Climate change and its impact on spatial and temporal distribution of Visceral leishmaniasis transmission risk in Nepal

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Visceral Leishmaniasis (VL) also known as kala-azar has posed significant challenges to elimination efforts due to increased reporting of new cases from high mountain and previously considered non-endemic areas in Nepal. Understanding the potential distribution of disease risk and its changing patterns in the context of climate change is vital to inform polices and target available resources effectively. In this study we modelled and mapped climatically (environmentally) suitable areas based on the ecological niche principle and machine learning modelling techniques. The results revealed that about 34% of the land area in the lowland Tarai region and river valleys in the hill and mountain regions of Nepal are currently suitable for VL transmission. Climate change is expected to increase the suitable area to 4.92% for 2050s while 43.77% for 2070s in the pessimistic scenario (SSP 585), while the area at risk of transmission will remain stagnant or slightly decrease in the optimistic scenario (SSP245) for both periods. Environmentally suitability for VL transmission will decrease in the eastern lowland and increase in the west. The assessment of the proportion of the population at risk of VL transmission is about 81% which is expected to decrease in future, as VL risk decreases in some more densely populated areas. However, the predicted spatial shift of the population at risk will expose new population at risk of transmission of VL. Our findings are important to design evidence-based health polices and to optimally target limited resources in the National VL Elimination programme.

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