

1422. Burden of Pertussis in South Korea: Implications for adults

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Background. There are a limited number of published studies on pertussis disease burden and epidemiology in South Korea, particularly those evaluating the impact in adults.

Methods. We conducted a systematic literature review on pertussis epidemiology and burden of disease in South Korea. The objective was to highlight evidence gaps which could help improve awareness about pertussis disease in adults in South Korea.

Results. Of 940 articles published between January 2000 to December 2019, 19 articles provided data for pertussis epidemiology and 9 provided data in adults. Laboratory confirmation rates in adults varied according to methodology, likely influenced by study/sampling variations. Three studies reported serological evidence of infection in adolescents and adults (33-57%). Among cases, the average cough duration was 16.5 days (range 7-30 days) and over 85% of cases presented with paroxysmal cough, while only 25% of cases or less presented with a characteristic whoop or post-tussive vomiting. Importantly, in 4 studies reporting vaccination status, almost all adult cases had no history of pertussis vaccination since childhood.

Conclusion. Primary childhood vaccination rates in South Korea are among the highest globally, while adult pertussis vaccine uptake appears to be quite low. Our literature review suggests that pertussis is underreported in adults, as evidenced by serology data demonstrating that tetanus antibody levels are low while pertussis toxin antibody levels are relatively high, suggesting continued circulation of community pertussis. These findings highlight the need for strategies such as maternal immunization and decennial revaccination of adults to address the changing epidemiology and waning immunity. Active pertussis testing/reporting and better utilization of adult vaccine registries is required to help provide robust data for vaccine decision-making at the national level. In the current COVID-19 environment, strategies that can reduce clinic or hospital visits will have substantial benefits to authorities managing rapid increases in health care resource utilization, and vaccine preventable diseases provide an easy and immediate target for achieving that goal.

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1423. Clinical Presentation Of Brucellosis: An Experience Of 29-Year Period

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Background. Brucellosis is a multi-organ zoonotic disease which may present with a myriad manifestation. In our country, brucellosis remains endemic and represents a public health problem. We aimed to study the clinical, therapeutic and evolutionary features of brucellosis.

Methods. We conducted a retrospective study including all patients hospitalized for brucellosis in the infectious diseases department between 1990 and 2018. Positive blood cultures to *Brucella spp* and/or standard agglutination test (SAT) titer > 1/160 confirmed the diagnosis.

Results. During the study period, we encountered 216 cases of brucellosis, among whom 140 cases were males (64.8%). The mean age was 40±17 years. Patients came from rural areas (89.8%) and had a close contact with animals (70.8%). The consumption of unpasteurized milk was noted in 182 cases (84.2%). A family history of brucellosis was noted in 53 cases (24.5%). In total, 68 patients had a previous medical history of treated brucellosis (31.4%). There were 113 cases (52.3%) of acute brucellosis and 103 cases (47.7%) of sub-acute brucellosis. Spondylodiscitis (65 cases; 63.1%), neurobrucellosis (17 cases; 16.5%) and sacroiliitis (12 cases; 11.7%) were the most common forms of the sub-acute brucellosis. The revealing symptoms were fever (83.8%), night sweats (71.3%), arthralgia (55.1%) and back pain (53.2%). Laboratory investigations revealed leukopenia (14.4%), anemia (49%) and elevated C-reactive protein levels (42.1%). Blood cultures were positive to *Brucella* in 17.1% of the cases. Patients received a combination therapy based on doxycycline and rifampicin in 141 cases (65.2%). Triple therapy regimen including doxycycline, rifampicin and co-trimoxazole was prescribed in 51 cases (23.6%). The mean treatment duration was 52±20 days in the acute form and 6±3 months in the sub-acute form. The disease evolution was favourable in 94.4% of the cases. Sequelae were noted in 12% of the cases and relapse in 3.7% of the cases. Four patients were dead (1.9%).

Conclusion. Due to its various clinical presentation, the diagnosis of brucellosis might be delayed. High index of suspicion is required in order to promptly diagnose the disease. Control and eradication of brucellosis in animals are mandatory so as to eradicate brucellosis.

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1424. Factors Associated with Failure to Clear Candidemia Infection: Surveillance Data from Eight States, 2017

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Background. Candidemia is a bloodstream infection commonly associated with high morbidity and mortality. Failure to clear candidemia can lengthen hospitalization and treatment. Factors associated with candidemia clearance are unknown.

Methods. We analyzed 2017 candidemia surveillance data from the Centers for Disease Control and Prevention's Emerging Infections Program. Data from eight sites (counties in California, Colorado, Georgia, Minnesota, New Mexico, New York, Oregon, and Tennessee) were included. Clearance was defined as having a blood culture negative for *Candida* ≤30 days after initial culture date (ICD). Cases with unknown clearance, unknown survival outcome, or death ≤30 days of ICD were excluded. Demographic and clinical factors associated with clearance were assessed with bivariate analysis using chi-square tests and multivariable logistic regression to calculate adjusted odds ratios (aOR) using backward selection (p-value< 0.10).

Results. Of 1,024 candidemia cases, 737 were included and 582 (79%) demonstrated clearance, of which 79% had evidence of clearance ≤5 days after ICD. In bivariate analysis, clearance was associated with central venous catheter (CVC) ≤2 days before ICD, CVC removal ≤7 days after ICD, and systemic antifungal medication within 14 days before ICD. Clearance was inversely associated with black race and admission from another hospital. In multivariable analysis, only race and admission from another hospital were significant predictors; age, sex, and CVC presence and subsequent removal were also retained for their clinical relevance. In the final model, clearance was less likely among black patients (aOR 0.51, 95% confidence interval [CI] 0.29-0.91) and those admitted from another hospital (aOR 0.28, 95% CI 0.11-0.75).

Table 1. Bivariate associations for select variables between individuals with documented candidemia clearance and those without documented clearance in eight Emerging Infections Program surveillance sites, 2017

Table 1. Bivariate associations for select variables between individuals with documented candidemia clearance and those without documented clearance in eight Emerging Infections Program surveillance sites, 2017

Characteristic	No documented clearance (N=155)	Documented clearance (N=582)	p-value
Sex (female)	80 (51.6)	264 (45.4)	0.307
Race			
White	96 (61.9)	383 (65.8)	0.341
Black	44 (28.4)	133 (22.9)	
Other	15 (14.9)	66 (11.3)	
Central venous catheter(s) present ≤2 days prior to initial culture date (yes)	75 (48.4)	397 (68.2)	<0.0001
Central venous catheter(s) removed/changed within 7 days after initial culture date (yes)	45 (58.4)	322 (80.7)	<0.0001
Systemic antifungal(s) within 14 days before initial culture date (yes)	96 (61.9)	547 (94.0)	<0.0001
Systemic antifungal(s) to treat candidemia (yes)	55 (35.5)	344 (59.1)	<0.0001
Preadmission location (prior to candidemia-associated hospitalization)			
Private residence	105 (74.5)	433 (75.7)	0.012
Hospital inpatient (admitted from another hospital)	10 (7.1)	16 (2.8)	
Long term care facility	20 (14.2)	80 (14.0)	
Long term acute care hospital	0 (0)	9 (1.6)	
Homeless	6 (4.3)	9 (1.6)	
Incarcerated	0 (0)	4 (0.7)	
Other	0 (0)	18 (3.2)	
Unknown	0 (0)	3 (0.5)	
Underlying conditions			
Chronic kidney disease	35 (22.6)	148 (25.4)	0.466
Chronic pulmonary disease	25 (16.1)	113 (19.4)	0.351
Cystic fibrosis	0 (0)	4 (0.7)	0.301
Diabetes mellitus	50 (32.3)	196 (33.7)	0.739
HIV	4 (2.6)	7 (1.2)	0.209
Injection drug use, current	24 (15.5)	65 (11.2)	0.143
Malignancy, hematologic	4 (2.6)	22 (3.8)	0.472
Malignancy, solid organ (non-metastatic)	16 (10.3)	88 (15.1)	0.127
Malignancy, solid organ (metastatic)	11 (7.1)	46 (7.9)	0.738
Transplant, hematopoietic stem cell	1 (0.7)	3 (0.5)	0.845
Transplant, solid organ	1 (0.7)	6 (1.0)	0.660

Conclusion: We found failure to clear candidemia infection to be associated with black race and prior hospital exposure, but not other factors previously shown to be associated (e.g., comorbidities, CVC presence). These associations could reflect illness severity, access to care, or other obstacles to effective treatment. Additional research is needed to investigate these associations further and identify other factors (e.g., treatment type and timing) to improve outcomes.

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1425. Impact of Social Determinants on Racial Differences in Carbapenem-Resistant Enterobacteriaceae Incidence, Atlanta, 2012-2018

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Background. Public health prioritizes addressing social determinants of health to promote health equity. We hypothesized that social determinants of health, including poverty, are associated with racial disparity in the incidence of carbapenem-resistant Enterobacteriaceae (CRE).

Methods. The Georgia Emerging Infections Program conducted CDC-funded, active population-based CRE surveillance in metropolitan Atlanta (2017 population: 3.9 million) from 2012-2018. CRE cases were defined as Atlanta residents with a urine or normally sterile specimen growing *E. coli*, *Klebsiella* spp., or *Enterobacter* spp. resistant to ≥ 1 carbapenems (excluding ertapenem) and all third generation cephalosporins tested. Poverty, education and insurance levels by census tract of residence were obtained from the US Census Bureau's 2017 American Community Survey. Race and end-stage renal disease (ESRD) were determined from chart review, and primary care provider (PCP) shortage area was obtained from the Health Resources and Services Administration. Age-adjusted incidence rate ratios were individually calculated using direct age standardization. Covariates were considered for inclusion in a multivariable Poisson regression model for the expected rate of CRE.

Results. Adjusting for age, CRE incidence was three times higher in blacks than whites. Higher CRE incidence was also observed among cases assigned > 40% below poverty level, > 15% below high school education, > 10% uninsured, and in a PCP shortage area (Table 1). CRE incidence was 58 times higher among ESRD cases than non-ESRD cases. In the multivariable model (Figure 1) addition of education, poverty or ESRD ($p < 0.001$), but not PCP access ($p = 0.61$) and insurance status ($p = 0.19$), significantly reduced the racial difference in CRE incidence compared to race and age alone. Although controlling for age and either education, poverty level or ESRD reduced CRE among blacks, CRE incidence in blacks remained double that of whites.

Figure 1. Comparison of race CRE incidence rate ratio adjusting for age alone (red line) to adjusting for age and individual social determinants (blue bars)

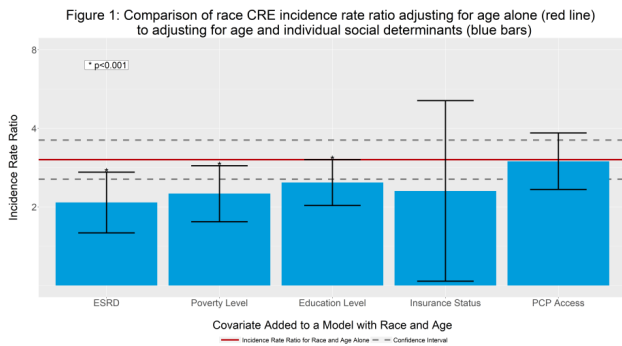


Table 1. Social Determinants Distribution and Age-Adjusted CRE Incidence Rate Ratio (N = 378)

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	%	IRR (95% CI)
Race		
Black	61%	3.06(2.44, 3.83)
White	30%	ref
Percentage below Poverty Level		
>40%	6%	5.27 (3.00,9.24)
<40%	39%	
<20%	28%	
<10%	19%	
<5%	8%	ref
Below High School Education		
>15%	32%	3.34 (2.42,4.62)
<15%	54%	
<5%	14%	ref
Insurance Status		
>10% uninsured	83%	3.34 (2.42,4.62)
<10% uninsured	17%	ref
PCP Shortage Area		
Yes	9%	1.78 (1.23, 2.59)
No	91%	ref
End-Stage Renal Disease		
Yes	16%	58.15 (26.86,125.94)
No	84%	ref

Conclusion: Poverty level, ESRD and education only partially account for the racial differences seen in CRE incidence. While ESRD suggests a possible biologic component, persistent racial differences indicate the need for targeted public health interventions to address social determinants of health.

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1426. Increased Visits to Respiratory Protection Webpages during COVID-19

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Background. COVID-19 transmission is thought to occur mainly via respiratory droplets produced when an infected person coughs or sneezes. Respiratory protection devices, when properly fitted and used, can prevent this type of illness transmission.

Methods. The Centers for Disease Control and Prevention's National Personal Protective Technology Laboratory (NPPTL) within the National Institute of Occupational Safety and Health (NIOSH) is responsible for the certification and approval of respirators for use in occupational settings. NPPTL maintains webpages with information on respiratory protection devices. We monitored the number of webpage views for several NPPTL webpages from January 1, 2020 to May 8, 2020. The number of webpage visits was then compared to significant events during the COVID-19 outbreak as well as the previous year's webpage visits.

Results. The landing page for NIOSH-approved N95 respirators received the most visits. This page received a total of 1,637,250 webpage visits with a peak of 63,715 on February 26, 2020, a 38,989% increase from the average daily page visits for that same month in 2019. This occurred on the same day as the White House gave its first televised briefing on COVID-19. The page providing general information on filtering facepiece respirators, including N95 respirators received 834,186 webpage visits with a peak of 20,520 on April 3, 2020, a 13,659% increase from the average daily webpage visits for that same month in 2019. This occurred on the same date as new CDC recommendations were provided for using cloth face masks in public places. The counterfeit respirator page maintained a steady, but small number of webpage visits, but increased from 4,261 on March 27, 2020 to 68,145 on March 29, 2020. This occurred as the first reports of fraudulent respirators were being published in the media. It then fell to 18,562 on March 30, 2020 and 13,093 on March 31, 2020. While most webpage visits were from the United States, visits from China, and Canada were higher than previous years.

Conclusion. During COVID-19 there was a large increase in the number of webpage visits for respiratory protection information which coincided with major events and media reports. Accurate, accessible respiratory protection information is an important resource during public health emergencies.

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1427. Key Clinical Research Questions Asked During Epidemic Respiratory Outbreaks: A Systematic Review of the Literature Published on Severe Acute Respiratory Syndrome and Middle East Respiratory Syndrome

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Background. As evidenced by the COVID-19 pandemic, rapid collection of data on clinical characterization, treatment, and diagnostics to inform rapid public health response is paramount in an outbreak of a novel infectious agent. In 2018, The World Health Organization R&D Blueprint identified a list of priority diseases for accelerated research based on their potential to cause a public health emergency. Among these diseases were Severe acute respiratory syndrome-coronavirus (SARS-CoV) and Middle East respiratory syndrome-coronavirus (MERS-CoV). To facilitate a rapid research response during an outbreak, standardized research protocols must be prepared before the outbreak occurs. The aim of this systematic review is to identify the most common clinical research questions asked during outbreaks of SARS-CoV and MERS-CoV to inform future clinical research protocol development for coronaviruses.

Methods. Medline, Embase, and Global Health bibliographic databases were searched to identify clinical studies published on SARS-CoV and MERS-CoV in the outbreak setting. Studies were grouped thematically according to the clinical research question addressed.

Results. From the research questions and objectives, eleven themes in the literature were identified: Clinical characterisation, prognosis, diagnosis, clinical management, viral pathogenesis, epidemiological characterisation, infection prevention and control, transmission, susceptibility, psychosocial, and aetiology. Case series made up the highest proportion of study designs, while clinical trials made up the lowest. 83% of the SARS-CoV studies were published after the end of the outbreak.