 학년군(1-3학년, 4-6학년)별로 제시하고 교육 전, 교육 후, 교육 3개월 후의 손씻기 인식 및 태도 변화는 손씻기 인식 10개 문항은 '그렇다'에 각 10점, '아니다'에 각 0점을 부여하고 손씻기 태도 5개 문항은 '그렇다'에 각 20점, '아니다'에 각 0점을 부여하여 각각 점수(0-100점)로 환산하였다. 각 점수는 평균±표준편차와 증감 %, 손씻기 인식 및 태도의 각 세부 문항은 '그렇다'로 응답한 %와 증감 %로 제시했다. 교육 참여자의 손씻기 인식 및 태도 변화는 성별, 학년군별, 시·군별 집단별 점수를 평균±표준편차로 제시하고 동일 시점에 그룹 간 비교는 독립표본 t-검정(independent samples t-test)을 하였고 교육 전, 교육 후, 교육 3개월 후의 변화는 개인 식별 정보를 취합하지 않아 독립표본간 일원분산분석(one-way ANOVA)을 실시하고 사후검정 하였다. 통계적 유의수준은 0.05 미만으로 하였고 평균 차이의 효과 크기 검정으로 코헨의 d 효과 크기(Cohen's d effect size)를 같이 제시하였다(d≤0.2, 작은 효과 크기; d=0.5, 중간 효과 크기[medium]; d≥0.8, 큰 효과 크기[large]).

표 1. 2024년 충청남도 감염병 예방교육 참여 초등학교 및 참여자 특성

구분			교육 및 교육 전, 후 손씻기 설문 참여(1단계)	1단계+교육 3개월 후 손씻기 설문 참여(2단계)
교육 참여 초등학교	전체		15 (100)	7 (100)
	시·군	시	8 (53.3)	2 (28.6)
		군	7 (46.7)	5 (71.4)
	권역	천안권역(천안, 아산)	4 (26.7)	1 (14.3)
		홍성권역(보령, 홍성, 예산, 청양)	5 (33.3)	3 (42.9)
		서산권역(서산, 당진, 태안)	1 (6.67)	1 (14.3)
		공주권역(공주, 부여)	2 (13.3)	0 (0.0)
		논산권역(논산, 계룡, 서천, 금산)	3 (20.0)	2 (28.5)
교육 참여 초등학생	전체		353 (100)	122 (100)
	성별	남	176 (49.9)	60 (49.2)
		여	177 (50.1)	62 (50.8)
	학년	1-3학년	167 (47.3)	53 (43.4)
		4-6학년	186 (52.7)	69 (56.6)
	시·군	시	219 (61.9)	24 (19.7)
		군	134 (38.1)	98 (80.3)
	권역	천안권역(천안, 아산)	133 (37.6)	11 (9.0)
		홍성권역(보령, 홍성, 예산, 청양)	74 (21.0)	39 (32.0)
		서산권역(서산, 당진, 태안)	13 (3.7)	13 (10.7)
		공주권역(공주, 부여)	50 (14.2)	0 (0.0)
		논산권역(논산, 계룡, 서천, 금산)	83 (23.5)	59 (48.3)

단위: 학교 수, 학생 수, (%).

결 과

1. 참여 학교 및 교육 참가자 특성

충남 내 보건교사가 미배치 된 전교생 50명 미만인 초등학교 74개 중 15개 학교에서 353명이 본 감염병 예방 교육에 참여했다. 학교 기준 시·군별로 각각 8개(53.3%), 7개(46.7%) 학교가 참여했고 충남 5개 권역 모두 참여했다. 참여 학생 기준으로 남자는 176명(49.9%), 여자는 177명(50.1%)이 참여했고 학년별로는 1-3학년이 167명(47.3%), 4-6학년이 186명(52.7%) 참여했다(표 1). 전체 사업 참여 학교 중 교육 3개월 후 손씻기 설문에도 참여한 학교는 15개 중 7개(46.7%)였고 참여 학생은 353명 중 122명(34.6%)이었다.

2. 학생 감염병 교육 사업 참여자의 교육 전, 후, 3개월 후 손씻기 인식 및 태도 변화

1) 손씻기 인식

감염병 안심학교에 참여한 초등학생들(353명)의 손씻기 인식(각각 0-100점)은 교육 전(353명, 85.7±17.3점)에 비해 교육 후(353명, 93.5±12.4점) 상승하는 추이를 보였고, 교육 3개월 후(122명, 89.7±15.7점)에도 교육 전에 비해 높은 추이를 보였다(표 2, 3, 그림 1). 코헨의 d 효과 크기(Cohen's d effect size)는 교육 전과 교육 후 비교 시 0.52 (중

표 2. 2024년 충청남도 감염병 예방교육 참여 초등학생의 손씻기 인식 및 태도 변화

구분		교육 전 (n=353)	교육 후 (n=353)	교육 후 증감 %[a]	교육 3개월 후(n=122)	3개월 후 증감 %[b]
손씻기 인식 (10개 문항)	지식 점수 환산(0-100점, 평균±표준편차)	85.7±17.3	93.5±12.4	9.10	89.7±15.7	-4.06
	1. 손씻기를 통해 손에 묻은 세균이 제거된다(%).	88.4	94.6	7.01	93.4	-1.27
	2. 손에 묻은 세균은 비누를 이용하여 깨끗이 씻으면 제거할 수 있다(%).	91.2	94.3	3.40	93.4	-0.95
	3. 손씻기는 흐르는 물로 실시하면 전염병 예방에 도움이 된다(%)	69.4	85.0	22.47	77.9	-8.35
	4. 손씻기를 자주하면 유행성 눈병을 예방하는 데 효과가 있다(%).	70.5	87.8	24.54	80.3	-8.54
	5. 손을 씻을 때는 손바닥, 손등, 깍지, 손가락과 손가락 사이, 손톱 밑을 반복하여 30초 이상 문질러 깨끗이 헹군다(%)	92.6	96.6	4.32	95.1	-1.55
	6. 손씻기는 화장실을 이용한 후 실시한다(%).	90.4	97.2	7.52	95.9	-1.34
	7. 손씻기는 식사 전에 실시한다(%).	93.8	98.0	4.48	95.9	-2.14
	8. 손씻기는 기침, 재채기, 코풀기 후 실시한다(%).	77.9	91.5	17.46	82.8	-9.51
	9. 손씻기는 외출에서 돌아오면 실시한다(%).	92.6	95.2	2.81	93.4	-1.89
	10. 손씻기는 학교에서 체육이나 바깥활동을 한 후 실시한다(%).	89.8	95.2	6.01	88.5	-7.04
손씻기 태도 (5개 문항)	태도 점수 환산(0-100점, 평균±표준편차)	85.2±21.2	91.6±17.8	7.51	88.6±19.2	-3.28
	1. 손씻기는 병에 걸리지 않게 하는 데 도움이 된다(%).	91.2	95.5	4.71	91.8	-3.87
	2. 감염병 예방을 위해서는 자주 손을 씻어야 한다(%).	92.1	94.1	2.17	96.7	2.76
	3. 손씻기 후에는 손을 완전히 말려야 한다(%).	66.6	85.8	28.82	73.0	-14.91
	4. 손씻기는 어린 시절부터 습관을 들여야 한다(%).	88.7	93.2	5.07	91.8	-1.50
	5. 손은 눈으로 보기에 더럽지 않아도 씻도록 한다(%).	87.3	89.8	2.86	89.3	-0.56

단위: 점수(0-100), %. [a][(교육 후-교육 전)/교육 전]×100 (%), [b][(교육 3개월 후-교육 후)/교육 후]×100 (%).

표 3. 2024년 충청남도 감염병 예방교육 참여 초등학생 특성별 손씻기 인식 및 태도 변화

구분			학생 수 (3개월 후)	교육 전(1) 손씻기 점수	교육 후(2) 손씻기 점수	교육 3개월 후(3) 손씻기 점수	p-value[c]	사후검정[d]
				(평균±표준편차)				
손씻기 인식 점수	전체		353 (122)	85.7±17.3	93.5±12.4	89.7±15.7	<0.001	(1)→(2) (1)→(3)
	성별	남	176 (60)	83.1±18.6	92.0±14.5	88.5±12.3	<0.001	(1)→(2) (1)→(3)
		여	177 (62)	88.3±15.5	95.1±9.54	90.8±18.4	<0.001	(1)→(2)
	p-value[a]			0.01	0.02	0.42		
	학년	1-3학년	167 (53)	84.0±18.4	91.5±13.1	89.1±12.9	<0.001	(1)→(2)
		4-6학년	186 (69)	87.2±16.1	95.4±11.4	90.1±17.6	<0.001	(1)→(2) (2)→(3)
	p-value[a]			0.09	0.00	0.69		
	시·군	시	219 (24)	86.4±17.5	93.4±12.9	91.3±16.2	<0.001	(1)→(2)
		군	134 (98)	84.5±16.8	93.8±11.5	89.3±15.6	<0.001	(1)→(2) (1)→(3)
	p-value[a]			0.31	0.75	0.60		
손씻기 태도 점수	전체		353 (122)	85.2±21.2	91.7±17.8	88.5±19.2	<0.001	(1)→(2)
	p-value[b]			0.59	0.01	0.43		
	성별	남	176 (60)	83.1±23.5	90.0±21.2	89.7±16.3	0.01	(1)→(2)
		여	177 (62)	87.2±18.5	93.3±13.4	87.4±21.8	<0.001	(1)→(2)
	p-value[a]			0.07	0.08	0.52		
	학년	1-3학년	167 (53)	82.9±22.8	89.5±19.4	89.1±18.2	0.01	(1)→(2)
		4-6학년	186 (69)	87.2±19.4	93.7±16.0	88.1±20.1	<0.001	(1)→(2)
	p-value[a]			0.06	0.03	0.79		
	시·군	시	219 (24)	85.4±22.2	92.1±18.1	89.2±16.7	<0.001	(1)→(2)
		군	134 (98)	84.8±19.5	91.0±17.3	88.4±19.9	0.03	(1)→(2)
	p-value[a]			0.79	0.60	0.84		

단위: 학생 수, 점수(0-100). [a]p-value는 독립표본 t-검정(independent samples t-test), [b]p-value는 손씻기 인식점수와 태도점수 간 독립표본 t-검정, [c]p-value는 독립표본 간 일원분산분석(one-way ANOVA)을 실시함. [d]사후검정은 Scheffé로 실시하였으며 p-value 0.05 미만으로 통계적으로 유의한 결과만 제시함.

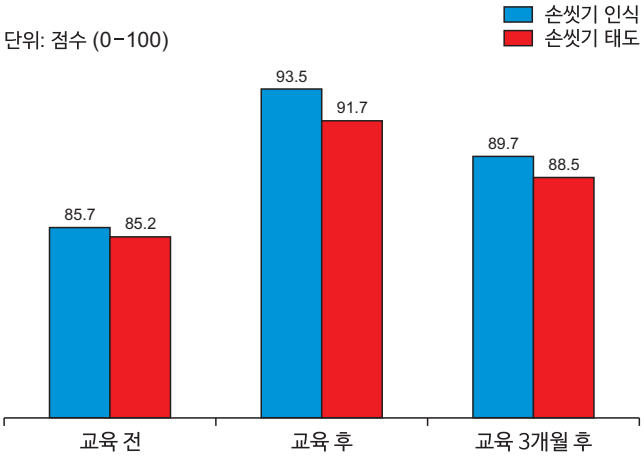

그림 1. 2024년 충청남도 감염병 예방교육 참여 초등학생의 손씻기 인식 및 태도 변화

간) 효과 크기를, 교육 전과 교육 3개월 후 비교 시 0.24 (작은) 효과 크기를, 교육 후와 교육 3개월 후 비교 시 −0.29 (작은, 교육 후가 더 큼) 효과 크기를 보였다. 손씻기 인식 정도는 성별, 학년군별, 시·군별 모두 교육 전에 비해 교육 후 높았고 남학생, 군 지역에서는 교육 3개월 후에도 교육 전에 비해 높았다(표 2, 3, 그림 2). 손씻기 인식 세부 문항(10개)별 인식 정도는 교육 후 10개 문항 모두 증가했고 교육 3개월 후에는 세부 문항(10개) 모두 인식 정도가 감소했다(표 2). 손씻기 인식은 태도에 비해 교육 전, 교육 후, 교육 3개월 후 지속적으로 높았으나 교육 후에만 유의했다(표 3, 그림 1). 성별로

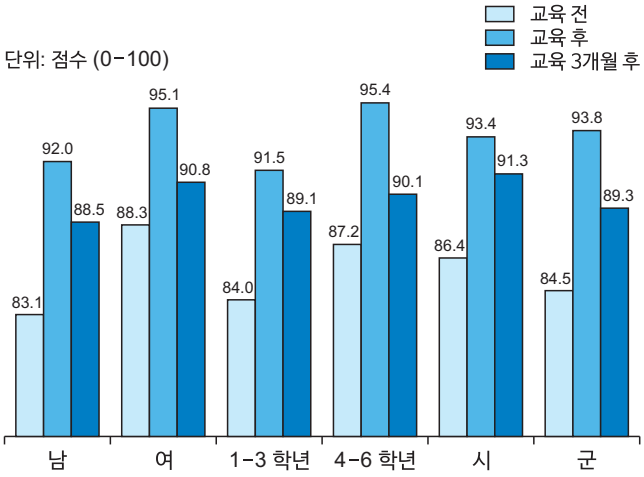

그림 2. 2024년 충청남도 감염병 예방교육 참여 초등학생 특성별 손씻기 인식 변화

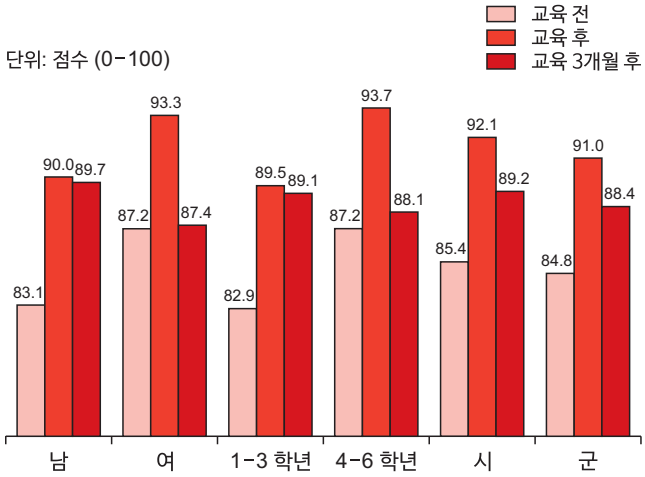

그림 3. 2024년 충청남도 감염병 예방교육 참여 초등학생 특성별 손씻기 태도 변화

는 교육 전, 교육 후 모두 여학생에서 손씻기 인식이 남학생보다 높았다(교육 전 남, 여 각각 83.1±18.6점, 88.3±15.5점; 교육 후 남, 여 각각 92.0±14.5점, 95.1±9.54점). 학년별로는 교육 후 고학년(4-6학년)에서 저학년(1-3학년)보다 손씻기 인식이 높았다(저학년 91.5±13.1점, 고학년 95.4±11.4점) (표 3, 그림 2).

2) 손씻기 태도

감염병 예방 교육에 참여한 초등학생들(353명)의 손씻기 태도(각각 0-100점)는 교육 전(353명, 85.2±21.2점)에 비해 교육 후 상승하는 추이를 보였다(353명, 91.7±17.8점) (표 2, 3, 그림 1). 코헨의 d 효과 크기(Cohen's d effect size)는 교육 전과 교육 후 비교 시 0.33 (중간) 효과 크기를, 교육 전과 교육 3개월 후 비교 시 0.16 (작은) 효과 크기를, 교육 후와 교육 3개월 후 비교 시 -0.18 (작은, 교육 후가 더 큼) 효과 크기를 보였다. 손씻기 태도는 성별, 학년군별, 시·군별 모두 교육 전에 비해 교육 후 높았다(표 3, 그림 3). 손씻기 태도 세부 문항(5개)별 태도 정도는 교육 후 5개 문항 모두 증가했고 교육 3개월 후에는 세부 문항(5개) 중 4개 문항은 태도 정도가 감소했으나 '감염병 예방을 위해서는 자주 손을 씻어야 한다'는 문항은 교육 3개월 후에도 증가하였다(교육 전 92.1%, 교육 후 94.1%, 교육 3개월 후 96.7%) (표 2). 학년별로는 교육 후 고학년(4-6학년)에서 저학년(1-3학년)보다 손씻기 태도 점수가 높았다(저학년 89.5±19.4점, 고학년 93.7±16.0점).

결 론

충남감염병관리지원단은 지난 2024년 충남 내 보건교사 미배치 학교이면서 전교생 50명 미만인 15개 초등학교 학생(353명)을 대상으로 감염병 예방 교육을 수행하였다. 교육 성과를 파악하기 위해 교육 전, 교육 후, 교육 3개월 후 손씻기 인식 및 태도를 파악하는 설문조사를 실시하였고 조사결과 교육 후 학생들의 손씻기 인식 및 태도는 교육 전에 비해 모두 상승하는 추이를 보였고 손씻기 인식은 교육 3개월 후에도 교육 전에 비해 높았다. 손씻기 인식은 태도에 비해 교육 후 높은 추이를 보였고 선행 연구에서도 본 연구 결과와 같이 손씻기 인식이 태도에 비해 높았는데[4,5] 이는 보건 행동 변화의 이론적 틀인 지식(knowledge)→태도(attitude)→행동(practice) 모형으로 설명할 수 있으며 보건 지식은 교육을 통해 단기간에 습득할 수 있는 반면 태도는 개인의 행동 습관 및 신념과 관련되어 있어 변화에 더 많은 시간과 반복적인 교육이 필요할 것으로 판단된다. 또한 손씻기 인식과 태도는 여학생에서

남학생보다, 고학년(4-6학년)에서 저학년(1-3학년)보다 높았는데 이는 선행 연구[4,6]의 손씻기 지식과 태도, 실천이 여성에서 더 높았던 결과와 일관된 것으로 여학생이 개인위생과 건강행동에 대한 관심과 실천 수준이 높은 경향과 관련한 것으로 판단된다. 또한 고학년에서 손씻기 인식과 태도가 높은 것은 인지발달 수준과 감염병 예방 중요성에 대한 이해 수준과 관련되는 것으로 판단된다.

본 연구 디자인의 제한으로 개인별 전, 후를 비교하지 못하고 집단수준에서의 전, 후를 비교한 것과 교육 3개월 후 조사 참여자가 353명에서 122명으로 감소하여 참가자의 선택편향(selection bias)이 있어 확정적인 결과보다는 탐색적 결과로 의미를 제한하여 해석할 수 있다. 또한 통계분석 결과는 개인을 식별할 수는 없으나 반복 측정된 데이터여서 통계적 독립성 가정을 위반하여 통계적으로 결과를 확정하는 것은 제한적이다. 본 조사는 충남 내 보건교사 미배치 학교이면서 전교생 50명 미만인 학교를 대상으로 하였으므로 충남 초등학교 전체를 대표할 수는 없다. 또한 보건교사 미배치 학교를 우선관리 대상으로 교육 대상으로 하였으나 보건교사가 배치된 학교에 비해 어떤 특징을 가졌는지는 이후 후속 사업에서 보건교사가 배치된 학교도 포함하여 보건교사 배치 여부, 학교 규모에 따른 차이 등도 파악하고자 한다. 또한 설문지의 내적 일관성을 확인하기 위한 신뢰도 지수(Cronbach's alpha)가 손씻기 인식문항(10개)은 0.72로 내적 일관성을 확보하였으나 손씻기 태도문항(5개)은 0.56으로 향후 손씻기 태도 문항에 대한 추가적인 보완 개발이 필요하다.

본 조사 결과 감염병 예방 교육 후에 손씻기 인식 및 태도가 개선되는 추이를 보였고 손씻기 인식 및 태도는 성별과 학년에 따라 차이가 있는 것으로 보였다. 이에 향후 학생 대상 감염병 예방 교육 시 학년, 성별 등을 고려한 맞춤형 교육과 교육의 효과 유지 기간을 고려한 정기적인 학생 감염병 예방 관리 교육이 진행되기를 기대한다.

Declarations

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Conflict of Interest: The authors have no conflicts of interest to declare.

Author Contributions: Conceptualization: JAL, DHH, OHC. Data curation: JAL, DHH, SOW, SJK. Formal analysis: JAL, DHH. Investigation: JAL, DHH, SOW, SJK. Methodology: JAL, DHH, OHC. Project administration: JAL, DHH, SOW, SJK. Resources: DHH. Software: JAL, DHH. Supervision: JAL, DHH. Writing – original draft: JAL, DHH. Writing – review & editing: JAL, OHC.

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Original Article

Impact of Infectious Disease Prevention Education Program on Hand Hygiene Awareness and Attitudes in Elementary School Students in Chungnam Province, Korea (2024)

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ABSTRACT

Objectives: In 2024, the Chungnam Center for Infectious Diseases Control and Prevention implemented an infectious disease prevention education program for elementary school students in Chungnam Province, the Republic of Korea. The program, titled Dream Tree Infectious Disease Safe School, was conducted between May and November 2024.

Methods: Fifteen elementary schools without school nurses and with fewer than 50 students participated, totaling 353 students. To evaluate the program effectiveness, surveys assessing handwashing awareness and attitudes were administered before, immediately after, and three months following the education session.

Results: Awareness and attitudes were scored on a scale of 0 to 100. Both handwashing awareness and attitudes improved after the educational intervention compared with baseline levels. The mean awareness score increased from 85.7±17.3 before education to 93.5±12.4 after education. Similarly, the mean attitude score increased from 85.2±21.2 to 91.7±17.8 after the intervention. Three months after the education, handwashing awareness remained above the pre-education level (89.7±15.7). Overall, awareness scores exceeded attitude scores after the program. Differences were also observed by student characteristics. Female students demonstrated higher awareness scores than male students both before and after education. Students in upper grades (grades 4–6) showed higher awareness and attitude scores than lower grades students (grades 1–3) after education.

Conclusions: These findings suggest that infectious disease prevention education can effectively improve handwashing awareness and attitudes among elementary school students. The results highlight the importance of providing regular, tailored infectious disease prevention education that considers student gender and grade level.

Key words: Communicable diseases; Education; Hand hygiene; Schools

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Introduction

Schools are collective environments where the introduction of infectious diseases can lead to group outbreaks within a short period. Therefore, systematic prevention and management of infectious diseases are crucial in these environments.

Key messages

① What is known previously?

Schools are high-risk settings for rapid infectious disease transmission due to close students contact. Recently, respiratory infections such as pertussis and scarlet fever have increased among school-aged children, highlighting the importance of infection prevention education in school settings.

② What new information is presented?

This study demonstrated that an infectious disease prevention education program improved handwashing awareness and attitudes among elementary school students. Handwashing awareness remained higher three months after the intervention than at baseline, and exceeded attitude scores after education. Differences in awareness and attitudes were also observed according to sex and grade level.

③ What are implications?

The findings indicate that infection prevention education can effectively improve handwashing awareness and attitudes among elementary school students. These outcomes support the regular implementation of such programs in schools, considering student characteristics.

In addition, the incidence of respiratory infectious diseases, such as pertussis and scarlet fever, has been increasing markedly, particularly among infants, school-aged children, and adolescents [1]. Accordingly, continuous infectious disease prevention education for students has become necessary, which led to the implementation of this project. In 2024, the Chungnam Center for Infectious Diseases Control and Prevention (CNCIDC) conducted an infectious disease prevention education program (Title: Dream Tree Infectious Disease Safe School), targeting elementary school students at small schools with fewer than 50 students in the Chungnam Province, where no school nurse was assigned. (According to Article 15(2) of the School Health Act, schools are required to appoint a school nurse responsible for student health education and management, but schools below a certain size may instead be served by a visiting school nurse.) Thus, this article presents the results of the infectious disease prevention education at such small schools and proposes ways to utilize those results effectively.

Methods

1. Selection of Target Institutions

The infectious disease prevention education was conducted for approximately seven months, from May 2024 to November 2024. Among 413 elementary schools in Chungnam Province (as of March 2024; data provided by the Chungnam Office of Education), 93 schools (22.5%) did not have an assigned school nurse. Among these, 74 schools (17.9%) with fewer than 50 students were selected as the target schools [2]. Official letters introducing the project and requesting participation were sent to the target schools, and 15 schools that expressed willingness to participate were finally selected as the participating institutions.

2. Education Program and Evaluation of Its Effects

1) Education program

The education program included mandatory instruction on handwashing and cough etiquette. The program consisted of viewing a handwashing education video, conducting an adenosine triphosphate (ATP) surface test practice (measuring microbial contamination on environmental surfaces such as

desks and chairs and on the hands of participating elementary school students using a 3M Clean-Trace ATP measuring device), and practicing handwashing using fluorescent lotion. As optional education, one topic was selected from the following: understanding the transmission of infectious diseases (respiratory, waterborne, and foodborne infectious diseases), common infectious diseases among children (varicella, mumps, and scarlet fever), and an infectious disease prevention quiz. Each education session was conducted within 60 minutes. Since the total number of students in each school was fewer than 50, the educational sessions were conducted with all grade levels gathered together in the auditorium or a classroom.

2) Evaluation of the effects of handwashing education

To assess the outcomes of the education, a survey on handwashing awareness (ten items) and attitudes (five items) was administered to participating students before the education, immediately after the education, and 3 months after the education. The handwashing awareness and attitude survey items were developed by simplifying the awareness and attitude items (16 and six items, respectively) from the questionnaire "Survey on Handwashing Practices and Public Awareness (Student Version)" used in the research project "Survey on Handwashing Practices and Development of Strategies to Improve Handwashing Compliance for Infectious Disease Prevention" (Korea Centers for Disease Control and Prevention, 2013) to ten and five items, respectively. Survey responses were structured as binary responses ("yes" or "no") [3]. The survey was self-administered by each student. For lower-grade students (grades 1–3), the survey items were read aloud, when necessary, to obtain responses. The handwashing surveys conducted before and after the education were administered to all participating schools and students. The handwashing survey was conducted 3 months after the education targeted schools that had received the education and had voluntarily agreed to participate. For these schools, experiential teaching materials using hand-shaped badges to check bacterial contamination on hands were provided so that the activity could be conducted independently prior to administering the survey. To verify the internal consistency of the survey instrument, Cronbach's alpha was calculated using the pre-education data. The results showed that Cronbach's alpha values for the handwashing awareness (ten items) and attitude items (five items) were 0.72 and 0.56, respectively.

3. Statistical Analysis

Statistical analyses were conducted using Excel (Microsoft) and the statistical program R (version 4.5.2; R Foundation for Statistical Computing). The frequencies (number, %) of elementary schools and students participating in the education were presented by city/county, by the five regions of Chungnam Province (Cheonan area, Hongseong area, Seosan area, Gongju area, and Nonsan area), and by sex and grade group (grades 1–3 and grades 4–6). Changes in handwashing awareness and attitudes before the education, immediately after the education, and 3 months after the education were calculated by assigning ten points to "yes" and zero point to "no" for each of the ten handwashing awareness items and assigning 20 points to "yes" and zero point to "no" for each of the five handwashing attitude items, and converting the scores to a scale ranging from 0 to 100 points. Each score was presented as mean±standard deviation and percent change (%). For each item, the percentage (%) of respondents answering "yes" and the percent change (%) were recorded. Changes in

handwashing awareness and attitudes among education participants were presented as mean±standard deviation by sex, grade group, and city/county groups. Comparisons between groups at the same time point were performed using an independent samples t-test. Because personal identification information was not collected, changes across the three time points (before the education, immediately after the education, and 3 months after the education) were analyzed using one-way analysis of variance for independent samples, followed by post hoc tests. The level of statistical significance was set at less than 0.05. In addition, Cohen's d effect size was presented as a measure of the effect size of mean differences (d≤0.2, small effect size; d=0.5, medium effect size; and d≥0.8, large effect size).

Results

1. Characteristics of Participating Schools and Education Participants

Among the 74 elementary schools in Chungnam Province with fewer than 50 students and without an assigned school

Table 1. Characteristics of elementary schools and students participating in the 2024 infectious disease education program in Chungnam Province, the Republic of Korea

Category			Participation in the pre- and post-handwashing survey (Step 1)	Step 1+Participation in the handwashing survey 3 months after (Step 2)
Participating elementary schools	All		15 (100)	7 (100)
	City county	City	8 (53.3)	2 (28.6)
		County	7 (46.7)	5 (71.4)
	Area	Cheonan area (Cheonan, Asan)	4 (26.7)	1 (14.3)
		Hongseong area (Boryeong, Hongseong, Yesan, Cheongyang)	5 (33.3)	3 (42.9)
		Seosan area (Seosan, Dangjin, Taean)	1 (6.67)	1 (14.3)
		Gongju area (Gongju, Buyeo)	2 (13.3)	0 (0.0)
		Nonsan area (Nonsan, Gyeryong, Seocheon, Geumsan)	3 (20.0)	2 (28.5)
Participating elementary students	All		353 (100)	122 (100)
	Sex	Male	176 (49.9)	60 (49.2)
		Female	177 (50.1)	62 (50.8)
	Grades	Grades 1–3	167 (47.3)	53 (43.4)
		Grades 4–6	186 (52.7)	69 (56.6)
	City county	City	219 (61.9)	24 (19.7)
		County	134 (38.1)	98 (80.3)
	Area	Cheonan area (Cheonan, Asan)	133 (37.6)	11 (9.0)
		Hongseong area (Boryeong, Hongseong, Yesan, Cheongyang)	74 (21.0)	39 (32.0)
		Seosan area (Seosan, Dangjin, Taean)	13 (3.7)	13 (10.7)
		Gongju area (Gongju, Buyeo)	50 (14.2)	0 (0.0)
		Nonsan area (Nonsan, Gyeryong, Seocheon, Geumsan)	83 (23.5)	59 (48.3)

Unit: number of schools, number of students (%).

Table 2. Changes in handwashing awareness and attitudes among participants in the 2024 infectious disease education program in Chungnam Province, the Republic of Korea

Category		Before education (n=353)	After education (n=353)	% Change after education[a]	After 3 months (n=122)	% Change after 3 months of education[b]
Handwashing awareness questions (10 items)	Knowledge points conversion (0–100 points, mean±SD)	85.7±17.3	93.5±12.4	9.10	89.7±15.7	-4.06
	1. Germs on the hands are removed through handwashing (%).	88.4	94.6	7.01	93.4	-1.27
	2. Germs on the hands can be removed by washing thoroughly with soap (%).	91.2	94.3	3.40	93.4	-0.95
	3. Washing hands with running water helps prevent infectious diseases (%).	69.4	85.0	22.47	77.9	-8.35
	4. Frequent handwashing is effective in preventing epidemic conjunctivitis (%).	70.5	87.8	24.54	80.3	-8.54
	5. When washing hands, the palms, backs of the hands, interlaced fingers, spaces between fingers, and under the fingernails should be rubbed for at least 30 seconds and rinsed thoroughly (%).	92.6	96.6	4.32	95.1	-1.55
	6. Handwashing should be performed after using the restroom (%).	90.4	97.2	7.52	95.9	-1.34
	7. Handwashing should be performed before meals (%).	93.8	98.0	4.48	95.9	-2.14
	8. Handwashing should be performed after coughing, sneezing, or blowing one's nose (%).	77.9	91.5	17.46	82.8	-9.51
	9. Handwashing should be performed after returning from the outside (%).	92.6	95.2	2.81	93.4	-1.89
	10. Handwashing should be performed after physical education classes or outdoor activities at school (%).	89.8	95.2	6.01	88.5	-7.04
Handwashing attitudes questions (5 items)	Attitudes points conversion (0–100 points, mean±SD)	85.2±21.2	91.7±17.8	7.51	88.6±19.2	-3.28
	1. Handwashing helps prevent illness (%).	91.2	95.5	4.71	91.8	-3.87
	2. Hands should be washed frequently to prevent infectious diseases (%).	92.1	94.1	2.17	96.7	2.76
	3. Hands should be dried completely after handwashing (%).	66.6	85.8	28.82	73.0	-14.91
	4. Handwashing should be established as a habit from an early age (%).	88.7	93.2	5.07	91.8	-1.50
	5. Hands should be washed even if they do not appear dirty (%).	87.3	89.8	2.86	89.3	-0.56

Unit: points (0–100), %. [a]% Change calculated as [(After education−Before education)/Before education]×100 (%). [b][(After 3 months of education−After education)/After education]×100 (%).

nurse, 15 schools and 353 students participated in this infectious disease prevention education program. At the school level, eight schools (53.3%) from cities and seven schools (46.7%) from counties participated, and schools from all five regions of Chungnam were represented. Among the participating students, 176 were male (49.9%), and 177 were female (50.1%). By grade group, 167 students were in grades 1–3 (47.3%) and 186 were in grades 4–6 (52.7%) (Table 1). Seven of the 15 schools (46.7%) also participated in the handwashing survey conducted 3 months after the education, and 122 of the 353 students (34.6%) participated in the follow-up survey.

2. Changes in Handwashing Awareness and Attitudes Before, After, and 3 Months after the

Table 3. Changes in handwashing awareness and attitudes by participant characteristics in the 2024 infectious disease education program in Chungnam Province, the Republic of Korea

Category			Number of students (after 3 months)	Before education (1) handwashing points	After education (2) handwashing points	After 3 months of education (3) handwashing points	p-value[c]	Post hoc test[d]
				(Mean±SD)				
Handwashing awareness points	All		353 (122)	85.7±17.3	93.5±12.4	89.7±15.7	<0.001	(1)→(2) (1)→(3)
	Sex	Male	176 (60)	83.1±18.6	92.0±14.5	88.5±12.3	<0.001	(1)→(2) (1)→(3)
		Female	177 (62)	88.3±15.5	95.1±9.54	90.8±18.4	<0.001	(1)→(2)
	p-value[a]			0.01	0.02	0.42		
	Grades	Grades 1–3	167 (53)	84.0±18.4	91.5±13.1	89.1±12.9	<0.001	(1)→(2)
		Grades 4–6	186 (69)	87.2±16.1	95.4±11.4	90.1±17.6	<0.001	(1)→(2) (2)→(3)
	p-value[a]			0.09	0.00	0.69		
	City county	City	219 (24)	86.4±17.5	93.4±12.9	91.3±16.2	<0.001	(1)→(2)
		County	134 (98)	84.5±16.8	93.8±11.5	89.3±15.6	<0.001	(1)→(2) (1)→(3)
	p-value[a]			0.31	0.75	0.60		
Handwashing attitudes points	All		353 (122)	85.2±21.2	91.7±17.8	88.5±19.2	<0.001	(1)→(2)
	p-value[b]			0.59	0.01	0.43		
	Sex	Male	176 (60)	83.1±23.5	90.0±21.2	89.7±16.3	0.01	(1)→(2)
		Female	177 (62)	87.2±18.5	93.3±13.4	87.4±21.8	<0.001	(1)→(2)
	p-value[a]			0.07	0.08	0.52		
	Grades	Grades 1–3	167 (53)	82.9±22.8	89.5±19.4	89.1±18.2	0.01	(1)→(2)
		Grades 4–6	186 (69)	87.2±19.4	93.7±16.0	88.1±20.1	<0.001	(1)→(2)
	p-value[a]			0.06	0.03	0.79		
	City county	City	219 (24)	85.4±22.2	92.1±18.1	89.2±16.7	<0.001	(1)→(2)
		County	134 (98)	84.8±19.5	91.0±17.3	88.4±19.9	0.03	(1)→(2)
	p-value[a]			0.79	0.60	0.84		

Unit: number of students, points (0–100). [a]p-values were derived from independent sample t-tests, [b]p-values were derived from independent sample t-tests comparing handwashing awareness and attitude scores, and [c]p-values were derived from one-way ANOVA. [d]Post hoc analyses were performed using the Scheffé method, and only statistically significant results ($p<0.05$) are presented.

Education among Participants in the Student Infectious Disease Education Program

1) Handwashing awareness

Handwashing awareness (0–100 points) among elementary school students (n=353) who participated in the Infectious Disease Safe School program showed an increasing trend after the education (353 students, 93.5±12.4) compared with before the education (353 students, 85.7±17.3). Three months after the education (122 students, 89.7±15.7), awareness levels remained higher than before the education (Tables 2, 3, Figure 1). Cohen's d effect size was 0.52 (medium effect size), 0.24 (small effect size), and −0.29 (small effect size; higher after the education) when comparing before and after the education, before and 3 months after the education, and after and 3 months after the education, respectively. The level of handwashing awareness was higher after the education than before the education across sex, grade group, and city/county groups. Among male students and students in county areas, handwashing awareness remained higher even 3 months after the education compared to before the education (Tables 2, 3, Figure 2). For the ten individual items measuring handwashing awareness, awareness increased across all items after the education. However, 3 months after the education, awareness decreased across all ten items (Table 2). Handwashing awareness scores were consistently higher than attitude scores before, after, and 3 months after the education; however, the difference was significant only after the education (Table 3, Figure

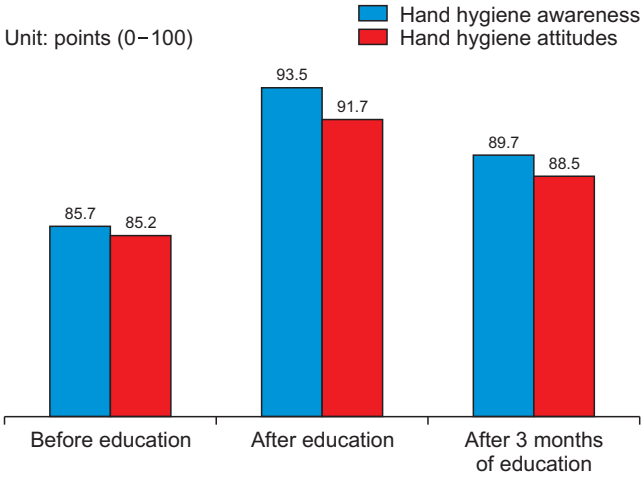

Figure 1. Changes in handwashing awareness and attitudes among participants in the 2024 infectious disease education program in Chungnam Province, the Republic of Korea

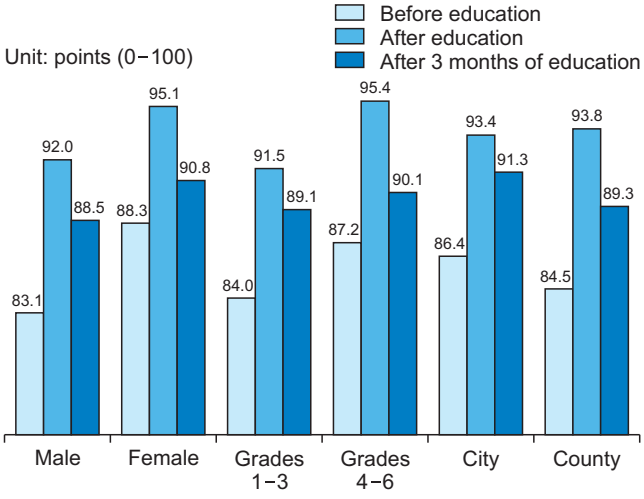

Figure 2. Changes in handwashing awareness by participant characteristics in the 2024 infectious disease education program in Chungnam Province, the Republic of Korea

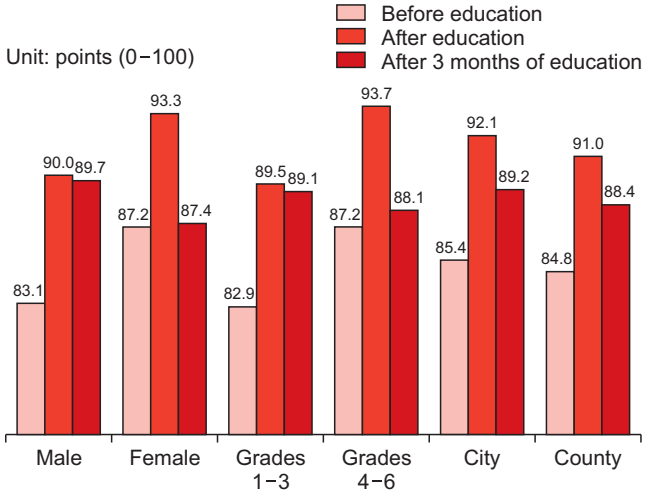

Figure 3. Changes in handwashing attitudes by participant characteristics in the 2024 infectious disease education program in Chungnam Province, the Republic of Korea

1). By sex, handwashing awareness was higher among females than males both before and after the education (before the education: males 83.1±18.6, females 88.3±15.5; after the education: males 92.0±14.5, females 95.1±9.54). By grade group, handwashing awareness after the education was higher among upper-grade students (grades 4–6) than among lower-grade students (grades 1–3) (lower grades: 91.5±13.1; upper grades: 95.4±11.4) (Table 3, Figure 2).

2) Handwashing attitudes

Handwashing attitudes (0–100 points) among elementary school students (n = 353) who participated in the infectious disease prevention education showed an increasing trend after the education (353 students, 91.7±17.8) compared with before the education (353 students, 85.2±21.2) (Tables 2, 3, Figure 1). Cohen's d effect size was 0.33 (medium effect size) when comparing before and after the education, 0.16 (small effect size) when comparing before the education and 3 months after the education, and –0.18 (small effect size; higher after the education) when comparing after the education and 3 months after the education. Handwashing attitudes were higher after the education than before the education across sex, grade group, and city/county groups (Table 3, Figure 3). For the five individual items measuring handwashing attitudes, attitudes increased for all five items after the education. Three months after the education, attitudes decreased for four of the five items; however, the item "Hands should be washed frequently to prevent infectious diseases" continued to increase even 3 months after the education (92.1%, 94.1%, and 96.7% before, after, and 3 months after the education, respectively) (Table 2). By grade group, handwashing attitude scores after the education were higher among upper-grade students (grades 4–6) than among lower-grade students (grades 1–3) (lower grades 89.5±19.4; upper grades 93.7±16.0).

Conclusion

In 2024, the CNCIDC conducted infectious disease prevention education for 353 students from 15 elementary schools in Chungnam Province that had no assigned school nurse and had fewer than 50 students. To assess educational outcomes, surveys measuring handwashing awareness and attitudes were conducted before, immediately after, and 3 months after the education. The results showed that students' handwashing awareness and attitudes both increased after the education compared with before the education, and handwashing awareness remained higher than before the education even 3 months after the education. Handwashing awareness showed a higher trend than attitudes after the education. Previous studies have similarly reported higher levels of handwashing awareness than attitudes [4,5]. This finding can be explained by the knowledge→attitude→practice model, a theoretical framework for health behavior change. While health knowledge can be acquired relatively quickly through education, attitudes are related to individuals' behavioral habits and beliefs and therefore require more time and repeated education to change. In addition, handwashing awareness and attitudes were higher among female students than male students and higher among upper-grade students (grades 4–6) than lower-grade students (grades 1–3). This finding was consistent with previous studies reporting that handwashing knowledge, attitudes, and practices were higher among females [4,6]. This finding might be attributed to the tendency for female students to demonstrate higher levels of interest in and practice of personal hygiene and health

behaviors. The higher levels of handwashing awareness and attitudes among upper-grade students might also be associated with more advanced cognitive development and a greater understanding of the importance of infectious disease prevention.

Due to limitations in the study design, individual-level before–after comparisons could not be performed, and comparisons were conducted at the group level. In addition, the number of participants in the survey 3 months after the education decreased from 353 to 122, introducing potential selection bias. Therefore, the results should be interpreted as exploratory rather than definitive findings. Furthermore, although individuals could not be identified in the statistical analysis, the data involved repeated measurements, which might violate the statistical assumption of independence and therefore limit the ability to statistically confirm the results. Since this survey targeted schools in the Chungnam Province without an assigned school nurse and with fewer than 50 students, the findings cannot be considered representative of all elementary schools in Chungnam. Although schools without an assigned school nurse were prioritized as target institutions for this education program, future follow-up projects will include schools with assigned school nurses in order to examine differences based on the presence of a school nurse, school size, and other related factors. In addition, the reliability index (Cronbach's alpha) used to assess the internal consistency of the questionnaire was 0.72 for the handwashing awareness items (ten items), indicating acceptable internal consistency, whereas the value for the handwashing attitude items (five items) was 0.56. Therefore, further refinement and development of the handwashing attitude items will be required in the future.

Overall, the results of this survey showed that handwashing awareness and attitudes improved following infectious disease prevention education and that differences in handwashing awareness and attitudes were observed according to sex and grade level. Hence, future infectious disease prevention education programs for students should incorporate tailored education that considers grade level and sex, as well as regular infectious disease prevention education that takes into account the duration of educational effects.

Declarations

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Conflict of Interest: The authors have no conflicts of interest to declare.

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