FACTORS AFFECTING THE ESTABLISHMENT OF DENGUE FEVER VECTORS: A GRAPHICAL MODEL

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A graphical model provides a visual representation of the complex interplay between various variables that influence a factor. This communication demonstrates the use of graphical form for the analysis of factors affecting dengue fever vectors. A graphical model of the factors affecting the establishment of dengue fever vectors including environmental and human factors such as a lack of awareness and movement between regions, socioeconomic factors like poverty and limited access to healthcare facilities and climate change, as well as globalization and international travel was designed and drawn using features of the Shape and SmartArt graphic menu of the Word software.

Keywords: *Aedes aegypti*, *Aedes albopictus*, dengue fever, graphical model, vectors

Graphs are widely used as a popular representation of the network structure of connected data. Graph data can be found in a broad spectrum of application domains such as social systems, ecosystems, biological networks, knowledge graphs, and information systems (Xia et al., 2021). A graphical model provides a visual representation of the complex interplay between various variables that influence a factor. This diagram type illustrates the relationship between variables, suggesting that changes in one variable may impact the others. Dengue fever is a mosquito-borne virus that poses a global health threat, with outbreaks occurring in new areas. It is primarily transmitted by *Aedes* mosquitoes, which thrive in urban environments. Based on studies conducted, environmental and human factors such as a lack of awareness and movement between regions, socioeconomic factors like poverty and limited access to healthcare facilities, and climate change, as well as globalization and international travel, are factors affecting the establishment of dengue fever vectors (Nasirian, 2025). This communication demonstrates the use of graphical form for the analysis of factors affecting dengue fever vectors.

Based on the study by Nasirian (2025) who researched the factors affecting the establishment of dengue fever vectors, and inspired by review studies (Ahmadi et al., 2024; Kassiri, Nasirian, 2021; Nasirian, 2016, 2017a, 2017b, 2019, 2020, 2022a, 2022b, 2023, 2024a, 2024d; Nasirian, Ahmadi, 2024a, 2024b; Nasirian, Zahirnia, 2021), a graphical model of the factors affecting the establishment of dengue fever vectors was designed and drawn using features of the Shape and SmartArt graphic menu of Word software with initiative and creativity (Fig. 1).
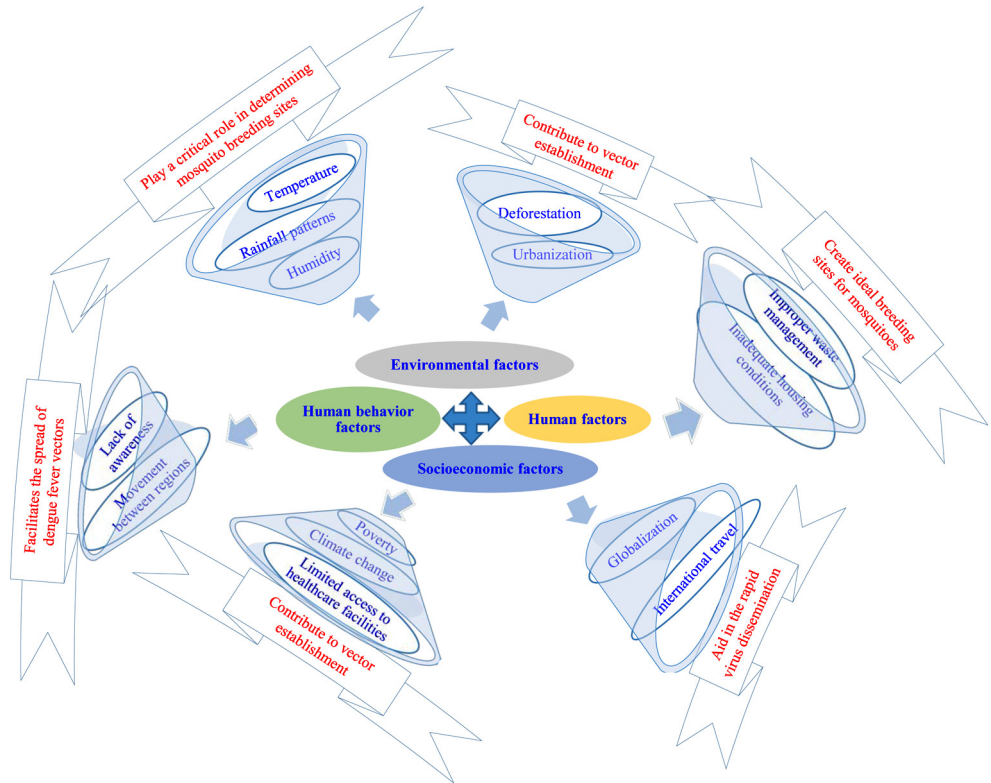

Figure 1. Graphical model of factors affecting the establishment of dengue fever vectors.
Рисунок 1. Графическая модель, показывающая факторы, влияющие на состояние переносчиков лихорадки Денге.

RESULTS AND DISCUSSIONS

Dengue fever is a mosquito-borne viral infection that causes flu-like symptoms such as high fever, severe headache, joint and muscle pain, and rash. It is spread by the *Aedes* mosquito and can be found in tropical and subtropical regions around the world. There is no specific treatment for dengue fever, but symptoms can be managed with rest, fluids, and pain relievers. In severe cases, hospitalization may be required. Preventive measures include using insect repellent, wearing long sleeves and pants, and eliminating standing water where mosquitoes breed (Azari-Hamidian, Harbach, 2023; Nasirian, 2024b, 2024c, 2025).

Invasive mosquito species are non-native species that have been introduced to a new environment and have negative impacts on native species and ecosystems. These species can outcompete native species for resources, disrupt natural habitats, and spread diseases. Invasive species are a major threat to biodiversity and can cause significant economic and environmental damage. It is important to prevent the introduction and spread of invasive species through measures such as monitoring and control programs (Azari-Hamidian, 2023; Nasirian, 2025).

Dengue fever vectors are primarily mosquitoes of the *Aedes* genus (Diptera: Culicidae), with *Aedes aegypti* and *Aedes albopictus* being the most common vectors. Several factors can influence the establishment and spread of these vectors, including climate, urbanization, and human behavior. Climate plays a significant role in the distribution of dengue fever vectors, as these mosquitoes thrive in warm and humid environments. Temperature and rainfall patterns can affect the breeding and survival of the mosquitoes, leading to fluctuations in their populations. Urbanization also plays a crucial role in the establishment of dengue fever vectors. Urban areas provide ample breeding sites for mosquitoes, such as stagnant water in containers, discarded tires, and other artificial containers (Azari-Hamidian, 2023; Nasirian, 2024b, 2024c, 2025).

The dense population in urban areas also increases the likelihood of human-mosquito contact, facilitating the transmission of the dengue virus. Human behavior, such as poor waste management practices and inadequate mosquito control measures, can further contribute to the establishment of dengue fever vectors. Improper disposal of waste can create breeding sites for mosquitoes, while the lack of mosquito control measures allows their populations to grow unchecked. Overall, a combination of climate, urbanization, and human behavior influences the establishment and spread of dengue fever vectors, highlighting the importance of comprehensive vector control strategies to prevent the transmission of the disease (Nasirian, 2024b, 2024c, 2025). In this graphical model, the factors affecting the establishment of dengue fever vectors are summarized.

CONCLUSION

A graphical model of the factors affecting the establishment of dengue fever vectors including environmental and human factors such as a lack of awareness and movement between regions, socioeconomic factors like poverty and limited access to healthcare facilities, and climate change, as well as globalization and international travel was designed and drawn using features of the Shape and SmartArt graphic menu of Word software with initiative and creativity.

DATA AVAILABILITY

The author declares that he is satisfied with the availability of the data and materials online.

ETHICAL TREATMENT OF ANIMALS

Not applicable.

CONFLICT OF INTEREST

None.

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ФАКТОРЫ, ВЛИЯЮЩИЕ НА СОСТОЯНИЕ ПЕРЕНОСЧИКОВ ЛИХОРАДКИ ДЕНГЕ: ГРАФИЧЕСКАЯ МОДЕЛЬ

Х. Насириан

Ключевые слова: *Aedes aegypti*, *Aedes albopictus*, лихорадка Денге, графическая модель, переносчики

РЕЗЮМЕ

Графическая модель визуализирует комплексное взаимодействие между разными переменными, влияющими на анализируемый фактор. Модель позволяет оценить факторы, обусловливающие появление очагов лихорадки Денге: неблагоприятные условия внешней среды, отсутствие информации о болезни, миграция населения между разными регионами, социологические и экономические факторы (нищета населения и ограниченный доступ к медицинским учреждениям), изменения климата, глобализация и международный туризм. Графическая схема создана при помощи меню Shape and SmartArt в модифицированной программе Word.