

NOTIFIED LEGIONNAIRES' DISEASE IN SOUTH AFRICA, 2018-2020

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Summary

Legionnaires' disease is a rare form of severe pneumonia caused by *Legionella* bacteria, which is transmitted through the inhalation or aspiration of contaminated water droplets. Cases of laboratory-confirmed Legionellosis notified to the National Institute for Communicable Disease's national notifiable medical conditions (NMC) surveillance system between 1 January 2018 and 30 September 2020 are described here. During this period, 93 cases of Legionellosis were notified, with the majority (72/93, 77.4%) of cases reported from the Western Cape Province. Most cases occurred in individuals aged between 40 and 69 years (65/93, 70.0%), in males (61/93, 65.6%), and in individuals with underlying illness (52/64, 81.3%). The case-fatality ratio was 20% (15/74). Whilst difficult to ascertain the source of infection due to poorly completed case investigation forms, Legionellosis cases were largely sporadic. Ongoing surveillance and improved investigation of Legionnaires' disease cases is important for cluster identification, particularly during the COVID-19 pandemic when lockdown measures have resulted in closure or restricted use of buildings, thereby increasing the risk for *Legionella* growth in water systems.

Introduction

Legionnaires' disease is a rare form of severe pneumonia caused by *Legionella* bacteria, most commonly *Legionella pneumophila* serogroup 1. Individuals typically present with an acute consolidating pneumonia, which can be radiologically and clinically indistinguishable from other aetiological causes of pneumonia. Older age (≥ 50 years), male gender and underlying illnesses such as chronic heart or lung disease, diabetes, cancer or immunosuppression, increase an individual's susceptibility to disease. The disease is associated with severe illness and a high case-fatality ratio of 10-15%.¹

Although *Legionella* spp. are ubiquitous in natural water sources, transmission predominantly occurs through the inhalation/aspiration of water droplets from man-made water systems such as industrial heating/cooling systems, plumbing systems, whirlpools and fountains which, if not adequately managed, allow the bacteria to proliferate to high levels.^{2,3} Warm water temperatures (25°C to 50°C) and poor or no water flow increases the risk of growth and spread of the bacteria.

Approximately 20 of the more than 50 identified species have been known to be pathogenic in humans, with *Legionella pneumophila* identified in 90% of cases in the United States and Europe.^{2,4,5} In some countries, such as Australia, *Legionella longbeachae* (also found in compost and potting soil) is predominant. Traditional diagnostic methods include culture and serology and, more recently, the urinary antigen test (only detecting *L. pneumophila* serogroup 1) and polymerase chain reaction (PCR) are being commonly used due to their improved speed and sensitivity, facilitating early diagnosis and treatment.^{1,3,6}

The prevalence of Legionnaires' disease is underestimated globally due to a lack of clinical index of suspicion and requests for testing by clinicians (who generally treat empirically for community-acquired pneumonia), inadequate diagnostic tests, and limited surveillance programmes. Many of these concerns are more marked in Africa from where data are severely limited.⁷

From June 2012 to September 2014, among 1805 patients hospitalised with pneumonia and enrolled in the National Institute for Communicable Diseases (NICD) pneumonia surveillance programme, 21 (1.2%) tested positive for *Legionella* spp. by PCR on nasopharyngeal and/or induced sputum specimens.⁸ Disease occurred predominantly in chronically ill adults living with human immunodeficiency virus (HIV) and/or tuberculosis infection. The majority of cases were not diagnosed with Legionnaires' disease and were sub-optimally treated. In this report, cases of laboratory-confirmed Legionellosis in South Africa notified to the NMC surveillance system between 1 January 2018 and 30 September 2020 are described.

Methods

Legionellosis is a category 2 notifiable medical condition in South Africa, which requires notification (either paper-based or electronically) by healthcare workers to the NICD's NMC surveillance system within seven days of diagnosis. Upon notification, basic demographic and clinical information are collected. Healthcare workers are also requested to complete and submit to the NICD a Legionnaires' disease case investigation form (CIF), which collects additional information such as underlying illness and potential sources of contaminated water exposure. Patient outcome data were obtained from the CIF where it was not available in the NMC database or had changed following notification.

Results

From 1 January 2018 through 30 September 2020, 93 laboratory-confirmed cases of Legionellosis were notified to the NMC surveillance system; 43 (46.2%) in 2018, 25 (26.9%) in 2019 and 25 (26.9%) in 2020 (Table 1 and Figure 1). The highest number of cases were reported in February 2018 (n=7) and March 2020 (n=7). Cases were observed throughout the year, with no specific seasonality identified. The majority of cases were reported from Western Cape Province (72/93, 77.4%), although the number of provinces reporting cases increased from 3 in 2018 to 5 in 2019 and 6 in 2020 (Figure 1). The majority of cases (81/93, 87.1%) were diagnosed by the urinary antigen test, with nine cases (9.7%) identified by PCR and three (3.2%) by serology.

All Legionellosis cases occurred in adults with the highest number observed in the 50-59 years age group (25/93, 26.9%), and with 70% (65/93) occurring in individuals aged between 40 and 69 years (Table 1 and

Figure 2). The majority of cases were males (61/93, 65.6%). Among patients with known admission status, 98.8% (83/84) were hospitalised. Of 64 cases for whom the CIF was completed, 52 (81.3%) reported having ≥ 1 underlying illness and 12 (18.8%) were HIV infected. At the time of notification or completion of the CIF, 20.3% (15/74) of individuals had died.

Table 1. Characteristics of notified cases of Legionnaires' disease in South Africa, January 2018 – September 2020 (N=93).

Characteristic	n/N (%)
Year	
2018	43/93 (46.2)
2019	25/93 (26.9)
2020	25/93 (26.9)
Sex	
Male	61/93 (65.6)
Female	32/93 (34.4)
Age group (years)	
<20	0/93 (0.0)
20-39	19/93 (20.4)
40-59	44/93 (47.3)
60-79	28/93 (30.1)
≥ 80	2/93 (2.1)
Province	
Eastern Cape	5/93 (5.4)
Free State	1/93 (1.1)
Gauteng	9/93 (9.7)
KwaZulu-Natal	2/93 (2.2)
North West	4/93 (4.3)
Western Cape	72/93 (77.4)
Admission status	
Inpatient	83/84 (98.8)
Outpatient	1/84 (1.2)
Diagnostic test	
Urinary antigen test	81/93 (87.1)
PCR	9/93 (9.7)
Serology	3/93 (3.2)
Underlying illness	
Yes	52/64 (81.2)
No	12/64 (18.8)
HIV status	
Infected	12/64 (18.8)
Uninfected	52/64 (81.2)
Outcome	
Died	15/74 (20.3)
Survived	59/74 (79.7)

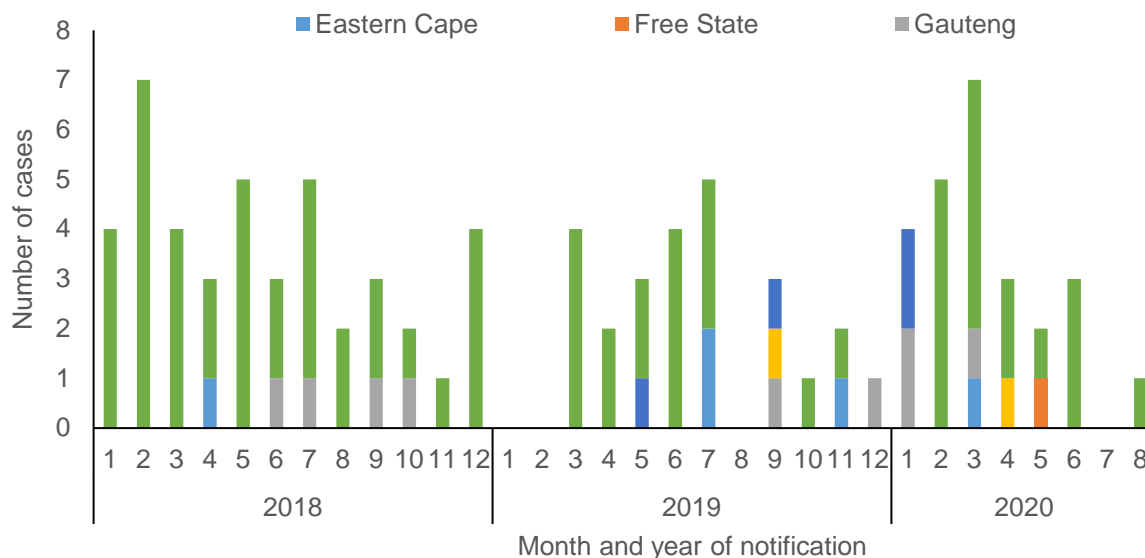


Figure 1. Legionellosis cases notified to the national Notifiable Medical Conditions (NMC) surveillance system by year and province, South Africa, January 2018 – 30 September 2020.

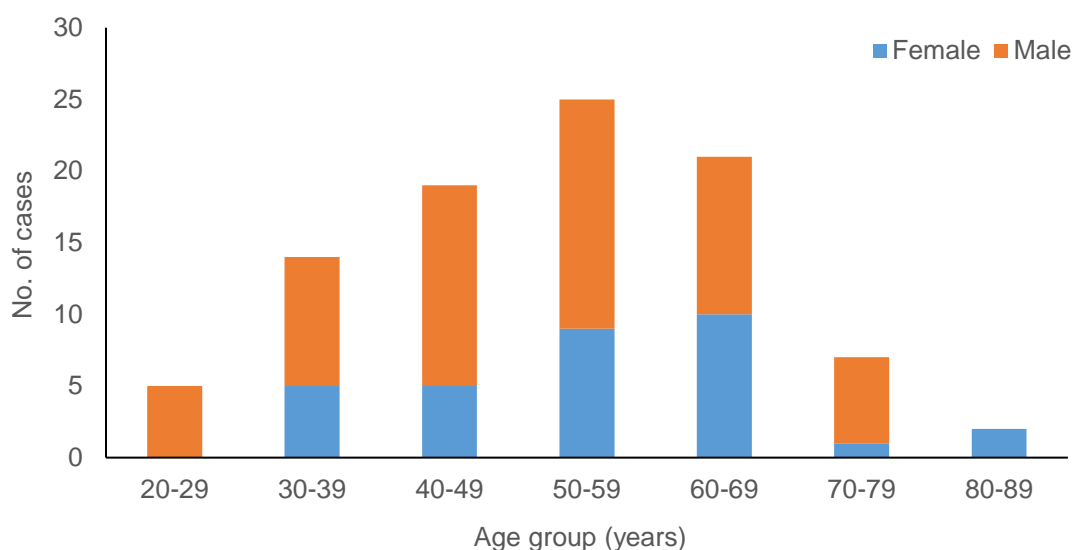


Figure 2. Legionellosis cases notified to the national Notifiable Medical Conditions (NMC) surveillance system by age and gender, South Africa, January 2018 – 30 September 2020.

Discussion

During the surveillance period, 93 cases of Legionnaire's disease were notified to the NMC system. The majority of cases were reported from the Western Cape Province, likely due to increased awareness and increased availability of diagnostic testing there. It should also be noted that the drought and resulting restrictions in water use in the province over recent years may also have had an effect. The increased number of provinces notifying cases over time may represent an increased awareness of the requirement to notify cases. As is typical for Legionnaire's disease^{1,9}, cases occurred in adults with the majority in older adults and males with underlying

illness. Almost all notified cases were hospitalised individuals, and a high case fatality ratio of 20% was observed.

These data are likely an underestimate of the burden of Legionnaires' disease in South Africa, and only represent cases where the disease was clinically suspected, laboratory testing was performed, and where healthcare workers notified cases to the NMC surveillance system. Most laboratories performed diagnostic testing using the urinary antigen test. While rapid and easy to use, this test only detects *L. pneumophila* serogroup 1 and therefore the prevalence of other *Legionella* species and other *L. pneumophila* serogroups that cause Legionellosis in South Africa are largely unknown. In a previous study from South Africa⁸, patients with Legionnaires' disease were likely to be HIV-infected, or chronically ill individuals with suspected or confirmed tuberculosis. Similarly, in this study >80% of individuals reported having at least one underlying illness. Although Legionnaires' disease is associated with a high mortality rate, the case fatality ratio of 20%, which is on the upper boundary of what is expected, likely represents a bias because individuals with severe disease are more likely to be tested for Legionellosis.

Due to the poor quality of data captured during completion of the CIF, potential sources of infection could not be adequately assessed. This may be a result of the CIF being completed by healthcare workers, whereas the environmental investigation is conducted by environmental health practitioners. In addition, individuals with Legionnaires' disease are often severely ill and therefore not able to provide exposure information.

Although Legionnaire's disease remains relatively rare in South Africa, it is important to diagnose and notify cases in order to identify potential clusters of disease and sources of infection for intervention. This has become increasingly important during the coronavirus disease 2019 (COVID-19) pandemic during which many places of work and large buildings such as hotels, offices, gyms and salons have reopened after being closed for extended periods. Closure or restricted use of buildings or parts of buildings can increase the risk for *Legionella* growth in water systems¹⁰, and thereby the risk of Legionnaires' disease. The Centers for Disease Control and Prevention (CDC)¹¹ and European Society of Clinical Microbiology and Infectious Diseases (ESCMID)¹² have published guidance for the management of water systems during the COVID-19 epidemic. Individuals with Legionellosis may present with similar signs and symptoms to COVID-19. In addition, SARS-CoV-2 and *Legionella* co-infection has been described¹³ and co-infection among patients with COVID-19 should be considered clinically as both pathogens cause more severe illness in the elderly and in males.¹⁴

Conclusion

Ongoing surveillance and improved investigation of Legionnaires' disease cases is important for cluster identification, particularly during the COVID-19 pandemic when lockdown measures have resulted in closure or restricted use of buildings, thereby increasing the risk for *Legionella* growth in water systems.

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