

CASE REPORT

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# Dengue virus infection in a French traveller to the hilly region of Nepal in 2015: a case report

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## Abstract

**Background:** Dengue viral infections are known to pose a significant risk during travel to tropical regions, but it is surprising to find dengue transmission in the hilly region of Nepal, which is over 1800mtr above sea level.

**Case presentation:** A 43-year-old Caucasian female traveler from France presented with fever and abdominal pain following a diarrheal illness while visiting the central hilly region of Nepal. Over the course of 9 days, she developed fever, body aches, and joint pain, with hemorrhagic manifestation. She was hospitalized in India and treated with supportive care, with daily monitoring of her platelets. An assessment by enzyme-linked immunosorbent assay showed that she was positive for dengue non-structural protein 1. Upon her return to France, dengue virus was confirmed by reverse transcriptase-polymerase chain reaction.

**Conclusion:** The district where this dengue case was reported is in the hilly region of Nepal, neighboring the capital city Kathmandu. To the best of our knowledge, there has previously been no dengue cases reported from the district. This study is important because it aims to establish a potential region of dengue virus circulation not only in the tropics, but also in the subtropics as well, which in Nepal may exceed elevations of 1800mtr. This recent case report has raised alarm among concerned health personnel, researchers, and organizations that this infectious disease is now on the way to becoming established in a temperate climate.

**Keywords:** Dengue virus, Hilly region, Nepal, Travel

## Background

Dengue is a mosquito-borne flaviviral infection that is endemic to the tropics and subtropics, affecting up to 100 million people per year [1]. The presentation of dengue virus (DENV) infection can be asymptomatic or manifest as a febrile illness; dengue fever. However, subsets of patients may develop dengue hemorrhagic fever, with complications such as gastrointestinal bleeding and ecchymoses, which may result in the potentially lethal form of the disease; dengue shock syndrome [2–4]. Around the world there are four distinct dengue virus serotypes (DENV 1–4) [5]. Interestingly, infection with one serotype confers serotype-specific immunity to

the host; however, if subsequent infection occurs with a different serotype, it can predispose the host to a grave clinical outcome [6–8].

Nepal shares an open border with India, an endemic region for DENV, thus is susceptible to an unprecedented flow of virus through infected patients crossing the border. Regulatory checkpoints and quarantines are not currently in place along the Nepali border. In 2013, a Nepali team isolated and characterized DENV circulating in a part of the eastern Terai that had previously seen cases of dengue in 2006 [9]. Comparing the data, Singh *et al.* [10] reported that, in fact, there were two different strains of DENV circulating in Nepal, raising the specter of an alarming dengue situation in Nepal.

We report a case of DENV infection in a Caucasian woman while she was traveling through the hilly region of Nepal.

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## Case presentation

A 43-year-old Caucasian female arrived in Kathmandu from Paris, and the same day traveled to Kavre District, in the inner hilly region (elevation: 1800mtr) of Nepal. Nine days after arriving in the hilly region, she developed fever, body aches and joint pain. She also experienced loose stools and vomiting along with hemorrhagic manifestations such as facial flushing, petechiae and edema. She was subsequently admitted to a hospital in Goa, India, owing to health insurance requirements. Upon examination, her blood pressure and other vital signs were normal, without abdominal distension or bleeding. Ultrasonography of her abdomen and pelvis showed borderline splenomegaly (12cm). An enzyme-linked immunosorbent assay was positive for dengue non-structural protein 1, although tests for immunoglobulins G and M were negative. She was given supportive care, including intravenous fluids. Daily monitoring of her platelet count revealed values as low as 37,000/mm<sup>3</sup> (Table 1). She was discharged from the hospital in Goa after 5 days, and returned to Paris, where she was hospitalized briefly and discharged. Dengue virus was confirmed by reverse transcriptase-polymerase chain reaction in Paris.

## Discussion

The first case of DENV2 infection in Nepal was reported in 2004 in a Japanese traveler [11]. Subsequently, confirmed cases were reported from nine districts in the lowland Terai region of Nepal in 2006, and all four DENV serotypes were found to be co-circulating that year [9]. Over the years, the Terai belt, located south of the Himalayan foothills, has become an established dengue

region. However, only limited data have been generated about DENV infection and disease in Nepal. Two major outbreaks have occurred in Nepal: one in 2010, dominated by DENV1, and the other in 2013, dominated by DENV2 [10, 12]. Dengue was reported in the highlands for the first time during the 2010 outbreak [12]. The 2013 outbreak also affected the highlands, including Kathmandu, though it was predominantly confined to Chitwan, Rupandehi, Parsa, and Dhanusa [10]. The shift of the viral disease from the subtropical Terai belt to the temperate hill region of Nepal is relevant to medical science because the disease could easily spread all over the world in the future, irrespective of climate [13]. The village to which the patient had traveled is at an elevation of 1800mtr. It is becoming apparent that DENV is adapting to temperate climates as well. This may be because of temperature change due to global warming, the resistance of mosquitoes to drugs, or other factors, all of which may have contributed to the increase in dengue fever cases around the world in recent years.

Reports of dengue among travelers worldwide have been increasing, but high-quality data on incidence are lacking. The increase in international travel to dengue-endemic regions, with the associated risk of travel-acquired dengue, poses a serious concern [14]. The shift in temperature around the world has enabled DENV to thrive in colder regions where it was previously not reported. To look for the causes, the mosquito vector *Aedes* spp. and mutations in the virus should be the foci of future research. *A. aegypti* was first reported in Kathmandu in 2010 and the vectors may have now established populations up in the mountains [12]. Serotype and genotype shifts have been reported based on sequencing of specific viral regions [15]. In-depth molecular study of the virus found in the hill region of Nepal might give insights into the climatic shift of dengue disease. Therefore, the authors strongly recommend active surveillance and identification of mosquitoes along with whole genome sequencing of the virus for greater awareness as well as knowledge of dengue fever and dengue hemorrhagic fever transmission.

## Conclusion

This is the second report of DENV infection in a foreigner travelling in Nepal, after the case in a Japanese traveler reported in 2004. Although initially it was thought that only the Terai belt of Nepal was endemic for dengue, a number of dengue cases are also being reported from the hill region. The Government of Nepal should take the initiative to eliminate adult mosquitoes, as well as larvae and eggs, to prevent further transmission of arboviruses in the hill region of Nepal, which is one of the most attractive touristic sites in Nepal.

**Table 1** Laboratory parameters of dengue case

Test	Result
Hemoglobin	13.6 g/dL
Packed cell volume	39.1 L/L
Platelets	37,000/mm <sup>3</sup>
Total bilirubin	0.9 mg/dL
Direct bilirubin	0.4 mg/dL
Serum glutamic oxaloacetic transaminase	93 IU/L
Serum glutamic-pyruvic transaminase	54 IU/L
Alkaline phosphatase	53 IU/L
Total proteins	7.7 g/dL
Albumin	4 g/dL
Globulin	3.7 g/dL
Albumin to globulin Ratio	1.08
Gamma-glutamyl transferase	45 IU/L
Dengue immunoglobulin G and M	Negative
Dengue non-structural protein 1 antigen	Positive

## Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

## Competing interests

The authors declare that they have no competing interests.

## Authors' contributions

BPG, AA, and RR designed the study. BPG, AA, RK, BPU, and KDM collected data from the patient. BPG, AA, BPU, BDP, BKJ, and KDM wrote the paper. All authors read and approved the final manuscript.

## Acknowledgement

The authors are very grateful to Lisa Krain from Johns Hopkins Bloomberg School of Public Health, Maryland, USA, for her thorough language editing of the manuscript. The authors also would like to thank the doctors, nurses, and laboratory staff for supportive treatment, care, and diagnosis in the case.

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Received: 27 January 2016 Accepted: 23 February 2016

Published online: 21 March 2016

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