



Dengue Crisis Prevention and Control: Governance Challenges and Way Forward

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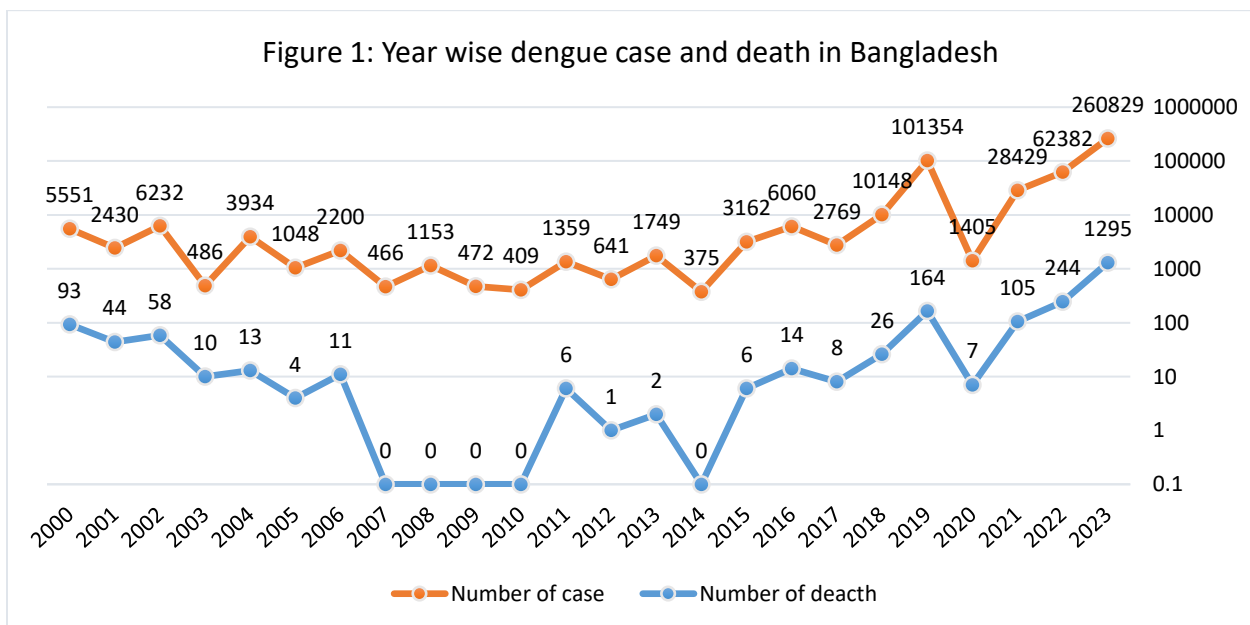
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Background and Context

- Dengue is a vector-borne disease, which spread by Aedes mosquito. It is transmitted by Aedes aegypti and Aedes albopictus species of mosquitoes. In addition to dengue, these mosquitoes transmit Chikungunya and Zika viruses.
- According to the World Health Organization (WHO), about 400 million people are infected with dengue every year in hundred countries.
- Although dengue cases have been recorded in Bangladesh since 1964, regular dengue outbreaks have started since 2000. The prevalence of dengue has been increasing since 2017 and a severe outbreak has been noticed occurring in 2023.
- According to the information of Director General of Health Services (DGHS), the number of dengue cases is about 261 thousand and the number of deaths is 1295 till 25 October 2023. According to the experts, the actual number of cases is 10 times higher than the number reported by the government.
- In 2017, although dengue outbreaks were low, a total of 13,814 persons infected with chikungunya transmission through the Aedes mosquito. There were no dengue deaths from 2007 to 2014.



Source: Director General of Health Services (DGHS) (Till 25 October 2023)

- Due to changes in the general pattern of rainfall because of climate change and lack of year-round Aedes mosquito control and dengue control activities, dengue outbreaks have become severe in recent years.
- In the past, the period of dengue outbreak in the country was usually May to September. However, since 2016, dengue outbreaks have been observed throughout the year. From the beginning of 2023, dengue spread widely throughout the country.

- In 2023, dengue spread widely outside Dhaka and 63 percent of the infection cases were from outside Dhaka.
- As the number of cases has increased several times than ever before, there is a huge crisis in the treatment system for dengue patients.
- According to data from the Director General of Health Services (DGHS), 56-77 percent of patients who died of dengue from September 10 to October 14, 2023 died within 24 hours of being admitted to the hospital; a maximum of 77 percent of patients died during the week of October 8 to 14, 2023.
- Although the prevalence of dengue has been observed continuously for the past few years, there is a continued deficiency in mosquito control and treatment of dengue patients.

Rationale of Study

- While the Sustainable Development Goals (SDGs) have pledged to eliminate all tropical disease epidemics by 2030 (Goal 3), there have been allegations of a lack of appropriate action in this regard.
- Although there were early warnings about the increase in the prevalence of dengue, the lack of appropriate action by the relevant authorities, mismanagement of mosquito control, irregularities and corruption in the purchase of insecticides, harassment and death of patients due to lack of adequate preparation of the medical system, shortage of medical supplies, etc. have been reported by various media.
- Health is one of the sectors of TIB's activities in establishing good governance. In this context, TIB identified the challenges of Aedes mosquito control in Dhaka city by conducting a research programme in 2019 and regularly maintains consultation with stakeholders to overcome these challenges.
- As a part of TIB's advocacy programme, this year (2023) in the month of July, TIB has proposed some recommendations to the relevant authorities to prevent and control the outbreak of dengue, but the authorities have not given importance to it.
- TIB and other research institutes and experts have been proposing various recommendations to deal with the ongoing dengue crisis in Bangladesh for almost two decades. The initiative of this research program has been undertaken to find out whether the implementation of these recommendations is effective and at the same time whether there are any kind of good governance challenges in the implementation of these proposals.

Overall Objective

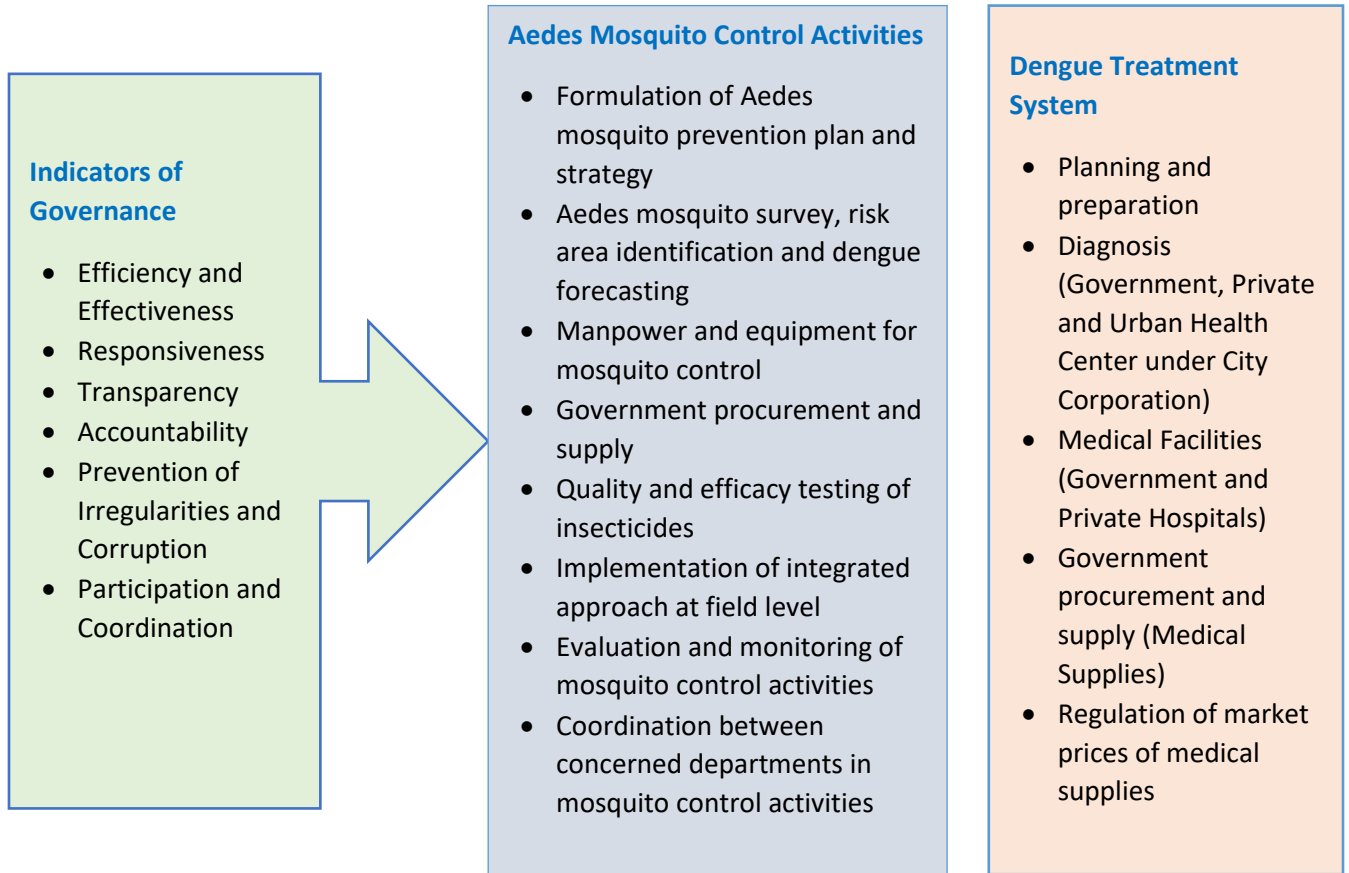
Identifying governance challenges in dengue crisis prevention and control activities.

Specific Objective

- Identifying governance challenges in Aedes mosquito prevention and control
- Identifying governance challenges in the treatment of dengue patients
- Reviewing the roles of stakeholders in Aedes mosquito control and dengue treatment

- To provide recommendations to address existing governance challenges in dengue crisis prevention and control activities

Scope of the Study



Considering the number of cases, the data of the 10 most affected districts till September 25, 2023 has been collected and analyzed

Research Methods and Data Collection

Data was collected and analysed from both primary and secondary sources using qualitative research methods.

- **Sources of Primary Data:** Director General of Health Services (DGHS), Institute of Epidemiology, Disease Control & Research (IEDCR), City Corporation, Municipalities, Government Hospitals and other related institutions.
- **Sources of Secondary Information:** Relevant laws and regulations, research reports, information published on websites, news published in various media

Primary Data Collection

- **Key Informants Interviews:** Officials and employees of the concerned departments, entomologists and public health researchers.
- **Institutional Data Collection:** Information about the activities of Dhaka and district level hospitals, city corporations and municipalities

Study Period: 25 September to 25 October 2023

Study Findings

Global Vector Control Response 2017-30 of WHO

In 2017, the World Health Organization (WHO) formulated the “Global Vector Control Response 2017-30” strategy to control dengue, malaria and other vector-borne diseases worldwide. Member States have been invited to formulate national vector control strategies and action plans in light of this strategy.

The strategy paper outlines priority activities based on four pillars and two key elements-

Four main pillars-

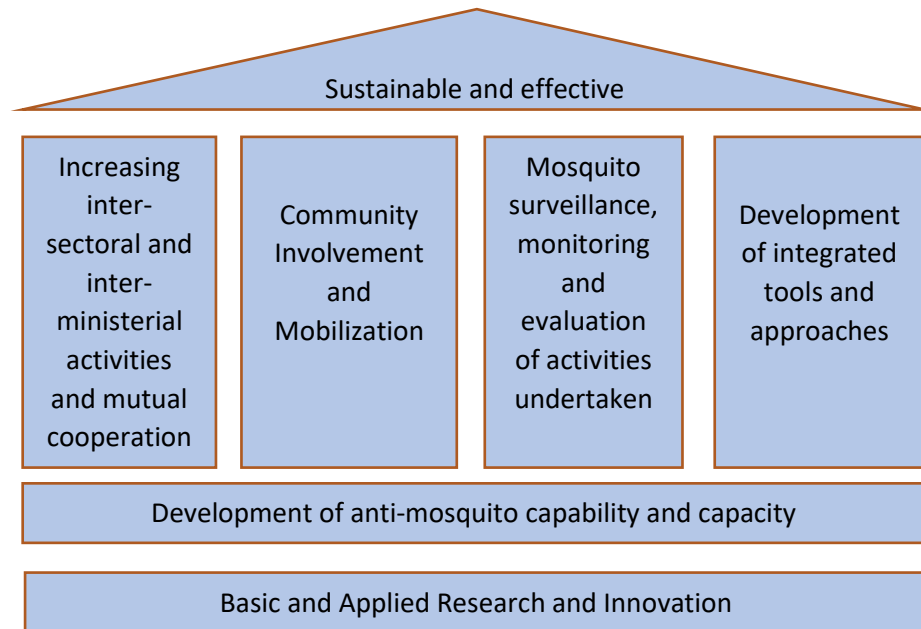
- Increasing mutual cooperation and activities between different sectors and institutions
- Engaging and mobilizing the community
- Monitoring and evaluation of vector/mosquito surveillance and enforcement activities
- Expansion of integrated tools and methods

Two main elements

- Capacity enhancement for vector/mosquito control
- Research and innovation in entomology and vector control

Effective implementation of these activities requires strong leadership, coordination among stakeholders, and legal and policy support

Global Vector Control Response Structure of WHO (Graph)

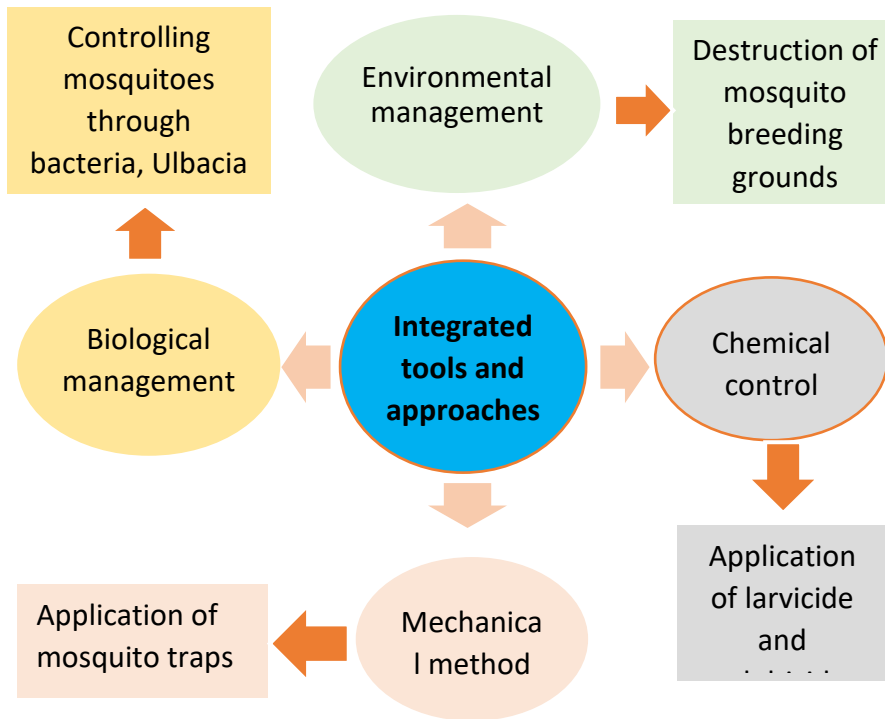


Supportive Issues

- Providing political commitment and leadership
- Advocacy, resource mobilization and coordination among stakeholders
- Establishment of laws, policies and normative standards

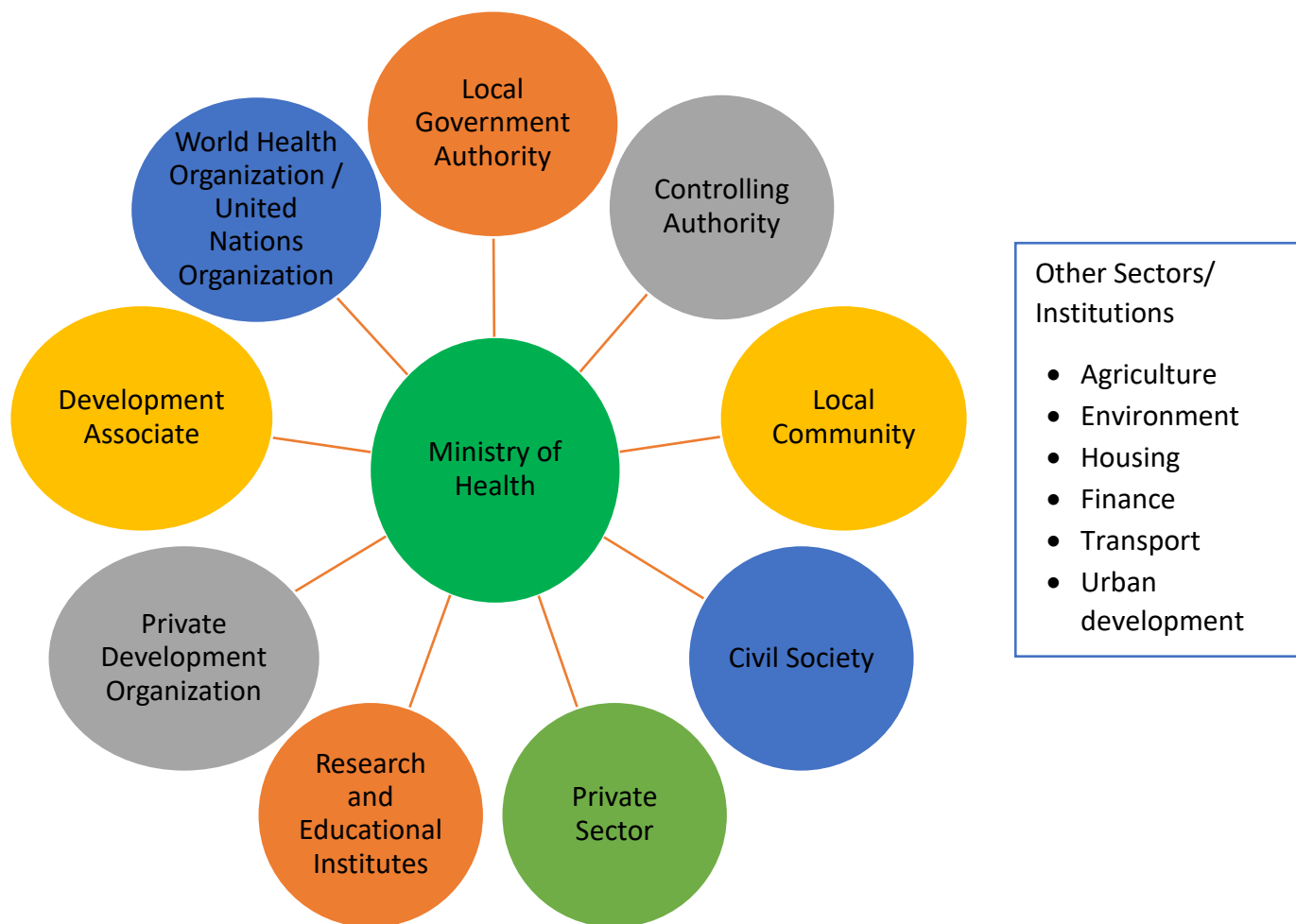
Integrated Mosquito Management Recommended by the World Health Organization

- The Integrated Vector Control Guidelines of the WHO specify four approaches to be used in an integrated manner for the Aedes mosquito control. These four methods are prescribed to be applied simultaneously throughout the year.
- WHO emphasized on applying environmental management and indoor space mosquito spraying to lessen this year's dengue outbreak in Bangladesh.



Various Stakeholders in Integrated Vector-Borne Disease Control in the WHO Strategy

- According to WHO's Global Vector Control Response Strategy, the health sector and health-related organizations have been placed at the center of vector-borne disease control activities.
- Who will involve other ministries, non-governmental organizations and communities outside the health sector as needed.
- In many countries, including India and Brazil, dengue control programs are conducted through the “National Dengue Control Program” under the Ministry of Health



Control of Communicable Diseases in Existing Laws in Bangladesh

Sections of the “Communicable Diseases (Prevention, Control and Eradication) Act, 2018” relating to the control of communicable diseases

- Section 5 (1) (A), To prevent, control and eradicate of communicable diseases and protect the population from national and international spread, the Department of Health should take the integrated initiative and develop a strategic plan.
- Section 5 (1) (B), Taking assistance from government and non-government, and national and international organizations for the implementation of the strategy.
- Section 5 (1) (I), Determination of safe levels of insecticides for prevention and control of vector-borne diseases, access to any premises for data collection, management of breeding grounds
- Section 9, Adherence to WHO guidelines for the prevention, control and eradication of communicable diseases
- Section 5 (2) The Director General of Health Services (DGHS) shall be responsible for the performance and execution of duties under this Act.

Formulation of Aedes Mosquito Prevention and Control Plan and Strategy

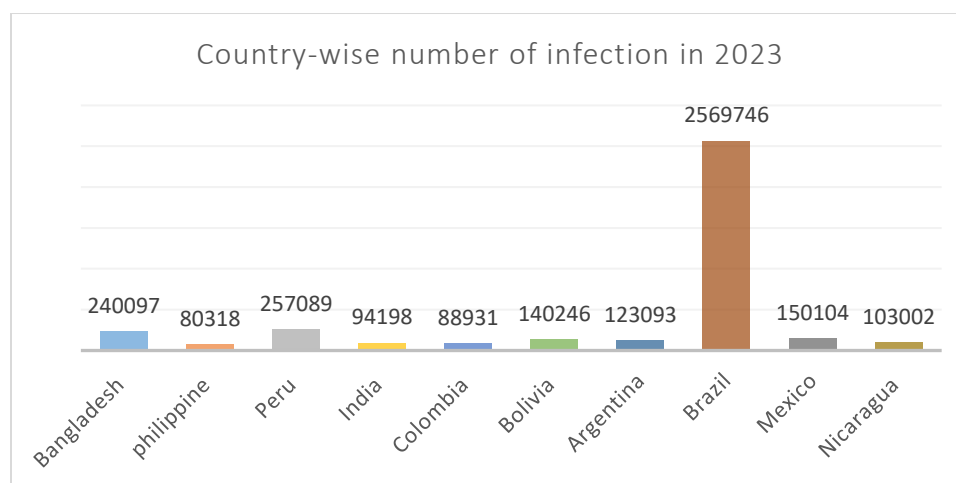
- Deficiency of the Director General of Health Services (DGHS) in following the “Communicable Diseases (Prevention, Control and Eradication) Act, 2018”
- Failure to develop a coordinated strategy by the Director General of Health Services (DGHS) to define the roles of stakeholders in dengue prevention following the strategy recommended by the World Health Organization.
- Local Government Department prepared “National Guidelines for the Prevention of Dengue and Other Mosquito-Borne Diseases” in August 2021 where there is a deficiency in following the law and WHO guidelines.

Limitations of Existing Plans: Lack of Participation and Coordination

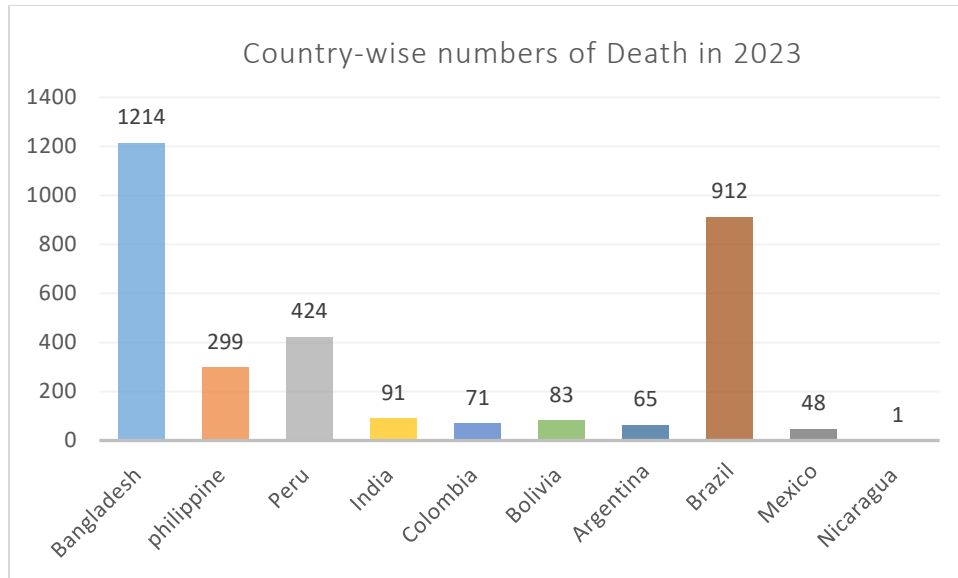
- Public health/epidemiological and entomological analysis and approaches are neglected
- Absence of integrated approach for mosquito control
- Absence of guidelines on mosquito survey, hotspot identification process, dengue surveillance process
- Not specifying the role of stakeholders other than local government institutions. The role of the Director General of Health Services (DGHS) is neglected.
- Although the roles of some of the participants are partially specified, there is no clear guidance on the process or method of implementing these activities.
- Not involving the Non-governmental organizations and experts (Public Health expert, Entomologists and Epidemiologists)

Lack of Responsiveness

- In 2023, Bangladesh has almost same number of dengue infection case compare to other countries except Brazil. But, among the countries with the highest number of dengue cases, Bangladesh ranks first in terms of the infected number and rate of deaths.

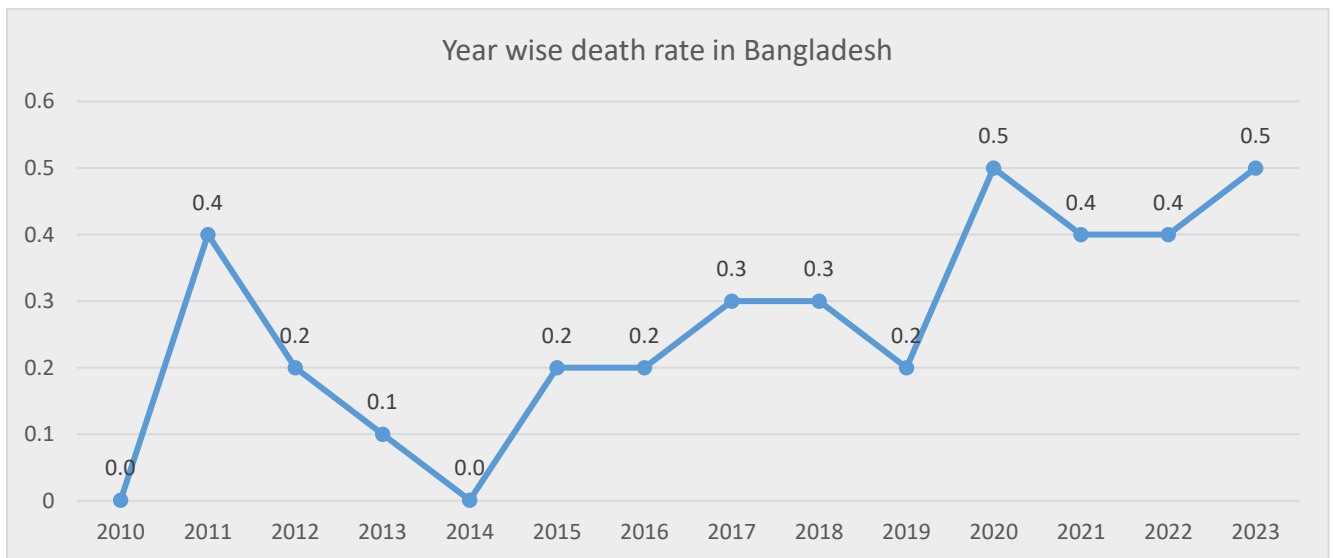


**Collected from different sources, 22 October, 2023*



**Collected from different sources, 22 October, 2023*

- From 2010 onwards, patients identified through testing are defined as dengue infected. Earlier, all suspected, probable and test-identified cases were counted as infected.
- Since 2010, the number of dengue cases and deaths in Bangladesh has varied in different years, but the death rate for the last four years is almost the same.
- In Bangladesh, the death rate due to dengue is close to that of the corona virus (1.4%), but dengue is not given the (same) importance.



**Source: Director General of Health Services (DGHS)*

- Politically and responsible ministries do not consider dengue as a crisis.
 - Although the opposition party in the Parliament raised the concern about dengue, the Minister-in-charge avoided the issue by highlighting the dengue crisis in Bangladesh continue same as in other countries.
 - Denying the severity of dengue and providing misleading information to those who are specifically responsible for dealing with the dengue crisis according to WHO guidelines and the existing laws of the country.

“Controlling dengue is not the job of the Ministry of Health. The function of the Ministry of Health is to provide medical services.” -Minister of Health

“The responsibility of killing mosquitoes is not the sole responsibility of the ministry.” “Dengue situation in our country is better than Singapore, Malaysia.” -Minister of Local Government, Rural Development and Cooperatives

“Dengue cannot be eradicated. But, the dengue situation is now under control. We are in a better position than other countries to control dengue.” -Mayor, Dhaka South City Corporation.

Aedes Mosquito Survey, Risk Area Identification, Dengue Forecasting

Mosquito Surveys: Lack of Appropriate Response and Capacity

- Conducting mosquito surveys three times a year (pre-monsoon, monsoon and post-monsoon) in two city corporation areas of Dhaka.
- Conducting survey during monsoon season in Chittagong, Gazipur, Narayanganj, Rajshahi, Patuakhali, Pirojpur, Jessore districts outside Dhaka. Out of the 10 most affected districts, 6 districts were not surveyed (Lakshmipur, Chandpur, Barishal, Faridpur, Cumilla, Manikganj).
- Except for Chittagong, Gazipur and Narayanganj, the survey was conducted with a small sample size, which did not give an accurate picture of the presence of mosquitoes.
- All the surveys showed an alarming picture of the presence of Aedes mosquitoes
- In some cases, not being able to immediately provide the information collected in the mosquito survey to the concerned institutions. Breteau (mosquito larval density) and house index (Aedes mosquito density) of the surveyed area has been changed between the time of data collection and publication of results.
- A city corporation has doubts about the results of a mosquito survey conducted by the Director General of Health Services (DGHS)- a ward had a Breteau index of 80, but no dengue patients were detected even in a month and a half after the survey.
- Only the Disease Control Branch of the Director General of Health Services (DGHS) conducted the survey. Not conducting a nationwide survey with the collaboration of various research/educational institutes across Bangladesh including IEDCR.
- Lack of adequate budget and manpower for mosquito survey.

Development of an Integrated Database on Dengue Infection Identification: Lack of Responsiveness and Capacity

- Failure to develop a comprehensive database of dengue infected individuals
- Lack of capacity to collect data from all hospitals. Only collected the data of admitted patients from a small number of hospitals and publish as total number of cases.
- Failure to identify hotspots by identifying infected individuals early in the course of infection.
- Limited identification of what type of virus is being transmitted.
- Not having dedicated diagnostic centers like for Covid-19.
- Data on dengue test was collected from 6.1% diagnostic centers of eight districts

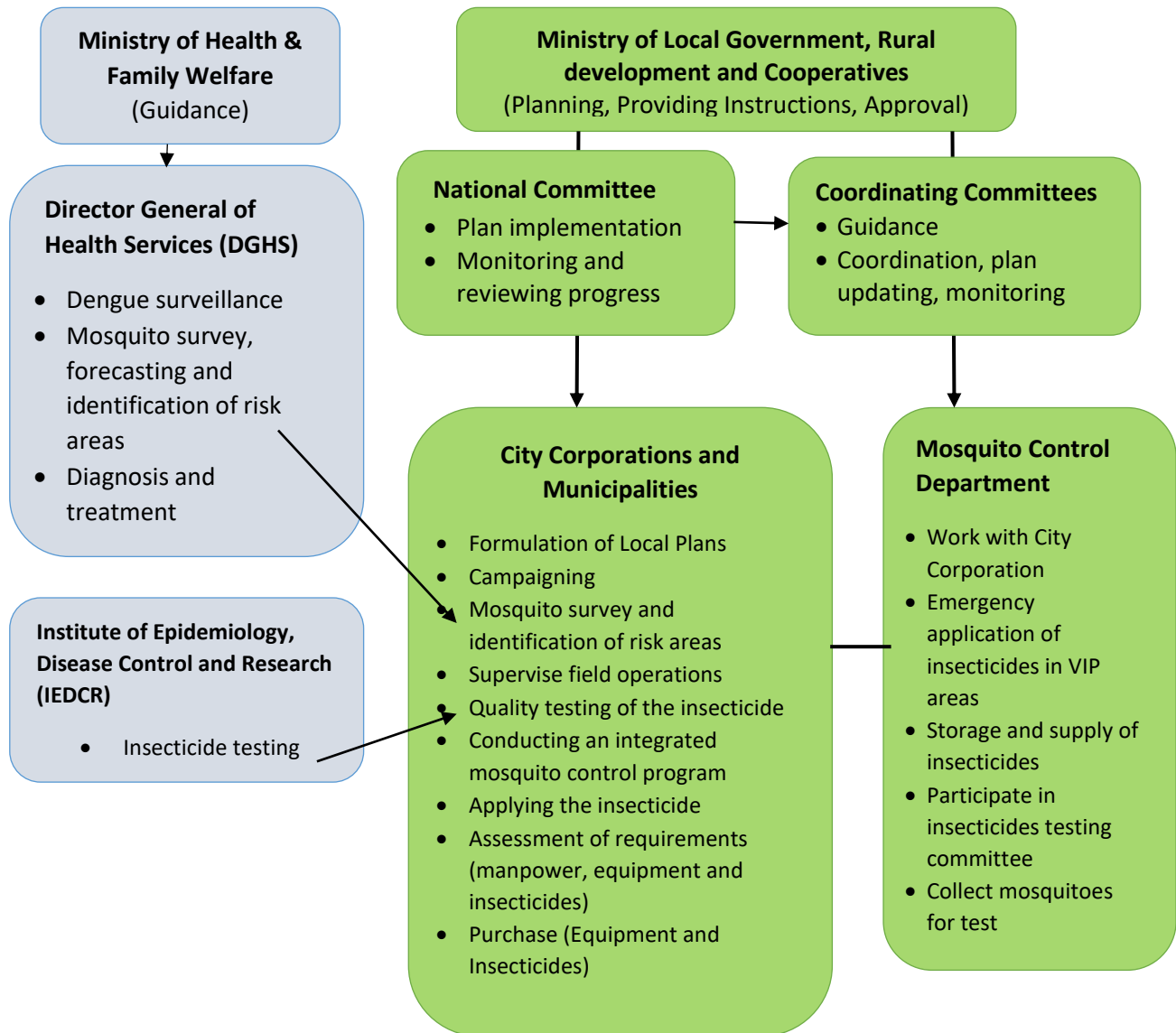
District	Total Diagnosis Centers*	Number of health centers providing dengue information**
Dhaka City	947	78
Chattogram	345	14
Comilla	429	17
Barisal	258	10
Faridpur	172	21
Lakshmipur	147	10
Chandpur	229	8
Pirojpur	160	7
Total	2687	165

* According to the website of the Director General of Health Services (DGHS) 's Hospital Service Management

** According to the data collected from field level

Aedes Mosquito Prevention and Control Activities: Role of Stakeholders

- Although the Act clearly mandates the central role of the Director General of Health Services (DGHS) in dengue prevention and control, their activities are limited to diagnosis and formulation of treatment measures.
- Lack of coordination between the activities of the Ministry of Health & Family Welfare and Ministry of Local Government, Rural Development and Cooperatives. Limited participation of non government organizations and volunteers.



Required Manpower, Budget, Materials and Equipment: Capacity Shortage

City Corporation	Area (Square K.M)	Holding	Budget		Existing Manpower	Equipment (Fogger machine, Spray)	Man-power: Holding	Per Holding Budget (in TK)
			Allocation	Actual Spending				
Dhaka North	196.2	340,000	7600	7600	811	551	1:419	2236
Dhaka South	109.3	254,895	2875	3500	975	1748	1:261	1128
Chattogram	Do not get Information							
Cumilla	53	50,500	120	Do not get Information	18	59	1:2806	238
Barisal	58	55,100	193	142	100	82	1:551	350
Municipalities								
Chandpur	22	27,000	25	25	20	27	1:1350	93
Pirojpur	29.5	15,869	19	19	12	10	1:1322	120
Patuakhali	14.2	13,927	50	24.6	32	14	1:435	360
Faridpur	22.4	36,500	3.5	3.5	20	35	1:1825	10
Lakshmipur	28.3	24,989	1.5	8	12	8	1:2082	6
Manikganj	42.28	20,000	40	11.5	3	16	1:6667	58

**According to the data collected from the field*

- Not determining the budget, manpower and machines in proportion to the volume and number of holdings
- Dengue control budget and manpower at the municipal level is negligible

Implementation of Integrated Approaches for Mosquito Control: Lack of Responsiveness and Capacity

- Mosquito control activities of all city corporations and municipalities are still limited to chemical methods (larvicides and adulticides)
- In some areas, mosquito breeding sites have been destroyed in public places, but there is still no initiative to identify and destroy mosquito breeding sites at home.

	Environmental Method	Biological Method	Chemical Method	Mechanical Method
Dhaka North	Partial	X	✓	X
Dhaka South	Partial	X	✓	X
Barisal	Partial	X	✓	X
Comilla	Partial	X	✓	X
Chattogram				
Manikganj	Partial	X	✓	X
Faridpur	Partial	X	✓	X
Lakshmipur	Partial	X	Partial	X
Chandpur	Partial	X	✓	X
Pirojpur	Partial	X	✓	X
Patuakhali	Partial	X	✓	X

Using the method= ✓ Not using the method= X Partially applied

*According to the data collected from the field

Deficiency in Evaluation and Monitoring of Mosquito Control Activities

In 11 years, two city corporations spent Tk 1080 crore on mosquito control. North City Corporation spent Tk 586.52 crore and South City Corporation spent Tk 492.24 crore.

"We have been using the wrong method so far. It has not destroyed the mosquitoes, but it has been a waste of money. We want to use the experience we have gained in Miami to eradicate mosquitoes in Dhaka." -Mayor, Dhaka North City Corporation

- Failure to evaluate the effectiveness of the implemented mosquito control measures. Applying similar methods over the years is a waste of money.
- Failure to apply insecticides in proper manner and dosage as per WHO guidelines due to lack of proper monitoring at field level. Not taking effective measures to eradicate the source of mosquitoes during the months of January to April.
- Absent of door to door operation of mosquito control activities

Lack of Capacity in Mosquito Control Activities

- Lack of technical knowledge and skills of mosquito control staff and supervisors. Works only based on ideas.
- Lack of initiative to improve technical skills.

Quality and Efficacy of Insecticides Testing

- In some areas the same pesticide has been used for 5-27 years
- In some places the effectiveness of insecticides is not tested
- Entomologists are not involved in insecticide testing
- Use of the same insecticide for many years lead mosquitoes to become resistant to the insecticides

	Name of insecticide used	Duration of insecticide used	Insecticide Efficacy Tester
Dhaka North	Malathion, Malaria Oil B, Pyriproxyfen, Temifos	5 years	IEDCR, Department of Agriculture
Dhaka South	Temiphos, Melathion and Deltamethrin	2 years	IEDCR, ICDDR B
Comilla	Lambda Ripcord, Tolstar	8 months	Not tested yet
Barisal	Delta Mix. Permethrin	5 years	Health Officer
Chattogram	Did not provide information		
Manikganj	Keratin (Syngenta)	27 years	Not tested yet
Faridpur	Couldn't say the name	4 months	Not tested yet
Lakshmipur	Vecon, Hilfs, Hilthrin	2 months	Not tested yet
Chandpur	Tepsi Liquid	1 month	Health Officer
Pirojpur	Lincoln and Davis Cipher	10 years	Health Officer
Patuakhali	Lambda and trip siliquite	6 months	Mosquito Supervisor

**According to the data collected from the field*

Lack of transparency in mosquito prevention and control activities

- Non-disclosure of dengue prevention and control information on the website of the concerned organization.
- Out of the 10 districts covered by the study, one city corporation did not provide information when requested

	Mosquito Control Budget	Information about Manpower	Workplan for Mosquito Control	Information about equipment	Hotline number
Dhaka North	θ	θ	θ	θ	θ
Dhaka South	θ	θ	∅	θ	θ
Barisal	∅	∅	∅	∅	∅
Comilla	θ	Δ	θ	Δ	∅
Chattogram	θ	Δ	Δ	θ	∅
Patuakhali	∅	∅	∅	∅	∅
Pirojpur	∅	∅	∅	∅	∅
Lakshmipur	∅	∅	∅	∅	∅
Chandpur	∅	∅	∅	∅	∅
Faridpur	∅	∅	∅	∅	∅
Manikganj	∅	∅	Δ	∅	∅

θ Provided Information **Δ Provided Information Partially** **∅ Did not Provide Information**

*According to the data collected from the field

Lack of Accountability in Mosquito Prevention and Control Activities

- No disciplinary action has been taken against City Corporation officials involved in irregularities and corruption in procurement of insecticides at various times.
- Out of the 9 local government institutions covered by the study, three institutions have no arrangement for citizen to complain.
- Out of the 9 local government institutions covered by the study, only four institutions took disciplinary action against staff for neglecting dengue mosquito control activities at the field level.

Treatment of Dengue Patients

Lack of Capacity in the Treatment System

- In most areas, health authorities begin preparations after the spread of infection
- If an admitted dengue patient stays in the hospital for 4-5 days, then the new and old patients together five times the number of admitted patients per day stay in the hospital which is much more than the allocated beds.
- Due to non-availability of ICU beds at the district level, there is a medical crisis for critical patients

District	Taking Preparation	Allocated Seat	ICU	Patient per day (September 2023)
Dhaka	-	2500	109	821
Cumilla	July 2023	Do not have separate seat	Do not have separate seat	48
Barisal	March 2023	Do not have separate seat	Do not have separate seat	119
Chattogram	June 2023	450	33	127
Manikganj	May 2023	210	Do not have separate seat	118
Faridpur	June 2023	150	10	46
Lakshmipur	June 2023	60	00	68
Chandpur	June 2023	100	00	46
Pirojpur	Jun 2023	Do not have separate seat	00	59
Patuakhali	Did not provide information			

**According to the data collected from the field*

Challenges Existing in Hospital Treatment Programmes

Information provided by Hospital/Civil Surgeon

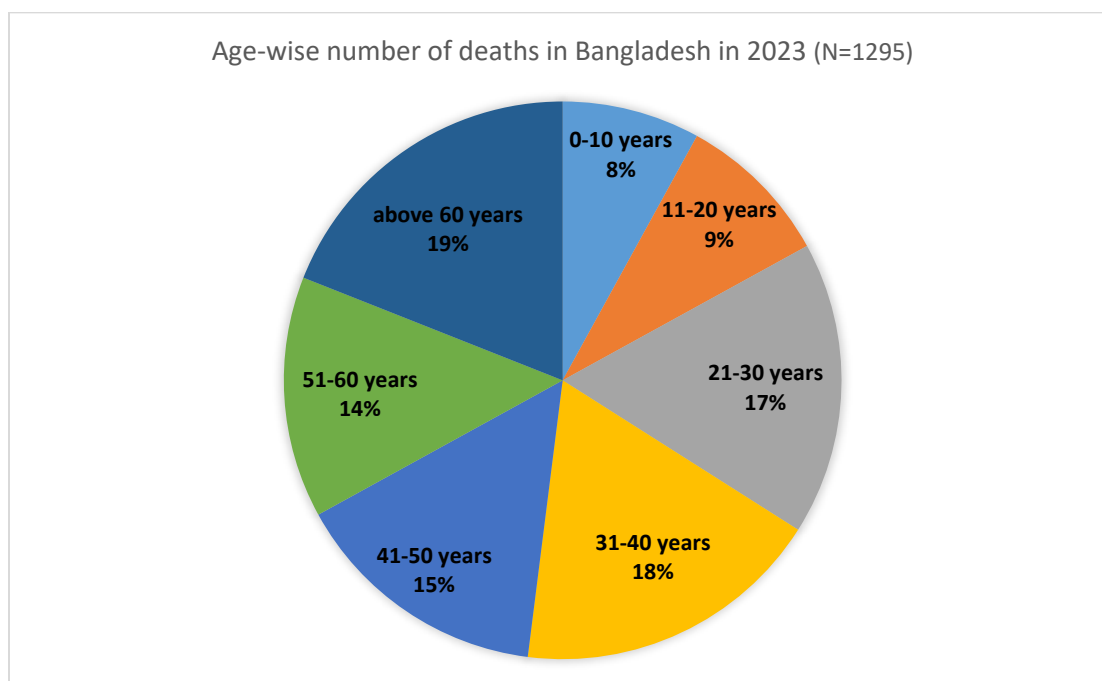
- Shortage of general bed to patient ratio
- Shortage of ICU beds to patient ratio
- Shortage of required manpower
- Shortage of PICU beds to patient ratio
- Budget deficit
- Shortage of essential medical supplies

Expert opinion

- Lack of stratified treatment system according to the complexity of dengue disease
- Initial admission of all types of patients at the medical college creates delay in getting treatment for critical patients
- Lack of diagnosis and treatment in proper time lead to sudden complications and death
- Lack experience or training of the doctors and nurses in dengue treatment
- Two types of health policies for urban and rural areas
- Deficiency in the use of technology and technics in the health sector
- Patients are dying due to the shortage of manpower in the hospitals for management of complex dengue patients.
- Many district hospitals outside Dhaka did not have centrifugal machines (to separate blood into red blood cells, platelets and plasma) and the supply of plasma was very low to meet the demand.
- Due to lack of importance in dengue disease and patient management compared to COVID-19, the number of patients and deaths are increasing day by day.

Deficiency in dengue prevention and treatment programmes for women, elderly and vulnerable people

- Among the total dengue deaths, the highest number of deaths occurred in persons aged 60 years or above (19%); In addition, the death rate of this category people is much higher in proportion to the number of patients.
- Among the total dengue death, 56.5% are women. A study shows that for the case of women, delays in diagnosis and treatment have been found to contribute to higher death rates among women.
- Deficiency in dengue prevention and treatment programs and lack of awareness raising activities for women, elderly and vulnerable people
- 17 percent of the total deaths are 20 years and under 20 years of age; though most of whom are students there is a lack of school-based dengue mosquito control activities outside Dhaka.



*Information Source: Director General of Health Services (DGHS) (25th October 2023)

Challenges in Dengue Diagnosis

- Showing false negative report of Common antigen (NS1 and IgM) tests, 41 percent of NS1 test negative cases were turned to be positive in RT-PCR test, many people including children die due to lack of proper diagnosis.
- There is no campaign about where to get dengue testing done in Dhaka.
- In City Corporation number of Urban Health Centers are inadequate. While there are more than 150 free dengue testing centers in Kolkata, there are 32 centers in Dhaka North City Corporation and 12 (temporary) in Dhaka South City Corporation for free dengue testing.

- Tk 50 for government hospitals and Tk 300 for private diagnostic centers has been fixed for dengue test but some private diagnostic centers are taking extra charges (though legal action was mentioned in this case, it is not applying)
- Although IEDCR has cooperated with some hospitals in previous years for dengue detection, they have not been involved this year.

Irregularities and Corruption in Mosquito Prevention and Control Activities

- There are complaints, in some cases, 'more effective' medicines are sprayed to the home by paying 100 to 500 taka to the field workers
- Though open tendering and direct procurement process is being followed in procurement of insecticides, in some cases 'Single bidding' has been observed in open tendering through EGP; A pesticide supplier got 16 purchase orders from three city corporations through open tendering out of which they were the sole bidder for 7.
- The dominance of a few organizations can be observed in purchasing insecticides. And there is some allegation of supply of low quality insecticides through these organizations.
- A company imports pesticides from other countries with the exception of the country specified purchase order through deception and fraud.
- Not getting registration of insecticides from Plant Protection Wing of Department of Agricultural Extension in case of importation of these insecticides.
- Without having proper testing of that unregistered and illicitly imported pesticides are using in mosquito prevention program.

Regulation of the Market Price for the Medical Service and Supplies

- By creating an artificial crisis in the market, intravenous saline priced at Tk 100 is sold at Tk 500-600
- Dengue testing facilities outside Dhaka are inadequate. The shortage of dengue testing kits can be seen in various hospitals and clinics in the municipal area including the Upazila Health Complex.
- The cost of treatment of a critical dengue patient is on an average Tk 7,142 per day in government hospitals and Tk 70,000 to 80,000 per day in private hospitals including ICU. People are being forced to take services from private hospitals at a cost of almost 10 times due to shortage of medical services in government hospitals.

Purchase and Supply of Medical Equipment

- The Director General of Health Services (DGHS) supplies Centrifugal machine only at 19 government hospitals across the country, including the capital, to concentrate platelets in the blood of dengue patients which is insufficient compared to the requirement.

Overall Observation

- Although dengue outbreaks in the country are consistent throughout the year, the prevention and control of the disease has not been given sufficient political attention. A tendency of avoiding responsibilities has been observed among the authorities who are mandated by the law.
- Dengue prevention and mosquito control programmes are being conducted uncoordinatedly without following WHO standards and international practices, along with not utilizing Bangladesh's experience in handling the COVID-19 crisis.
- Deficits in good governance persist at various stages of dengue prevention and control activities, which is one of the reasons why dengue prevention and control programs are not effective and a huge amount of money is wasted.
- Although the dengue outbreak was initially concentrated in a few cities including Dhaka, it has now spread widely throughout the country and one of the reasons for the continued dengue outbreak throughout the year is the lack of good governance in mosquito control activities.
- Due to the lack of adequate treatment of dengue and prevention of Aedes mosquitoes outside Dhaka, the number of infected and the number of deaths has increased this year.

Recommendations

1. By considering dengue as a national health crisis and giving proper political and governmental importance, a "National Integrated Vector Management Plan" should be formulated for the prevention and control of Aedes mosquitoes and other mosquitoes, following the guidelines and standards of the World Health Organization, with the support of experts and related stakeholders.
2. Short, medium and long-term action plans should be formulated specifying the responsibilities and duties of the institutions under the Ministry of Health and the Ministry of Local Government and other related sectors and institutions and stakeholders.
3. A "National Committee on Dengue Prevention" should be formed under the leadership of the Ministry of Health comprising officials from other concerned ministries/departments, public health experts, entomologists, NGO representatives who will evaluate and monitor the proper implementation of the action plan.
4. Year-round integrated activities should be undertaken across the country by ensuring the use of all types of mosquito control methods (environmental methods, biological methods, chemical methods, mechanical methods).
5. The use of environmentally friendly methods of mosquito control should be increased (e.g., elimination of the mosquito source- identification and elimination of mosquito sources on each floor of multi-storied buildings, removal of waste accumulated in non-trafficked areas between two buildings, etc.)
6. Necessary training should be provided to the responsible persons at various levels in the application of integrated approach to mosquito control according to WHO standards.
7. All types of mosquito control activities implemented at field level should be monitored and evaluated by a third party, including determination of appropriate insecticides,

insecticide efficacy and mosquito tolerance tests and proper application of various methods.

8. Area/Mahalla based volunteer teams should be formed involving students, scouts, girl guides, NGO workers by providing proper training. Cleaning operations should be conducted with mosquito-killing workers and volunteers by going door to door on regular basis.
9. The City Corporation or Municipality should consider the population, size, number of holdings, dengue incidence rate, vulnerable areas, etc. to assess the need of field manpower and recruit or outsource the manpower. For this, adequate budget allocation, stocking, and supply of necessary materials should be ensured.
10. Information about dengue disease tests and treatment services from all public and private hospitals and diagnostic centers around the country should be stored in a central database of the Director General of Health Services (DGHS) and used for dengue surveillance and hotspot identification.
11. As soon as dengue patients are identified in the central database during the pre-monsoon season of the Director General of Health Services (DGHS) should direct the responsible authorities of the respective areas to take appropriate measures.
12. With the help of the Director General of Health Services (DGHS) and various public and private research institutes/universities at the national and local levels, mosquito surveys should be conducted regularly throughout the country before the onset of dengue outbreaks every year.
13. The Director General of Health Services (DGHS) should carry out nationwide dengue surveillance in collaboration with public and private institutions involved in public health research and instructed to the concerned parties take appropriate measures by identifying the type of infection and the cause of the outbreak in the area.
14. Special teams or rapid action teams should monitor hotspots or risk areas identified through mosquito survey or surveillance and immediate integrated method should be implemented.
15. According to the experience of Covid-19, necessary number of diagnostic centers should be set up in each district at public and private level, where free dengue testing will be provided. Publicity should be done on which health centers are conducting dengue testing.
16. Research activities on dengue should be increased through engaging public health experts, entomologists, universities and private research organizations.
17. To inform about the prevention and control of Aedes mosquito and dengue disease, promotional activities should be undertaken in all media (news media and social media); Promotional activities should be carried out through area-based miking, songs, street dramas, religious and educational institutions.
18. Textbooks should cover topics related to general cleanliness, waste management, prevention of various communicable diseases including mosquito-borne diseases.
19. Irregularities-corruption and dereliction of duty in mosquito prevention operations should be investigated and those involved should be brought under exemplary punishment.

20. A unified hotline number should be established to report outbreaks of Aedes and dengue, obtain information about the test and treatment of infected persons and report complaints on mosquito control and treatment.
21. Reports on the activities undertaken for mosquito control and treatment of dengue disease, proceedings of various committee meetings, etc. should be published.

Annex Table 1: Dengue prevalence round the year in Bangladesh

	January	February	March	April	May	June	July	August	September	October	November	December
2008	-	-	-	-	-	-	160	473	334	184	-	-
2009	-	-	-	-	1	-	4	125	188	154	-	-
2010	-	-	-	-	-	-	61	183	120	45	-	-
2011	-	-	-	-	-	61	255	691	193	114	36	9
2012	-	-	-	-	-	10	129	122	246	107	27	-
2013	6	7	3	3	12	5	172	339	385	501	218	53
2014	15	7	2	-	8	9	82	80	76	63	22	11
2015	-	-	2	6	10	28	171	765	965	869	271	75
2016	13	3	17	38	70	254	926	1,451	1,544	1,077	522	145
2017	92	58	36	73	134	267	286	346	430	512	409	126
2018	26	7	19	29	52	295	946	1,796	3,087	2,406	1,192	293
2019	38	18	17	58	193	1,884	16,253	52,636	16,856	8,143	4,011	1,247
2020	199	45	27	25	10	20	23	68	47	164	546	231
2021	32	9	13	3	43	272	2,286	7,698	7,841	5,458	3,567	1,207
2022	126	20	20	23	163	737	1,571	3,521	9,911	21,932	17,583	6,775
2023	566	166	111	143	1,036	5,956	43,854	71,976	79,598	46,137		

**Information Source: Director General of Health Services (DGHS)*

Annex Table 2: Number of infection and deaths by districts in Bangladesh

serial no	District	Number of Infected patient	Number of Death
1	Dhaka	81,378	618
2	Chittagong	9,136	71
3	Barishal	8,236	65
4	Patuakhali	5,019	5
5	Manikganj	4,953	6
6	Lakshipur	4,075	0
7	Pirojpur	3,794	9
8	Chandpur	3,510	0
9	Farispur	3,478	47
10	Cumilla	3,423	1

**Data as on 25 September 2023*

**Information Source: Director General of Health Services (DGHS)*