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REVIEW PAPER

Dengue fever in pediatric travelers – a literature review

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ABSTRACT

Dengue fever, predominantly affecting children, is/has been becoming increasingly relevant as cases rise globally due to climate change and expanded travel to endemic regions. In Poland, reported dengue cases rose from 70 in 2023 to 126 in 2024, indicating a growing risk even in temperate zones. Most infections are mild; however, severe cases are notably more common in children and those with comorbidities. The dengue virus has four serotypes, and reinfection can lead to more severe disease. Currently, two vaccines, Dengvaxia and QDENGA, provide options for prevention, with QDENGA showing promise for use regardless of prior infection status. A review of literature from 2009–2024 highlighted 95 pediatric cases of dengue linked to travel in/to endemic regions, emphasizing the need for increased awareness and preventive measures, particularly among families traveling to areas with known dengue transmission. Continued vigilance and education in travel medicine are essential to mitigate risk.

KEY WORDS:

fever, dengue, traveler.

INTRODUCTION

Dengue affects millions worldwide, including children, but it is a rare disease in temperate zones [1, 2]. In 2023, the number of imported dengue cases in Europe tripled compared to 2022, rising from 1,572 to 4,900. In Poland, in 2023, there were 70 dengue cases (0.19 per 100,000) [3]. The rate was higher than in the pre-pandemic years of 2018 and 2019, which was 0.1 per 100,000. In Europe, the first outbreaks of dengue fever were recorded in France and Croatia in 2010 and Madeira in 2012 [4, 5]. In 2023, there were sporadic autochthonous cases and outbreaks reported in three countries: Italy (82 cases), France (43 cases), and Spain (3 cases). These outbreaks are linked to the risk of indigenous transmission of dengue virus (DENV) in Europe [6]. In many dengue-endemic countries, half of the dengue cases occur in children [7]. Rates of dengue are the highest among teenagers, followed by infants (of less than 1 year of age) and children aged 5–9 years. There is no evidence that sex is a risk factor for infection or severe disease. Humans can be infected with a DENV several times over their lifetime. After an infection with a DENV, the patient will have lifelong type-specific immunity. Short-term cross-immunity against other DENV types lasts 2–6 months [8, 9].

SYMPTOMS

The World Health Organization classifies dengue into three categories: dengue without warning signs, dengue with warning signs, and severe dengue. Patients experiencing dengue with warning signs or severe dengue need careful observation and inpatient care [8]. Most infections are asymptomatic or mild. More severe disease progression usually occurs in children and people with comorbidities. The most common of these are asthma, hypertension, hepatitis, anemia, and thrombocytopenia [8]. The severity of symptoms depends on the form of dengue; the classic form is characterized by fever lasting 2–7 days and at least

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two nonspecific symptoms, such as headache, muscle and joint pain, general malaise, eye pain, nausea and vomiting, diarrhea, or rash [9]. The morphology often shows a decreased leukocyte count [8]. Red flags are abdominal pain, bleeding from mucous membranes, overhydration or dehydration, anxiety, agitation, drowsiness, and hepatomegaly. They can be accompanied by low platelets and increased hematocrit [9]. The severe form of dengue, in addition to severe general symptoms, is characterized by a loss of body fluids, leading to hypovolemic shock or acute respiratory distress syndrome, symptoms of acute bleeding, organ failure – liver, heart, and kidneys, and changes in the central nervous system (convulsions, impaired consciousness). The diagnosis of dengue can be made based on serological tests performed no earlier than on the fifth day of symptoms or detection of the virus's genetic material using molecular tests [8, 9].

Dengue is usually a self-limiting disease – in mild cases, the infection is treated symptomatically. Patients with the severe form require treatment in intensive care units. Hammond *et al*., in a retrospective study done in Nicaragua, found that severe dengue was found/observed predominantly in infants 4–9 months of age and children 5–9 years old, and secondary DEN infection was a risk factor for severity in children. Age-related differences were identified in the prevalence of specific clinical manifestations [10].

VACCINE

Two vaccines are available against the dengue virus: Dengvaxia and QDENGA (TAK-003). Dengvaxia can only be used in people who have previously had this infection. Vaccination may increase the risk of severe dengue in those who have never had the disease if they contract it after immunization [11]. It was the first licensed vaccine against dengue.

QDENGA was introduced in 2024. It does not require prior confirmation of dengue infection, is highly effective, and reduces the risk of complications. The vaccine is advised for people residing in regions where dengue is prevalent and often seen. A clinical trial has confirmed its effectiveness and safety in children over 4 years of age [12].

Currently, vaccines are not recommended as a routine prophylaxis for children traveling to endemic zones.

The aim of this study was to review and analyze published case reports and studies of dengue fever in pediatric travelers returning from endemic regions, in order to assess the clinical characteristics, severity, diagnostic challenges, and potential risk factors for severe disease in this underreported population.

MATERIAL AND METHODS

The SCOPUS, PUBMED, and OVID search engines were used with the keywords "(dengue* OR dengue virus*) AND (children* OR pediatric cases*) AND (travel*)", based on the MESH terms suggested by PUBMED. The inclusion criteria were applied for the selection of studies:

- patients infected with dengue,
- returning from travel to the endemic areas,
- pediatric patients,
- observational studies, case reports, and case studies,
- published in English in 2009–2024.

RESULTS

Eight articles described 95 cases of children with dengue after returning from Africa, Asia, and South America. Data on cases were collected in 1997–2020. The children described came from the United States, Spain, Russia, South Korea, Finland, and Sweden. The primary confirmation method was serological tests and a positive epidemiological interview regarding staying in an area with dengue cases. Most of the children were of school age. Among the described children, three cases of hemorrhagic dengue were recorded – in each patient, there was a confirmed previous exposure to the dengue virus. One patient died – a school-age boy who had been to the Dominican Republic twice. Details are presented in Table 1 [4, 7, 13–18].

DISCUSSION

Approximately 40% of the world's population lives in dengue-infected areas [8]. Many of these places are attractive tourist destinations. The number of dengue cases worldwide has been increasing for years. Global incidence (per 100,000 population) more than tripled, from 431.6 in 1990 to 1371.3 in 2017 [19]. Annual dengue deaths increased from just under 17,000 to over 40,000 in 2017, and the global age-standardized mortality rate increased by 0.31–0.53 [20]. The highest age-standardized rates were for the young (0–1 years) and elderly (> 80 years). From/Since 1990–2021, the global burden of dengue incidence and its associated disability-adjusted life-years (DALYs) was/has been consistently higher in children and adolescents than in the entire population [20].

Dengue is a significant cause of fever in travelers returning from the tropics. In a prospective European multicenter study of international travelers (2017–2019), Camprubí-Ferrer *et al*. described the frequencies and predictors of the leading causes of fever in travelers [21]. More than 40% of travelers with fever at centers in Spain, Belgium, and Switzerland had malaria or dengue, infections that can be easily diagnosed with rapid diagnostic tests. Among the arboviral cases, 85% were dengue, and 74% were diagnosed in May–November. Arboviruses were the most common cause of fever after malaria, with most cases diagnosed during the high season for *Aedes spp*. [21]. The analysis of epidemiology of travel-associated dengue in 2007–2022 performed by Duvignaud *et al*.

TABLE 1. Literature review on dengue in pediatric travelers

Author	Year of publication	Home country	Trip destination	Number of dengue cases	Period of the study	Age of children (years)
Choi *et al.* [8]	2009	North Korea	Philippines	3	2008	8–18
Krishnan *et al.* [13]	2011	USA	Dominicana, Puerto Rico	8	2007–2010	0–18
Redondo-Bravo *et al.* [4]	2019	Spain	Africa, South America, Asia	56	1997–2016	0–15
Mäkelä *et al.* [14]	2020	Finland	Thailand, Indonesia, Maldives	9	2016–2019	0–18
Zvereva *et al.* [15]	2020	Russia		8	2009–2017	0–18
Khan *et al.* [12]	2021	USA	Africa, Asia, Caribbean	6	2007–2017	13–16
Bonheur *et al.* [16]	2021	USA	Dominican Republic	1	2019	7–14
Satarvandi *et al.* [17]	2024	Sweden	Africa	4	2015–2020	1–17

showed that the most frequent region of acquisition was Asia (65.3%), only a few (1.6%) travelers had complicated dengue, 0.5% had severe dengue, and one died. This analysis included 5,958 travelers with confirmed (n = 4,859; 81.6%) or probable (n = 1,099; 18.4%) dengue. The median age was 33 years [22].

Our analysis showed that little data have been collected on dengue virus cases in traveling children. It is estimated that 7% of travelers are children. Among the described traveling children, school-age children visiting family and friends predominated. Such trips are associated with a higher risk of acquiring infection compared to people spending time in resorts. Based on global dengue numbers and the number of tourists visiting dengue-endemic areas, we assume that the real number of cases of dengue fever in children returning from the tropical zone remains undiagnosed [21]. The course of the disease is not characterized by specific symptoms, and serological verification is not routinely performed [22]. Fever is a common problem in children, so many parents are accustomed to it.

In our analysis, three out of 95 described children had severe dengue, and one died. The risk factors for severe dengue are secondary dengue infection, female sex, and white or Caucasian ethnicity. For the death outcome, respiratory symptoms and age < 18 years were identified as risk factors. Severe dengue and death are both relatively rare in tourists but more frequently in those visiting friends and relatives [23]. The lack of dengue awareness among patients is associated with the lack of dengue prophylaxis [16]. As a result, the more people travel, the more cases of infection are recorded, and the more frequent occurrence of a more severe course of the disease. Dengue should be considered in any patient with a fever developed within 14 days after returning from the tropics. Its symptoms are difficult to distinguish in children traveling, and diagnosis is delayed because the symptoms may resemble other tropical diseases such as malaria or Zika [23–25].

CONCLUSIONS

Information on health problems in children returning from tropical areas is limited. The reports are mainly based on studies conducted in single centers in specific population groups, such as hospitalized patients or people using/attending medical clinics before traveling.

Dengue virus is the arbovirus with the highest number of cases globally, and it is still on the rise in non-endemic areas. There is a need to build dengue awareness among pediatricians and prepare healthcare systems for providing optimal care.

DISCLOSURES

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