

Title: Rabies control in Bangladesh and prediction of human rabies cases by 2030: a One Health approach

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Abstract: Background Bangladesh is making progress toward achieving zero dog-mediated rabies deaths by 2030, a global goal set in 2015.

Methods Drawing from multiple datasets, including patient immunisation record books and mass dog vaccination (MDV) databases, we conducted a comprehensive analysis between 2011 and 2023 to understand the effectiveness of rabies control programmes and predict human rabies cases in Bangladesh by 2030 using time-series forecasting models. We also compared rabies virus sequences from GenBank in Bangladesh and other South Asian countries.

Findings The estimated dog population in Bangladesh was determined to be 1,668,140, with an average dog population density of 12.83 dogs/km² (95% CI 11.14–14.53) and a human-to-dog ratio of 86.70 (95% CI 76.60–96.80). The MDV campaign has led to the vaccination of an average of 21,295 dogs (95% CI 18,654–23,935) per district annually out of an estimated 26,065 dogs (95% CI 22,898–29,230). A declining trend in predicted and observed human rabies cases has been identified, suggesting that Bangladesh is poised to make substantial progress towards achieving the ‘Zero by 30’ goal, provided the current trajectory continues. The phylogenetic analysis shows that rabies viruses in Bangladesh belong to the Arctic-like-1 group, which differs from those in Bhutan despite sharing a common ancestor.

Interpretation Bangladesh's One Health approach demonstrated that an increase in MDV and anti-rabies vaccine (ARV) resulted in a decline in the relative risk of human rabies cases, indicating that eliminating dog-mediated human rabies could be achievable.

Key words: Human rabies Time-series forecasting models Mass dog vaccination Bangladesh

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