



Dengue and leptospirosis infection during the coronavirus 2019 outbreak in Sri Lanka

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A significant decrease in dengue fever cases and a contrasting increase in leptospirosis cases were reported for the second quarter of 2020 compared with 2019 in Sri Lanka. In the absence of significant environmental and weather-related differences to account for these changes in incidence, we investigated the possibility that the effects of the COVID-19 pandemic on public health, social behaviour and the restrictions imposed during the lockdown influenced the fluctuations in dengue and leptospirosis infections.

Keywords: COVID-19, dengue fever, leptospirosis, pandemic, tropical infections

Introduction

Coronavirus 2019 (COVID-19) has had a widespread impact on public health and healthcare systems worldwide. Sri Lanka has been relatively spared, with <3500 confirmed cases reported and a very low death rate due to COVID-19 up to the end of September 2020.^{1,2} This was due to timely lockdowns, aggressive contact tracing and quarantine procedures. The height of the first wave of the COVID-19 outbreak in Sri Lanka was during the second quarter of 2020. This is the period during which the southwest monsoon is active and outbreaks of dengue fever (DF) and leptospirosis (both notifiable diseases) are an annual feature.³ With the onset of the COVID-19 epidemic, many anticipated that there would be an increase in DF and leptospirosis due to neglect of preventive public health measures, which were focused almost entirely on COVID-19. Similarly, there had been warnings and predictions of larger than normal outbreaks of DF from Singapore.⁴ Against this unique background of an ongoing global healthcare crisis, we observed the impact of the COVID-19 pandemic on DF and leptospirosis crude incidence patterns in Sri Lanka.

COVID-19 and DF

Data from the Epidemiology Unit of the Ministry of Health in Sri Lanka shows that during the second quarter of 2020 (1 April to 30 June 2020) there were 3492 cases of confirmed DF, a 73.6% reduction compared with the same period in 2019, when there were 13 249 cases (Table 1).⁵ The trend from March to June, the period during which the impact of the first COVID-19 outbreak was at its height in Sri Lanka, reported cases of DF were at their lowest for the past 5 y (Figure 1).⁵ In fact, from March to Septem-

ber 2020, monthly DF cases did not reach the IQR of the DF cases reported from January to September since 2016, and the median number of monthly DF cases during January to September significantly dropped after the onset of COVID-19 (Table 2).

The observed reduction in reported DF cases may be partly explained by changes in rainfall patterns. Below normal rainfalls were received over most parts of the island from January to March 2020 due to weaker northeast monsoon conditions compared with the same period in 2019.⁶ However, during the months of April to June 2020, near-normal rainfalls were received over most parts of the island from inter-monsoon conditions compared with the same period in 2019.⁶

The decrease in cases of DF cannot be solely explained by changes in weather conditions. Under-reporting of cases may be one explanation, with relatively milder cases of DF not presenting to hospitals due to fear of the risk of hospital-acquired COVID-19 infection. We believe that a decrease in transmission of DF due to the closure of schools and offices during the lockdown was a major contributing factor. The decrease in the number of DF-breeding sites because of aggressive cleaning up of the city limits by municipal councils, as well as household surroundings by residents, may also have led to reduced mosquito density and reduced disease transmission during the lockdown. The closure of airports may have contributed to reduced numbers of imported cases of DF in the region.

COVID-19 and leptospirosis

There were 3404 cases of reported leptospirosis during the second quarter of 2020, an increase of 38.5% compared with the

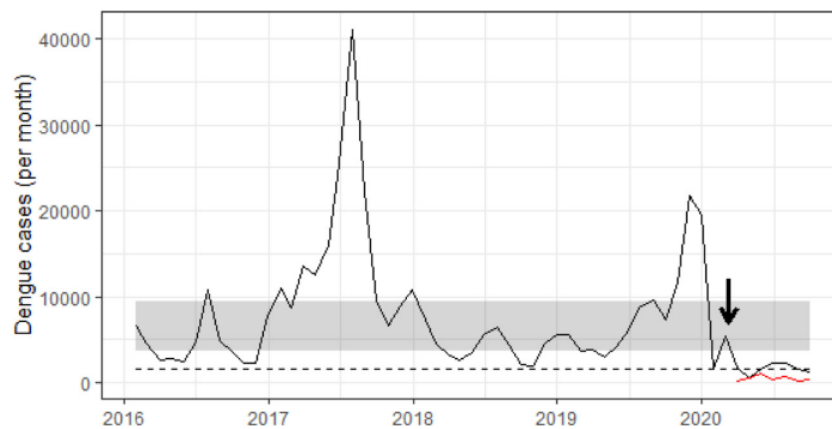


Figure 1. Seasonal variation of monthly dengue cases from January 2016 to September 2020 and reported COVID-19 cases from March to September 2020. The black line indicates the seasonal variation of monthly dengue cases from January 2016 to September 2020. The red line indicates the reported COVID-19 cases from March to September 2020. The grey colour band shows the IQR (Q1–Q3) of monthly dengue cases reported from January to September before COVID-19. The dashed line indicates the minimum number of monthly dengue cases reported from January to September before COVID-19. The arrow indicates the time of the first local case of COVID-19 in Sri Lanka.

Table 1. Reported cases of dengue and leptospirosis during the second quarter (Q2) of 2019 and 2020

Month	2019	2020
Dengue—reported cases		
April	2970	482
May	4260	1370
June	6019	1640
Total for Q2	13 249	3492
Change from 2019 to 2020		–73.6%
Leptospirosis—reported cases		
April	311	133
May	508	1109
June	464	833
Total for Q2	2457	3404
Change from 2019 to 2020		+38.5%

Table 2. Comparison of monthly cases of dengue and leptospirosis from January to September during 2016–2020 (cases reported from October to December have not been considered)

	Before COVID-19 Median (IQR) of monthly cases	After COVID-19 Median (IQR) of monthly cases	Wilcoxon rank sum test (p-value)*
Dengue	5440 (3656–9364)	1548 (1324–1968)	<0.001
Leptospirosis	353 (284–405)	695 (412–1081)	0.054

*p < 0.07 was considered as significant as non-parametric tests were used.

same period in 2019 when there were 2457 cases (Table 1).⁴ The median number of monthly leptospirosis cases during January to September increased significantly during the COVID-19 pandemic (Table 2).

During the COVID-19 pandemic, the highest number of monthly cases of leptospirosis were reported since 2016. Also, from March to September 2020, the IQR for monthly leptospirosis cases did not decline to the IQR of monthly leptospirosis cases reported for January to September from 2016 onwards (Figure 2).

Leptospirosis is highly driven by agricultural work, during which manual labourers have to wade through leptospira-rich static water bodies. The observed increase in leptospirosis cases can be attributed to increased farming activity that was actively encouraged by the government during the lockdown (to stabilise food supplies), together with the non-implementation of

the state-sponsored doxycycline prophylaxis programme for individuals at high risk during the COVID-19 epidemic. Previously uncultivated or abandoned land being recultivated and individuals with no prophylaxis engaging in farming activities could also have contributed to the increase in the reported cases of leptospirosis.

Conclusion

We observed a significant decrease in DF cases and an increase in leptospirosis cases for the second quarter of 2020 compared with 2019. For DF, this is despite the more pronounced outbreaks that were predicted. In the absence of significant environmental and weather-pattern differences to account for the lowest crude incidence of DF for the last 5 y in Sri Lanka, it is reasonable to assume that the reduction in cases may have been influenced by the COVID-19 epidemic for the reasons alluded to above. Similarly, the COVID-19 epidemic may also have influenced the

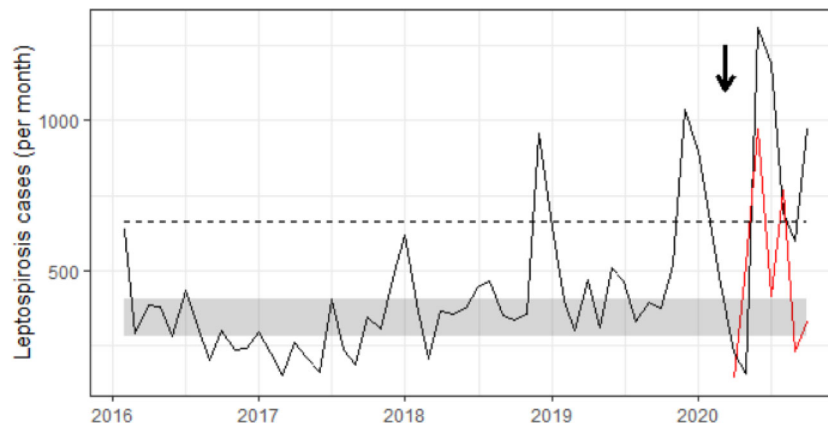


Figure 2. Seasonal variation of monthly leptospirosis cases from January 2016 to September 2020 and reported COVID-19 cases from March to September 2020. The black line indicates the seasonal variation of monthly leptospirosis cases from January 2016 to September 2020. The red line indicates the reported COVID-19 cases from March to September 2020. The grey colour band shows the IQR (Q1–Q3) of monthly leptospirosis cases reported from January to September before COVID-19. The dashed line indicates the maximum number of monthly leptospirosis cases reported from January to September before COVID-19. The arrow indicates the time of the first local case of COVID-19 in Sri Lanka.

increase in leptospirosis cases. Our observations highlight the indirect effects of the COVID-19 epidemic on public health, in this instance on two important endemic infectious diseases in Sri Lanka.

There are several limitations to interpretation of the above conclusion. This study only presents the numbers of monthly DF, leptospirosis and COVID-19 cases reported from routinely collected health facility data by the Ministry of Health, Sri Lanka, and therefore the true number of cases may be higher than the number reported. With the cyclic trend of DF being 3–5 y, it is expected to display one of the lowest incidence rates. The observed reduced number of cases of DF could also be due to the COVID-19 pandemic affecting not only the healthcare-seeking behaviour of patients, but also because as health facilities were overwhelmed with COVID-19 priority cases, they became less accessible to other patients. DF transmission is closely related to people's movement, which was obviously restricted during the COVID-19 pandemic, not so much because of the disease, but because of the lockdown restrictions. With leptospirosis being a disease that arises from livelihood exposure in peridomestic environments, it is more likely to continue its usual cycle of infection and may increase in prevalence, despite the lockdown restrictions. The study period relating to COVID-19 is relatively short compared with the pre-COVID-19 period, and future studies conducted over extended periods of time will provide a better insight into the disease trends that were observed in the current study. Furthermore, not all known risk factors for DF and leptospirosis were assessed in the current study, making some of the observations presented here less robust.

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