

**BRAC JAMES P GRANT SCHOOL of PUBLIC HEALTH, BRAC UNIVERSITY
MPH 20th COHORT**

**Report on Summative Learning Project (SLP) presented to the BRAC James P Grant
School of Public Health, BRAC University.**

**Challenges to Dengue Treatment Access and Delivery at Savar Upazila Health Complex,
Dhaka, Bangladesh: A Concurrent Mixed-Methods Study**

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Batch & Year: MPH 20th Cohort, 2024

IRB Protocol number: MPH-2024-001

Purpose: In Partial Fulfillment of the Requirements for the Degree of Master of Public Health
(MPH)

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Abstract:

Introduction: Dengue remains a critical public health challenge in Bangladesh, particularly during peak seasons when healthcare facilities encounter high demand. A concurrent mixed-methods research examines the challenges that patients face in accessing treatment and healthcare providers experience in delivering care at the Savar Upazila Health Complex in Dhaka, Bangladesh.

Method: Quantitative data on satisfaction with services were gathered from 167 dengue patients, through semi-structured surveys, while qualitative data were obtained from 8 key informant interviews with healthcare providers.

Findings: Quantitative findings indicated that 64.07% of dengue patients received adequate details about diagnostic tests, and 77.25% of dengue patients perceived the facility as well-equipped. However, only 34.73% of patients expressed satisfaction with the healthcare services they received. Additionally, 55.09% of patients reported long waiting times, 57.49% rushed consultations, and 61.08% difficulties making appointments as important service delivery challenges that need to be addressed. More than half (52.10%) of patients shared financial issue as an important barrier to accessing treatment on time. Qualitative findings revealed critical shortages of resources, including beds, medical supplies, and diagnostic tools, particularly during peak dengue seasons as important challenges for the efficient delivery of services. The healthcare providers highlighted operational inefficiencies, overcrowded wards, and limited post-hours diagnostic services as key challenges.

Conclusion: The results of this study demonstrate significant gaps in service delivery that influence patient satisfaction and effective care. These challenges include inadequate infrastructure, insufficient medical supplies, long waiting times, and rushed. Recommended interventions include expanding facility capacity to serve more patients, increasing healthcare staff, and ensuring consistent availability of diagnostic tools and other medical supplies. Engaging the community through focused awareness campaigns is also crucial to enhancing treatment-seeking and disease-prevention practices.

Key words: Patient Satisfaction, Dengue Treatment access, Healthcare providers Challenges,

Introduction:

Dengue is a mosquito-borne viral disease that is caused by the dengue virus and transmitted to humans primarily by the *Aedes aegypti* mosquito (CDC, 2024). Dengue is commonly prevalent in tropical and subtropical regions of the world, which encompasses around 129 countries, and half of the world population is prone to the risk of dengue (Giang et al., 2021). The climate condition of these regions provides a good condition for mosquitoes breeding and spreading (WHO, 2024). Globally 7.6 million cases of dengue have been reported as of April of 2024 with more than 3000 deaths, and most cases occurred in the Americas region where the total cases of dengue exceeded 7 million till April of 2024 (WHO, 2024).

The widespread transmission of Dengue is a critical public health concern where the cases of dengue sharply increased in the last 5 years, particularly in the Americas, Western Pacific, and South Asia regions which contributed 70 % to the worldwide burden of dengue (WHO, 2024). A combination of factors such as unplanned and rapid urbanization, dense population, climate change, global warming, and inadequate control measures of the vector significantly contribute to the increase in dengue cases (Rahman, 2023; Mohammad Sarwar Hossain et al., 2023).

In Bangladesh, a total of 69483 dengue cases were reported between January 2023 and August 2023 with 327 deaths (WHO, 2023). The case fatality rate was higher among females 0.72% compared to males 0.32% (WHO, 2023). Dengue outbreaks are more common in the monsoon season when patients load increases rapidly in the Upazila Health Complexes (UHC), as these health facilities act as the main primary health care centers (The Daily Star, 2024). In Bangladesh, the available healthcare services to meet the needs of the population were reported by the World Bank as only 47% of community clinics and 83% of Upazila Health Complexes (Kabir et al., 2023; The Business Standard, 2024). However, the UHCs experience several health system-related challenges such as, inadequate supply of medical equipment and drugs, shortage of doctors and healthcare professionals, and lack of public amenities and accessible infrastructure which make it difficult to deliver dengue services effectively (Taufique Joarder, 2021; Sprecha Foundation, 2024).

Bangladesh has made good progress in improving healthcare service delivery and access to healthcare in the last couple of years, however, still there are significant challenges that need to be addressed, as only 30% of total population in Bangladesh have access to basic healthcare

services, and large disparity exist in the distribution of healthcare providers between rural and urban areas (Rumi et al., 202; The Business Standard, 2024; United Nations Bangladesh, 2024). In a densely populated country like Bangladesh, ensuring access to healthcare is vital to allow people utilize formal healthcare services which would improve population health outcome (Md. Fuad Rabbi Shuvra, 2020).

In the recent past the government of Bangladesh implemented many policies and strategies through implementing initiatives such as the National Malaria and Aedes Transmitted Disease Control Program which contains programs for the control of mosquitoes through integrated, and coordinated efforts, like removing stagnant water, and using chemical for insecticides (National Guideline for Clinical Management of Dengue Syndrome, 2018). Furthermore, government collaborates with local non-governmental organizations (NGOs), and use mass media for educating people on how to prevent dengue by using mosquito nets, repellents, covering water storage, and removing stagnant water (National Strategic Plan for Malaria Elimination in Bangladesh, 2021; Mustafa, 2023).

In Bangladesh, many studies have been conducted that focus on the incidence, prevalence, signs/symptoms, risk factors, and climate factors that directly influence the transmission of dengue (Hossain et al., 2021). However, there are significant knowledge gaps in the management part of dengue cases in healthcare facilities, especially with limited attention to the quality of care provided, and examining whether patients are satisfied with the quality of services, they (Rumi et al., 2021). The above-mentioned gaps make it difficult for the health policy makers and program managers to address structural issues in dengue healthcare service delivery.

Identification of service delivery gaps in primary healthcare facilities like Saver Upazila Health Complex is important to address structural barriers that prevent delivering quality care to dengue patients. In rural areas, where timely and efficient management of dengue cases are mostly hampered due to a lack of qualified healthcare professionals, insufficient funding, and logistical challenges (Rumi et al., 2021).

The aim of this study to investigate how patients and healthcare providers perceive about the dengue-related services that exist in the Savar UHC. A mixed-method study was adopted for this research which included a patient satisfaction survey and qualitative interviews with healthcare providers to explored the viewpoint of healthcare providers and examined the difficulties they face in providing quality care.

Research question: What are the challenges faced by dengue patients in accessing treatment and by healthcare providers in delivering efficient care to dengue patients at the Savar Upazila health complex in Dhaka, Bangladesh?

Objectives:

1. To identify the challenges that dengue patients face in accessing treatment at the Savar Upazila Health Complex in Dhaka.
2. To identify the patient's satisfaction level with dengue treatment services at the Savar Upazila Health Complex in Dhaka.
3. To investigate the challenges healthcare providers, encounter in delivering efficient care to dengue patients at the Savar Upazila Health Complex in Dhaka.
4. To provide recommendations to the health authority on how to improve the access to dengue healthcare, and enhance efficient service delivery at the Savar Upazila Health Complex in Dhaka.

Conceptual framework:

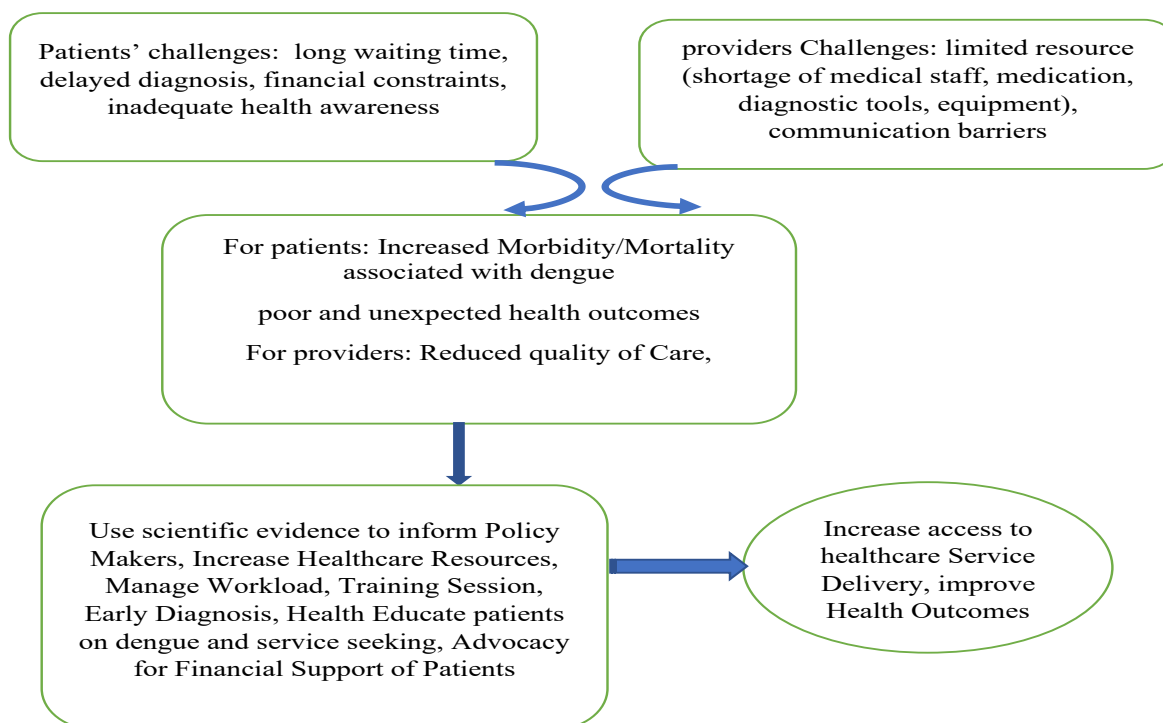


Figure 1: Conceptual framework (challenges in accessing and delivery of dengue services)

Figure 1, describe the specific challenges faced by patients and healthcare providers, when trying to access services and manage dengue cases respectively. It encompasses a complex interplay of elements that influence access to healthcare and delivery of healthcare services, including

financial limitations, delayed diagnoses, long waiting times for patients, and a lack of knowledge on health service availability, as well as difficulties faced by healthcare providers, such as inadequate medical staff, medication, diagnostic tools, equipment, and communication barriers (Runge-Ranzinger et al., 2016).

Together, the above difficulties cause results for patients. For providers the difficulties negatively affect their capacity to deliver prompt and efficient treatment by lowering the quality of service, and causing healthcare providers disengagement. To address these interrelated challenges, the conceptual framework looks into the possible solutions and highlights the importance of educating legislators, expanding healthcare funding, handling patient workload, training healthcare professionals, encouraging early diagnosis, putting health education campaigns into action (WHO, 2020).

Table1: Operational definitions of concepts:

Concepts	Operational definitions
Geographical Accessibility	All individuals can easily reach to healthcare facilities or services which included distance, transportation, travel time, and physical barriers (roads, weather).
Affordability	The level to which an individuals can financially access healthcare services without any financial hardship. This includes both direct and indirect cost (consultation fees, treatment costs, travel expenses, and lost wages).
Availability	All the necessities of healthcare services should be present (staff, equipment, and medications).
Acceptability and Appropriateness	The quality of healthcare services and intervention among patients and healthcare providers align with the patient social, culture and personal preferences (doctor-patient communication, hospital environment).

Methodology:

Study Design: We used a cross sectional concurrent mixed method design, which combines both qualitative and quantitative approaches of data collection at the same time to generate evidence on the challenges encountered by both patients and healthcare providers in accessing (patient) and delivering dengue-related services (providers) effectively.

Study site: Savar UHC is located approximately 24 Kilometer from the Dhaka city, Bangladesh. It is considered a public primary healthcare facility under the Dhaka district with a coverage

population of 1385910 (National Encyclopedia of Bangladesh, 2023). This UHC is a 50-bedded health facility that is fully owned by the Government under the Directorate General Health Services. It provides primary healthcare services, including maternal and child health, out-patient and in-patient care, emergency services, pathology, pharmacy and ambulance support. The facility has a dengue ward that can serve 8 dengue patients at time.

Study Population: Dengue patients and healthcare providers at Savar UHC in Dhaka, Bangladesh.

Inclusion criteria:

1. Dengue infected patients who got treatment from Savar UHC in the last six months prior to the survey or are currently receiving treatment at the Savar UHC.
2. Healthcare worker who had been or are currently engaged in treating dengue cases at the Savar UHC.
3. Age of participant 18 and above.
4. Participants who agree to participate in the study, and provided consent for the study.

Exclusion criteria:

1. Healthcare workers who have been involved for less than 6 months in dengue treatment at the Savar UHC.
2. Participants aged less than 18 years.
3. Dengue patients or healthcare providers who did not provide informed consent.
4. Incomplete survey forms.

Case Definition: A dengue suspected case with laboratory confirmation if one of these tests is positive (Non-structural protein,1 antigen test, IgM and IgG antibodies, and Revers Transcription Polymerase Chain Reaction).

Sampling method:

In the quantitative surveys, the dengue patient's registry book was utilized to record all dengue cases from the last 6 months (June 2024 to November, 2024). A total of 403 dengue patients were admitted to the Savar UHC during this period. After applying several exclusion criteria, the number of eligible participants was reduced. Specifically, 70 children under 18 years of age were excluded to ensure that the study focused only on adult patients. Also, we excluded 58 participants due to missing contact details in the registry book. Furthermore, 78 patients refused to participate when approached, leaving the total number of eligible participants at 197. A total

of 197 eligible dengue patient were invited to participate in the study. However, 17 participants were not available at the time of data collection, reducing the number of individuals who could participate to 180. Ultimately, 180 individuals agreed to participate in the study, and were included in the final stage of the study. But 13 survey forms were incomplete, resulting in the final sample size of 167 participants.

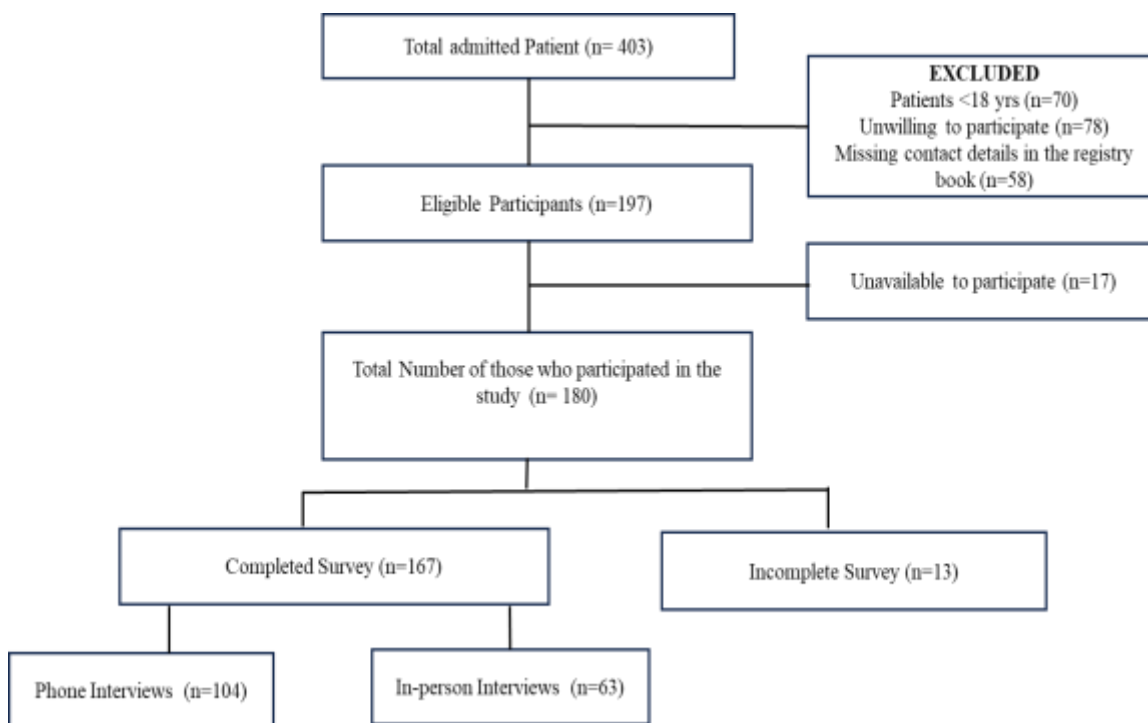


Figure 2: Method of selected participants

For the qualitative study, we applied a purposive sampling method and conducted 8 Key Informant Interviews (KIIs), with healthcare providers. This method allowed for the intentional selection of those healthcare providers who have knowledge and experience about the challenges they faced while delivering services to dengue patients.

Study tool: Data was collected through semi structured questionnaire with patients satisfactory survey and guideline for key informant interviews (KIIs).

Data Collection process:

The data was collected by skilled data collectors who were selected for their experience, knowledge, and proficiency in both quantitative and qualitative methods to manage the survey perfectly and ensure reliable data collection. The data collection process was designed to be flexible and adaptable to the challenges presented by the study setting. The study aimed to gather

detailed information on the challenges faced by dengue patients, and healthcare providers at the Savar UHC. After the initial 197 eligible participants were invited to participate in the study. The participants were interviewed using two primary methods: phone calls and in-person visits. Phone call surveys were done with 104 participants who could not be reached in person, utilizing the contact details provided in the records book of the Savar UHC.

By using these 2 methods, the study team was able to manage some of the logistical challenges related to conducting research in a resource-limited setting, ensuring that a diverse group of participants was included, and that data collection proceeded smoothly within the study's timeline. Online tools like Google Forms were used to gather quantitative data. Furthermore, to decrease any bias, and maintain flexibility to meet the participant presence, our multi-modal method guaranteed thorough data gathering.

A semi-structured questionnaire with closed-ended questions and a patient satisfaction survey was used to collect data on challenges faced by dengue patients in accessing dengue treatment services at the Savar UHC. The patient satisfaction survey questionnaire includes questions on the following domains; the socio-demographics of the participants, geographical accessibility, affordability, availability, acceptability, and appropriateness.

As part of the qualitative data collection process, Key informant interviews (KII) were conducted with relevant healthcare providers to gain deep insight into the challenges they encounter while delivering services to dengue patients. The qualitative interviews were recorded and transcribed for analysis.

The tools (patient satisfaction questionnaire and KIIs guideline), were translated into the local Bangla language to maximize participant understanding. The tools were contextualized based on feedback from all the researchers involved in the research.

Pre-testing of the survey questionnaire and qualitative guideline was conducted in Rupganj UHC, and lessons learned from that exercise were incorporated while finalizing the tools. Data collection took place for both quantitative and qualitative components from 24th November 2024 to 7th December 2024.

Data storage: The data were stored on password-protected computers, accessible only to the study team members to ensure data security and confidentiality.

Data Management and Analysis Plan:

Each completed questionnaire was thoroughly checked twice and verified on the same day to ensure consistency and completeness as a part of our research strategy. Utilizing Google Forms' data-collecting features, the team promptly collected and safely saved the information. In order to detect any missing or inconsistent responses, the dataset was continuously examined.

After completing the data collection process, we downloaded the datasets in Excel format, and the data cleaning process began using both Excel and Stata 17. We used analysis software Stata 17, to generate and recode new variables, such as age, gender, marital status, education level, and monthly household expenditure and income, which were categorized for further analysis.

Descriptive statistics were used for describing the key socio-demographic factors. To give a summary of the distribution of factors like (gender, marital status, education level, income, expenditure and employment status), frequencies and percentages were computed. The information was made easily readable and visually inherent for readers by presenting these descriptive statistics in tabular and graphical representations.

In the analysis, Chi-square tests were used for dichotomous and categorical variables to determine if access to dengue treatment services was statistically significantly correlated with categorical variables such as gender, marital status, education level, expenditure, and income. Additionally, key variables such as geographical accessibility, affordability, availability and acceptance or appropriateness were considered for bivariate analysis. A p-value of <0.05 was considered as the cut-off for statistical significance.

For qualitative data, we used Dedoose software and Excel sheet Metrix to conduct a thematic analysis and identify common themes and patterns in the interview data. After completing the analysis, the results gave us a comprehensive insight into the challenges faced by healthcare providers in delivering dengue services. The quantitative and qualitative findings were triangulated to ensure a valuable understanding of the research topic.

Ethical Considerations:

This study sought ethical approval from the independent ethical review board of BRAC James P Grant School of Public Health, BRAC University. All respondents were given an information sheet in Bengali explaining their rights relating to their voluntary participation in the study, and informed written consent was taken prior to the survey. For phone surveys verbal consent was documented, following an approved consent protocol and ensuring all the ethical guidelines were

adhered to, and to ensure confidentiality of the data, access to data was limited to core research members only.

Results:

Socio-economic and Demographic Characteristics of the Participants (n=167):

The sociodemographic features of the study participants were heterogeneous (Table 2). The sample included both males and females' participants, with males representing most of the sample (65.87%), and females accounting for 34.13%. More of the participants were married (73.65%). A tiny portion (0.60%) were widowed.

The largest proportion 65.27% of participants were younger aged between 18 and 35 years. Participants aged 36-45 account for 19.76%, those aged 46-55 accounts for 9.58%, and group of participants aged above 55 account for 5.39%.

More than one third (39.52%) of the participants had completed secondary school highlighting access to secondary education within the population. This was followed by 20.96% those who had completed higher secondary school, and a small portion of the participants, 15.57% had completed graduation. Among all the participants, only 7.78% reported having no formal education.

Figure 3 demonstrates that a large proportion (91.62%) of the participants had the opportunity to access education, while 8.38% of participants did not.

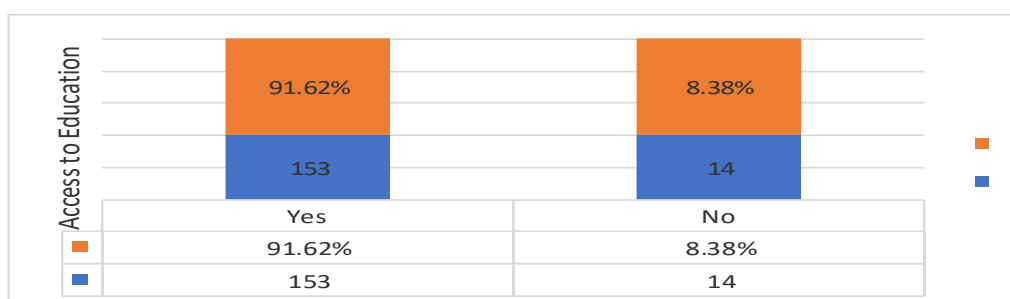


Figure 3: Access to education (n=167)

The employment status of the participants shows that more than half (58.68%) were employed at the time of data collection. Respectively homemakers constitute 19.76% of the participants, while students make up 15.57%. A relatively small number of participants were unemployed (4.79%) or retired (1.20%), indicating limited unemployment or retirement among the study participants. Many households (36.53%) earned between 10001-20000 BDT, representing a

middle-income group, while 34.73% of households earned between 20001-30000 BDT, during the time of survey data collection. However, 28.74% of the participants earn more than 30001 BDT per month. The monthly expenditure of households varied among the participants, like most of households (43.11%) spent 10001-20000 BDT per month, 34.13% of households spent between 20,001-30,000 BDT.

Table 2: Socio-economic and Demographic characteristics of the participants (n=167)

Characteristics	Frequency	Percentage (%)
Gender		
Male	110	65.87
Female	57	34.13
Marital Status		
Single	43	25.75
Married	123	73.5
Widowed	1	0.60
Age (year)		
18-25	55	32.93
26-35	54	32.34
36-45	33	19.76
46-55	16	9.58
>55	9	5.39
level of education		
Graduation	26	15.57
Higher secondary school	35	20.96
Secondary school	66	39.52
Primary school	21	12.57
Madrasa	6	3.59
No formal education	13	7.78
Household income /month		
10001-20000	61	36.53
20001-30000	58	34.73
>30001	48	28.74
Household expenditure/month		
10001-20000	72	43.11
20001-30000	57	34.13
>30001	38	22.75
Employment Status		
Currently employed	98	58.68
Unemployed	8	4.79
Homemaker	2	1.20
Retired	33	19.76
Student	26	15.57

Table 3 provides a comprehensive summary of the demographic and occupational details of eight participants who participated in the Key informant interviews (KIIs). Six male and two female represent the informants, whose ages range from 27 to 58 year. The heterogeneous traits of healthcare delivery are reflected in their positions which combine clinical and administrative responsibilities.

Table 3: Demographic characteristics of healthcare providers (Savar UHC)

#	Code	Age	Gender	Education
1	KII 1	44	Male	FCPS
2	KII 2	30	Male	HSC Pass
3	KII 3	57	Male	B.Sc., M.Sc.
4	KII 4	27	Female	Graduation
5	KII 5	58	Female	Diploma
6	KII 6	43	Male	Doctor of medicine
7	KII 7	57	Male	Degree
8	KII 8	42	Male	MBBS

Satisfaction Levels of the survey Dengue patients (n=167)

Table 4 shows the satisfaction level of the survey participants (dengue patients) based on their experience at the Savar UHC. The data exhibited key aspects of satisfaction such as availability, accessibility, affordability, and acceptance or appropriateness. These data provide a comprehensive quantitative assessment of patient satisfaction with the services.

Table 4: Patient satisfaction level				
#	Domains	Agree (%)	Disagree (%)	Uncertain (%)
Acceptance/Appropriateness				
1	The doctors explain the purpose of the necessary medical tests for dengue.	64.07	22.16	13.77
2	The medical care I receive for dengue at the Savar Upazila Health Complex is satisfactory.	34.73	10.18	55.09
3	I sometimes doubt if the diagnosis provided is accurate.	45.51	52.10	2.40
4	When I go for medical care, they are careful to check everything when treating and examining me for dengue symptoms.	44.91	6.59	48.50
5	The doctors sometimes appear too busy or	60.48	28.14	11.38

	impersonal when treating dengue patients.			
6	My doctors treat me in a very friendly and polite way.	53.89	4.19	41.92
7	The healthcare providers sometimes rush through my dengue treatment.	57.49	17.96	24.55
8	Doctors sometimes ignore what I tell them.	49.70	41.92	8.38
9	I have some concern about the ability of the doctors who treat me.	42.51	50.90	6.59
10	Doctors usually spend plenty of time with me to address my dengue-related questions.	37.72	7.78	54.49
11	I am dissatisfied with certain aspects of the dengue care provided at this health complex.	56.29	35.33	8.38
Accessibility				
12	I can easily access any specialized care or facilities needed for my dengue treatment.	51.50	11.38	37.38
13	The wait time for urgent dengue treatment at this health complex is too long.	55.09	37.72	7.19
14	I find it hard to get an appointment for dengue treatment when I need it.	61.08	26.35	12.57
Availability				
15	The Upazila Health Complex has the necessary facilities and equipment to provide complete care for dengue.	77.25	12.57	10.18
16	I am able to get the necessary medical care for dengue whenever I need it.	38.32	11.38	50.30
Affordability				
17	I feel confident that I can afford the dengue treatment provided at the Savar Upazila Health Complex.	34.73	52.10	13.17
18	The cost of dengue treatment here is more than I can afford.	50.90	32.34	16.77

Acceptability and appropriateness:

The quantitative survey results, presented in Table 4, show that most of dengue patients (64.07%), feel that doctors properly explain the purpose of the medical test for dengue. Despite the above positive expression, only 34.73% of the dengue patients expressed satisfaction with the care they received, and almost half (45.51%) of the dengue patients have doubts about the accuracy of their diagnosis and the quality of services. Furthermore, a notable proportion (37.72%) of the dengue patients believe that doctors spend enough time to address their needs. However, 49.70% of the dengue patients reported that doctors ignored their concerns in patient-provider communication.

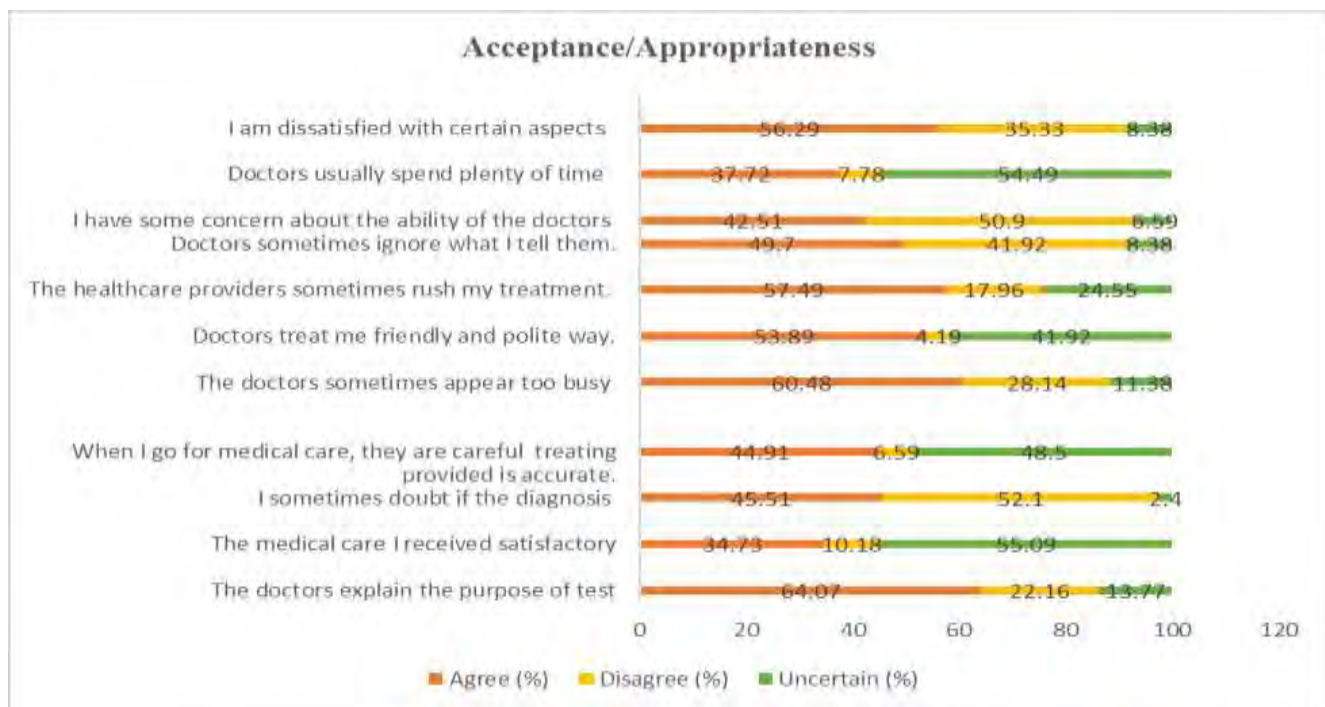


Figure 4: Acceptance/appropriateness

These quantitative findings were reflected in the qualitative data, where a healthcare providers figured out these challenges such as long waiting time and ignoring patient concerns, which directly impact satisfaction and ability to access quality and timely care, as a healthcare provider said.

"The healthcare facilities lack sufficient beds to accommodate the growing number of dengue patients, leading to overcrowded wards and delays in treatment. Patients were being forced to wait in corridors due to a shortage of beds, which slowed down patient care." (KII 7).

This statement demonstrates how overload and shortage of healthcare providers impact the quality of care provided by healthcare facilities. Another healthcare provider said.

"Limited nurses and doctors cannot provide adequate care to all patients, leading to rushed consultations and unmet needs." (KII 4).

The above finding from qualitative data shows a critical issue in the healthcare system where there are not sufficient doctors and nurses to meet the demand for patient care. As a result, consultations are often rushed, meaning that healthcare professionals have less time to thoroughly assess, diagnose, and treat each patient. This issue was also reported by healthcare provider, as one of them mentioned.

"With fewer staff on duty, the quality of care has deteriorated, and patients feel neglected." (KII 7),

This finding shows that how patients feeling unheard and dissatisfied with their care experience due to lack of sufficient staff, which often results rush consultations, inadequate attention to patients concerns and less patient-provider interaction.

Accessibility:

Challenges in accessing timely healthcare services were highlighted by 55.09% (figure 5) dengue patients, reporting long waiting time which has an impact on the satisfaction of the patients. Additionally, more than half 61.08% (figure 5), of the dengue patients reported that making an appointment with a doctor is challenging, which contributes to dissatisfaction and frustration regarding access to timely care. Moreover, a total of 11.38% (figure 5) of the dengue patients reported difficulties in accessing specialized care in Savar UHC.



Figure 5: Accessibility

Overall, the survey data shows significant challenges in accessing healthcare services, with notable dissatisfaction and uncertainty in the process. Where these challenges address by the qualitative findings how these factors significantly impact the ability to access timely service as a healthcare provider said.

“A disabled person or an elderly individual aged 55–75 cannot possibly wait in a long line for three hours to receive treatment.” (KII 1).

This finding highlights that long waiting time is challenging especially for disabled and elderly patients which directly impacts their ability to get quality and timely care. Particularly for those stay for away from healthcare facility pose extra pressure as mentioned by another healthcare provider.

“The facility is not accessible to everyone. For people living far away, such as in Ashulia or near the airport, coming to this a hospital is extremely difficult.” (KII 1),

Though geographical distance emerged as another key challenges mentioned by healthcare providers, with many patients facing long travel time to reach to the Savar UHC.

Availability:

Availability of essential medical supplies emerged as mixed challenges, with 77.25% (figure 6) of the dengue patients believe the healthcare facility is well-equipped with essential medical tools, beds, and infrastructure which shows a positive experience.



Figure 6: Availability

However, qualitative data highlights crucial gaps in availability such as inadequate beds, insufficient diagnostic tools, shortage of healthcare providers that expand quantitative findings

and provide a comprehensive understanding of challenges faced by patients and healthcare providers. A healthcare providers said.

“The infrastructure is inadequate for a densely populated area like Savar, which has nearly 2 million people. A 50-bed hospital cannot manage the volume of patients during peak dengue season” (KII 1).

This finding shows that inadequate availability of resources not merely compromises the quality of care, but creates critical implications for healthcare providers while delivering services, and shows how scarcity of resources affects the accessibility of vital services, which leads to delays in delivering the services and impact on patient outcomes. Meanwhile another healthcare provider noted.

"The most important thing is the number of beds. Because here, there is a 50-bed hospital, but the issue is treating 60-65 patients with dengue." (KII 3).

This result highlights how important immediate scaling is, because overcrowding not merely puts pressure but also challenges healthcare providers to deliver quality care and manage more patients beyond the hospital capacity.

Affordability:

Affordability poses a critical challenges as financial limitations are compounded by supply shortages, where the lack of diagnostic equipment delays the diagnosis of cases, and insufficient medical tools hinder the capability to offer timely and quality services, where 52.10% (figure 7) of the dengue patients mentioned that they are not able to afford the treatment cost.



Figure 7: Affordability

These findings highlight financial challenges combines with scarcity of resources which not only delays timely diagnosis and treatment. However, it exacerbates the financial burden on patients

which further limit access to essential healthcare services, as a qualitative data also addressed this issue and one healthcare provider mentioned.

"Patients are often referred to external facilities for diagnostic tests due to limited in-house resources". (KII 5).

Such limitation and scarcity of resources enforce healthcare providers to take difficult decisions, and frequently patients are referring to external healthcare center for diagnostic tests, which causes delays in diagnosis and treatment and poses extra financial burdens on patients. Also, another healthcare provider mentioned

"Limited availability of diagnostic kits and supplies impacts treatment. If I need ten items but only have two, I have to manage with those two." (KII 2).

This statement indicates how scarcity of resources forcing healthcare providers to make significant compromises in patient care which ultimately impacts the quality of services provided.

Table 6: Determinants of patients' satisfaction

Table 6, shows the association between patients' satisfaction and different determinants measured by geographical accessibility, affordability, appropriateness and acceptance of care.

Geographical accessibility	Dissatisfied	Uncertain	Satisfied	Chi-square P-Value
	Frequency (%)	Frequency (%)	Frequency (%)	
How far is the healthcare facility from your home?				
Less than 1 Km	29(45.31)	30(46.88)	5(7.91)	0.000
1-3 Km	2(5.13)	27(69.23)	10(25.64)	
3-5 Km	1(5.26)	10(52.63)	8(42.11)	
5-10 Km	4(15.38)	15(57.69)	7(26.92)	
More than 10 Km	3(15.35)	12(36.16)	4(21.05)	
How long did it take for you to reach the healthcare facility?				
Less than 10 min	15(31.25)	28(58.33)	5(10.42)	0.029
10-30 min	19(22.26)	43(51.19)	22(26.19)	
31-45 min	5(38.46)	6(46.15)	2(15.38)	
More than 45 min	0(0.00)	17(77.27)	5(22.73)	
Did the distance to the healthcare facility affect your decision to seek care?				
Yes	7(41.18)	10(58.82)	0(0.00)	0.040
No	32(21.33)	84(56.00)	34(22.67)	

How long did you wait to receive care after arriving at the healthcare facility?				
Less than 10 min	26(22.41)	70(60.34)	20(17.24)	0.200
10-30 min	10(23.91)	19(45.24)	13(30.95)	
31-45 min	1(50.00)	0(0.00)	1(50.00)	
More than 45 min	2(28.57)	5(71.43)	0(0.00)	
Availability				
Did the healthcare facility have adequate diagnostic facilities for dengue?				
Yes	11(13.41)	56(68.29)	15(18.29)	0.004
No	28(32.94)	38(44.29)	19(22.35)	
Were the diagnostic results for dengue provided in a timely manner?				
Yes	35(25.00)	80(57.14)	25(17.86)	0.151
No	4(14.81)	14(51.85)	9(33.33)	
Was a doctor or specialist available to treat you during your visit?				
Yes	33(25.00)	75(56.82)	24(18.18)	0.328
No	6(17.14)	19(54.29)	10(28.57)	
Were healthcare workers (nurses, doctors, or technicians) available 24/7 at the healthcare facility?				
Yes	35(23.18)	85(56.29)	31(20.53)	0.979
No	4(25.00)	9(56.25)	3(18.75)	
Were there sufficient beds available when you needed to be admitted?				
Yes	31(23.85)	75(57.69)	24(18.46)	0.521
No	8(21.62)	19(51.35)	10(27.03)	
Did the healthcare facility have a sufficient/necessary medical supply (IV fluids, medications)?				
Yes	30(22.06)	78(57.35)	28(20.59)	0.707
No	9(29.03)	16(51.61)	6(19.35)	
Affordability				
Were you able to purchase all prescribed medications for your treatment?				
Yes	30(20.83)	82(56.94)	32(22.22)	0.095
No	9(39.13)	12(52.17)	2(8.70)	
Did the cost of treatment or associated expenses delay your decision to seek care?				
Yes	7(21.21)	17(51.52)	9(27.27)	0.0545
No	32(23.88)	77(57.46)	25(18.66)	

How much did you spend on transportation to and from the healthcare facility?				
Less or equal to 100 BDT	22(20.00)	65(59.09)	23(20.91)	0.110
101-500 BDT	10(22.73)	25(56.82)	9(20.45)	
>501	7(53.85)	4(3.77)	2(15.38)	
Acceptance and appropriateness				
Were you happy with the services you received for dengue treatment?				
Yes	36(25.17)	81(56.64)	26(18.18)	0.153
No	3(12.50)	13(56.29)	8(20.36)	
What aspects of the Healthcare facility did you like?				
Doctor's behavior	17(30.36)	24(42.86)	15(26.79)	0.008
Preventative measures taken by the hospital	0(0.00)	4(66.67)	2(33.33)	
Timely care and treatment	3(17.65)	11(64.71)	3(17.65)	
None of the above	0(0.00)	5(45.45)	6(54.55)	
All of the above	19(24.68)	50(64.94)	8(10.39)	
What aspects of the healthcare facility did you dislike?				
Inattentive behavior from staff	7(31.82)	7(31.82)	8(36.36)	0.004
Lack of cleanliness or hygiene	13	37	4	
Inadequate explanation of diagnosis or treatment	0(0.00)	1(100.00)	0(0.00)	
Delayed treatment or long waiting times	0(0.00)	3(100.00)	0(0.00)	
Other (Overcrowding, unavailability of specialists, high noise levels, lack of privacy)	1(8.33)	5(41.67)	6(50.00)	
None of the above	18(28.13)	39(60.94)	7(10.94)	
All of the above	0(0.00)	2(33.33)	4(66.67)	

Geographical accessibility:

Table 6, shows the association between patients' satisfaction and different determinants measured by geographical accessibility, affordability, appropriateness, and acceptance of care. The distance between the healthcare facility and the patient's home demonstrates a significant association with patient satisfaction ($P = 0.000$), indicating as the distance increases access to healthcare facilities decreases which directly impacts patients' satisfaction. Likewise, the p-value for travel time to the facility ($P = 0.029$) and the distance's effect on seeking medical care ($P = 0.040$) further indicates the significant associations between geographical challenges and patient satisfaction. This underscores how physical accessibility is a significant determinant of

healthcare utilization and patient satisfaction. The qualitative data highlighted the reason regarding these issues as one of the healthcare providers noted.

"The large geographical area of Savar and long travel times to the health complex create physical barriers to accessing healthcare services." (KII,8).

This finding shows those patients who live far away from healthcare facilities how geographical challenges make it hard to access care, which significantly delays treatment increases the burden of diseases, and dissatisfaction of patients regarding accessing care.

Availability:

Certain availability of medical tools and acceptance factors such as, adequate diagnostic facilities for dengue care are correlated with dengue patients' satisfaction $P = 0.004$ (table 6). Some of these factors include the timely availability of sufficient diagnostic tools and healthcare staff. However, from qualitative data, we found that the Savar UHC encounters inadequate medical supplies and other essential tools, as one of the healthcare providers hinted at.

"The facility lacks the necessary resources, especially diagnostic kits, to meet the growing demands of a large population". (KII 8).

These qualitative insights highlighted scarcity of resources and shows the pressing need for strengthening the infrastructure at Savar UHC. Limitations with working hours create challenges to timely care and puts stress on patients to seek alternative and external facilities which cause extra costs and further affect patient satisfaction. Another healthcare providers mentioned,

"A significant challenge is the shortage of dengue test kits, which affects diagnosis and treatment. Essential medicines are available, but diagnostic kits are not." (KII 8),

These findings emphasize a critical disparity in allocation of resources, where the presence of important medication is undermined because of insufficient diagnostic equipment, challenging timely and quality care for dengue management.

Acceptance and appropriateness:

The behavior of healthcare providers was reported as a positive aspect where dengue patients were satisfied $P = 0.004$ (table 6) which shows the commitment of the healthcare workers to providing care to all patients, regardless of their background or condition, ensuring that the most vulnerable populations receive necessary medical attention. One of the doctors reported,

"Efforts are made to ensure equitable access for children, elderly, and disabled patients, minimizing discrimination." (KII 6).

This result states a strong commitment to healthcare, ensuring that elderly, children, and disabled patients get equal access to services, which fosters equity and reduce discrimination. Also, another healthcare provider mentioned.

"Staff shortages require role adjustments to maintain operations. If there is a shortage of staff, another person is assigned to do the work." (KII 2),

This result indicates a shortage of healthcare staff roles beyond their responsibility which mostly leads to increased work pressure and compromises the quality of services. However, the negative aspects of healthcare facilities $P = 0.008$ (table 6) were also found to be significantly associated with patient satisfaction, like cleanliness and the environment of the health complex that directly led to affect patient satisfaction. A healthcare pointed out,

"The hospital lacks proper ventilation and mosquito-proofing measures. The entire hospital is mosquito-prone, with surrounding bushes, drains, and garbage contributing to mosquito infestations." (KII 1).

These results highlight the importance of addressing environmental and infrastructure challenges in Savar UHC, as they influence the accessibility of dengue services and overall satisfaction among patients, and environmental factors such as drains, garbage, and surrounding bushes significantly lead to infestation of mosquitos and compromise the comfort and safety of patients. One healthcare provider reported,

"Bamboo stairs and inaccessible washrooms hinder access for disabled individuals,". (KII 4).

These results highlight how structural challenges like inaccessible washrooms and stairs pose significant challenges for disabled patients, and limit their ability to access essential services.

Patients' satisfaction level and their Demographic characteristics:

Table 5, shows the association between patient's demographic characteristics and their level of satisfaction with the care received at Savar UHC. According to the findings of the Chi-square tests, no statistically significant association exists between patients' satisfaction and their socio-demographic characteristics.

Table 5: Association between sociodemographic characteristics and overall patients' satisfaction.

Variables	Dissatisfied	Uncertain	Satisfied	Chi-square P-Value
	Frequency (%)	Frequency (%)	Frequency (%)	
Gender				0.425
Female	16(28.07)	32(56.14)	9(15.79)	

Male	23(20.91)	62(56.36)	25(22.73)	
Marital status				0.706
Married	28(22.76)	72(58.54)	23(18.70)	
Single	11(25.58)	21(48.84)	11(25.58)	
Widowed	0(0.00)	1(100.00)	0(0.00)	
Education Level				0.273
Graduation	7(26.92)	12(46.15)	7(26.92)	
Higher secondary school	13(37.14)	16(45.71)	6(17.14)	
Madrasa	0(0.00)	6(100.00)	0(0.00)	
No formal education	3(23.08)	8(61.54)	2(15.38)	
Primary education	2(9.52)	14(66.67)	5(23.81)	
Secondary education	14(21.21)	38(57.58)	14(21.21)	
Age (year)				0.342
18-25	15(27.27)	28(50.91)	12(21.82)	
26-35	12(22.22)	31(57.41)	11(20.37)	
36-45	7(21.21)	21(63.64)	5(15.15)	
46-55	4(25.00)	6(37.50)	6(37.50)	
>55	1(11.11)	8(88.89)	0(0.00)	
Household expenditure				0.348
10001-20000	17(23.61)	40(55.56)	15(20.83)	
20001-30000	14(24.56)	28(49.12)	15(26.32)	
>30001	8(21.05)	26(68.42)	4(10.53)	
Income /Month				0.236
10001-20000	11(18.03)	36(59.02)	14(22.95)	
20001-30000	19(32.76)	27(46.55)	12(20.69)	
>30001	9(18.75)	31(64.58)	8(20.36)	
Employment Status				0.739
Currently employed	26(26.53)	52(53.06)	20(20.41)	
Unemployed	1(12.50)	6(75.00)	1(12.50)	
Retired	0(0.00)	1(50.00)	1(50.00)	
Homemaker	5(15.15)	22(66.67)	6(18.18)	
student	7(26.92)	13(50.00)	6(23.08)	

Discussion:

The results of this study provided a comprehensive understanding of the challenges and strengths in delivering dengue services at Savar UHC. While the quantitative findings demonstrate deep insight into the patient's experience and the challenges they faced while accessing care, the qualitative data provides important insights into these issues by uncovering and addressing the

systemic challenges faced by both patients and healthcare providers. Geographical accessibility, as indicated a significant association between distance and patient satisfaction, along with availability, affordability, and acceptance/appropriateness of care also emerged as key determinants that influence patient satisfaction.

Effective communication between patients and healthcare providers is vital for ensuring trust and supporting adherence to treatment plans (Sharkiya, 2023). This study highlighted a remarkable strength in the level of patient awareness about diagnostic tests and procedures, as 64.07% of respondents reported that doctors completely describe the purpose of medical tests. This result is in line with other studies showing that patients who are acknowledged for their medical tests and other treatment procedures are more likely to follow medical advice, and the reports show a higher level of satisfaction (Brighton et al., 2019). Nevertheless, merely 34.74% of the participants mentioned being overall satisfied with the services they received, apart from this motivating trend, patient expectations were not met (Rohit et al., 2021).

Our study demonstrates the issue related to resource insufficiency, particularly in the peak season of dengue. Most of the dengue patients (77.25%) report that the facility is well equipped, but healthcare providers hinted at a critical shortage of essential medical equipment like kits, medication, and beds. This finding is supported by Ahmed et al. (2020), who reported that healthcare infrastructure in resource-limited settings often becomes overwhelmed during epidemic outbreaks. For instance, a study done in urban India reported overcrowded wards and inadequate medical tools, particularly in the peak season of dengue, which directly led to limited quality and delays in diagnosis and treatment (Singh et al., 2019).

The financial burden of treatment is another critical issue pointed out with 52.10% of participants not able to afford the cost related to dengue care. Findings from this research figured out, as healthcare providers reported that patients are mostly referred to external healthcare facilities for diagnostic tests because of inadequate in-house resources, which exacerbates the financial burden (Momen et al., 2024; Garrett Wallace Brown et al., 2023).

More than half (55.09% and 57.49%), of the participants mentioned long waiting times and rushed consultations as significant challenges which shows systematic inefficiency. In LMIC countries the shortage of healthcare workers is highlighted in many existing literatures which significantly impact service delivery, with overburdened staff struggling to provide the quality of care to the patients (Gupta et al., 2021). The finding from qualitative data of our study fortifies

this, as healthcare providers hinted that a single doctor frequently examines 200-250 patients per day, for sure deteriorates the quality of patient interactions.

Geographical accessibility appeared as a big challenge, and qualitative finding shows that patients from far areas face long travel time to get to the Savar UHC. The finding from qualitative data aligns with studies done on healthcare access disparities, which mostly show complex challenges of distance and transportation costs and limited time in rural and pre-urban areas (Weeks et al., 2023). The correlation between patient satisfaction and geographical factors ($p < 0.05$) noted in our study is aligned with other studies that showed the crucial role of location in accessing healthcare and utilization of healthcare (Baandrup et al., 2021).

Environmental factors and cleanliness play a vital role in changing patient experience. While behavioral aspects of health staff were positively reported, however, some basic issues like poor ventilation, mosquito infestation, with inaccessible services were the main sources of dissatisfaction. Likewise, studies from Southeast Asia show that inadequate infrastructure and hygiene in healthcare centers prevent service utilization and directly contribute to poor health outcomes (Amin et al., 2024).

Significant challenges regarding office hours and inadequate diagnostic services after 2:30 PM were reported. Similar findings about these challenges were reported in other LMICs, where these challenges can limit operational hours and insufficient services hindering quality and timely access to care (Khan et al., 2017). These challenges are more problematic during the peak season of dengue, which delays essential intervention. In LMICs the lack of diagnostic services 24/7 is a repeating issue in the healthcare system and shows the need for systematic reforms to ensure stable availability of care (Kavosi et al., 2012).

The lack of trained healthcare workers and the inadequate staff-to-patient ratio are also highlighted by this study, which contributes to patients' dissatisfaction and aligns with findings from other studies focusing on sufficient human resources for health to control infectious disease outbreaks (Sharma et al., 2024). Moreover, this issue exacerbated by the lack of training opportunities and professional development programs for healthcare providers as staff may have the lack of essential skills to cope with serious cases effectively (World Bank, 2022).

Strengths and limitations of the study:

The study's strengths include its mixed method design, which incorporates quantitative surveys (dengue patients) and qualitative KIIs (healthcare providers). The study identified significant

gaps in healthcare infrastructure, resource allocation, and delivery of services, focusing on fundamental issues like geographical accessibility, affordability, and equity in healthcare delivery. Study limitations included merely concentrating on a specific Upazila health complex in Savar which may not represent the situation across Dhaka, Bangladesh. Additionally, resource constraints and short data collection timeframe have limited the ability to capture variation in patient experience across the various seasons.

Recommendation:

- Enhancing healthcare infrastructure (increase bed capacity and other medical necessities in UHC to meet the patients' needs during peak season of dengue), with specialized ward for dengue and OPD to reduce overcrowding and improve the quality of care for patients.
- Allocate sufficient budget to ensure the availability of diagnostic tools and medications.
- Strengthening human resources (training healthcare staff to address patient workload and others)
- Extend the operating hours of diagnostic and treatment facilities beyond regular office hours to improve accessibility.
- Community health awareness campaigns for early diagnosis and treatment.
- Implement and develop mobile health clinics in remote areas to improve accessibility to healthcare.

Conclusion:

Overall, this study emphasizes the significant challenges in accessing and delivering dengue services at Savar UHC, for instance, inadequate bed capacity, limited resources, shortage of health workers, and operational insufficiencies. These challenges are further exacerbated by geographical, and financial scarcity, which delay timely care and compromise the quality of care. A multimodal approach is essential to address these issues: increasing the capacity of the facility, simplifying patient management systems, hiring and training more staff, and guaranteeing a consistent supply of necessary resources. Better vector-control strategies, engaging community, and awareness campaigns are vital for better service delivery and lowering the spread of disease. Applying these recommendations has the potential to improve significantly the patient outcomes and the overall effectiveness of dengue services at Savar UHC. Upcoming studies must examine the impact of this intervention to guide a long-lasting improvement in dengue management.

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