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DENGUE ENDEMIC IN BANGLADESH: ENDURING FIGHT AGAINST A RELENTLESS VIRUS

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A B S T R A C T

Amidst the aftermath of the unprecedented challenges of the COVID-19 pandemic, global health systems remain poised to tackle emerging diseases. Among these, dengue fever has emerged as a persistent concern in Southeast Asia, with Bangladesh at the forefront. Since its initial outbreak in 2000, dengue has followed the typical epidemic trajectory, marked by increasingly frequent and expansive outbreaks that have spread across Bangladesh. With nearly a quarter-century of dengue outbreaks in Bangladesh, the disease has undoubtedly become an emerging outbreak of the decade. Dengue, caused by the dengue virus (DENV) and primarily transmitted through Aides mosquitoes, affects millions worldwide annually. Most cases are mild, but severe dengue poses life-threatening risks. Bangladesh faces a persistent dengue burden due to urbanization, climate change, and high population density. An escalating outbreak in 2023 necessitates urgent action. Dhaka city is the epicenter, with around 80% of deaths and 64.5% of hospitalizations nationally. The government has designated 63 medical facilities to manage cases, including specialized Dengue cells. Efforts to control dengue vectors continue, but the unique climate supports transmission. Public awareness and preventive strategies are crucial. Dhaka city's vulnerability emphasizes precise interventions. Dengue's economic impact strains healthcare and households. Coordinated efforts are vital to combat dengue in Bangladesh and globally. The World Health Organization (WHO) plays a pivotal role in providing support and strategies for effective management and control.

INTRODUCTION

After the unprecedented challenges posed by the COVID-19 pandemic (1), global health systems remain on high alert to confront emerging diseases (2). Among these, dengue fever has emerged as a persistent concern in Southeast Asian countries, with Bangladesh being particularly affected. Since its initial outbreak in 2000, dengue has followed the typical epidemic trajectory, marked by increasingly frequent and expansive outbreaks that have gradually expanded geographically across Bangladesh. As nearly a quarter-century of dengue outbreaks in Bangladesh unfolds, the disease has undeniably become an emerging outbreak of this decade.

Dengue fever is a significant arbovirus infection caused by the dengue virus (DENV) and primarily transmitted through Aides mosquitoes. It impacts millions of people worldwide, with an estimated 100-400 million infections occurring each year. Most cases are asymptomatic or mild, while severe dengue can be fatal. Common symptoms include high fever, headache, body aches, and rash. Severe cases require hospitalization. There is currently no specific treatment for dengue; the focus is on pain management. Preventing mosquito bites is crucial in avoiding dengue transmission. The virus spreads through mosquito bites and human-to-mosquito transmission, with the risk of maternal transmission during pregnancy. Urbanization and climate change can influence the spread of dengue. To prevent dengue, individuals should protect themselves from mosquito bites using various measures. One vaccine (Dengvaxia) is available for individuals with past dengue infection. The World Health Organization (WHO) plays a crucial role in responding to dengue outbreaks by providing support, guidance, and strategies for effective management and control (3).

Bangladesh is one of the countries that has been significantly impacted by dengue. Until the year 2000, dengue incidence in Bangladesh was sporadic, with only occasional cases reported between 1964 and 1999. However, in 2000, the country experienced its first major outbreak, recording 5,551 hospitalized cases and 93 deaths. Since then, dengue has become an endemic disease in Bangladesh, causing thousands of infections and significantly affecting the quality of life of its population (4).

Statistical Analysis of Dengue Outbreaks in Bangladesh

In recent times, Bangladesh has witnessed a concerning surge in dengue outbreaks, marked by a sharp increase in both cases and fatalities, raising alarm about the current state of the disease's epidemiological landscape. According to the Directorate General of Health Services (DGHS), as of July 16, 2023, a staggering total of 20,878 documented cases of dengue infection have been reported, accompanied by a tragic toll of 106 lives lost to this relentless mosquito-borne ailment. This year's death toll is a fivefold rise compared to the corresponding period in 2022, highlighting an urgent need for immediate attention and decisive actions (5).

The city of Dhaka, with its high population density, has emerged as the epicenter of this year's outbreak, accounting for nearly 80 percent of reported fatalities and a significant 64.5 percent of overall hospitalizations across the nation. Responding to this escalating crisis, the government has allocated 63 medical facilities within Dhaka city, both public and private, to manage dengue cases. Prominent healthcare institutions, such as Bangladesh Shishu Hospital, have established specialized Dengue cells. Further, the Dhaka North City Corporation (DNCC) Hospital has transformed into a dedicated facility catering exclusively to Dengue patients (6).

The year 2022 witnessed a distressing zenith in the dengue outbreak, recording a staggering 61,089 cases and a devastating death toll of 269 individuals. This somber statistic marked the highest fatality count since dengue outbreak tracking commenced in 2000. This grim reality underscores the

imperative to address the formidable prevalence of the disease within the country. Analysis of previous years' data reveals a consistent pattern: the latter half of each year presents the most significant risk for dengue transmission. Notably, Dhaka city and Chittagong emerged as the most severely impacted regions, possibly due to their high population density and conducive environmental factors (7).

Despite the temporary decline in dengue cases due to the COVID-19 pandemic in 2020, the year 2022 saw a resurgence of the disease, establishing it as the leading cause of mortality in Bangladesh. Intriguingly, data highlights the heightened vulnerability of children under 15 to severe dengue cases in Asia, while moderate disease primarily affects adults in the Americas. While efforts have been made to control dengue vectors, Bangladesh's climatic conditions during the monsoon season, spanning from May to August, continue to support dengue transmission. Thus, it is paramount for the government to prioritize public awareness and effective preventive strategies to counter the relentless spread of this fatal disease. Dhaka city's susceptibility underscores the critical need for precise interventions, especially in densely populated urban areas (8).

Dengue Awareness and Preventive Measures

Public awareness campaigns play a crucial role in educating communities about dengue prevention and early symptom recognition. These campaigns aim to inform the public about the risks of dengue transmission and the importance of taking preventive measures. Through various communication channels, such as mass media, social media, posters, and community outreach programs, people are educated about the breeding habitats of Aides mosquitoes, the primary vectors responsible for dengue transmission. They are also made aware of the specific actions they can take to reduce mosquito breeding, such as removing stagnant water containers, using mosquito nets, and using insect repellents. Another vital aspect of dengue awareness campaigns is to educate the public about the early symptoms of dengue fever. Recognizing these symptoms is crucial for early detection and timely medical intervention. High fever, severe headache, joint and muscle pains, nausea, vomiting, swollen glands, and a characteristic rash are some of the common symptoms of dengue. By knowing these symptoms, individuals can seek medical attention promptly, which can be crucial in preventing the progression of the disease to severe dengue. In addition to public awareness campaigns, measures like mosquito control and improved sanitation are crucial in controlling dengue transmission, especially in densely populated areas. Mosquito control involves strategies to reduce the population of Aedes mosquitoes, such as using insecticides, mosquito traps, and biological control methods. Improved sanitation practices, such as proper waste management and reducing clutter that can serve as breeding sites for mosquitoes, are also effective in minimizing the mosquito population (9).

Symptoms and Treatment Options

Recognizing the symptoms of dengue is of utmost importance as it allows for early detection, timely medical intervention, and appropriate treatment. Common symptoms of dengue fever include a sudden onset of high fever, severe headache, intense joint and muscle pains (hence the nickname "break bone fever"), nausea, vomiting, swollen glands, and a characteristic rash that often appears on the skin. Identifying these symptoms early on can help differentiate dengue fever from other illnesses and facilitate prompt medical attention. While there is no specific antiviral treatment for dengue, supportive care forms the mainstay of management. Hydration is essential to maintain tissue perfusion

and prevent complications arising from dehydration. Patients are advised to drink plenty of fluids, and in severe cases, intravenous fluids may be administered. Pain relief medication, such as acetaminophen (avoiding aspirin and non-steroidal anti-inflammatory drugs that may increase the risk of bleeding), can help alleviate the muscle and joint pain associated with dengue. Severe cases of dengue, which can lead to life-threatening complications such as dengue hemorrhagic fever or dengue shock syndrome, require hospitalization and close monitoring. In these cases, medical professionals closely monitor the patient's vital signs, fluid balance, and platelet count. If necessary, blood transfusions may be performed to manage bleeding. Early detection, supportive care, and close medical supervision are vital in reducing the mortality and morbidity associated with severe dengue cases. Research into antiviral therapies and vaccines is ongoing, providing hope for more effective treatment options in the future (10).

Recent Developments in Drug Research

Dengue fever is a widespread and significant arboviral infection caused by the dengue virus (DENV) and transmitted by infected mosquitoes. There are four serotypes of DENV, making multiple exposures possible. The clinical course of dengue fever starts with flu-like symptoms, but some patients progress to severe dengue characterized by plasma leakage, hemorrhaging, and shock. Secondary heterologous dengue infection is a significant risk factor for severe disease, mainly attributed to antibody-dependent enhancement (ADE), which increases virus production (11).

Currently, there are no specific antiviral therapies for dengue, and supportive care remains the mainstay of treatment. Fluid administration to maintain tissue perfusion and judicious use of antipyretics are crucial. However, recent studies have raised concerns about the safety and efficacy of paracetamol in dengue patients, highlighting the need for caution in its prescription. The over the counter (OTC) drug acetaminophen (Tylenol, others) can hel SAJBR-231220-10011-GPp reduce muscle pain and fever. But if you have dengue fever, you should avoid other OTC pain relievers, including aspirin, ibuprofen (Advil, Motrin IB, others) and naproxen sodium (Aleve). These pain relievers can increase the risk of dengue fever bleeding complications (12).

Research on direct-acting and host-targeting antivirals has shown promising preclinical data. JNJ-A07, a NS4B inhibitor, and Ivermectin have demonstrated efficacy in reducing viral burden in animal models. Additionally, Doxycycline, an antibiotic, and inhibitors of host factors like mast cells and metabolic agents are being investigated for their potential therapeutic benefits. In the realm of monoclonal therapeutics, humanized pan-serotype anti-DENV antibodies, like VIS513, AV-1, and Dengushield are in clinical trials to evaluate their safety and efficacy. Another potential therapeutic avenue lies in targeting host factors like mast cells which have been implicated in severe dengue symptoms. Drugs like ketotifen, cromolyn, nafamostat mesylate, montelukast, ketanserin and rupatadine have shown efficacy in animal models and are being studied in clinical trials (13).

Economic Impact of Dengue in Bangladesh

The Dengue outbreak in Bangladesh has exerted a profound economic impact, placing immense strain on the country's healthcare system, and imposing substantial financial burdens on individuals and the overall economy. The swift and severe spread of the outbreak triggered a surge in hospitalizations, particularly in densely populated areas like Dhaka city, where a large number of patients sought medical attention. This surge in healthcare demands overwhelmed hospitals and clinics, driving up the costs of treatment and medical supplies. As the outbreak intensified, the direct costs of Dengue

treatment soared considerably. Private healthcare facilities experienced an overwhelming influx of patients, leading to higher medical expenses for those seeking medical attention. Patients were burdened with out-of-pocket expenditures, encompassing medical consultations, diagnostic tests, medications, and hospitalization costs. Additionally, the informal costs incurred by patients in public hospitals, such as bribes for basic services, further added to the financial strain (14).

The economic impact of the Dengue outbreak was not limited to direct costs alone; it also encompassed significant indirect expenses. Hospitalization led to income losses for patients and their caregivers, as patients had to forgo workdays, resulting in reduced productivity and potential income declines. Furthermore, caregivers, often comprising family members or friends, dedicated their time to assist patients during hospitalization, incurring additional expenses for transportation and accommodation. The cumulative economic expenditure caused by the Dengue outbreak in Bangladesh has been substantial, with Dhaka city alone shouldering an estimated economic burden of over US$15 million. This tremendous burden stretched the country's resources and public health infrastructure to the limit, with private healthcare facilities facing the brunt of higher costs, exacerbating healthcare access disparities. Addressing the economic impact of future Dengue outbreaks necessitates crucial investments in preventive measures and extensive public awareness campaigns. By actively promoting mosquito control, proper waste management, and educating the public about Dengue prevention, the country can curtail the number of cases and hospitalizations, thereby alleviating the economic strain on both individuals and the healthcare system (15).

CONCLUSION

Dengue remains an emerging outbreak in Bangladesh, posing a significant threat to public health and the economy. To combat the spread of dengue, comprehensive and collaborative strategies are required, including mosquito control, public awareness campaigns, and urban planning initiatives. Continued research into drug development is essential to reduce the disease's impact on the population. By implementing effective preventive measures and fostering community engagement, Bangladesh can address the growing threat of dengue and protect the well-being of its citizens.

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Conflict of Interest

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REFERENCES

1. Umar TP, Kamal AL, Shafiul M, Mohammed YA, Setti MO. Healthcare system preparedness for

the next pandemic beyond COVID-19 situation. 2022; 493–4.
2. Kubra K, Shafiul Kadir AKM, Jobran AWM. Emergence and re-emergence of infectious diseases in South Asia: A call for action. Ann Med Surg. 2022 Dec; 84:104878.
3. Dengue - Bangladesh [Internet]. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON481
4. Hossain MS, Noman A Al, Mamun SMA Al, Mosabbir A Al. Twenty-two years of dengue outbreaks in Bangladesh: epidemiology, clinical spectrum, serotypes, and future disease risks. Trop Med Health [Internet]. 2023; 51(1):37. Available from: https://doi.org/10.1186/s41182-023-00528-6
5. Bangladesh Dengue Response Operation 2023 - DREF Operation (MDRBD031) - Bangladesh | ReliefWeb [Internet]. Available from: https://reliefweb.int/report/bangladesh/bangladesh-dengue-response-operation-2023-dref-operation-mdrbd031
6. Dengue: Delay in hospitalization increases death risk | Prothom Alo [Internet]. Available from: https://en.prothomalo.com/bangladesh/w8qdmoh7jy
7. Kayesh ME, Khalil I, Kohara M, and Tsukiyama-Kohara K. Increasing Dengue Burden and Severe Dengue Risk in Bangladesh: An Overview. Vol. 8, Tropical Medicine and Infectious Disease. 2023.
8. Bhowmik KK, Ferdous J, Baral PK, Islam MS. Recent outbreak of dengue in Bangladesh: A threat to public health. Heal Sci Reports [Internet]. 2023 Apr 1; 6(4):e1210. Available from: https://doi.org/10.1002/hsr2.1210
9. Hossain MI, Alam NE, Akter S, Suriea U, Aktar S, Shifat SK, et al. Knowledge, awareness and preventive practices of dengue outbreak in Bangladesh: A countrywide study. PLoS One [Internet]. 2021 Jun 10; 16(6):e0252852. Available from: https://doi.org/10.1371/journal.pone.0252852
10. Wiwanitkit V. Unusual mode of transmission of dengue. J Infect Dev Ctries [Internet]. 2009 Nov 30; 4(01 SE-View Points):51–4. Available from: https://jidc.org/index.php/journal/article/view/20130380
11. Palanichamy Kala M, St. John AL, Rathore APS. Dengue: Update on Clinically Relevant Therapeutic Strategies and Vaccines. Curr Treat Options Infect Dis [Internet]. 2023; 15(2):27–52. Available from: https://doi.org/10.1007/s40506-023-00263-w
12. For Healthcare Providers | Dengue | CDC [Internet]. Available from: https://www.cdc.gov/dengue/healthcare-providers/index.html
13. Bardiot D, Koukni M, Smets W, Carlens G, McNaughton M, Kaptein S, et al. Discovery of Indole Derivatives as Novel and Potent Dengue Virus Inhibitors. J Med Chem [Internet]. 2018 Sep 27; 61(18):8390–401. Available from: https://doi.org/10.1021/acs.jmedchem.8b00913
14. Islam S, Huq I. Economic Cost of Dengue: A Selective Case in Bangladesh. Int J Appl Econ Financ. 2020; 15(1):1–10.
15. Uddin MA. Exploring Socio-Economic Impact of Chikungunya Fever in Dhaka: A Statistical Modeling Approach. Eur J Med Heal Sci. 2021; 2(6):103–10.