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주간 건강과 질병

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Content

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Aims and Scope

주간 건강과 질병(*Public Health Weekly Report*) (약어명: *Public Health Wkly Rep*, PHWR)은 질병관리청의 공식 학술지이다. 주간 건강과 질병은 질병관리청의 조사 · 감시 · 연구 결과에 대한 근거 기반의 과학적 정보를 국민과 국내 · 외 보건의료인 등에게 신속하고 정확하게 제공하는 것을 목적으로 발간된다. 주간 건강과 질병은 감염병과 만성병, 환경기인성 질환, 손상과 중독, 건강증진 등과 관련된 연구 논문, 유행 보고, 조사/감시 보고, 현장 보고, 리뷰와 전망, 정책 보고 등의 원고를 게재한다. 주간 건강과 질병은 전문가 심사를 거쳐 매주 목요일(연 50주) 발행되는 개방형 정보열람(Open Access) 학술지로서 별도의 투고료와 이용료가 부과되지 않는다.

저자는 원고 투고 규정에 따라 원고를 작성하여야 하며, 이 규정에 적시하지 않은 내용은 국제의학학술지편집인협의회(International Committee of Medical Journal Editors, ICMJE)의 Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals (https://www.icmje.org/) 또는 편집위원회의 결정에 따른다.

About the Journal

주간 건강과 질병(eISSN 2586-0860)은 2008년 4월 4일 창간된 질병관리청의 공식 학술지이며 국문/영문으로 매주 목요일에 발행된다. 질병관리청에서 시행되는 조사사업을 통해 생성된 감시 및 연구 자료를 기반으로 근거중심의 건강 및 질병관련 정보를 제공하고자 최선을 다할 것이며, 제공되는 정보는 질병관리청의 특정 의사와는 무관함을 알린다. 본 학술지의 전문은 주간 건강과 질병 홈페이지(https://www.phwr.org/)에서 추가비용 없이 자유롭게 열람할 수 있다. 학술지가 더 이상 출판되지 않을 경우 국립중앙도서관(http://nl.go.kr)에 보관함으로써 학술지 내용에 대한 전자적 자료 보관 및 접근을 제공한다. 주간 건강과 질병은 오픈 액세스(Open Access) 학술지로, 저작물 이용 약관(Creative Commons Attribution Non-Commercial License; http://creativecommons.org/licenses/by-nc/4.0)에 따라 비상업적 목적으로 사용, 재생산, 유포할 수 있으나 상업적 목적으로 사용할 경우 편집위원회의 허가를 받아야 한다.

Submission and Subscription Information

주간 건강과 질병의 모든 논문의 접수는 온라인 투고시스템(https://www.phwr.org/submission)을 통해서 가능하며 논문투고 시 필요한 모든 내용은 원고 투고 규정을 참고한다. 주간 건강과 질병은 주간 단위로 홈페이지를 통해 게시되고 있으며, 정기 구독을 원하시는 분은 이메일(phwrcdc@korea.kr)로 성명, 소속, 이메일 주소를 기재하여 신청할 수 있다.

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2019–2020년 우리나라 감수성 결핵환자 치료결과

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초 록

우리나라 결핵환자는 2011년 최고치(39,557명)를 기록한 후 연평균 7.4%씩 감소하여 지난 10년간 절반 이상(53.6%)으로 환자규모가 감소하고 있다. 지속적인 결핵환자 감소를 위해서는 결핵 치료성공률 향상이 요구되며, 세계보건기구에서는 '치료성공률'을 결핵관리 주요지표로 선정하고, '90% 이상'의 목표치를 제시하고 있다. 우리나라의 2020년 전체 결핵환자의 치료성공률은 80.1%로 전년대비 1.8%p 감소하였으며, 사망한 환자의 분율은 14.8%로 전년대비 1.7%p 증가하였다. 65세 이상의 치료성공률은 70.8%로 가장 낮았으며, 결핵 종류별 치료성공률은 폐외결핵(82.6%), 도말음성 폐결핵(81.6%), 도말양성 폐결핵(74.7%) 순이었다. 신환자의 치료성공률(81.3%)이 재치료자(75.2%)보다 6.1%p 높았으며, 치료중단율은 신환자(1.8%)보다 재치료자(3.6%)가 2배 높았다. 결핵환자의 사망원인 파악 등 치료성공률 향상을 위한 다각도의 노력이 요구되고, 도말양성환자, 재치료자 등 치료성공률이 상대적으로 낮고 치료에 취약한 환자군을 규명하여 치료성공률을 향상시키기 위한 정책 및 사업 개발이 필요하다.

주요 검색어: 결핵; 치료; 치료결과; 사망률

서 론

세계보건기구는 2022년 10월 「Global Tuberculosis Report 2022」를 통해 전 세계 및 우리나라 결핵 지표 현황을 발표하였다. 이에 따르면 우리나라는 전 세계 215개국 중 인구 10만명 당 발생이 44명으로 106위, 사망은 3.8명으로 111위를 차지하고 있고[1], OECD 가입국(38개국) 중에서는 발생률 1위로 2021년 기준 OECD 평균 5.7명 대비 약 8배, 사망률은 멕시코와 공동 3위(3.8명)로 OECD 평균 0.56명 대비 약 7배에 해당한다.

결핵은 여러 종류의 항결핵제들을 6개월 이상 정해진 기간 동안 꾸준히 복용하면 완치가 가능하나, 치료기간이 길기 때문에 치료중단 위험이 있다. 치료를 중단하거나 불규칙적으로 항결핵제를 복용하면 내성이 생겨 다제내성결핵으로 진행될 수 있고, 다제내성결핵이 될 경우 치료기간이 더 길어져 치료가 매우 어려워진다. 이러한 결핵치료에 성공한다는 것은 결핵의 전염력을 감소시켜 타인에게 전파를 최소화하고, 결핵의 재발과 약제 내성의 발생 및 전파 예방이라는 의미가 있어

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핵심요약

① 이전에 알려진 내용은?

지속적인 결핵환자 감소를 위해서는 결핵 치료성공률 향상이 요구되며, 세계보건기구에서는 '치료성공률'을 결핵관리 주요지표로 선정하고, '90% 이상'의 목표치를 제시하고 있다.

② 새로이 알게 된 내용은?

2020년 전체 결핵환자의 치료성공률은 80.1%로 전년대비 1.8%p 감소하였으며, 사망한 환자의 분율은 14.8%로 전년대비 1.7%p 증가하였다. 65세 이상의 치료성공률은 70.8%로 가장 낮았으며, 결핵 종류별 치료성공률은 폐외결핵(82.6%), 도말음성 폐결핵(81.6%), 도말양성 폐결핵(74.7%) 순이었다. 신환자의 치료성공률(81.3%)이 재치료자(75.2%)보다 6.1%p 높았으며, 치료중단율은 신환자(1.8%)보다 재치료자(3.6%)가 2배 높았다.

③ 시사점은?

결핵환자의 사망원인 파악 등 치료성공률 향상을 위한 다각도의 노력이 요구되고, 도말양성환자, 재치료자 등 치료성공률이 상대적으로 낮고 치료에 취약한 환자군을 규명하여 치료성공률을 향상시키기 위한 정책 및 사업 개발이 필요하다.

치료성공률 등 치료결과를 모니터링하는 것은 환자 규모를 파악하는 것만큼 중요한 지표이다. 세계보건기구는 결핵종식 목표 아래 주요 모니터링 지표로 '치료성공률'을 선정하였고, 달성해야 할 목표치로 '90% 이상'을 제시하고 있다[2]. 또한 치료성공률 등 치료결과에 대한 현황이 파악되어야 추진하고 있는 결핵관리사업에 대한 평가와 치료성공률 향상을 위한 정책 개발이 가능하다.

세계보건기구의 보고서[1]에서 발표한 2020년 치료성공률 주요 현황을 보면, OECD 가입국의 치료성공률 평균이 68.5%, 중앙값이 74%이며, 우리나라는 81%로 가입국 중 8위이었다. 이외의 주요국가 현황을 보면, 1위는 호주(90%), 2위 뉴질랜드 · 노르웨이(89%), 미국(74%)은 14위, 일본(65%) 26위 등이다.

일부 연구에서는 몇 개의 의료기관에 등록한 환자의 치료성공률과 치료성공의 위험요인을 분석한 결과를 발표했는데, 그 위험요인으로는 연령(고령), 성별, 도말양성 여부, 흡연 여부, 당뇨병, 재발 여부, 다제내성결핵, 사회경제적 요인 등을 보고하였다[3-7].

우리나라는 「감염병의 예방 및 관리에 관한 법률」에 따라 결핵을 제2급 감염병으로 지정하고 있고, 결핵과 관련하여 별도의 「결핵예방법」에 따라 관리하고 있다. 결핵환자 치료와 관리에 대해서는 모니터링 지표를 지정하여 주기적으로 지표결과를 산출하고 '결핵관리소식지'발간을 통해 시 · 도 및 보건소에 환류하고 있으며, 지표에는 결핵 발생률, 가족접촉자 검진율, 결핵 치료성공률 등이 포함되어 있다. 높은 수준의 결핵 치료성공률 달성은 결핵 예방 및 전파 차단과 우리나라의 결핵퇴치에 있어 중요한 과제이다. 이에 위험요인별 우리나라 결핵환자의 치료결과를 파악하고, 결핵환자 관리정책 개발의 기초자료로 활용하고자 한다.

방 법

우리나라는 「결핵예방법」 제8조(의료기관 등의 신고 의무)에 따라, 의료기관의 장, 의사 및 그 밖의 의료기관 종사자 등은 결핵환자를 진단 및 치료한 경우 관할 보건소에 신고해야 하고, 질병관리청은 신고자료를 분석하여 매년 2월 1일을 기준일로 이전 연도의 「결핵환자 신고현황 연보」를 발간하고 있다[8]. 본 연구는 「결핵환자 신고현황 연보」 발표 시에 확정된 신고환자를 대상으로 분석하였으며, 2019년 30,304명, 2020년 25,350명이었다. 전체 신고환자 중 결핵이 아닌 것으로 '진단 변경'이 되었거나, 외국인 결핵환자 중 본국으로 귀국하면서 치료를 중단하는 '귀국 중단'인 환자들은 분석에서 제외하였다. 이들은 2019년 627명, 2020년 595명이었다. 결핵환자 중 당해 연도 약제감수성검사에서 한 번이라도 내성결핵(리팜핀단독내성, 다제내성결핵, 광범위약제내성 전단계 결핵, 광범위약제내성결핵)으로 진단된 2019년 706명,

2020년 755명의 환자는 분석대상에서 제외하였다. 따라서 본 연구의 최종 분석대상은 감수성결핵환자 2019년 28,971명과 2020년 24,000명이다(그림 1).

각 결핵환자의 최종 치료결과는 환자로 신고된 연도의 익익년 2월 1일까지 입력된 결과 정보를 기준으로 하고, 환자가 다중으로 등록된 경우 치료 시작부터 종료까지의 신고자료를 등록된 시간 순서대로 연결하여 마지막으로 등록된 결과를 최종 치료결과로 사용하였다. 치료결과로는 '완치', '치료완료', '치료중단', '치료실패', '치료 중', '사망'이 등록된다. '완치'는 치료를 종결한 환자 중 이전의 배양검사 결과가 음성이면서 치료 종결 후 시행한 객담 배양검사에서도 음성인 경우를 말하고, '치료완료'는 치료 실패의 증거가 없고 종결 이전의 도말 및 배양검사 결과가 적어도 1회 음성인 경우로, 치료결과가 '완치' 또는 '치료완료'인 경우 '치료성공'으로 구분한다. '치료중단'은 치료를 시작하지 않았거나, 연속하여 2달 이상 치료를 받지 않은 환자의 치료결과이며, '치료실패'는 치료 4개월 후 또는 그 이후 시행한 객담 배양검사 결과가 양성인 환자의 치료결과이다. '사망'은 환자가 치료를 받는 도중에 사망한 환자의 치료결과이며, '결핵 관련 사망'과 '결핵 이외의 원인에 의한 사망'으로 분류된다.

본 연구에서는 치료결과에 영향을 미치거나 치료성공의 위험요인으로 알려져 있는 연령, 도말검사 양성여부, 신환자/재치료자로 구분하여 치료결과에 대한 현황을 분석하였다. 연령의 경우 0-19세, 20-49세, 50-64세, 65세 이상으로 분류하였으며, 결핵종류는 병변 위치에 따라 폐결핵과 폐외결핵으로 구분하였고, 폐결핵과 폐외결핵에 모두 해당하는 경우 폐결핵으로 분류하였다. 도말검사 양성여부는 폐결핵 중 객담 도말검사 결과에 따라 구분하였다. 신환자는 신고일 이전인 과거에 결핵치료를 받은 적이 없고 신고일 이후부터 치료를 받는 환자이고, 재치료자는 과거에 항결핵제를 복용한 적이 있으며, 이전 치료에서 치료실패 또는 치료중단 후 다시 치료를 받는 환자와 과거의 치료여부가 불명확한 경우가 해당한다.

이외에 환자가 치료를 받은 기관별 치료결과를 파악하였다. 치료기관은 보건소, 민간공공협력(Public-Private Mix, PPM) 결핵관리사업 참여의료기관(PPM 참여의료기관), PPM 미참여의료기관으로 구분하였다. 우리나라의 대부분 결핵환자는 민간의료기관에서 결핵치료를 받고 있고, 특히, PPM 참

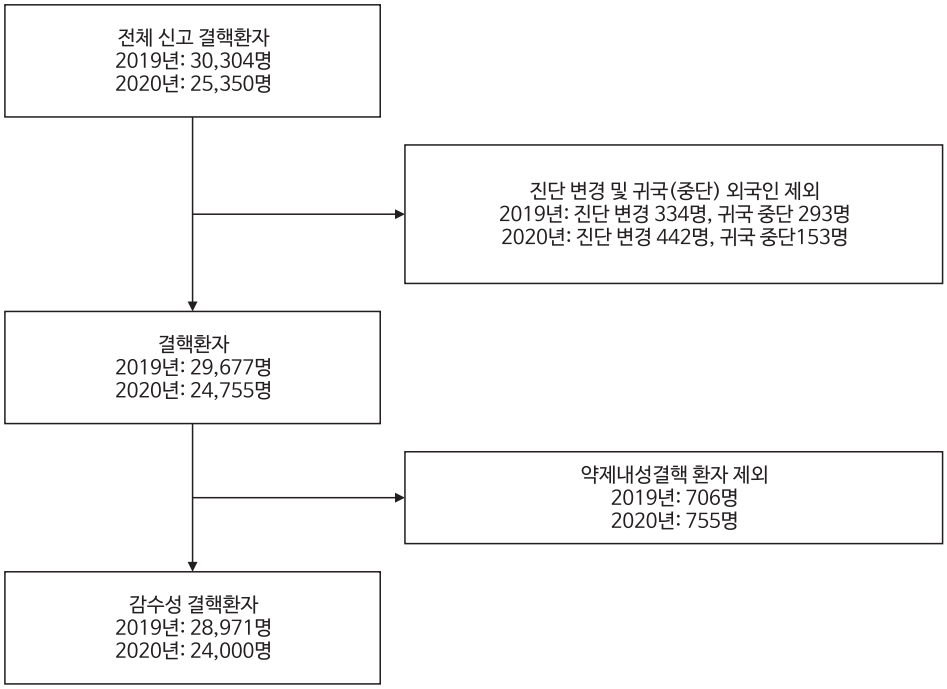

그림 1. 치료결과 분석 대상

여의료기관에서 치료를 받는 환자가 약 80%를 차지하고 있다[8].

결 과

1. 결핵환자 현황

진단변경 및 귀국(중단)외국인, 약제내성결핵 환자를 제외한 결핵환자는 2019년 28,971명, 2020년 24,000명이었고, 이 중 남성의 결핵환자 비율은 2019년 60.6%, 2020년 60.4%로 여성 결핵환자의 비율보다 높았다. 65세 이상 결핵환자의 비율은 2019년 47.7%, 2020년 49.3%로 65세 이상이 차지하는 비율이 증가하였으며(2019년 대비 1.6%p 증가), 전체 결핵환자의 약 절반을 차지하고 있다.

폐결핵 환자는 2019년 79.8%, 2020년 77.2%로 전체환자의 약 80%의 비중을 차지하였고, 그중 객담 도말양성 환자는 2019년 33.2%, 2020년 33.6%로 폐결핵 환자 3명 중 1명이 객담 도말양성 결핵환자였다.

결핵신환자는 2019년 79.3%, 2020년 79.7%를 차지하였고, 재치료자는 2019년 20.7%, 2020년 20.3%를 차지하였다.

환자가 치료관리를 받고 있는 의료기관 현황을 보면, PPM 참여의료기관에서 신고 및 관리한 환자가 2019년 76.7%, 2020년 77.6%로 가장 많았으며, 보건소에서 관리한 환자는 2019년 3.6%, 2020년 1.9%였다(표 1).

표 1. 결핵환자의 현황

항목	2019년	2020년
전체	28,971 (100.0)	24,000 (100.0)
성별		
남성	17,567 (60.6)	14,505 (60.4)
여성	11,404 (39.4)	9,495 (39.6)
연령		
65세 미만	15,153 (52.3)	12,162 (50.7)
0–19세	423 (1.5)	281 (1.2)
20–49세	7,179 (24.8)	5,753 (24.0)
50–64세	7,551 (26.1)	6,128 (25.5)
65세 이상	13,818 (47.7)	11,838 (49.3)
결핵종류		
폐결핵	23,121 (79.8)	18,521 (77.2)
도말양성	7,672 (33.2)	6,214 (33.6)
도말음성	15,449 (66.8)	12,307 (66.4)
폐외결핵	5,850 (20.2)	5,479 (22.8)
신환자/재치료자		
신환자	22,976 (79.3)	19,119 (79.7)
재치료자	5,995 (20.7)	4,881 (20.3)
의료기관구분		
PPM	22,234 (76.7)	18,630 (77.6)
Non-PPM	5,706 (19.7)	4,910 (20.5)
보건소	1,031 (3.6)	460 (1.9)

단위: 명(%). PPM=Public-Private Mix.

2. 결핵환자 치료결과

2020년 전체 결핵환자의 치료성공률은 80.1%로 전년대비 1.8%p 감소하였다. 치료결과 완치인 환자의 비율은 14.7%이며, 치료완료인 환자의 비율은 65.4%로 완치율이 치료완료율에 비해 낮았다. 치료결과 '사망'으로 등록된 환자의 비율은 14.8%로 전년대비 1.7%p 증가하였으며, 사망원인 중 '결핵 관련 사망'은 2020년 2.7%였으나, '결핵 이외 원인 사망'은 12.1%로 '결핵 이외의 원인에 의한 사망'의 비율이 높았다(표 2, 3).

1) 성별, 연령별 치료결과

2020년 성별 치료결과, 남성 결핵환자의 치료성공률은 79.1%이며, 여성은 81.5%로 여성에 비해 남성의 치료성공률이 낮았고, 치료중단율, 사망분율, 치료 중인 환자의 비율 등 대부분의 부정적인 치료결과 모두가 남성에서 소폭 높았다. 치료실패의 경우는 남성에서 7명이 있었고, 여성에서는 한 명도 없었다.

2020년 연령대에 따른 치료성공률을 보면, '사망'을 포함하여 산출한 65세 이상의 치료성공률은 70.8%로 가장 낮았으며, 연령이 적을수록 치료성공률이 높았다. 연령대별 환자의 사망분율은 65세 이상이 25.2%로 가장 높았고, 연령이 적

표 2. 2019년 결핵환자 치료 결과

항목	치료 결과								
	치료 성공			치료 중단	치료 실패	사망			치료 중
	소계	완치	완료			소계	결핵 관련 사망	결핵 이외 사망	
전체 (28,971)	23,727	4,882	18,845	625	14	3,805	640	3,165	800
	(81.9)	(16.9)	(65.0)	(2.2)	(0.0)	(13.1)	(2.2)	(10.9)	(2.8)
성별[a]									
남성(17,567)	14,225	3,104	11,121	420	13	2,363	402	1,961	546
	(81.0)	(17.7)	(63.3)	(2.4)	(0.1)	(13.5)	(2.3)	(11.2)	(3.1)
여성(11,404)	9,502	1,778	7,724	205	1	1,442	238	1,204	254
	(83.3)	(15.6)	(67.7)	(1.8)	(0.0)	(12.6)	(2.1)	(10.6)	(2.2)
연령									
65세 미만(15,153)[a]	13,569	2,814	10,755	410	12	609	126	483	553
	(89.5)	(18.6)	(71.0)	(2.7)	(0.1)	(4.0)	(0.8)	(3.2)	(3.6)
0–19세(423)	401	61	340	5	0	1	0	1	16
	(94.8)	(14.4)	(80.4)	(1.2)	(0.0)	(0.2)	(0.0)	(0.2)	(3.8)
20–49세(7,179)[a]	6,559	1,354	5,205	198	4	137	33	104	281
	(91.4)	(18.9)	(72.5)	(2.8)	(0.1)	(1.9)	(0.5)	(1.4)	(3.9)
50–64세(7,551)[a]	6,609	1,399	5,210	207	8	471	93	378	256
	(87.5)	(18.5)	(69.0)	(2.7)	(0.1)	(6.2)	(1.2)	(5.0)	(3.4)
65세 이상(13,818)	10,158	2,068	8,090	215	2	3,196	514	2,682	247
	(73.5)	(15.0)	(58.5)	(1.6)	(0.0)	(23.1)	(3.7)	(19.4)	(1.8)
결핵 종류									
폐결핵(23,121)	18,888	4,659	14,229	437	14	3,153	567	2,586	629
	(81.7)	(20.2)	(61.5)	(1.9)	(0.1)	(13.6)	(2.5)	(11.2)	(2.7)
도말양성(7,672)	5,969	1,889	4,080	120	10	1,273	351	922	300
	(77.8)	(24.6)	(53.2)	(1.6)	(0.1)	(16.6)	(4.6)	(12.0)	(3.9)
도말음성(15,449)	12,919	2,770	10,149	317	4	1,880	216	1,664	329
	(83.6)	(17.9)	(65.7)	(2.1)	(0.0)	(12.2)	(1.4)	(10.8)	(2.1)
폐외결핵(5,850)[a]	4,839	223	4,616	188	0	652	73	579	171
	(82.7)	(3.8)	(78.9)	(3.2)	(0.0)	(11.1)	(1.2)	(9.9)	(2.9)
환자 구분[a]									
신환자(22,976)	19,113	3,965	15,148	350	6	3,016	502	2,514	491
	(83.2)	(17.3)	(65.9)	(1.5)	(0.0)	(13.1)	(2.2)	(10.9)	(2.1)
재치료자(5,995)	4,614	917	3,697	275	8	789	138	651	309
	(77.0)	(15.3)	(61.7)	(4.6)	(0.1)	(13.2)	(2.3)	(10.9)	(5.2)
기관 구분									
PPM (22,234)[a]	18,345	3,615	14,730	444	12	2,864	488	2,376	569
	(82.5)	(16.3)	(66.2)	(2.0)	(0.1)	(12.9)	(2.2)	(10.7)	(2.6)
Non-PPM (5,706)	4,434	873	3,561	147	1	921	152	769	203
	(77.7)	(15.3)	(62.4)	(2.6)	(0.0)	(16.1)	(2.7)	(13.5)	(3.6)
보건소(1,031)[a]	948	394	554	34	1	20	0	20	28
	(91.9)	(38.2)	(53.7)	(3.3)	(0.1)	(1.9)	(0.0)	(1.9)	(2.7)

단위: 명(%). PPM=Public-Private Mix. [a]반올림으로 인해 퍼센트의 총합이 100이 아님.

표 3. 2020년 결핵환자 치료 결과

항목	치료 결과								
	치료 성공			치료 중단	치료 실패	사망			치료 중
	소계	완치	완료			소계	결핵 관련 사망	결핵 이외 사망	
전체(24,000)[a]	19,212	3,519	15,693	522	7	3,550	640	2,910	709
	(80.1)	(14.7)	(65.4)	(2.2)	(0.0)	(14.8)	(2.7)	(12.1)	(3.0)
성별									
남성(14,505)	11,469	2,230	9,239	330	7	2,230	403	1,827	469
	(79.1)	(15.4)	(63.7)	(2.3)	(0.0)	(15.4)	(2.8)	(12.6)	(3.2)
여성(9,495)[a]	7,743	1,289	6,454	192	0	1,320	237	1,083	240
	(81.5)	(13.6)	(68.0)	(2.0)	(0.0)	(13.9)	(2.5)	(11.4)	(2.5)
연령									
65세 미만(12,162)	10,833	1,948	8,885	291	5	571	138	433	462
	(89.1)	(16.0)	(73.1)	(2.4)	(0.0)	(4.7)	(1.1)	(3.6)	(3.8)
0–19세(281)	263	41	222	2	0	3	1	2	13
	(93.6)	(14.6)	(79.0)	(0.7)	(0.0)	(1.1)	(0.4)	(0.7)	(4.6)
20–49세(5,753)[a]	5,262	879	4,383	142	3	128	42	86	218
	(91.5)	(15.3)	(76.2)	(2.5)	(0.1)	(2.2)	(0.7)	(1.5)	(3.8)
50–64세(6,128)	5,308	1,028	4,280	147	2	440	95	345	231
	(86.6)	(16.8)	(69.8)	(2.4)	(0.0)	(7.2)	(1.6)	(5.6)	(3.8)
65세 이상(11,838)[a]	8,379	1,571	6,808	231	2	2,979	502	2,477	247
	(70.8)	(13.3)	(57.5)	(2.0)	(0.0)	(25.2)	(4.2)	(20.9)	(2.1)
결핵 종류									
폐결핵(18,521)[a]	14,686	3,369	11,317	359	7	2,923	574	2,349	546
	(79.3)	(18.2)	(61.1)	(1.9)	(0.0)	(15.8)	(3.1)	(12.7)	(2.9)
도말양성(6,214)	4,640	1,374	3,266	91	2	1,255	349	906	226
	(74.7)	(22.1)	(52.6)	(1.5)	(0.0)	(20.2)	(5.6)	(14.6)	(3.6)
도말음성(12,307)	10,046	1,995	8,051	268	5	1,668	225	1,443	320
	(81.6)	(16.2)	(65.4)	(2.2)	(0.0)	(13.6)	(1.8)	(11.7)	(2.6)
폐외결핵(5,479)	4,526	150	4,376	163	0	627	66	561	163
	(82.6)	(2.7)	(79.9)	(3.0)	(0.0)	(11.4)	(1.2)	(10.2)	(3.0)
환자 구분									
신환자(19,119)	15,540	2,860	12,680	345	4	2,739	498	2,241	491
	(81.3)	(15.0)	(66.3)	(1.8)	(0.0)	(14.3)	(2.6)	(11.7)	(2.6)
재치료자(4,881)	3,672	659	3,013	177	3	811	142	669	218
	(75.2)	(13.5)	(61.7)	(3.6)	(0.1)	(16.6)	(2.9)	(13.7)	(4.5)
기관 구분									
PPM (18,630)	15,162	2,775	12,387	360	4	2,626	494	2,132	478
	(81.4)	(14.9)	(66.5)	(1.9)	(0.0)	(14.1)	(2.7)	(11.4)	(2.6)
Non-PPM (4,910)[a]	3,651	590	3,061	141	3	899	137	762	216
	(74.4)	(12.0)	(62.3)	(2.9)	(0.1)	(18.3)	(2.8)	(15.5)	(4.4)
보건소(460)	399	154	245	21	0	25	9	16	15
	(86.7)	(33.5)	(53.3)	(4.6)	(0.0)	(5.4)	(2.0)	(3.5)	(3.3)

단위: 명(%). PPM=Public-Private Mix. [a]반올림으로 인해 퍼센트의 총합이 100이 아님.

을수록 사망분율도 낮아지면서 치료성공률이 높아지는 경향을 보였다.

결핵환자 중 '사망' 환자를 제외할 경우 전체 결핵환자의 치료성공률은 93.9%였으며, 65세 미만의 치료성공률은 93.5%, 65세 이상은 94.6%였다. '사망'환자를 제외한 경우의 치료성공률은 '사망'환자를 포함하여 산출한 치료성공률의 양상과는 다르게, 65세 이상 결핵환자의 치료성공률이 65세 미만 결핵환자의 치료성공률보다 높았다(그림 2).

2) 결핵 종류별 치료결과

2020년 폐결핵 환자의 치료성공률은 79.3%이며, 폐외결핵 환자의 치료성공률은 82.6%로 폐외결핵 환자의 치료성공률이 소폭 높았다. 폐결핵 환자 중 객담 도말양성 환자의 치료성공률은 74.7%이며, 객담 도말음성 환자의 치료성공률은 81.6%로 도말양성 환자의 치료성공률이 낮았다. 결핵 종류별 치료성공률은 폐외결핵, 도말음성 폐결핵, 도말양성 폐결핵 순으로 높았다. 치료성공률은 도말양성 환자가 낮았지만, 완치율의 경우 도말양성 환자가 22.1%로 도말음성 환자(16.2%)보다 높았다. 결핵 종류별 사망분율은 도말양성 폐결핵(20.2%), 도말음성 폐결핵(13.6%), 폐외결핵(11.4%) 순으로 높았다(표 3).

3) 신환자/재치료자 치료결과

2020년 신환자의 치료성공률은 81.3%이며, 재치료자의 치료성공률은 75.2%로 신환자보다 6.1%p 낮았다. 치료중단율은 신환자가 1.8%, 재치료자는 3.6%로 신환자보다 2배 높았으며, 치료 중인 환자의 비율은 신환자 2.6%, 재치료자는 4.5%로 재치료자에서 높았다(표 3).

4) 의료기관별 치료결과

2020년 의료기관별 치료성공률은 보건소(86.7%), PPM 참여의료기관(81.4%), PPM 미참여의료기관(74.4%) 순으로 치료성공률이 높았다. 특히 완치율의 경우 PPM 참여의료기관은 14.9%, PPM 미참여의료기관 12.0%, 보건소 33.5%로 보건소가 민간의료기관에 비해 2배 이상 높았다. 사망분율은 PPM 미참여의료기관이 18.3%로 가장 높았으며, 보건소가 5.4%로 가장 낮았다. 치료중단율은 보건소가 4.6%로 가장 높았으며, PPM 참여의료기관이 1.9%로 가장 낮았다(표 3).

3. 결핵 신환자 및 재치료자 치료결과

1) 성별 및 연령별 치료결과

2020년 남성 중 신환자의 치료성공률은 80.7%이며, 재

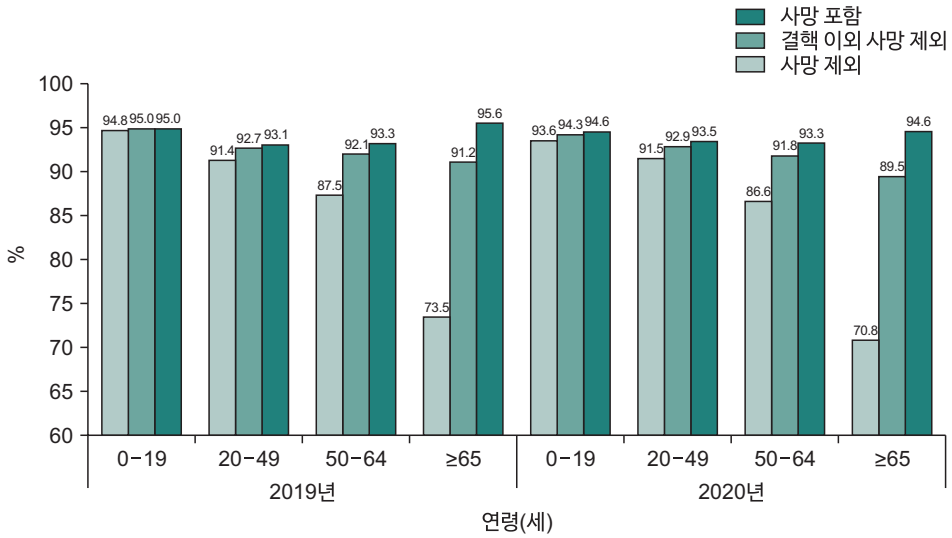

그림 2. 사망환자 포함여부에 따른 치료성공률

치료자의 치료성공률은 73.6%로, 신환자의 치료성공률이 7.1%p 높았다. 여성에서는 신환자의 치료성공률은 82.0%, 재치료자는 78.9%로 여성도 신환자의 치료성공률이 3.1%p 높았다. 치료중단율은 남성의 경우 신환자가 1.7%, 재치료자는 4.1%로 남성 재치료자가 2.4%p 높았다. 여성에서는 신환자가 1.9%, 재치료자는 2.6%로 여성의 치료중단율은 재치료자가 0.7%p 높았다. 신환자와 재치료자 간의 치료성공률 및 치료중단율의 차이가 여성보다 남성에서 더 컸다.

연령별 치료성공률을 보면, 신환자, 재치료자 모두 0–19세에서 가장 높았고(신환자 94.1%, 재치료자 88.9%), 65세 이상의 치료성공률(신환자 71.6%, 재치료자 67.4%)이 가장 낮았다. 사망분율이 65세 이상 신환자는 24.7%, 65세 이상 재치료자는 26.9%로 다른 연령대보다 높았다. 치료중단율은 2020년 신환자에서는 연령별 네 그룹 모두 2% 미만이었다. 재치료자에서는 65세 미만 4.5%, 65세 이상 2.7%로 65세 미만 환자에서 치료중단율이 더 높았고, 특히 0–19세 연령은 7.4%로 가장 높았다. 또한 연령과 관계없이 재치료자가 신환자보다 치료중단율이 높았다(표 4).

2) 결핵 종류별 치료결과

2020년 폐결핵 신환자의 치료성공률은 80.7%이며, 재치료자의 치료성공률은 74.3%로 폐결핵 신환자의 치료성공률이 6.4%p 높았다. 폐외결핵 신환자의 치료성공률은 83.3%이며, 재치료자의 치료성공률은 79.2%였다. 폐결핵 환자 중 객담 도말양성 신환자의 치료성공률은 75.8%이며, 도말양성 재치료자의 치료성공률은 69.5%로 도말양성 신환자의 치료성공률이 6.3%p 높았다. 도말음성 신환자의 치료성공률은 83.3%, 도말음성 재치료자는 76.2%로 도말음성 신환자의 치료성공률이 7.1%p 높았다.

폐결핵 신환자의 사망분율은 15.3%이며, 이 중 도말양성 환자는 20.1%, 도말음성 환자는 12.7%였고, 폐외결핵 신환자의 사망분율은 11.2%였다. 도말양성 재치료자의 사망분율은 20.7%로 신환자와 유사하였지만, 도말음성 재치료자의 사망분율은 16.2%로 신환자보다 3.5%p 높았다.

신환자의 치료중단율은 객담 도말양성 1.0%, 도말음성 1.7%, 폐외결핵 2.8%였고 재치료자의 치료중단율은 도말양성 3.5%, 도말음성 3.7%, 폐외결핵 3.7%로 신환자보다 상대적으로 높았다(표 4).

3) 의료기관별 치료결과

의료기관별 치료결과를 보면 신환자는 79.7%가, 재치료자는 69.4%가 PPM 참여의료기관에서 치료관리를 받고 있었다. 재치료자는 PPM 미참여의료기관 및 보건소에서 치료를 받는 비율이 신환자에 비해 상대적으로 높았다. 치료성공률은 앞서 살펴본 바와 같이 보건소에서의 치료성공률(신환자 93.2%, 재치료자 80.0%)이 의료기관보다 높았고, 신환자에서의 기관별 치료성공률 차이(보건소 93.2%, PPM 참여의료기관 82.3%, 10.9%p 차이)는 재치료자에서의 치료성공률 차이(보건소 80.0%, PPM 참여의료기관 77.2%, 2.8%p 차이)보다 컸다. 의료기관 구분별 사망분율을 보면, 모든 기관에서 신환자의 사망분율이 재치료자의 사망분율보다 낮았으나, 보건소에서 관리 받은 환자의 경우 신환자와 재치료자의 사망분율 차이가 민간의료기관에서의 차이보다 상대적으로 컸다(표 4).

논 의

결핵 치료기간은 수개월에서 수년에 걸쳐 진행되기 때문에 결핵의 타인 전파를 최소화하고, 결핵 재발과 약제 내성의 발생 및 전파 예방을 위해서 결핵 치료결과를 모니터링하는 것은 중요하다. 특히, 우리나라 인구구조상 65세 이상 고령층이 증가함에 따라 결핵환자의 연령구조도 변화하였고, 연령별 치료성공률, 사망분율 등 치료결과를 확인하는 것이 더욱 중요해졌다.

연령 구분별 치료성공률의 경우 연령이 증가할수록 치료

표 4. 2020년 결핵 신환자 및 재치료자 치료 결과

항목	신환자				재치료자			
	환자수	치료 성공	치료 중단	사망	환자수	치료 성공	치료 중단	사망
전체	19,119 (100.0)	15,540 (81.3)	345 (1.8)	2,739 (14.3)	4,881 (100.0)	3,672 (75.2)	177 (3.6)	811 (16.6)
성별								
남성	11,105 (58.1)	8,966 (80.7)	192 (1.7)	1,634 (14.7)	3,400 (69.7)	2,503 (73.6)	138 (4.1)	596 (17.5)
여성	8,014 (41.9)	6,574 (82.0)	153 (1.9)	1,105 (13.8)	1,481 (30.3)	1,169 (78.9)	39 (2.6)	215 (14.5)
연령								
65세 미만	9,638 (50.4)	8,750 (90.8)	178 (1.8)	394 (4.1)	2,524 (51.7)	2,083 (82.5)	113 (4.5)	177 (7.0)
0-19세	254 (1.3)	239 (94.1)	0 (0.0)	3 (1.2)	27 (0.6)	24 (88.9)	2 (7.4)	0 (0.0)
20-49세	4,754 (24.9)	4,429 (93.2)	88 (1.9)	87 (1.8)	999 (20.5)	833 (83.4)	54 (5.4)	41 (4.1)
50-64세	4,630 (24.2)	4,082 (88.2)	90 (1.9)	304 (6.6)	1,498 (30.7)	1,226 (81.8)	57 (3.8)	136 (9.1)
65세 이상	9,481 (49.6)	6,790 (71.6)	167 (1.8)	2,345 (24.7)	2,357 (48.3)	1,589 (67.4)	64 (2.7)	634 (26.9)
결핵 종류								
폐결핵	14,530 (76.0)	11,719 (80.7)	215 (1.5)	2,227 (15.3)	3,991 (81.8)	2,967 (74.3)	144 (3.6)	696 (17.4)
도말양성	5,116 (26.8)	3,877 (75.8)	53 (1.0)	1,028 (20.1)	1,098 (22.5)	763 (69.5)	38 (3.5)	227 (20.7)
도말음성	9,414 (49.2)	7,842 (83.3)	162 (1.7)	1,199 (12.7)	2,893 (59.3)	2,204 (76.2)	106 (3.7)	469 (16.2)
폐외결핵	4,589 (24.0)	3,821 (83.3)	130 (2.8)	512 (11.2)	890 (18.2)	705 (79.2)	33 (3.7)	115 (12.9)
의료기관 구분								
PPM	15,243 (79.7)	12,546 (82.3)	252 (1.7)	2,102 (13.8)	3,387 (69.4)	2,616 (77.2)	108 (3.2)	524 (15.5)
Non-PPM	3,641 (19.0)	2,775 (76.2)	87 (2.4)	634 (17.4)	1,269 (26.0)	876 (69.0)	54 (4.3)	265 (20.9)
보건소	235 (1.2)	219 (93.2)	6 (2.6)	3 (1.3)	225 (4.6)	180 (80.0)	15 (6.7)	22 (9.8)

단위: 명(%). 치료결과 중 치료실패와 치료중인 환자수는 포함되지 않음. PPM=Public-Private Mix.

성공률이 감소하였으며, 연령이 증가할수록 사망분율은 증가하였다. '사망'의 경우 결핵 관련 사망률보다 결핵 이외의 원인에 의한 사망률이 높았으며, 특히 65세 이상의 경우 결핵 관련 사망률과 결핵 이외의 원인에 의한 사망률은 큰 차이를 보였다.

결핵환자 중 사망한 환자를 제외할 경우 전체환자의 치료성공률은 90% 이상이었으며, 사망환자를 포함하였을 때의 치료성공률과 다르게 65세 이상 환자의 치료성공률이 65세 미만 환자에서의 치료성공률보다 높았다. 신고된 결핵환자를 대상으로 하는 취약성 평가에서 65세 미만 환자에서는 38.5%

가 동반질환이 있는 반면, 65세 이상에서는 80.4%가 동반질환이 있다고 응답[9]하였던 것을 미루어 볼 때, 고령층의 경우 결핵 이외의 동반질환이나 노환 등의 사유로 사망하는 환자가 많기 때문에 사망환자를 포함하여 산출한 치료결과에서의 치료성공률이 낮은 것으로 판단된다.

2021년 일본에서의 감수성 결핵환자 치료성공률은 66.5%이며, 65세 미만 환자의 치료성공률은 81.8%, 65세 이상 환자의 경우는 59.0%로 우리나라 결핵환자 치료성공률보다 낮았고, 감수성 결핵환자의 사망분율은 23.1%이며, 65세 미만은 3.2%, 65세 이상은 32.8%였다[10]. 유엔과 한국 통계청에 따르면 일본의 경우 노령화 지수는 2020년 248.3으로 한국(129.3)보다 높았지만 2030년에는 한국의 노령화지수(301.6)는 빠른 속도로 상승하여 일본(293.8)보다 높아질 것으로 예측하고 있다[11]. 그러므로, 향후 고령층 결핵환자의 비중도 지속적으로 증가할 것으로 예상되며, 결핵환자 치료성공률을 향상시키는 것은 더욱 어려운 과제가 될 것이다. 고령층 결핵환자의 '결핵 관련 사망'과 '결핵 이외의 원인에 의한 사망'을 제외한 후 산출한 치료성공률 모니터링이 필요하며, 타 질환으로 인한 사망이 많은 고령층 결핵환자에 대한 사망원인을 파악하는 것이 요구된다.

결핵종류에 따라서 폐외결핵, 도말음성 폐결핵, 도말양성 폐결핵 순으로 치료성공률이 높았지만, 완치율에서는 도말양성 환자(2019년 24.6%, 2020년 22.1%)가 도말음성 환자(2019년 17.9%, 2020년 16.2%)보다 높았다. 이는 도말양성 결핵환자의 경우 환자가 배출하는 결핵균의 양이 많아 전염력이 강하기 때문에 의료진이 검사를 통해 결핵균의 음전여부를 확인하는 비율이 높았다고 판단되며, 지역사회 전파차단을 위해서는 향후 도말양성 환자에 대해 완치율을 높일 수 있는 유인책 마련이 필요하다.

결핵 재치료자는 치료성공률이 신환자보다 6%p 이상 낮았다. 치료 중인 환자의 비율은 재치료자가 신환자보다 높았는데, 이전 결핵치료에서 치료실패 또는 치료중단 후 다시 치료를 받는 재치료자의 경우 수약 불협조 또는 불규칙 투약, 연락두절 등 치료에 순응하지 않음으로 인해 치료기간이 연장되어 치료 중인 환자의 비율이 높은 것으로 보인다. 치료중단율 또한 재치료자가 신환자보다 약 2배 정도 높았다. 이에 결핵균의 타인전파 차단과 치료실패로 인한 내성 획득 예방을 위해 재치료자의 복약관리 및 관리체계를 강화할 필요가 있다.

환자가 치료관리를 받고 있는 기관은 PPM 참여의료기관의 환자가 2019년 76.7%, 2020년 77.6%로 가장 많았으며, 보건소의 경우 2019년에 3.6%의 환자를 치료관리하였으나, 코로나19 유행시기인 2020년에는 1.9%로 감소하였다.

치료성공률은 보건소, PPM 참여의료기관, PPM 미참여의료기관 순으로 높았으나, 완치율에서는 보건소가 타 기관에 비해 2배 이상 높았다. 사망분율은 PPM 미참여의료기관에서 가장 높았으며, 보건소가 관리하는 결핵환자에서 가장 낮았다. 이는 보건소의 경우 관리하는 환자의 수가 적고, 환자의 상태가 상대적으로 양호한 환자들이 보건소에서 치료를 받기 때문에 사망분율은 낮고 치료성공률은 높게 나왔을 것으로 보인다.

치료중단율은 보건소에서 가장 높았고, PPM 참여의료기관의 경우 가장 낮았다. 기관별 관리환자의 특성을 살펴보면, PPM 참여의료기관에 관리하는 환자의 82%가 신환자이고, 재치료자는 18%로 신환자의 비중이 높은 반면, 보건소에서는 신환자 51%, 재치료자 49%로 보건소의 재치료자 비중은 PPM 참여의료기관에 비해 상대적으로 높았다. 재치료자는 치료중단율이 높기 때문에 재치료자의 비율이 높은 보건소에서 치료를 받는 환자의 치료중단율이 상대적으로 높을 수 밖에 없다. 신환자와 재치료자를 구분 후에 각 환자 군에서 기관별 치료중단율은 기관별 차이가 적은 것으로 나타났다.

결핵환자의 약 80%를 관리하는 PPM 참여의료기관은 코로나19 유행 대응에도 불구하고 치료성공률의 감소폭이 가장 작고 치료중단율도 가장 낮으며, PPM 모니터링 결핵관리지표 중 객담 도말검사 시행률과 객담 배양검사 시행률, 성인 및

소아 접촉자 검진율과 잠복결핵감염 치료시작률과 같은 지표가 향상되었다[12]. 주요 지표들의 값이 비슷한 수준으로 유지되거나 향상된 것을 보면 위기상황 속에서도 결핵환자 치료, 결핵환자 접촉자 검진 등 결핵 관리가 지속적으로 잘 되었음을 시사한다.

결핵은 만성감염병으로서 치료하는데에 6개월 이상의 긴 시간이 소요되고, 환자의 결핵상태라는 직접적인 요인뿐만 아니라 사회경제적 요인도 치료에 영향을 준다[13]. 정부는 결핵안심벨트 지원사업, 입원명령제도 운영, 복약관리사업 등 다양한 환자 관리 및 지원사업을 통해 최대한 치료성공률을 끌어올리고자 노력하고 있으며, 이러한 노력은 궁극적으로 결핵 전파를 차단하고 환자 발생을 감소시키는데 기여하고 있다.

고령층 환자 증가 등 치료성공률 향상의 저해요인이 있으나, 결핵 치료결과를 계속 모니터링하면서, 치료에 취약한 환자군을 규명하고, 이러한 환자군의 치료성공률을 향상시킬 수 있는 전략과 사업을 개발하여 시행하는 일련의 사이클을 지속하는 것이 필요하다. 본 연구의 결과처럼 고령층 결핵환자, 재치료자, 도말양성 결핵환자와 치료가 어렵고 치료기간이 더 긴 내성결핵에 대한 복약관리, 치료 지원 등 중점적으로 치료성공률을 높이기 위한 방안 모색이 지속되어야 할 것이다.

이번 연구의 치료결과는 「결핵환자 신고현황 연보」 발표시에 확정된 신고환자를 대상으로 분석하였으며, 결핵환자별 마지막 신고서에 등록된 최종 치료결과를 사용하였다. 기존에 공개된 PPM 참여의료기관의 치료결과 지표의 산출기준 및 산출시점이 달라 분석결과도 상이할 수 있으므로 해석에 주의가 필요하다.

Declarations

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Treatment Outcomes among Drug-susceptible Patients with Tuberculosis in the Republic of Korea, 2019–2020

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ABSTRACT

The number of patients with tuberculosis (TB) in the Republic of Korea (ROK) has decreased by 7.4% on average each year over the past decade since reaching its peak in 2011 (39,557 cases) and declined to more than 50% in 2021. To continue reducing the number of patients with TB, an improvement in the TB treatment success rate (TSR) is required. The World Health Organization considers the "TB TSR" as a significant indicator for TB control, with a target reaching at least "90%." In ROK, the TSR and mortality rate among all patients with TB was 80.1% and 14.8% in 2020 and decreased by 1.8% and increased by 1.7%, respectively, compared with the rates in 2019. The TB TSR among aged 65 years and older was the lowest at 70.8% (extra-pulmonary TB, 82.6%; smear-negative pulmonary TB, 81.6%; and smear-positive pulmonary TB, 74.7%). The TSR was 6.1% higher in new patients (81.3%) than that in previously treated patients (75.2%), and the treatment interruption rate was two times higher in previously treated patients (3.6%) than in new patients (1.8%). Various efforts are necessary to improve the TSR not only by investigating the cause of death but also developing relevant policies and projects to support vulnerable patients that target groups with have a relatively low TSR, including smear-positive and previously treated patients.

Key words: Tuberculosis; Therapy; Treatment outcome; Mortality

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Introduction

The World Health Organization (WHO) Global Tuberculosis Report 2022 released in October 2022 reported the status of tuberculosis (TB) indicators in countries worldwide, including the Republic of Korea (ROK). According to the report, the ROK ranked 106th and 111th among 215 countries, with a TB incidence of 44 per 100,000 persons and TB mortality of 3.8 per 100,000 persons, respectively [1]. Among the 38 Organisation for Economic Co-operation and Development (OECD) countries, the ROK ranked first in 2021 for TB incidence, which was approximately eight-fold higher than the mean OECD incidence of 5.7 per 100,000 persons, and third alongside Mexico for TB mortality (3.8 per 100,000 persons), which was approximately seven-fold higher than the mean OECD rate of 0.56 per 100,000 persons.

Key messages

① What is known previously?

In order to continue to reduce the number of patients with tuberculosis (TB), an improvement in the TB treatment success rate (TSR) is required. The World Health Organization the "TB TSR" a target of reaching at least "90%."

② What new information is presented?

The TSR and mortality rate among all patients with TB was 80.1% and 14.8% in 2020, and these rates decreased by 1.8% and increased by 1.7% respectively compared to 2019. The TB TSR among 65-year-old and over was the lowest at 70.8%. The TSR was 6.1% higher in new patients (81.3%) than in previously treated patients (75.2%).

③ What are implications?

Relevant policies and projects should be developed to improve the TSR by identifying vulnerable patients who have a relatively low TSR and investigating the cause of death.

While TB can be completely cured through the continuous administration of various anti-tuberculosis drugs for ≥6 months, the long treatment duration poses a risk of treatment interruption that could cause resistance to anti-tuberculosis drugs, leading to multidrug-resistant TB (MDR TB). The treatment duration is additionally increased in MDR TB, posing further treatment difficulties. Successful TB treatment includes the minimization of contagion via reduced infectivity of TB and the prevention of TB recurrence as well the development and spread of drug resistance. Hence, monitoring treatment outcomes including the treatment success rate (TSR) is as critical as defining the patient population. The WHO has identified TSR as a key monitoring indicator under the End-TB strategy, with a proposed target rate of ≥90% [2]. Additionally, determining the status of treatment outcomes such as the TSR allows the development of policies to evaluate projects related to TB management and the improvement of TSR.

In 2020, the WHO [1] reported mean and median TSRs of 68.5% and 74%, respectively, across the OECD countries, among which the ROK ranked 8th with a TSR of 81%. Among other major countries, Australia showed the highest TSR (90%), followed by New Zealand and Norway (89%). The United States ranked 14th (74%), while Japan was 26th (65%).

Previous studies analyzed the risk factors for treatment success and TSR in patients registered in several medical centers. These risk factors included age (old), sex, smear positivity, smoking, diabetes, MDR TB, recurrence, and socioeconomic factors [3-7].

In the ROK, TB is designated as a Class II infectious disease based on the Infectious Case Control and Prevention Act and managed according to the independent TB Prevention Act. Regarding the treatment and management of patients with TB, the results of predefined monitoring indicators are periodically obtained and shared with the city, province, and regional public health centers through the TB Newsletter. These indicators include the incidence of TB, rate of family contact, and TB TSR. To achieve a high TB, TSR is a critical parameter for the End-TB strategy and the prevention of TB incidence and contagion in the ROK. Thus, the present study investigated the treatment outcomes in Korean patients with TB according to each risk factor to provide basic data for the development of national policies regarding the management of TB treatment.

Methods

In the ROK, Article 8 of the Tuberculosis Prevention Act

(Reporting Obligation of Medical Institutions) mandates that the directors of medical institutions, physicians, and other health professionals should report diagnosed or treated cases of TB to the public health center of the administrative district. The Korea Disease Control and Prevention Agency analyzes the reported data and publishes an Annual Report on Notified Tuberculosis on February 1 of the following year [8]. The present study analyzed data of patients with confirmed TB reported at the time of publication of the Annual Report on Notified Tuberculosis. The data included 30,304 and 25,350 cases, respectively, in 2019 and 2020. Among the reported cases, those with a Change Diagnosis to non-TB and those with Returnee Interruption, defined as a foreign TB patient whose treatment has been interrupted upon returning to the home country, were excluded. A total of 627 and 595 cases were excluded in 2019 and 2020, respectively. The analysis also excluded the data of patients with TB with at least one previous diagnosis of drug-resistant TB (DR-TB), including rifampin mono-resistant TB, MDR-TB, pre-extensively drug resistant-TB and XDR-TB in drug susceptibility testing in the respective year. A total of 706 and 755 such patients were excluded in 2019 and 2020, respectively. Thus, the final analysis in the present study included 28,791 patients in 2019 and 24,000 in 2020 (Figure 1).

The final treatment outcome of each patient with TB was based on the results documented by February 1 of the year that followed the reporting year. If several reports were made on a single patient, the reports were chronologically listed from the onset to the end of treatment, and the last report was used as the treatment outcome. The reported treatment outcomes were categorized as "cured", "treatment completed", "treatment interruption", "treatment failure", "ongoing treatment", and "death". The categories were defined as follows: "cured" was a culture-negative patient in the post-treatment sputum test among patients who had completed treatment and were negative on the previous culture test. "Treatment completed" was a patient showing no evidence of treatment failure and with at least one negative result on the smear or culture test

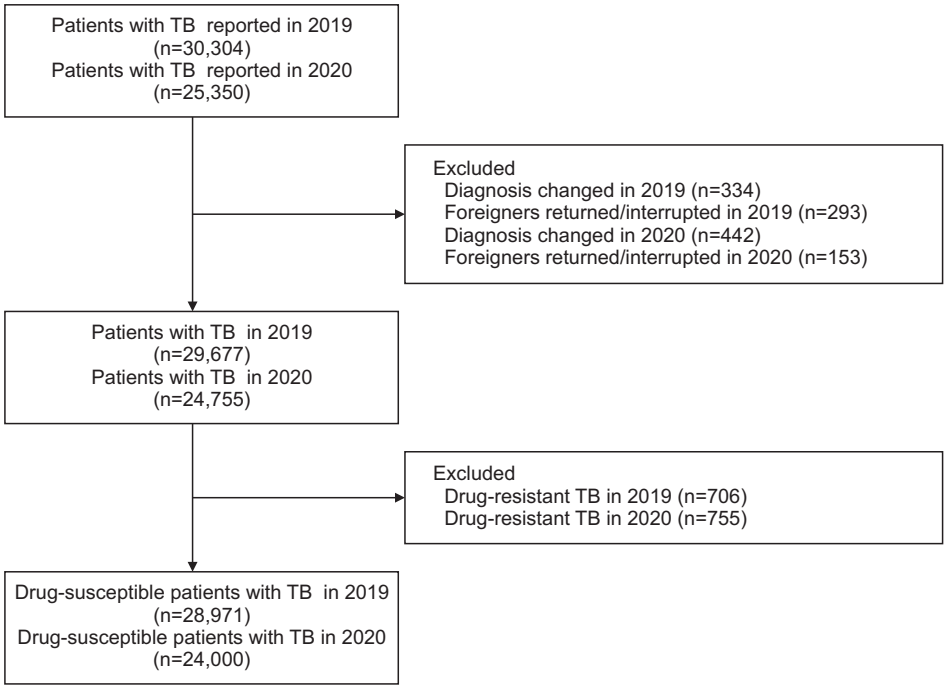

Figure 1. The study subjects included for analysis of treatment outcomes.
TB=tuberculosis.

before the end of treatment. The treatment outcomes of "cured" or "treatment completed" were considered "treatment success." "Treatment interruption" was a patient who had yet to start treatment or have not received the treatment for more than two consecutive months. "Treatment failure" was a patient with a positive result on the sputum test at or after the 4th month of treatment. "Death" was a patient who died in the middle of treatment. These cases were divided into TB death and non-TB death.

This study analyzed the status of TB treatment outcomes by grouping the patients according to the risk factors for treatment success and factors known to affect the treatment outcomes: age, smear positivity, and new or previously treated patients. For age, the subcategories were 0–19, 20–49, 50–64, and ≥65 years. The TB type was divided into pulmonary TB and extra-pulmonary TB based on the lesion site. If the case corresponded to both types, this was categorized as pulmonary TB. Smear-positivity was determined according to the results of sputum smear tests in patients with pulmonary TB. New patients were those who had received no previous TB treatment before the reporting date and were receiving TB treatment after the reporting date, while previously treated patients were those with a history of anti-TB drug administration, patients receiving TB treatment again due to failure or interruption of the previous treatment, and patients with an unclear history of treatment.

The treatment outcomes at each institution where the patients received treatment were analyzed by categorizing the treatment institutions into public health centers, private medical centers participating in the public-private mix (PPM) TB management projects (PPM centers), and non-PPM centers. Most patients with TB in the ROK (approximately 80%) were receiving TB treatment at private medical centers [8].

Results

1. Status of Patients with TB

After excluding cases with changed diagnosis, returnee (interruption) and patients with DR-TB, 28,971 and 24,000 patients had TB in 2019 and 2020, respectively. The percentages of male patients were 60.6% in 2019 and 60.4% in 2020 and were higher than those of female patients. The percentage of patients with TB aged ≥65 years was 47.7% in 2019 and 49.3% in 2020, indicating an increase of 1.6% in 2020 compared to 2019; these patients also accounted for approximately half of the total number of patients with TB.

Patients with pulmonary TB comprised approximately 80% of the patients with TB in 2019 and 2020 (79.8% and 77.2% respectively). The percentage of patients with pulmonary TB with positive sputum smear test results was 33.2% in 2019 and 33.6% in 2020, indicating that one in three patients with pulmonary TB was smear-positive.

New patients with TB comprised 79.3% of patients with TB in 2019 and 79.7% in 2020, compared to 20.7% and 20.3% of previously treated patients with TB, respectively.

Regarding the current status of medical institutions where patients received TB treatment and management, most patients were reported and managed by PPM centers (76.7% in 2019 and 77.6% in 2020) compared to those managed by public health centers (3.6% in 2019 and 1.9% in 2020) (Table 1).

2. Treatment Outcomes of Patients with TB

The overall TSR for patients with TB in 2020 was 80.1%,

Table 1. Characteristics of patients with TB

Characteristic	2019	2020
Total	28,971 (100.0)	24,000 (100.0)
Sex		
Male	17,567 (60.6)	14,505 (60.4)
Female	11,404 (39.4)	9,495 (39.6)
Age (yr)		
<65	15,153 (52.3)	12,162 (50.7)
0–19	423 (1.5)	281 (1.2)
20–49	7,179 (24.8)	5,753 (24.0)
50–64	7,551 (26.1)	6,128 (25.5)
≥65	13,818 (47.7)	11,838 (49.3)
TB types		
PTB	23,121 (79.8)	18,521 (77.2)
Smear-positive	7,672 (33.2)	6,214 (33.6)
Smear-negative	15,449 (66.8)	12,307 (66.4)
EPTB	5,850 (20.2)	5,479 (22.8)
Treatment history		
New patients	22,976 (79.3)	19,119 (79.7)
Previously treated patients	5,995 (20.7)	4,881 (20.3)
Medical institutions		
PPM hospitals	22,234 (76.7)	18,630 (77.6)
Non-PPM hospitals	5,706 (19.7)	4,910 (20.5)
Public health center	1,031 (3.6)	460 (1.9)

Values are presented as number (%). TB=tuberculosis; PTB=pulmonary TB; EPTB=extra-pulmonary TB; PPM=Public-Private Mix.

a decrease of 1.8% compared to 2019. In terms of treatment outcomes, 14.7% of patients were "cured", while 65.4% were "treatment completed." The percentage of "death" was 14.8%, an increase of 1.7% compared to 2019. Among the causes of death in 2020, the percentage of patients who died due to TB was lower than that for non-TB deaths (2.7% vs. 12.1%) (Tables 2, 3).

1) Treatment outcomes by age and sex

The TSR for patients with TB in 2020 was lower in males than that in females (79.1% vs. 81.5%). The proportions of negative treatment outcomes such as the rates of "treatment interruption", "death", and "ongoing treatment" were slightly higher in males. Regarding "treatment failure", seven cases were reported in males.

The TSR was 70.8% in patients aged ≥65 years when *death* was included in the estimation and increased as the age decreased. The percentage of "death" was highest in patients aged ≥65 years (25.2%) and showed age-dependent decline, with a consequent trend of increasing TSR.

The overall TSR for patients with TB was 93.9% when "death" was excluded from the estimation (93.5% in patients aged <65 years and 94.6% in patients aged ≥65 years). In contrast to the TSR with the inclusion of "death", the TSR with the exclusion of "death" was higher in patients with TB aged ≥65 years than in patients with TB aged <65 years (Figure 2).

Table 2. Treatment outcomes among patients with TB in 2019

Characteristic	Treatment outcomes								
	Treatment success			Treatment interruption	Treatment failed	Death			Still on treatment
	Sub-total	Cured	Completed			Sub-total	TB-related	Others	
Total (28,971)	23,727	4,882	18,845	625	14	3,805	640	3,165	800
	(81.9)	(16.9)	(65.0)	(2.2)	(0.0)	(13.1)	(2.2)	(10.9)	(2.8)
Sex[a]									
Male (17,567)	14,225	3,104	11,121	420	13	2,363	402	1,961	546
	(81.0)	(17.7)	(63.3)	(2.4)	(0.1)	(13.5)	(2.3)	(11.2)	(3.1)
Female (11,404)	9,502	1,778	7,724	205	1	1,442	238	1,204	254
	(83.3)	(15.6)	(67.7)	(1.8)	(0.0)	(12.6)	(2.1)	(10.6)	(2.2)
Age (yr)									
<65 (15,153)[a]	13,569	2,814	10,755	410	12	609	126	483	553
	(89.5)	(18.6)	(71.0)	(2.7)	(0.1)	(4.0)	(0.8)	(3.2)	(3.6)
0–19 (423)	401	61	340	5	0	1	0	1	16
	(94.8)	(14.4)	(80.4)	(1.2)	(0.0)	(0.2)	(0.0)	(0.2)	(3.8)
20–49 (7,179)[a]	6,559	1,354	5,205	198	4	137	33	104	281
	(91.4)	(18.9)	(72.5)	(2.8)	(0.1)	(1.9)	(0.5)	(1.4)	(3.9)
50–64 (7,551)[a]	6,609	1,399	5,210	207	8	471	93	378	256
	(87.5)	(18.5)	(69.0)	(2.7)	(0.1)	(6.2)	(1.2)	(5.0)	(3.4)
≥65 (13,818)	10,158	2,068	8,090	215	2	3,196	514	2,682	247
	(73.5)	(15.0)	(58.5)	(1.6)	(0.0)	(23.1)	(3.7)	(19.4)	(1.8)
TB types									
PTB (23,121)	18,888	4,659	14,229	437	14	3,153	567	2,586	629
	(81.7)	(20.2)	(61.5)	(1.9)	(0.1)	(13.6)	(2.5)	(11.2)	(2.7)
Smear-positive (7,672)	5,969	1,889	4,080	120	10	1,273	351	922	300
	(77.8)	(24.6)	(53.2)	(1.6)	(0.1)	(16.6)	(4.6)	(12.0)	(3.9)
Smear-negative (15,449)	12,919	2,770	10,149	317	4	1,880	216	1,664	329
	(83.6)	(17.9)	(65.7)	(2.1)	(0.0)	(12.2)	(1.4)	(10.8)	(2.1)
EPTB (5,850)[a]	4,839	223	4,616	188	0	652	73	579	171
	(82.7)	(3.8)	(78.9)	(3.2)	(0.0)	(11.1)	(1.2)	(9.9)	(2.9)
Treatment history[a]									
New patients (22,976)	19,113	3,965	15,148	350	6	3,016	502	2,514	491
	(83.2)	(17.3)	(65.9)	(1.5)	(0.0)	(13.1)	(2.2)	(10.9)	(2.1)
Previously treated patients (5,995)	4,614	917	3,697	275	8	789	138	651	309
	(77.0)	(15.3)	(61.7)	(4.6)	(0.1)	(13.2)	(2.3)	(10.9)	(5.2)
Medical institutions									
PPM (22,234)[a]	18,345	3,615	14,730	444	12	2,864	488	2,376	569
	(82.5)	(16.3)	(66.2)	(2.0)	(0.1)	(12.9)	(2.2)	(10.7)	(2.6)
Non-PPM (5,706)	4,434	873	3,561	147	1	921	152	769	203
	(77.7)	(15.3)	(62.4)	(2.6)	(0.0)	(16.1)	(2.7)	(13.5)	(3.6)
Public health center (1,031)[a]	948	394	554	34	1	20	0	20	28
	(91.9)	(38.2)	(53.7)	(3.3)	(0.1)	(1.9)	(0.0)	(1.9)	(2.7)

Values are presented as number (%). TB=tuberculosis; PTB=pulmonary TB; EPTB=extra-pulmonary TB; PPM=Public-Private Mix. [a]The sum of the percentages does not equal 100% because of rounding.

Table 3. Treatment outcomes among patients with TB in 2020

Characteristic	Treatment outcomes								
	Treatment success			Treatment interruption	Treatment failed	Death			Still on treatment
	Sub-total	Cured	Completed			Sub-total	TB-related	Others	
Total (24,000)[a]	19,212	3,519	15,693	522	7	3,550	640	2,910	709
	(80.1)	(14.7)	(65.4)	(2.2)	(0.0)	(14.8)	(2.7)	(12.1)	(3.0)
Sex									
Male (14,505)	11,469	2,230	9,239	330	7	2,230	403	1,827	469
	(79.1)	(15.4)	(63.7)	(2.3)	(0.0)	(15.4)	(2.8)	(12.6)	(3.2)
Female (9,495)[a]	7,743	1,289	6,454	192	0	1,320	237	1,083	240
	(81.5)	(13.6)	(68.0)	(2.0)	(0.0)	(13.9)	(2.5)	(11.4)	(2.5)
Age (yr)									
<65 (12,162)	10,833	1,948	8,885	291	5	571	138	433	462
	(89.1)	(16.0)	(73.1)	(2.4)	(0.0)	(4.7)	(1.1)	(3.6)	(3.8)
0–19 (281)	263	41	222	2	0	3	1	2	13
	(93.6)	(14.6)	(79.0)	(0.7)	(0.0)	(1.1)	(0.4)	(0.7)	(4.6)
20–49 (5,753)[a]	5,262	879	4,383	142	3	128	42	86	218
	(91.5)	(15.3)	(76.2)	(2.5)	(0.1)	(2.2)	(0.7)	(1.5)	(3.8)
50–64 (6,128)	5,308	1,028	4,280	147	2	440	95	345	231
	(86.6)	(16.8)	(69.8)	(2.4)	(0.0)	(7.2)	(1.6)	(5.6)	(3.8)
≥65 (11,838)[a]	8,379	1,571	6,808	231	2	2,979	502	2,477	247
	(70.8)	(13.3)	(57.5)	(2.0)	(0.0)	(25.2)	(4.2)	(20.9)	(2.1)
TB types									
PTB (18,521)[a]	14,686	3,369	11,317	359	7	2,923	574	2,349	546
	(79.3)	(18.2)	(61.1)	(1.9)	(0.0)	(15.8)	(3.1)	(12.7)	(2.9)
Smear-positive (6,214)	4,640	1,374	3,266	91	2	1,255	349	906	226
	(74.7)	(22.1)	(52.6)	(1.5)	(0.0)	(20.2)	(5.6)	(14.6)	(3.6)
Smear-negative (12,307)	10,046	1,995	8,051	268	5	1,668	225	1,443	320
	(81.6)	(16.2)	(65.4)	(2.2)	(0.0)	(13.6)	(1.8)	(11.7)	(2.6)
EPTB (5,479)	4,526	150	4,376	163	0	627	66	561	163
	(82.6)	(2.7)	(79.9)	(3.0)	(0.0)	(11.4)	(1.2)	(10.2)	(3.0)
Treatment history									
New patients (19,119)	15,540	2,860	12,680	345	4	2,739	498	2,241	491
	(81.3)	(15.0)	(66.3)	(1.8)	(0.0)	(14.3)	(2.6)	(11.7)	(2.6)
Previously treated patients (4,881)	3,672	659	3,013	177	3	811	142	669	218
	(75.2)	(13.5)	(61.7)	(3.6)	(0.1)	(16.6)	(2.9)	(13.7)	(4.5)
Medical institutions									
PPM (18,630)	15,162	2,775	12,387	360	4	2,626	494	2,132	478
	(81.4)	(14.9)	(66.5)	(1.9)	(0.0)	(14.1)	(2.7)	(11.4)	(2.6)
Non-PPM (4,910)[a]	3,651	590	3,061	141	3	899	137	762	216
	(74.4)	(12.0)	(62.3)	(2.9)	(0.1)	(18.3)	(2.8)	(15.5)	(4.4)
Public health center (460)	399	154	245	21	0	25	9	16	15
	(86.7)	(33.5)	(53.3)	(4.6)	(0.0)	(5.4)	(2.0)	(3.5)	(3.3)

Values are presented as number (%). TB=tuberculosis; PTB=pulmonary TB; EPTB=extra-pulmonary TB; PPM=Public-Private Mix. [a]The sum of the percentages does not equal 100% because of rounding.

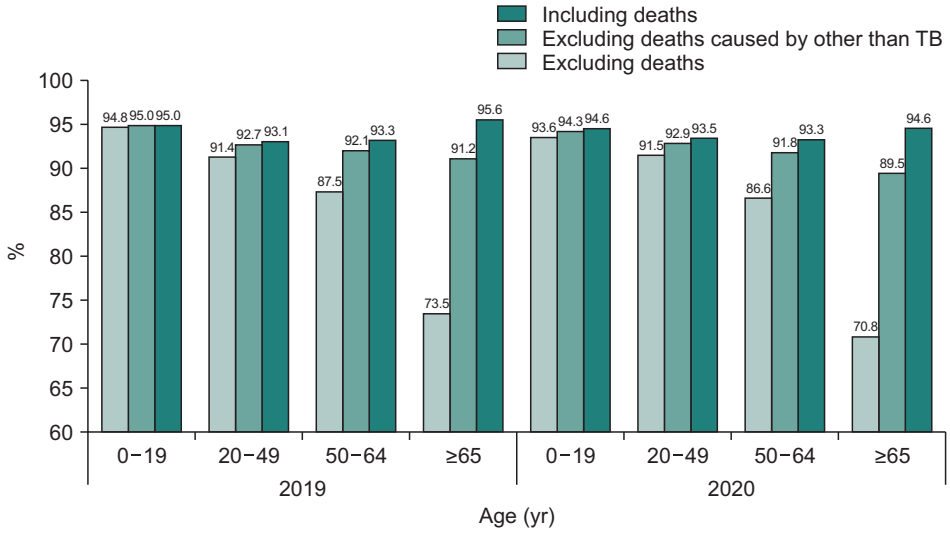

Figure 2. Treatment outcomes by the inclusion of deaths.

2) Treatment outcomes by TB type

In 2020, the TSR was slightly higher in patients with extra-pulmonary TB compared to that in patients with pulmonary TB (82.6% vs. 79.3%). Among patients with pulmonary TB, sputum smear-positive patients showed a slightly lower TSR compared to that in smear-negative patients (74.7% vs. 81.6%). Regarding TSR by TB type, the TSR was highest in extra-pulmonary TB, followed by smear-negative pulmonary TB and smear-positive pulmonary TB. While the TSR was lower in smear-positive patients, the percentage of "cured" was higher in smear-positive patients compared to that in smear-negative patients (22.1% vs. 16.2%). The rate of "death" by TB type decreased from smear-positive pulmonary TB (20.2%) to smear-negative pulmonary TB (13.6%) and extra-pulmonary TB (11.4%) (Table 3).

3) Treatment outcomes of patients with new and previously treated TB

In 2020, the TSR was 81.3% for new patients and 75.2% for previously treated patients, with the latter exhibiting 6.1% only. The rate of "treatment interruption" was two-fold higher in previously treated patients compared to new patients (3.6% vs. 1.8%). The rate of "ongoing treatment" was higher in previously treated patients compared to new patients (4.5% vs. 2.6%) (Table 3).

4) Treatment outcomes by institution

By institution, the TSR in 2020 was the highest in public health centers (86.7%), followed by PPM centers (81.4%) and non-PPM centers (74.4%). For the rate of "cured", public health centers showed ≥2-fold higher levels compared to private medical institutions (PPM centers 14.9% and non-PPM centers 12.0% vs. public health centers 33.5%). The rate of "death" was highest in non-PPM centers (18.3%) and lowest in public health centers (5.4%). The rate of treatment interruption was highest in public health centers (4.6%) and lowest in PPM centers (1.9%) (Table 3).

3. Treatment Outcomes of Patients with New and Previously Treated TB

1) Treatment outcomes by age and sex

In 2020, the TSR for males was 7.1% higher in new patients compared to previously treated patients (80.7% vs. 73.6%). Likewise, the TSR for females was 3.1% higher in new patients compared to that in previously treated patients (82.0% vs. 78.9%). The rate of "treatment interruption" for males was 2.4% higher in previously treated patients compared to that in new patients (4.1% vs. 1.7%). Similarly, the rate of "treatment interruption" for females was a 0.7% higher in previously treated patients compared to that in new patients (2.6% vs. 1.9%). The variation in TSR and treatment interruption rate between new and previously treated patients was larger in males than in females.

By age, the TSR was highest in the 0–19 years age group in both new and previously treated patients (94.1% vs 88.9%) and lowest in the ≥65 years age group (71.6% vs. 67.4%). The rate of "death" was higher in new patients aged ≥65 years (24.7%) than that in previously treated patients aged ≥65 years (26.9%). The rate of "treatment interruption" in 2020 was <2% in new patients of all four age groups. The rate of "treatment interruption" in previously treated patients was higher in patients aged <65 years (4.5%) than that in patients aged ≥65 years (2.7%). The rate was highest (7.4%) in the 0–19 years age group. The rate was also higher in previously treated patients compared to that in new patients regardless of age (Table 4).

2) Treatment outcomes by TB type

In 2020, the TSR for pulmonary TB was 6.4% higher in new patients compared to that in previously treated patients (80.7% vs. 74.3%). The TSR for extra-pulmonary TB was 83.3% in new patients and 79.2% in previously treated patients. Among patients with pulmonary TB, the TSR for sputum smear positivity was 6.3% higher in new patients compared to that in previously treated patients (75.8% vs. 69.5%). The TSR for sputum smear-negativity was 7.1% higher in new patients compared to that in previously treated patients (83.3% vs. 76.2%).

The rate of "death" for pulmonary TB was 15.3% in new patients (20.1% smear-positive and 12.7% smear-negative). The rate of "death" for new patients with extra-pulmonary TB was 11.2%. Among previously treated patients, the rate was 20.7% for smear-positivity, similar to that for new patients. The rate was 16.2% for smear-negative, 3.5% higher than that in new patients.

The rates of "treatment interruption" in new patients were 1.0% for smear-positive pulmonary TB, 1.7% for smear-negative pulmonary TB, and 2.8% for extra-pulmonary TB. The rates in previously treated patients were 3.5% for smear-positive pulmonary TB, 3.7% for smear-negative pulmonary TB, and 3.7% for extra-pulmonary TB, with relatively higher levels compared to those in new patients (Table 4).

3) Treatment outcomes by institution

By institution, 79.9% of new patients and 69.4% of previously treated patients were receiving TB treatments at and managed by PPM centers. The percentages of previously treated patients at non-PPM centers and public health centers were relatively higher than those of new patients. As aforementioned, the TSR was higher at public health centers (new patients 93.2% and previously treated patients 80.0%) than

Table 4. Treatment outcomes among new patients with TB and previously treated patients in 2020

Characteristic	New patients				Previously treated patients			
	Total	Treatment success	Treatment interruption	Death	Total	Treatment success	Treatment interruption	Death
Total	19,119 (100.0)	15,540 (81.3)	345 (1.8)	2,739 (14.3)	4,881 (100.0)	3,672 (75.2)	177 (3.6)	811 (16.6)
Sex								
Male	11,105 (58.1)	8,966 (80.7)	192 (1.7)	1,634 (14.7)	3,400 (69.7)	2,503 (73.6)	138 (4.1)	596 (17.5)
Female	8,014 (41.9)	6,574 (82.0)	153 (1.9)	1,105 (13.8)	1,481 (30.3)	1,169 (78.9)	39 (2.6)	215 (14.5)
Age (yr)								
<65	9,638 (50.4)	8,750 (90.8)	178 (1.8)	394 (4.1)	2,524 (51.7)	2,083 (82.5)	113 (4.5)	177 (7.0)
0-19	254 (1.3)	239 (94.1)	0 (0.0)	3 (1.2)	27 (0.6)	24 (88.9)	2 (7.4)	0 (0.0)
20-49	4,754 (24.9)	4,429 (93.2)	88 (1.9)	87 (1.8)	999 (20.5)	833 (83.4)	54 (5.4)	41 (4.1)
50-64	4,630 (24.2)	4,082 (88.2)	90 (1.9)	304 (6.6)	1,498 (30.7)	1,226 (81.8)	57 (3.8)	136 (9.1)
≥65	9,481 (49.6)	6,790 (71.6)	167 (1.8)	2,345 (24.7)	2,357 (48.3)	1,589 (67.4)	64 (2.7)	634 (26.9)
TB types								
PTB	14,530 (76.0)	11,719 (80.7)	215 (1.5)	2,227 (15.3)	3,991 (81.8)	2,967 (74.3)	144 (3.6)	696 (17.4)
Smear-positive	5,116 (26.8)	3,877 (75.8)	53 (1.0)	1,028 (20.1)	1,098 (22.5)	763 (69.5)	38 (3.5)	227 (20.7)
Smear-negative	9,414 (49.2)	7,842 (83.3)	162 (1.7)	1,199 (12.7)	2,893 (59.3)	2,204 (76.2)	106 (3.7)	469 (16.2)
EPTB	4,589 (24.0)	3,821 (83.3)	130 (2.8)	512 (11.2)	890 (18.2)	705 (79.2)	33 (3.7)	115 (12.9)
Medical institutions								
PPM hospitals	15,243 (79.7)	12,546 (82.3)	252 (1.7)	2,102 (13.8)	3,387 (69.4)	2,616 (77.2)	108 (3.2)	524 (15.5)
Non-PPM hospitals	3,641 (19.0)	2,775 (76.2)	87 (2.4)	634 (17.4)	1,269 (26.0)	876 (69.0)	54 (4.3)	265 (20.9)
Public health center	235 (1.2)	219 (93.2)	6 (2.6)	3 (1.3)	225 (4.6)	180 (80.0)	15 (6.7)	22 (9.8)

Values are presented as number (%). Treatment outcomes excluded treatment failure and under treatment. TB=tuberculosis; PTB=pulmonary TB; EPTB=extra-pulmonary TB; PPM=Public-Private Mix.

others, and the variation in TSR in new patients (public health centers 93.2% and PPM centers 82.3%; 10.9% difference) exceeded that in previously treated patients (public health centers 80.0% and PPM centers 77.2%; 2.8% difference). The rate of "death" across all institutions was lower in new patients than that in previously treated patients. However, for patients managed by public health centers, the variation in the rate of "death" between new patients and previously treated patients was larger

than for patients managed by private medical centers (Table 4).

Discussion

The TB treatment duration could stretch from several months to several years; thus, monitoring TB treatment outcomes is critical to minimize contagion and prevent the recurrence as well as the outbreak and spread of drug resistance. With the increasing number of individuals aged ≥65 years in the population of the ROK, the age range of patients with TB has changed, which further underscores the importance of monitoring treatment outcomes, including the TSR and rate of "death" by age.

The TSR decreased with increasing age, while the rate of "death" increased. The rate of non-TB death was higher than that of TB death, with a large variation between the rates of non-TB and TB deaths in patients aged ≥65 years.

After excluding deaths, the overall estimated TSR for patients with TB was ≥90%, and was higher in patients ≥65 years compared to that in patients <65 years, in contrast to the TSR estimated with the inclusion of death.

The result of Tuberculosis Vulnerability Assessment Internal Report (July to August 2022) showed comorbidity in 38.5% of patients aged <65 years and 80.4% of patients aged ≥65 years [9]. Based on these findings, the estimated TSR for older adults with the inclusion of death was low due to a high percentage of death related to aging or comorbidity other than TB.

The TSR for patients with drug-susceptible TB in Japan in 2021 was 66.5% (81.8% in patients aged <65 years and 59.0% in patients aged ≥65 years), lower than that in the ROK. Moreover, the rate of "death" for drug-susceptible patients with TB was 23.1%; 3.2% in patients aged <65 years and 32.8% in patients aged ≥65 years [10]. According to the United Nations and Statistics Korea, the aging index in Japan in 2020 was higher than that in the ROK (248.3 vs. 129.3), but the aging index in the ROK is predicted to exceed that in Japan by 2030 (301.6 vs. 293.8) [11]. Hence, the percentage of older adult patients with TB is predicted to continue to increase, while the improvement of TSR for patients with TB is likely to become even more challenging. Thus, monitoring the estimated TSR with the exclusion of TB and non-TB death is needed in older adult patients with TB. Moreover, the causes of death in these patients should be identified as their deaths may be due to a different ailment.

Among TB types, the TSR was the highest for extra-pulmonary TB, followed by smear-negative pulmonary TB and smear-positive pulmonary TB, whereas the rate of "cured" was higher in smear-positive patients (24.6% in 2019 and 22.1% in 2020) compared to that in smear-negative patients (17.9% in 2019 and 16.2% in 2020). This is presumed to be because, in the case of smear-positive patients with TB, the negative conversion rate was determined through tests by the medical staff due to the high infectivity of TB bacteria released by the patient. To block the community-based spread of TB, an inducement strategy is needed to increase the "cured" rate for patients with smear-positive TB.

The TSR in previously treated patients was lower than that in new patients by ≥6%. The rate of "ongoing treatment" was higher in previously treated patients compared to that new patients, presumably because the treatment duration increased in previously treated patients receiving TB treatment due to failure or interruption of the previous treatment as they did not adhere to or received irregular drug administration or showed

uncooperativeness such as being out of contact. The rate of "treatment interruption" was also ~2-fold higher in previously treated patients compared to that in new patients. Therefore, reinforcing the drug regimen and patient management systems for previously treated patients is needed to prevent TB contagion and the acquisition of drug resistance via treatment failure.

Among institution types, PPM had the highest number of TB patients under treatment and management, with 76.7% in 2019 and 77.6% in 2020. Public health centers treated and managed 3.6% of patients with TB in 2019, which decreased to 1.9% in 2020 during the coronavirus disease 2019 (COVID-19) pandemic.

The TSR was highest in public health centers, followed by PPM and non-PPM centers. However, the "cured" rate was ≥2-fold higher at public health centers. The rates of death were the highest in non-PPM centers and lowest in public health centers. The low rate of death and high TSR in public health centers are presumed to be due to the relatively small number and moderate health status of patients under care at these centers.

The rate of "treatment interruption" was highest in public health centers and lowest in PPM centers. Based on the patient characteristics at each institution, the percentage of new patients and previously treated patients was 82% and 18% in PPM centers; while these were 51% and 49% in public health centers respectively, indicating the higher proportion of previously treated patients in public health centers compared to PPM centers. As the rate of "treatment interruption" is high in previously treated patients, the rate of "treatment interruption" for patients treated at public health centers with a high percentage of previously treated patients is inevitably high. After distinguishing between new patients and previously treated patients, the rate of "treatment interruption" by institution varied little in each patient group.

Despite the response to the COVID-19 pandemic, PPM centers with approximately 80% patients with TB showed the lowest margin of TSR decrease and the lowest rate of "treatment interruption". Among the TB indicators monitored by PPM centers, the implementation of sputum smear and culture tests, the detection rate of adult and pediatric patient contact, and the rate of treatment onset for latent TB improved [12]. The similar or improved levels of the key indicators suggest that the management of TB from TB treatment to the testing of TB patient contacts continued to be effective even during the recent crisis.

The treatment duration for TB as a chronic infectious disease is ≥6 months; thus, TB treatment is affected not only directly by TB status but also by patient socioeconomic factors [13]. The Korean government has made continuous efforts to maximize the TSR through various patient care and support projects such as the project to support TB-safety belts, the system of forced hospitalization, and the drug regimen management project. These efforts have ultimately contributed to the prevention of TB contagion and the reduction of new patients with TB.

While some factors may inhibit the improvement of TSR such as the increased proportion of older adult patients, continued monitoring of TB treatment outcomes, identification of vulnerable patient groups, and development of strategies and projects are needed to improve the TSR in these patients. The results of this study revealed that the treatment difficulty increased in elderly patients with TB, previously treated patients, and smear-positive patients with TB. Thus, methods to increase the TSR should be sought, with concentrated efforts

related to drug regimen management and treatment support for DR-TB with longer treatment duration.

This study analyzed the data of patients with confirmed TB, at the time at which the Annual Report on Notified Tuberculosis was published and used the final treatment outcomes in the last report for each patient with TB. Care should be taken in interpreting the results as they may vary due to the differences in the criteria and time of estimation of the treatment outcome indicators in the previously released data of PPM centers.

Declarations

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한국 출혈성뇌졸중 등록사업을 통한 출혈성뇌졸중 환자의 기초 임상자료 분석

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초 록

뇌졸중은 한국에서 사망과 장애의 주요 원인이며, 인구의 고령화 추세를 감안하면 뇌졸중 발생은 지속적으로 증가할 것으로 예상된다. 특히 출혈성뇌졸중은 발병하면 예후가 상당히 좋지 않은 중증도가 높은 질환이다. 따라서 출혈성뇌졸중 환자 관리를 위한 레지스트리 구축 및 다기관 등록을 통하여 환자의 임상적, 역학적 특성에 대한 분석으로 대상자의 특성을 확인하여 근거기반의 관리 및 연구가 필요하다. 본 연구는 2021년 9월 1일부터 2022년 7월 31일까지 '한국 출혈성뇌졸중 등록사업'에 등록된 국내 3개 대학병원(권역심뇌혈관질환센터)의 출혈성뇌졸중 환자 457명을 대상으로 임상자료를 데이터베이스화하여 등록자료의 결과를 분석한 것이다. 등록된 환자의 평균연령은 62.8세였으며 남성이 51.4%였다. 그중 뇌내출혈(68.9%)이 가장 많은 비율을 차지했고, 지주막하출혈(26.1%), 뇌실내출혈(5.0%) 순이었다. 61.7%의 환자가 발병 후 3시간 이내에 병원에 도착했고, 81.4%의 환자가 구급차로 병원에 왔다. 병원에 도착한 환자의 49.2%는 혼미 이하 상태였다. 출혈성뇌졸중의 가장 흔한 위험인자는 고혈압(50.5%), 음주(37.6%), 흡연(24.3%) 순이었다. 평균 사망률은 13.6%로 지주막하출혈이 18.5%로 가장 높았다. 추후 장기간 추적 관찰을 통한 연구가 추가적으로 이루어져서 근거기반의 출혈성뇌졸중 지침과 향후 국가 보건정책 결정의 기반 마련에 기여할 수 있을 것으로 기대한다.

주요 검색어: 뇌졸중; 출혈성뇌졸중; 레지스트리; 보건정책

서 론

우리나라의 뇌졸중으로 인한 사망은 2021년 인구 10만 명당 44.0명으로 악성신생물, 심장질환, 폐렴에 이어 사망원인 4위이며, 특히 60대와 70대에서는 3위를 차지하고 있다[1]. 매년 10만 5천명의 새로운 뇌졸중 환자가 발생하고 있으며[2], 인구의 고령화 추세를 감안하면 뇌졸중 발생은 지속적으로 증가할 것으로 예상된다[3].

뇌졸중은 뇌혈관질환으로 혈관이 터져 뇌안에 혈액이 고이는 출혈성뇌졸중과 혈관이 막혀 뇌의 일부에 혈액이 공급되지 않는 허혈성뇌졸중으로 구분된다. 뇌졸중이 발병되면 환자의 15-20%가 사망하게 되고 10%는 완전 회복되며, 나머지 70-75%는 불완전 회복되어 여러 가지 장애를 초래하는데, 뇌손상부위, 범위 및 위치에 따라 편마비, 언어장애, 어지러움,

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핵심요약

① 이전에 알려진 내용은?

뇌졸중은 한국에서 사망과 장애의 주요 원인이다. 특히 출혈성뇌졸중은 예후가 좋지 않은 중증 질환으로 이에 대한 관리가 빨리 이루어져야 효과적이다. 그러나 출혈성뇌졸중 환자에 대한 상세 정보는 알려져 있지 않으며 현재까지 출혈성뇌졸중 환자를 대상으로 한 국내 통계 및 연구가 부족한 상황이다.

② 새로이 알게 된 내용은?

'한국 출혈성뇌졸중 등록사업'을 통해 국내 3개 대학병원(권역심뇌혈관질환센터)의 자료를 확인함으로 국내 출혈성뇌졸중 환자의 기초 임상자료를 분석할 수 있었다.

③ 시사점은?

출혈성뇌졸중 환자의 임상양상 및 그 특성을 확인할 수 있는 기초자료로서의 의의를 가지며, 앞으로 확장된 레지스트리 구축에 기여할 수 있을 것으로 생각된다. 또한 추가적으로 장기간 추적관찰을 통한 연구로 근거기반의 출혈성뇌졸중 관련 지침과 향후 국가 보건정책 결정의 기반 마련에 기여할 수 있을 것으로 기대한다.

연하장애, 감각장애 그리고 배뇨장애 등의 다양한 문제가 야기된다[4]. 또한 재발률이 높아 전체 뇌졸중의 25%를 차지하며 재발시기는 5년 이내에 26.4%, 10년 이내에 39.2%로 예후는 처음 발병 시보다 치명적이며[5], 이는 의료비의 부담을 가중시키는 것으로 보고되고 있다[6].

이러한 뇌졸중의 발생률과 사망률을 줄이기 위해 질환의 임상적, 역학적 특징 분석 및 높은 근거수준의 연구결과를 도출하여 진료의 표준화, 진료지침 및 질 관리를 통해 해당 보건정책 수립에 기여하는 것은 자명한 일이기에 외국에서는 이미 많은 기관에서 이를 체계적으로 데이터베이스화하여 분석해 오고 있다[7,8]. 이에 한국 정부는 뇌혈관질환에 대한 의료서비스의 지속적인 질 관리를 통해 사망률 및 장애 발생률을 감소시키기 위해 노력하였다. 2006년부터 심뇌혈관질환 종합대책을 수립하여 위험요인을 확인하였고 심뇌혈관질환 관리센터를 운영하는 등 다각적인 노력을 기울이고 있으며 2007년부터는 급성기 뇌졸중 적정성 평가를 시행하고 있다. 또한 2006년 제1기 '심뇌혈관질환 종합대책'이 수립되면서 2008년 3개의 권역심뇌혈관질환센터를 지정하였고, 2023년 현재 14개의 권역심뇌혈관질환센터가 선정되어 급성기 치료뿐만 아니라 관리 및 예방을 포함하는 사업과 권역 뇌졸중 레지스트리(Regional Stroke Registry, RSR) 등록을 하고 있다. 하지만 현재의 권역 뇌졸중 레지스트리는 허혈성뇌졸중 환자가 주를 이루고 있으며 등록항목 역시 출혈성뇌졸중 환자의 특징을 포함하기에는 미흡한 것으로 생각된다. 또한 현재 출혈성뇌졸중 데이터로 포괄적인 자료를 얻기에는 부족하여 국외 데이터를 활용하고 있는 실정으로 국내의 현황 파악이 절실하다.

출혈성뇌졸중은 전체 뇌졸중의 23.7%를 차지하며, 76.3%를 차지하는 허혈성뇌졸중에 비해 발생률이 낮지만[9], 예후 및 경과는 허혈성뇌졸중보다 더 심각하다[10,11]. 최근 뉴스에서 보도된[12,13] 유명배우와 간호사 사망과 같이 출혈성뇌졸중은 발병하면 예후가 상당히 좋지 않은 중증도가 높은 질환으로 관리의 필요성이 대두되고 있다.

따라서 출혈성뇌졸중 환자 관리를 위하여 급성기 치료에서 퇴원 후 관리를 포함하는 표준화된 데이터베이스 등록체계 구축이 필요하다. 이에 권역심뇌혈관질환센터로 지정된 울산대학교병원, 인하대학교병원, 충남대학교병원에서 '한국 출혈성뇌졸중 등록사업(Korean Hemorrhagic Stroke Registry, KHSR)' 시스템을 개발하여 2021년 9월부터 임상자료를 수집하고 있다. 아직 초창기 사업이지만 출혈성뇌졸중 환자의 임상적, 역학적 특성에 대한 분석으로 대상자의 특징을 확인하여 출혈성뇌졸중 환자의 관리, 연구 및 보건정책 수립에 기초자료를 제시하기 위해 본 연구를 시행하였다.

방 법

1. 연구대상 및 자료수집

연구대상은 2021년 9월 1일부터 2022년 7월 31일까지 울산대학교병원, 인하대학교병원 및 충남대학교병원에 급성기 출혈성뇌졸중(I60-I62, I60: 지주막하출혈, I61: 뇌내출혈, I62: 기타 비외상성 두개내출혈)을 주상병으로 증상 발생 7일 이내 응급실을 내원한 환자이다.

자료수집은 국내 3개의 대학병원(권역심뇌혈관질환센터)에서 공동으로 개발·등록하고 있는 '한국 출혈성뇌졸중 등록사업' 레지스트리의 569건 중 입력 누락된 자료 112건을 제외하고 총 457건을 후향적으로 분석하였다.

2. 자료조사 및 분류

레지스트리에 입력된 자료 중 수집한 정보는 대상자의 일반적인 특성, 출혈성뇌졸중 분류, 병원 전 단계, 내원 시 상태, 출혈성뇌졸중 위험인자, 출혈성뇌졸중 치료방법 및 퇴원 시 상태 등을 확인하였다.

병원 전 단계로 타원경유 또는 직접내원으로 구분하였고, 내원수단은 구급차, 자가용, 택시, 대중교통과 기타로 분류하였다. 내원 시 상태로는 신경학적 결손 상태(Glasgow Coma Scale, GCS)와 첫 뇌영상 촬영 소요시간을 구하였다. 또한 증상 발생 후 본원 내원 시까지 경과시간을 확인하였는데, 이는 증상 발생 날짜와 시각이 불분명한 대상자는 제외하였고 타원을 경유한 경우에는 본원 내원한 시각을 기준으로 분석하였다. 출혈성뇌졸중 위험인자로는 뇌졸중 과거력, 뇌졸중 가족력, 심장질환, 혈압, 당뇨, 고지혈증, 심방세동, 간경화, 신부전, 음주, 흡연 및 약물복용력(항혈소판제, 항응고제)으로 구분하였다. 출혈성뇌졸중을 뇌내출혈, 지주막하출혈, 뇌실내출혈로 구분하였으며, 이에 따른 발생원인, 병변위치와 치료방법에 대해 확인하였다. 퇴원 시 상태로 신체기능적 결손 상태(modified Rankin Scale, mRS), 입원기간 및 재활의학과 전과 여부를 확인하였고, 퇴원 형태로는 사망, 전원 또는 집으로 퇴원으로 분류하였다.

환자의 자료입력과 평가는 본 연구의 목적과 레지스트리 입력에 충분하게 숙련된 의사와 간호사에 의해 시행되었다. 본 연구는 후향적 연구로 동의서 취득면제를 승인받았다(울산대학교병원 임삼연구심의위원회, IRB No. 2022-11-025).

3. 자료 분석방법

수집된 자료는 IBM SPSS (version 24.0; IBM Co.) 프로그램을 이용하여 분석하였다. 대상자의 일반적 특성, 질환별 분류, 내원 방법, 내원 시까지 경과시간, 신경학적 결손 상태, 치료방법, 위험인자 및 퇴원형태 등에 대해 연속형 변수의 경우에는 평균, 표준편차와 중앙값을, 범주형 변수의 경우에는 빈도와 백분율로 나타냈다.

결 과

1. 대상자의 일반적 특성

2021년 9월 1일부터 2022년 7월 31일까지 레지스트리

표 1. 대상자의 일반적 특성

특성	대상자 수(%) (n=457)	평균±표준 편차
성별		-
남성	235 (51.4)	
여성	222 (48.6)	
나이(세)		62.8±15.3
≤20	3 (0.7)	
21-40	38 (8.3)	
41-60	151 (33.0)	
61-80	206 (45.1)	
≥81	59 (12.9)	
신장(cm)		163.1±9.5
체중(kg)		64.2±15.2
혈압(mmHg)		
수축기 혈압		163.8±35.1
이완기 혈압		92.9±20.5

에 등록된 457건이 분석되었다. 출혈성뇌졸중 환자의 나이는 평균 62.8±15.3세이며, 남자가 51.4%를 차지하였다. 키와 체중은 평균 163.1±9.5 cm, 64.2±15.2 kg이며, 내원 시 평균혈압은 수축기/이완기 혈압 163.8±35.1/92.9±20.5 mmHg였다(표 1).

2. 출혈성뇌졸중 분류

출혈성뇌졸중을 세부 진단으로 분류하면 뇌내출혈이 315건(68.9%), 지주막하출혈이 119건(26.1%), 뇌실내출혈이 23건(5.0%)를 차지하였다(그림 1).

3. 병원 전 단계

출혈성뇌졸중 환자 중 328건(71.8%)은 직접내원, 129건(28.2%)은 타원을 경유하여 내원하였다. 내원수단으로는 58.2%가 119구급차를 이용하였고 사설 · 병원 · 기타 구급차의 이용률까지 모두 포함하면 전체 구급차 이용률은 81.4%를 차지하였다. 그 밖에 자가용 17.6%, 택시 0.4%, 대중교통 0.2% 순이었다(표 2).

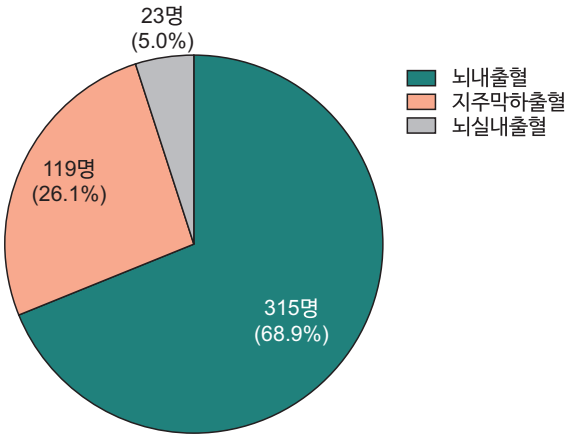

그림 1. 출혈성뇌졸중 분류

표 2. 내원 시 대상자의 이동수단

이동수단	대상자 수(%) (n=457)
구급차	372 (81.4)
119구급차	266 (58.2)
이외의 구급차	106 (23.2)
자가용	80 (17.6)
택시	2 (0.4)
대중교통	1 (0.2)
기타	2 (0.4)

4. 내원 시 상태

1) 신경학적 결손 상태

뇌손상 환자의 의식을 평가하는 가장 기본적인 평가도구인 GCS는 총점이 15점이며, 8점 이하는 중증, 9–12점은 중등도, 13–15점은 경증으로 정의하고 있다[14].

본 연구에서 입원 시 GCS 평균은 10.9±4.2점이며, 중증(8점 이하)은 33.7%, 중등도(9–12점)는 15.5%, 경증(13–15

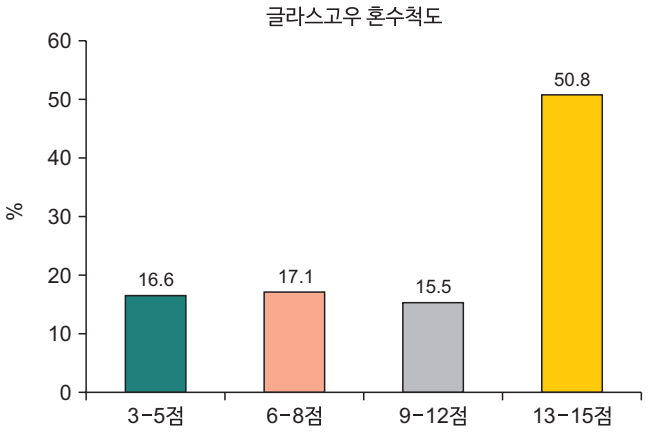

그림 2. 내원 시 신경학적 결손 상태

표 3. 증상 발생 후 내원 시까지 경과시간

누적 비율(시간)	대상자 수(%) (n=360)	평균±표준 편차
≤1	134 (37.2)	
1–2	185 (51.4)	
2–3	222 (61.7)	
3–6	280 (77.8)	
6–12	302 (83.9)	
12–24	320 (88.9)	
1–3 (일)	351 (97.5)	
≥7 (일)	360 (100.0)	
평균 경과시간		9.3±22.0

점)은 50.8%였다(그림 2). 다시 말하면 출혈성뇌졸중 환자의 49.2%가 중등도 이하(GCS 12점 이하)의 상태로 내원하였다.

2) 증상 발생 후 내원 시까지 경과시간

출혈성뇌졸중 환자의 증상 발생 후 병원 내원 시까지의 경과시간은 날짜와 시각이 불분명한 97건을 제외한 360건으로 분석하였다. 내원 시까지 평균 9.3±22.0시간 소요되었고, 이 중 3시간 이내에 방문한 환자는 61.7%이며 88.9%의 환자가 증상 발생 24시간 이내에 도착하였다(표 3).

3) 첫 뇌영상 촬영 소요시간

병원 도착 후 첫 뇌영상 촬영까지의 소요시간은 첫 증상 발생 후 6시간을 초과하여 도착한 158명을 제외한 299건으로 분석하였다. 이는 6시간 이내에 내원한 환자들에게 뇌졸중 발생 여부를 확인하기 위해 빠른 영상검사를 시행하는 것이 중요하다는 선행연구[15]와 건강보험심사평가원에서 시행하는 '급성기 뇌졸중 적정성 평가'[6]의 평가지표를 참고하여, 레지스트리 개발 당시 첫 증상 발생 후 6시간을 초과하여 도착한 대상자를 제외하였다. 본 연구에서 첫 뇌영상 촬영 소요시간은 평균 35.1±110.0분이었으며, 이 중 60분 이내 영상촬영률은 92.3%를 차지하였다(표 4).

표 4. 첫 뇌영상 촬영 소요시간

분류	대상자 수(%) (n=299)	평균±표준 편차
60분 이내 영상 촬영	276 (92.3)	
평균 영상 촬영 시간(분)		35.1±110.0

5. 출혈성뇌졸중 위험인자

출혈성뇌졸중의 위험인자를 확인한 결과 고혈압이 50.5%로 가장 높았으며, 음주(37.6%), 흡연(24.3%), 당뇨(22.1%), 뇌졸중 과거력(18.8%), 항혈소판제 복용(14.9%), 고지혈증(11.2%), 심방세동(10.5%) 등의 순으로 동반되었다(그림 3).

6. 출혈성뇌졸중 분류 및 치료방법

뇌내출혈의 원인으로 고혈압으로 인한 출혈이 94.3%였고, 출혈의 병변으로는 기저핵 부위가 38.1%로 가장 높은 비율을 차지하였다. 치료방법으로는 보존적 치료가 74.0%, 수술이 26.0% 시행되었다. 지주막하출혈의 원인으로는 뇌동맥류에 의한 출혈이 92.4%였고, 병변위치로 중대뇌동맥이 27.7%, 전교통동맥 22.7%, 후교통동맥 17.6% 순이었다. 치료방법으로 수술치료가 82.4% 시행되었는데, 그중에서 혈관내 수술이 79.6%, 클립결찰술이 20.4%를 차지했다. 보존적 치료를 받은 17.6% 대상자 중에는 내원 시부터 불량한 예후로 수술을 하지 못한 경우가 포함되었다. 뇌실내출혈은 고혈압으로 인한 출혈이 65.2%였고, 60.9%에서 수술치료가 이루어졌다(표 5).

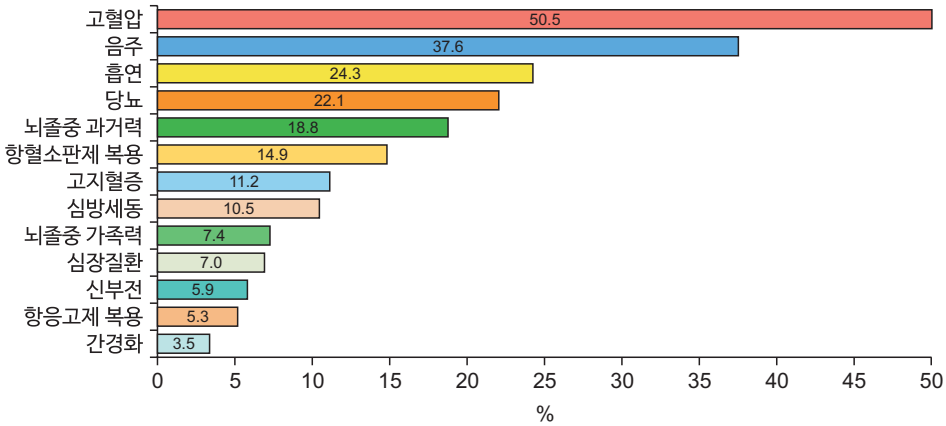

그림 3. 출혈성뇌졸중 위험인자

표 5. 출혈성뇌졸중 분류 및 치료방법

분류(n=457)	원인	대상자 수(%)	위치	대상자 수(%)	치료방법	대상자 수(%)
뇌내출혈(n=315)	고혈압	297 (94.3)	기저핵	120 (38.1)	보존적 치료	233 (74.0)
	모야모야병	3 (0.9)	시상	71 (22.5)	수술	82 (26.0)
	뇌동정맥 기형 파열	15 (4.8)	피질하	81 (25.7)		
			소뇌	23 (7.3)		
			뇌간	20 (6.4)		
지주막하출혈(n=119)	뇌동맥류	110 (92.4)	전교통동맥	27 (22.7)	보존적 치료	21 (17.6)
			전대뇌동맥	5 (4.2)	수술	98 (82.4)
			내경동맥	9 (7.6)	클립결찰술	20 (20.4)
			후교통동맥	21 (17.6)	혈관내 수술	78 (79.6)
			중대뇌동맥	33 (27.7)	코일색전술	16 (20.5)
			기저동맥	4 (3.4)	스텐트 지지하 색전술	61 (78.2)
			후대뇌동맥	3 (2.5)	혈관내 포착술	1 (1.3)
			후하소뇌동맥	3 (2.5)		
			척추동맥	4 (3.4)		
			전하소뇌동맥	1 (0.8)		
	비-뇌동맥류	9 (7.6)	비-뇌동맥류	9 (7.6)		
뇌실내출혈(n=23)	고혈압	15 (65.2)			보존적 치료	9 (39.1)
	모야모야병	6 (26.1)			수술	14 (60.9)
	뇌동정맥 기형 파열	2 (8.7)				

표 6. 출혈성뇌졸중 환자의 입원 및 재활치료

요인	값(n=457)
신경외과 입원기간 (일)	19.8±16.5
재활 협진 환자	434 (95.0)
재활 협진 의뢰일 (일)	1.0±1.2
재활의학과 전과 환자	134 (29.3)

단위: 평균±표준 편차 혹은 명(%).

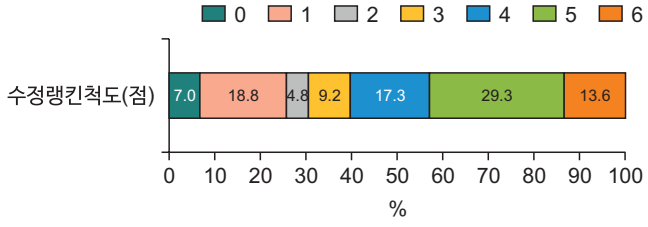

그림 4. 퇴원 시 신체기능적 결손 상태

7. 출혈성뇌졸중 환자의 입원 및 재활치료

뇌졸중 이후 조기재활의 중요성과 효과에 대한 근거는 이미 많이 밝혀져 있는 상태로[16], 본 연구에서 72시간 이내 재활 협진은 98.6% 이루어졌고 재활 협진 의뢰 평균일수는 1.0±1.2일이었다. 또한 신경외과 치료 후 재활의학과로 전과된 환자는 29.3%를 차지했다(표 6).

8. 퇴원 시 상태

1) 신체기능적 결손 상태

그림 4는 퇴원 시 출혈성뇌졸중 환자의 신체기능적 결손 상태를 나타내는 mRS이다. 퇴원 시의 mRS 점수는 0-6점으로, 30.6%가 좋은 경과(0-2점)였고 69.4%가 나쁜 경과(3-6점)로 확인되었다.

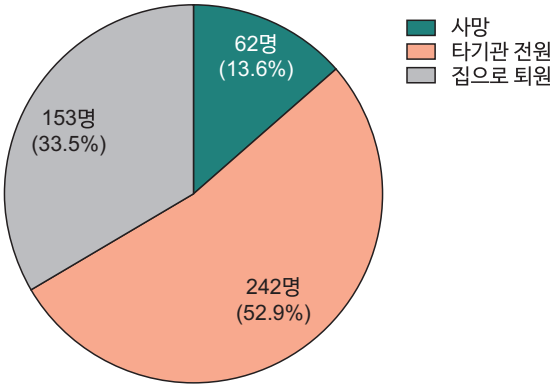

그림 5. 퇴원 형태

2) 퇴원 형태

본 연구에서 신경외과 평균 입원기간은 19.8±16.5일이었으며(표 6), 환자의 33.5%는 집으로 퇴원, 52.9%는 타기관으로 전원하였다. 입원기간 중 병원 내 사망률은 13.6%로 지주막하출혈이 18.5%로 가장 높았다(그림 5). 또한 입원기간 중 환자 또는 보호자에게 제공한 뇌졸중 교육 실시율은 64.1%였다.

논 의

본 연구는 권역심뇌혈관질환센터인 국내 3개 대학병원의 출혈성뇌졸중 환자를 대상으로 '한국 출혈성뇌졸중 등록사업'을 통한 임상자료를 데이터베이스화하여 등록자료의 결과를 분석한 것이다. 이는 출혈성뇌졸중에 대한 통계가 미흡한 국내 현실에서 등록사업을 시작하여 출혈성뇌졸중 환자의 임상양상 및 그 특성분포를 가늠할 수 있는 기초자료로 기반을 마련한 것에 의의를 둘 수 있다.

출혈성뇌졸중 환자의 일반적 특성에서 성별은 남자가 51.4%였는데 이는 건강보험심사평가원 적정성 평가 자료를 활용한 Ko 등[17]의 연구와 국내 다기관 코호트 연구인 Shin 등[18]의 결과와 유사하였다. 반면 출혈성뇌졸중 환자만을 대상으로 한 연구를 찾기가 쉽지 않아 이에 대한 자료구축과 연구가 필요할 것으로 생각된다. 출혈성뇌졸중 환자의 평균연령은 62.8±15.3세였고 연령이 높아질수록 유병률이 증가하는 것을 본 연구에서 확인할 수 있었는데, 이는 국내 뇌졸중 재활 코호트 자료를 분석한 Kim 등[19]의 연구에서도 평균연령이 65.1±13.5세로 유사하였고, 연령이 높아짐에 따라 뇌졸중 발생률이 증가하였다[3,17].

본 연구에서 병원 전 단계로 병원 내원수단은 119구급차 이용률이 58.2%이며 사설 · 병원 · 기타 구급차의 이용률까지 모두 포함하면 전체 구급차 이용률은 내원수단의 81.4%를 차지하였는데, 이는 허혈성뇌졸중 환자를 대상으로 연구한 구급차 이용률 76.1%인 결과와 유사하였다[20]. 또한 우리나라 2019년 응급의료모니터링 시스템과 비교해보면 응급실 내원수단으로 119구급차 이용률은 2013년 21.5%, 2017년 33.5%로 증가추세를 확인할 수 있었고[21] 현 시점의 통계는 더 높은 비율을 차지할 것으로 생각된다.

내원수단에 따른 증상 발생 후 내원 시까지의 경과시간을 비교해보면 본 연구에서는 증상 발생에서 병원 도착까지 113분이며, 119구급차 이용 시 60분, 119 이외의 수단 이용 시 236분이 경과되어 119구급차를 이용한 경우가 119 이외의 수단에 비해 3.9배 빨리 병원에 도착하는 것을 알 수 있었다. 응급환자 이송 수단 관련 선행연구에서는 119구급차를 이용한 경우가 병원에 가장 빨리 내원하였다고 확인되었는데[22], 이와 유사하게 건강보험심사평가원 보고[23]에서도 급성기 뇌졸중의 경우 증상 발생에서 병원 도착까지 204분이며, 119구급차를 이용한 경우 121분, 이용하지 않았을 경우 447분으로 119구급차를 이용한 경우가 3.7배 빨리 병원에 도착한다고 하였다. 이에 따라 119구급차 이용 시 가장 신속하게 병원에 도착할 수 있다는 국민의 인지 개선을 위해 노력이 필요할 것으로 생각된다[24].

본 연구에서 내원 시 GCS는 평균 10.9±4.2점으로, 49.2%가 중등도 이상의 결손인 GCS 12점 이하로 내원하였다. 이는 Kim 등[3]의 연구에서도 증상 발생 시 심각한 신경학적 결손으로 내원한 경우가 허혈성뇌졸중에서 1.5%인데 비

해 출혈성뇌졸중에서 13.9%인 결과와 유사하다. 또한 증상 발생 후 내원 시까지의 경과시간은 본 연구에서 37.2%가 1시간 이내에 도착하였고 61.7%가 3시간 이내에 내원하였다. 이는 뇌졸중 환자를 대상으로 한 Kim 등[3]의 연구에서 41.8%가 3시간 이내에 도착한 것과 비교하면 출혈성뇌졸중은 내원 시 중증도가 심각하여 증상 발생 후 빨리 병원을 내원한다는 의견을 뒷받침해 준다. 병원 도착 후 영상 촬영 시까지 소요된 시간은 본 연구에서 평균 35.1±110.0분이며 60분 이내 92.3%가 촬영되었는데, 이는 2020년 건강보험심사평가원의 뇌졸중 적정성평가에서 60분 이내 촬영률이 99.2%인 것과 유사하다.

출혈성뇌졸중 위험인자는 고혈압, 음주, 흡연, 당뇨 등이 있었는데, 이는 뇌졸중 환자를 대상으로 한 Kim 등[3]의 연구와 허혈성뇌졸중 환자를 대상으로 한 Lee 등[25]의 연구에서 알코올, 고혈압, 당뇨병, 심방세동 등의 결과와 유사하였다. 따라서 조절할 수 있는 위험인자의 관리가 뇌졸중 예방에 중요하다는 것을 시사해 주고 있다. 재활 협진은 본 연구에서 평균 1.0±1.2일, 3일 이내에 98.6%가 협진 의뢰되었는데, 2020년 급성기 뇌졸중 적정성 평가지표인 재활의학과 5일 이내 협진에서도 역시 97.8%의 높은 비율을 보였다. 이는 Kim 등[19]의 연구에서 재활 협진 의뢰일 평균인 2.1–2.7일보다도 더 빠른 결과이며, 또한 입원 시 재활 협진 환자 비율이 75.1–85.7%인 것과 비교해도 더 높다는 것을 알 수 있다.

다음으로 치료방법을 살펴보면 출혈성뇌졸중에서 지주막하출혈은 내원 시 예후가 상당히 불량하여 수술하지 못하는 경우가 흔하며, 그 이외에는 클립결찰술 또는 코일색전술을 시행한다. 본 연구에서 지주막하출혈 수술 중 클립결찰술은 20.4%, 코일색전술은 79.6%가 시행되었는데, 이는 동일한 조건의 연구가 없어 비교가 쉽지 않지만 Kim 등[19]의 연구에서 출혈성뇌졸중 초기 치료방법으로 2012–2015년의 자료와 2021년 자료를 비교하면 클립결찰술의 비율은 줄어들고 코일색전술의 비율은 증가하는 추세임을 알 수 있었다. 이는 분리형 코일을 이용한 뇌동맥류의 혈관내 치료기법이 임상 적용되면서 뇌동맥류의 주된 치료방법으로 발전하게 되는 것으로 여겨진다[26].

본 연구에서 재활의학과로 전과되는 환자가 29.3%를 차지했는데 이는 뇌졸중 환자를 대상으로 한 Kim 등[19]의 연구에서 16.5–19.7%를 차지한 것과 비교하면 본 연구의 전과 비율이 높은 것을 알 수 있다. 이는 본 연구결과의 퇴원 시 mRS의 나쁜 경과인 3점 이상이 69.4%인 것과 함께 설명하면, 출혈성뇌졸중 환자는 예후가 불량하여 이에 따라 재활의학과로의 전과 비율이 높다고 할 수 있을 것 같다. 향후 신체기능적 결손 상태에 대해 추후 퇴원 시뿐만 아니라 장기적인 비교 분석이 필요할 것으로 생각된다.

퇴원 형태로는 본 연구에서 13.6%가 원내에서 사망하였는데 동일한 기간의 연구 자료가 없어 비교하기 어렵지만, Kim 등[3]의 연구에서 한 달 이내의 사망률이 허혈성뇌졸중 5.2%, 뇌내출혈 21.6% 그리고 지주막하출혈 25.1%로 확인되어 출혈성뇌졸중 질환의 중증도가 높은 것을 시사해 준다.

이상의 연구결과를 종합해 볼 때, 본 연구는 국내 환자의 전체를 반영하고 있다고 볼 수 없어 한계가 있지만 추가적으로 다기관 등록으로 확장하여 자료를 수집하고 장기간 추적관찰 연구를 수행하였으므로 근거기반의 출혈성뇌졸중 관련 지침과 향후 국가 보건정책 결정 자료에 기여할 수 있을 것으로 기대한다.

Declarations

Ethics Statement: The requirement of informed consent in this study was waived by Ulsan University Hospital's Institutional Review Board (No. 2022-11-025) because the study was a retrospective study.

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An Analysis of Basic Clinical Data on Hemorrhagic Stroke Patients Using the Korean Hemorrhagic Stroke Registry

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ABSTRACT

Stroke is a major cause of death and disability in Korea and given its aging population, stroke incidence cases are expected to continue to increase. In particular, hemorrhagic stroke is a highly severe type of strokes with poor prognosis. Therefore, it is necessary to build the multi-center registry system to accumulate data on clinical and epidemiological characteristics of various hemorrhagic stroke patients and based on the accumulated data to do researches on it. This study made into database the clinical data on 457 hemorrhagic stroke patients of three Korean university hospitals (Regional Cardiocerebrovascular Centers) included in the *Korean Hemorrhagic Stroke Registry* from September 1, 2021 to July 31, 2022 and analyzed the data. The mean age of patients in the registry was 62.8 years old, with males being 51.4%. Among them, the largest proportion of hemorrhagic stroke was taken up by intracerebral hemorrhage (68.9%), followed by subarachnoid hemorrhage (26.1%) and intraventricular hemorrhage (5.0%). 61.7% of patients arrived within 3 hours of onset, and 81.4% of patients were carried to hospital by ambulance. Arriving at hospital, 49.2% of patients were under stupor or worse. The most prevalent risk factor for hemorrhagic stroke was high blood pressure (50.5%), followed by alcohol (37.6%) and smoking (24.3%). The mean rate of expired at hospital was 13.6%, with that of subarachnoid hemorrhage being the highest (18.5%). This study expects that there will be further long-term follow-up studies in the future that will contribute to creating the guidelines for hemorrhagic stroke and establishing national public health policies.

Key words: Stroke; Hemorrhagic stroke; Registries; Health policy

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Introduction

In 2021, the mortality rate from stroke in Republic of Korea (ROK) was 44 per 100,000 population. That year, cerebrovascular accidents, more commonly known as stroke, were the fourth leading cause of mortality after malignant neoplasms, heart disease, and pneumonia. In addition, the third leading cause of mortality among patients aged 60–79 was a stroke [1]. There are 105,000 newly diagnosed cases of stroke each year [2]. Current trends show that the population is aging and that the incidence of stroke will increase simultaneously [3].

Key messages

① What is known previously?

Stroke is a leading cause of death and disability in Republic of Korea (ROK). Especially hemorrhagic stroke is a severe type of strokes with poor prognosis, and it is known that it should be made as soon as possible after its onset to make the treatment effective. Besides that, however not much has been known about hemorrhagic stroke patients in ROK. Statistics and studies on patients with hemorrhagic stroke have not yet been accumulated enough in ROK.

② What new information is presented?

This study was able to analyze basic clinical data about hemorrhagic stroke patients in ROK by checking the data from three Korean university hospitals (Regional Cardiocerebrovascular Centers) included in the *Korean Hemorrhagic Stroke Registry*.

③ What are implications?

The findings of this study are meaningful as a basic data which can be used to identify clinical features and characteristics of patients with hemorrhagic stroke. And they can also contribute to constructing an expanded registry on hemorrhagic stroke in the future. It is also expected that if further long-term follow-up studies are done in the future, the findings will serve as the basis for creating the guidelines for hemorrhagic stroke and establishing national public health policies on it.

A stroke is classified as either a hemorrhagic or an ischemic stroke. Hemorrhagic strokes are defined as ruptured blood vessels with subsequent accumulation of blood in the brain. In contrast, ischemic strokes result from blocked vasculature and lead to decreased brain perfusion. Patients with a recent stroke history have a 15–20% likelihood of dying, a 10% likelihood of achieving complete recovery, and a 70–75% likelihood of failing to return to their premorbid state. Complications, including hemiplegia, aphasia, dizziness, dysphagia, decreased sensation, and urinary incontinence, occur based on the specific area of the brain that is affected area; the extent of the damage also determines the complications that are likely to persist beyond the acute phase of the stroke [4]. The rate of relapse after a stroke is extremely high, with an incidence of 25%. Of the patients who relapse, 26.4% will relapse within five years, and at least 39.2% will relapse within ten years. Therefore, the mortality rate associated with a stroke progressively increases as the time elapsed from the acute phase increases [5]. Therefore, the burden of medical costs increases the longer the patient survives [6].

To reduce the incidence and mortality from a stroke, relevant health policies based on standardizing medical care, treatment guidelines, and quality management through analyzing clinical and epidemiological characteristics of the disease and deriving high-level research evidence need to be established. Many institutions have already been systematically databased and studied in other countries [7,8]. Accordingly, the Korean government attempts to reduce mortality and disability rates by continuously managing the quality of healthcare services for cerebrovascular diseases. Even so, starting in 2006, Comprehensive Measures for (the identification of) Cardiovascular and Cerebrovascular Disease(s) have been evaluated. These comprehensive measures include operating a cardiovascular and cerebrovascular disease management center, which began in 2007, and a Quality Assessment Program for Acute Stroke. The first 'Comprehensive Measures for Cardiovascular and Cerebrovascular Disease' was established in 2006, and three regional cardio-cerebrovascular disease centers were designated in 2008. As of 2023, fourteen regional cardio-cerebrovascular disease centers have been established. These centers focus on acute treatment, patient management

and prevention, and registering patients with the Regional Stroke Registry (RSR). The RSR primarily consists of patients with a recent history of ischemic stroke. Unfortunately, the registered items were insufficient to include in this study as the availability of patients with a recent history of a hemorrhagic stroke was sparse. In addition, available data on hemorrhagic strokes are inadequate to understand their incidence comprehensively. Therefore, foreign data is analyzed to elucidate the current situation in ROK further.

Hemorrhagic stroke account for 23.7% of all stroke cases. However, its incidence is lower than that of ischemic stroke, which accounts for 76.3% [9] of patients. Even so, the prognosis and progress for hemorrhagic strokes are worse than for ischemic strokes [10,11]. As emphasized by the recently reported deaths of a famous actor and nurse by the media [12,13], hemorrhagic strokes have a very poor prognosis after the initial onset of symptoms. This suggests the need for continued management.

Therefore, a standardized database registration system that stipulates the acute treatment and management protocols for the care of patients with a recent history of a hemorrhagic stroke after discharge needs to be established. Consequently, Ulsan University Hospital, Inha University Hospital, and Chungnam National University Hospital were designated Regional Cardio-cerebrovascular Disease Centers and comprised the 'Korean Hemorrhagic Stroke Registry (KHSR)' system. The system began collecting clinical data in September 2021. Even though the study is still in the preliminary stage, the study aims to present primary data for managing, researching, and establishing health policies for patients with a history of a hemorrhagic stroke by analyzing and identifying clinical and epidemiological characteristics.

Methods

1. Research Subjects and Data Collection

Patients who visited the emergency room within seven days of the onset of symptoms with a principal diagnosis of acute hemorrhagic stroke (I60–I62, I60: subarachnoid hemorrhage, I61: intracerebral hemorrhage, I62: other non-traumatic intracranial hemorrhage) at Ulsan University Hospital, Inha University Hospital, and Chungnam National University Hospital between September 1, 2021, and July 31, 2022, were included in the study.

Data were retrospectively collected for 457 cases. One hundred and twelve cases with missing data among the 569 patients of the KHSR were excluded. This registry was jointly developed and registered by three university hospitals (Regional Cardio-cerebrovascular Disease Centers) in ROK.

2. Measurements and Classification

Data collected from the registry included patient characteristics, hemorrhagic stroke classification, pre-hospital stage, clinical features at presentation to the hospital, risk factors for hemorrhagic stroke, treatment methods, and clinical features at discharge.

The pre-hospital stage was classified as either a referral from another hospital or a direct visit. The mode of transportation used to reach the hospital was classified as an ambulance, personal car, taxi, public transportation, and others. The presenting features, the neurological deficit (Glasgow Coma Scale, GCS), and the time taken for the first brain imaging were measured. The elapsed time from the onset of symptoms to the patient's arrival at the hospital was measured. Even so, patients with uncertain dates and times for the onset of symptoms were

excluded. The time at hospital admission, calculated as the time taken to arrive at a hospital, was reviewed in this study. Risk factors for hemorrhagic stroke included a previous stroke history, a positive family history of strokes, concomitant heart disease, persistently elevated blood pressures, diabetes, hyperlipidemia, atrial fibrillation, liver cirrhosis, renal failure, alcohol consumption, smoking, and a drug history that included antiplatelets and anticoagulants.

Hemorrhagic strokes were classified as intracerebral, subarachnoid, and intraventricular hemorrhages. The cause, lesion location, and treatment methods were also identified. Clinical features of patients at discharge, including functional deficits (modified Rankin Scale, mRS), the length of hospitalization, and being transferred to a rehabilitation department, were evaluated. Discharge was classified as death, transfer, or discharge to home.

Skilled doctors and nurses performed the data entry and evaluation. Data were entered into the registry. The requirement of informed consent in this study was waived by Ulsan University Hospital's Institutional Review Board (No. 2022-11-025) because the study was a retrospective study.

3. Data Analysis

The IBM SPSS (version 24.0; IBM Co.) program was used for data analysis. Patient histories, including disease classification, mode of transportation to the hospital, the elapsed time from the onset of symptoms until presentation to the hospital, neurological deficits, treatment methods, risk factors, hospital discharge type, the mean, the standard deviation, and the median, were calculated for continuous variables. Frequencies and percentages were calculated for categorical variables.

Results

1. Subject's Characteristics

Four hundred and fifty-seven cases registered in the RSR between September 1, 2021 and July 31, 2022 were analyzed. The average age of the hemorrhagic stroke patients was 62.8±15.3 years, with males accounting for 51.4% of the cases. The average height and weight of the patients were 163.1±9.5 cm and 64.2±15.2 kg. The mean blood pressure at presentation to the hospital visit was 163.8±35.1/92.9±20.5 mmHg (systolic/diastolic) (Table 1).

2. Hemorrhagic Stroke Classification

Three hundred and fifteen (68.9%) patients had an intracerebral hemorrhage. One hundred and nineteen (26.1%) patients had a subarachnoid hemorrhage. Twenty-three patients (5.0%) had an intraventricular hemorrhage (Figure 1).

Table 1. General characteristics of participants

Characteristics	Value (n=457)	Mean±SD
Gender		-
Male	235 (51.4)	
Female	222 (48.6)	
Age (yr)		62.8±15.3
≤20	3 (0.7)	
21–40	38 (8.3)	
41–60	151 (33.0)	
61–80	206 (45.1)	
≥81	59 (12.9)	
Height (cm)		163.1±9.5
Weight (kg)		64.2±15.2
BP (mmHg)		
Systolic BP		163.8±35.1
Diastolic BP		92.9±20.5

Values are presented as number (%). SD=standard deviation; BP=blood pressure.

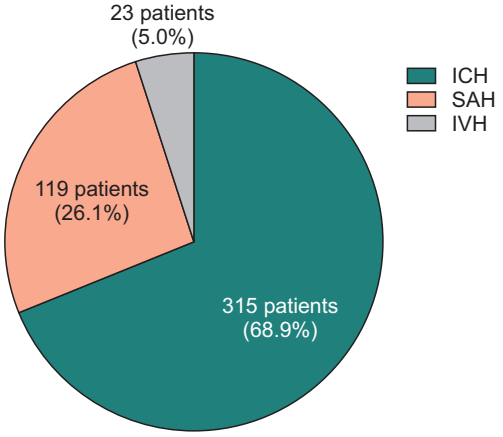

Figure 1. Types of hemorrhagic stroke of the participants
ICH=intracerebral hemorrhage; SAH=subarachnoid hemorrhage; IVH=intraventricular hemorrhage.

Table 2. Transportation method of the participants at admission

Transportation method	Value (n=457)
Ambulance	372 (81.4)
119 ambulance	266 (58.2)
Others ambulance	106 (23.2)
Private vehicle	80 (17.6)
Taxi	2 (0.4)
Public vehicle	1 (0.2)
Others	2 (0.4)

Values are presented as number (%).

3. The Pre-Hospital Stage

Three hundred and twenty-eight patients (71.8%) were direct visits to the hospitals, while 129 (28.2%) were referrals from another hospital. 119 Ambulances were used to transport 58.2% of the patients with a hemorrhagic stroke. Arriving via an ambulance, whether private, hospital, or other ambulances, accounted for 81.4% of the included patients. Even so, 17.6% of the patients were transported to the hospital in personal cars, 0.4% of the patients used taxis, and 0.2% of the patients used public transportation (Table 2).

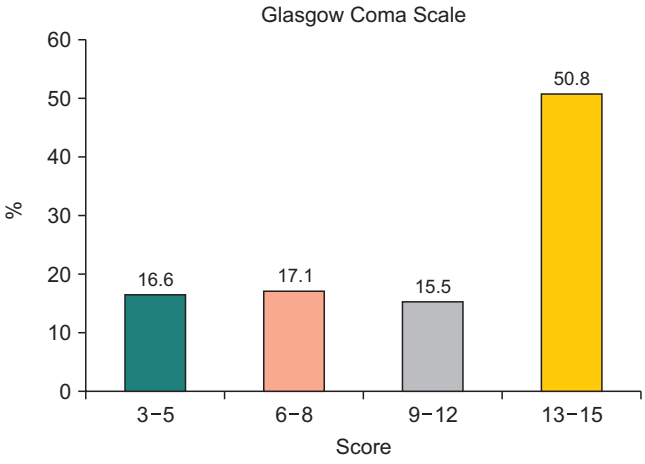

Figure 2. Hemorrhagic stroke severity at admission

4. Presenting Complaints

1) Neurological deficit

The GCS, the most basic tool to assess consciousness after a traumatic brain injury, includes a total score of 15 points. Severe injuries are indicated when the score is eight points or less, moderate injuries are indicated when the score is 9 to 12 points, and mild injuries are indicated by a score between 13 and 15 [14].

In this study, the average GCS score at admission was 10.9±4.2. Severe injuries accounted for 33.7% of the patients, moderate injuries accounted for 15.5%, and mild injuries accounted for 50.8% (13 to 15 points) (Figure 2). Therefore, 49.2% of the included patients had presented to the hospital with moderate or severe symptoms (GCS score of 12 and less).

2) Time elapsed from the onset of the symptoms until arrival at the hospital

Three hundred and sixty hemorrhagic stroke patients were analyzed to determine the time elapsed from symptom onset until arrival at the hospital. Ninety-seven patients with uncertain dates and times of symptom onset were excluded. Patients

took an average of 9.3±22.0 hours to present to the hospital; 61.7% of these patients came to the hospital within 3 hours of becoming symptomatic, while 88.9% came to the hospital within 24 hours of symptom onset (Table 3).

3) Time elapsed between arrival at the hospital and the first brain imaging

The time between arrival at the hospital and the time taken for the first brain imaging was analyzed in 299 cases. Based on the protocol of a previous study, 158 patients who arrived more than 6 hours after the onset of symptoms were excluded when the registry was developed. The previous study determined the importance of a rapid imaging test to confirm the incidence of a stroke in patients who visited the hospital within 6 hours of symptom onset [15]. A previous study has established an evaluation index for the 'Quality Assessment Program for Acute Stroke' by the Health Insurance Review and Assessment Service [6]. In this study, the average time for the first brain imaging after the patient's arrival at the hospital was 35.1±110.0 minutes, and 92.3% of these scans were taken within 60 minutes of arrival (Table 4).

Table 3. Onset to hospital arrival time

Cumulative frequency (hr)	Value (n=360)	Mean±SD
≤1	134 (37.2)	
1–2	185 (51.4)	
2–3	222 (61.7)	
3–6	280 (77.8)	
6–12	302 (83.9)	
12–24	320 (88.9)	
1–3 (day)	351 (97.5)	
≥7 (day)	360 (100.0)	
Mean time		9.3±22.0

Values are presented as number (%). SD=standard deviation.

5. Risk Factors for Hemorrhagic Stroke

Hypertension was a common risk factor for a stroke, accounting for 50.5% of cases. Drinking (37.6%) was the second most common risk factor for a stroke, followed by smoking (24.3%), diabetes (22.1%), a previous history of a stroke (18.8%), use of antiplatelet drugs (14.9%), hyperlipidemia (11.2%) and atrial fibrillation (10.5%) (Figure 3).

Table 4. The time interval between hospital arrival to first neuro-imaging

Categories	Value (n=299)	Mean±SD
≤60 min	276 (92.3)	
Mean time (min)		35.1±110.0

Values are presented as number (%). SD=standard deviation.

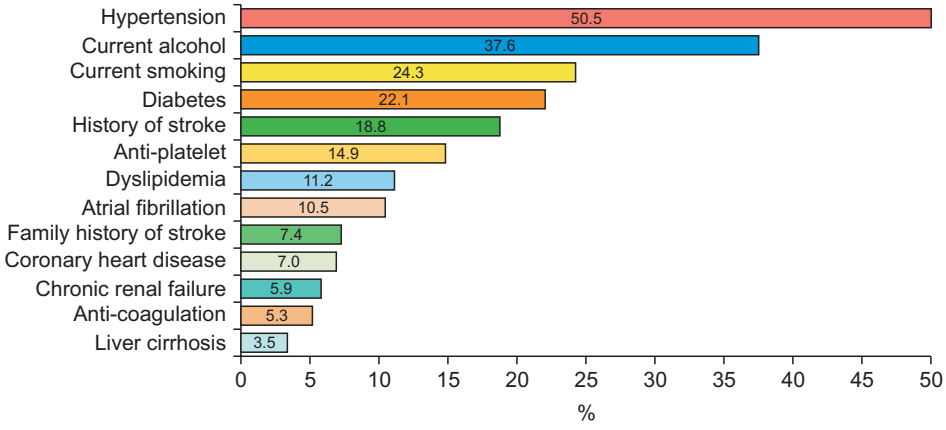

Figure 3. Prevalence of risk factors of the participants

6. Managing Hemorrhagic Strokes

Hypertension was the etiologic factor for 94.3% of the intracerebral hemorrhage cases, and 38.1% of the bleeding lesions were located in the basal ganglia area. Seventy-four percent of these cases were managed conservatively, while 26.0% were managed surgically. Ruptured cerebral aneurysms accounted for 92.4% of subarachnoid hemorrhage cases. Ruptured middle cerebral arteries, anterior communicating arteries, and posterior communicating arteries accounted for 27.7%, 22.7%, and 17.6% of subarachnoid hemorrhages, respectively. Surgery was the treatment of choice in 82.4% of these cases. The surgical management included endovascular surgeries (79.6%) and cerebral aneurysm ligations (20.4%). Patients with poor prognoses (17.6%) on admission were managed conservatively. Hypertension was the etiologic factor for bleeding in 65.2% of the intraventricular hemorrhage cases, and 60.9% were managed surgically (Table 5).

7. Hospitalization and Rehabilitation of Patients with a Recent History of Hemorrhagic Stroke

Previous studies have shown the importance and effectiveness of early rehabilitation after a stroke [16]. In this study, 98.6% of the patients were referred for rehabilitation consultations within 72 hours of becoming symptomatic. The average number of days for referrals to be made was 1.0±1.2 days. In addition, transfers to the Department of Rehabilitation

Table 5. Hemorrhagic stroke subtype and medical treatment of participants

Categories (n=457)	Diagnosis	Value	Location	Value	Medical treatment	Value
ICH (n=315)	HTN	297 (94.3)	Basal ganglia	120 (38.1)	Conservative care	233 (74.0)
	MMD	3 (0.9)	Thalamus	71 (22.5)	Operation	82 (26.0)
	AVM rupture	15(4.8)	Subcortical	81 (25.7)		
			Cerebellum	23 (7.3)		
			Brain stem	20 (6.4)		
SAH (n=119)	Aneurysm	110 (92.4)	A-com.	27 (22.7)	Conservative care	21 (17.6)
			ACA	5 (4.2)	Operation	98 (82.4)
			ICA	9 (7.6)	Clip	20 (20.4)
			P-com.	21 (17.6)	Endovascular	78 (79.6)
			MCA	33 (27.7)	Simple coil	16 (20.5)
			Basilar	4 (3.4)	SAC	61 (78.2)
			PCA	3 (2.5)	Trapping	1 (1.3)
			PICA	3 (2.5)		
			VA	4 (3.4)		
			AICA	1 (0.8)		
	Non-aneurysm	9 (7.6)	Non-aneurysm	9 (7.6)		
IVH (n=23)	HTN	15 (65.2)			Conservative	9 (39.1)
	MMD	6 (26.1)			Operation	14 (60.9)
	AVM rupture	2 (8.7)				

Values are presented as number (%). ICH=intracerebral hemorrhage; SAH=subarachnoid hemorrhage; IVH=intraventricular hemorrhage; HTN=hypertension; MMD=moyamoya disease; AVM=arteriovenous malfomation; A-com.=anterior communicating artery; ACA=anterior cerebral artery; ICA=internal carotid artery; P-com.=posterior communication artery; MCA=middle cerebral artery; PCA=posterior cerebral artery; PICA=posterior inferior cerebellar artery; VA=vetebral artery; AICA=anterior inferior cerebellar artery; SAC=stent-assisted coil.

Medicine after neurosurgery accounted for 29.3% of these patients (Table 6).

8. Patient Characteristics at Discharge

1) Functional deficits

Figure 4 shows the mRS and presents the functional deficits for patients with hemorrhagic stroke at discharge. The mRS score at discharge ranged from 0–6. "Good progress" was observed in 30.6% of the patients (0–2 points), while 69.4% of the patients had "bad progress" (3–6 points).

2) Discharge classification

In this study, the average length of hospitalization in the neurosurgery department was 19.8±16.5 days (Table 6). Approximately 33.5% of these patients were discharged to home, while 52.9% were transferred to other institutions. The in-hospital mortality rate was 13.6%, with 18.5% of patients dying from subarachnoid hemorrhage (Figure 5). Only 64.1% of patients or caregivers were educated on stroke during hospitalizations.

Table 6. Hospital treatment and rehabilitation therapy of participants

Categories	Value (n=457)
Hospital day on neurosurgery department (day)	19.8±16.5
Consultation for rehabilitation	434 (95.0)
Consultation for rehabilitation (day)	1.0±1.2
Transfer to rehabilitation department	134 (29.3)

Values are presented as mean±standard deviation or number (%).

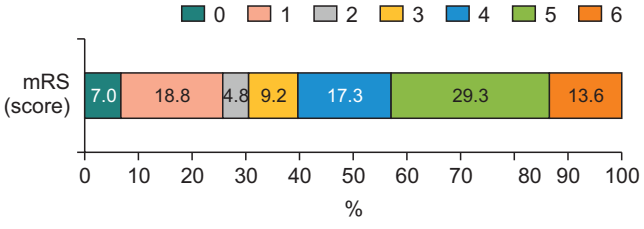

Figure 4. Modified Rankin Scale (mRS) at discharge

Discussion

This study analyzed clinical data from the KHSR on hemorrhagic stroke patients from three university hospitals and regional cardio-cerebrovascular disease centers in ROK. The study is significant since the primary data collected by the RSR on the clinical features and characteristics of Korean patients with hemorrhagic stroke is insufficient.

Males accounted for 51.4% of the patients. Similar results were shown by Ko et al. [17] in a study that included data from a quality assessment program by the Health Insurance Review and Assessment Service and the results of a multicenter cohort study by Shin et al. [18] in ROK. Previous studies focused on patients with a recent history of a hemorrhagic stroke are limited. Therefore, research and data accumulation on hemorrhagic strokes are necessary. This study showed that the average age of patients presenting with a hemorrhagic stroke was 62.8±15.3 years; the disease prevalence increased with age. These results were congruent with a study by Kim et al. [19] that analyzed

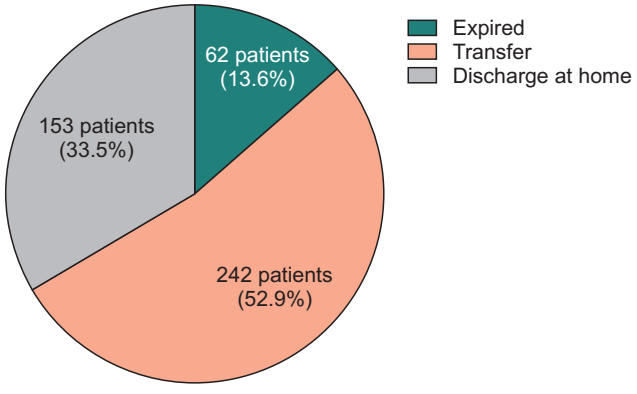

Figure 5. Status of discharge of the participants

a cohort of stroke rehabilitation patients in ROK. The average age of these patients was 65.1±13.5 years, and this prevalence notably increased with age [3,17].

The 119 ambulances were used by 58.2% of the patients to visit the hospital. Even so, the total number of patients transported to the hospital via an ambulance, whether private, hospital or other, was 81.4%. These results were similar to a previous study in which 76.1% of the patients with a recent history of an ischemic stroke were transported to the hospital via an ambulance [20]. Compared to the results of the emergency medical monitoring system in ROK in 2019, the use rate of 119 ambulances to visit the emergency room was 21.5% in 2013 and 33.5% in 2017. The use rate of 119 ambulances is expected to increase yearly [21].

In this study, the time elapsed from symptom onset until the patient presented to the hospital was an average of 113 minutes. When 119 ambulances were used, the elapsed time decreased to 60 minutes. However, this time increased to 236 minutes when other modes of transportation were used. Therefore, the 119 ambulance service is 3.9 times faster than other modes of transporting patients to the hospital. Similarly, a previous study showed that emergency patients transported by 119 ambulances arrived at the hospital faster than other modes of transportation [22]. A report by the Health Insurance Review and Assessment Service [23] that focused on the acute phase of a stroke showed that 204 minutes were taken from symptom onset to the patient's arrival at the hospital. Specifically, the 119 ambulances took 121 minutes to arrive at the hospital, while other modes of transportation took 447 minutes to arrive at the hospital. The study similarly showed that the 119 ambulances arrived at the hospital at times that were 3.7 times faster than other modes of transportation. Therefore, a concerted effort should be made to improve public awareness of the fact that 119 ambulances are the fastest mode of transporting patients to the hospital [24].

The average neurological deficit, as calculated with the GCS, at the time of arrival at the hospital in this study was 10.9±4.2. In addition, 49.2% of the patients had moderate or severe deficits and a GCS score of 12 or less. A study by Kim et al. [3] showed similar results. In that study, They revealed that 1.5% of patients with an ischemic stroke presented with severe neurological deficits at the time of symptom onset. In contrast, 13.9% of patients with a hemorrhagic stroke presented at the time of symptom onset. In addition, this study showed that 37.2% of the patients presented to the hospitals within 1 hour of symptom onset, while 61.7% of the patients presented to the hospital within 3 hours of the onset of symptoms.

In contrast, the study by Kim et al. [3] showed that 41.8% of stroke patients visited hospitals within 3 hours of symptom onset. Hemorrhagic stroke patients should visit hospitals as soon as possible after the onset of symptoms, based on the severity of their condition. Even so, this study identified that the average elapsed time from arrival at the hospital to taking images was 35.1±110.0 minutes; 92.3% of these patients had imaging within 60 minutes of their arrival. These results were similar to the quality assessment results by the Health Insurance Review and Assessment Service, in which 99.2% of patients had imaging within 60 minutes of their arrival in 2020.

Risk factors for hemorrhagic stroke that were identified in this study included hypertension, alcohol consumption, smoking, and diabetes. These risk factors were also identified by Kim et al. [3] in their study on stroke patients and by Lee et al. [25] in their study on ischemic stroke patients. In these studies,

alcohol consumption, hypertension, diabetes, and atrial fibrillation were determined to be risk factors for cerebrovascular accidents. The similarities in the findings of these studies suggest that managing modifiable risk factors is an essential strategy to prevent a stroke. In this study, 98.6% of the patients were referred to the rehabilitation department within three days of symptom onset. The average referral time was 1.0±1.2 days. The rate of referring patients to rehabilitation departments within five days of symptom onset, and the evaluation index for the Quality Assessment Program for Acute Stroke in 2020, was 97.8%. The rehabilitation referral times noted in this study were shorter than those observed in the study by Kim et al. [19], where the average number of days decreased from 2.1 to 2.7 days, and the number of referrals increased from 75.1% to 85.7%.

Patients with subarachnoid hemorrhages often have poor prognoses. Therefore, surgical management is not typically offered. Even so, clip ligation or coil embolization may be performed. In this study, clip ligation was performed in 20.4% of patients who presented with a subarachnoid hemorrhage, while coil embolization was performed in 79.6% of the subarachnoid hemorrhage surgeries. Comparative analyses of the treatment options for subarachnoid hemorrhages are limited. However, Kim et al. [19] reported that using clip ligations as the initial treatment method has decreased while using coil embolization as the initial treatment method has increased in their studies published between 2012–2015 and 2021. The endovascular treatment technique, in which a detachable coil is used, has been increasingly used clinically and is fast becoming the primary treatment method for treating cerebral aneurysms [26].

In this study, 29.3% of patients were transferred to the Department of Rehabilitation Medicine. The number of patients transferred in this study was higher than the 16.5% to 19.7% of patients who had been transferred to a similar department in a study by Kim et al. [19]. The discrepancy in the number of transferred patients may be accounted for by the higher number of patients with a recent history of a hemorrhagic stroke (69.4%) that had a poor prognosis (3 points or more on the mRS) at discharge in this study. Patients with a history of a hemorrhagic stroke have a poor prognosis, and the transfer rate to the rehabilitation medicine department is high. Therefore, future studies should include long-term comparative analyses of functional deficits.

The in-hospital mortality rate in this study was 13.6%. Since previous studies have not analyzed the mortality in hemorrhagic patients during the same period, comparative analyses could not be performed. Even so, a study by Kim et al. [3] showed that the mortality rate within one month of an ischemic stroke was 5.2%, while the mortality rate after an intracerebral hemorrhage for the same period was 21.6% and that for a subarachnoid hemorrhage was 25.1%. These results suggest that hemorrhagic strokes are more severe.

A limitation of this study is its inability to be generalized to the entire Korean population. Even so, the study might still contribute to evidence-based hemorrhagic stroke-related guidelines. The results may also be included in data used to formulate national health policies through data collection from expanding the multi-center registration project and through future long-term follow-ups.

Declarations

Ethics Statement: The requirement of informed consent

in this study was waived by Ulsan University Hospital's Institutional Review Board (No. 2022-11-025) because the study was a retrospective study.

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

Author Contributions: Conceptualization: WJL, SCK, DH, HJK. Data curation: WJL, SCK, DH, HJK. Investigation: WJL, SCK, DH, HJK. Formal analysis: WJL, SCK. Methodology: WJL, SCK. Project administration: SCK, DH, HJK. Resources: SCK, DH, HJK. Software: WJL, SCK, DH, HJK. Supervision: SCK, DH, HJK. Validation: WJL, SCK, DH, HJK. Visualization: WJL, SCK. Writing–original draft: WJL. Writing – review & editing: SCK, DH, HJK.

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PHWR Public Health Weekly Report

고위험음주율 추이, 2012–2021년

만 19세 이상 고위험음주율은 남자의 경우 2021년 19.7%로 2020년 21.6%에 비해 1.9%p 감소하였고, 여자는 큰 변화 없었다(그림 1). 남자는 40대와 50대, 여자는 20대와 30대가 다른 연령대에 비해 고위험음주율이 높았다(그림 2).

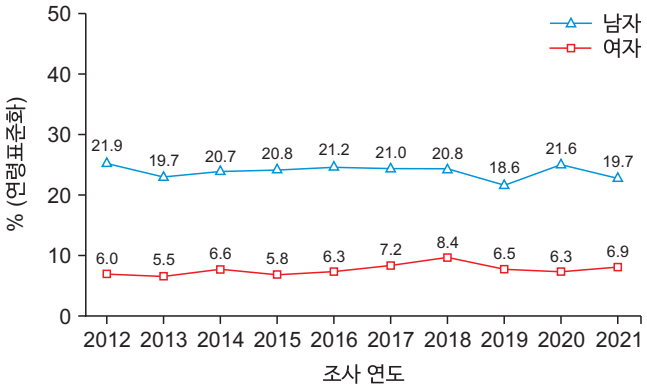

그림 1. 고위험음주율 추이, 2012–2021년

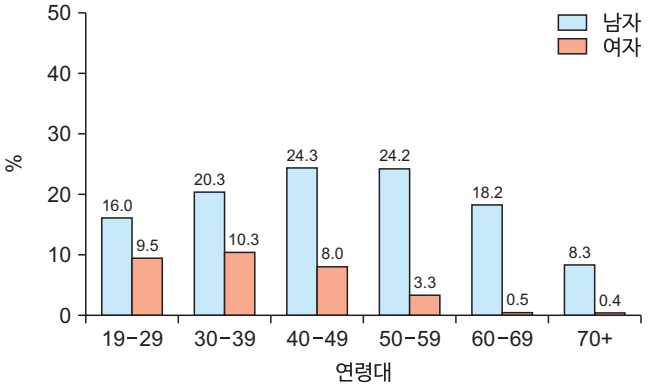

그림 2. 연령대별 고위험음주율, 2021년

*고위험음주율: 1회 평균 음주량이 남자의 경우 7잔 이상, 여자의 경우 5잔 이상이며 주 2회 이상 음주하는 분율, 만 19세 이상
†그림 1의 연도별 지표값은 2005년 추계인구로 연령표준화

출처: 2021 국민건강통계, https://knhanes.kdca.go.kr/

작성부서: 질병관리청 만성질환관리국 건강영양조사분석과

KDCA Korea Disease Control and Prevention Agency

QuickStats

Trends in the Prevalence of High-Risk Drinking, During 2012–2021

The prevalence of high-risk drinking among those aged ≥19 years has slightly decreased among men, from 21.6% to 19.7% during 2020–2021, but has not changed much among women (Figure 1). Men in their 40s and 50s and women in their 20s and 30s had a higher prevalence of high-risk drinking than the other age groups (Figure 2).

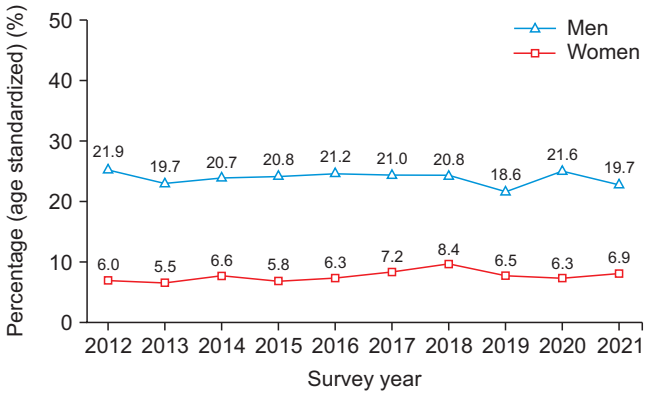

Figure 1. Trends in the prevalence of high-risk drinking, 2012–2021

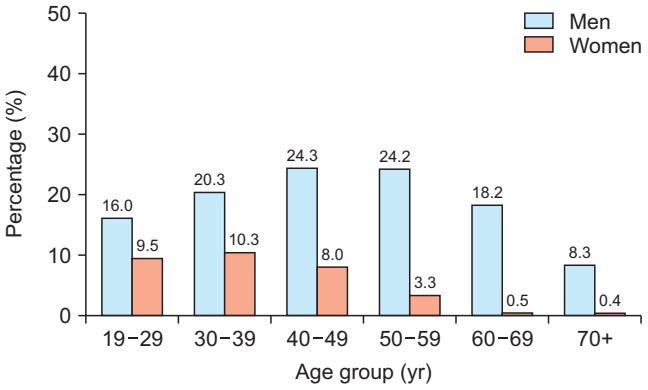

Figure 2. Prevalence of high-risk drinking by age group, 2021

*Prevalence of high-risk drinking: the proportion of people aged ≥19 years who drink ≥2 times per week and consume a large amount of alcohol each time (an average of ≥7 glasses for men and ≥5 glasses for women per episode).

†The mean in Figure 1 was calculated using the direct standardization method based on a 2005 population projection.

Source: Korea Health Statistics 2021, Korea National Health and Nutrition Examination Survey, https://knhanes.kdca.go.kr/

Reported by: Division of Health and Nutrition Survey and Analysis, Bureau of Chronic Disease Prevention and Control, Korea Disease Control and Prevention Agency