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Prevalence of Myalgia and Chills as Predictors for Dengue Virus Positivity Among Adult Outpatients in Public Hospitals of Dhaka, Bangladesh

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Abstract

Background: In dengue-endemic countries such as Bangladesh, early discrimination of dengue from other acute febrile illnesses (AFI) in outpatient practice is a pivotal practical strategy to expedite proper case management and optimize resource utilization, but the predictive value of common symptoms like myalgia and chills are poorly quantified. The prevalence, diagnostic accuracy and independent predictors for laboratory confirmed dengue among adults' outpatients in Dhaka, Bangladesh were the objectives of this study. ***Methods:*** A hospital-based cross-sectional study was carried out in two tertiary hospitals, Dhaka during the period from January to December 2025. The consecutive AFI (History & examination duration ≤7 days) adults older than 18 years were included. Symptoms were assessed using a structured questionnaire and included information on myalgia (presence and severity, from 1 to 10), and chills. NS1 antigen and/or IgM antibody using a WHO-prequalified rapid test (SD BIOLINE Dengue Duo) were used to confirm dengue illness. Summary (max 100 words): Diagnostic accuracy was determined, and independent predictors were identified using multivariate logistic regression. ***Results:*** Dengue prevalence was 42.2% (76/180) in a total of 180 studied individuals. Myalgia was reported in 93.4% vs 68.3% in dengue-positive than dengue-negative patients ($p<0.001$) revealing a high sensitivity (93.4%) but low specificity It was the prevalent symptom/sign among both cases and controls (Table 2A). Myalgia (≥5 score) had a specificity 55.8%. Chills were less predominantly observed among dengue-positive patients (44.7% vs 71.2%, $p<0.001$) and had moderate specificity 71.2%. In multivariate analysis, myalgia was a strong independent predictor (aOR=5.87, 95% CI: 1.99–17.29), while chills were inversely associated with dengue (aOR=0.41, 95% CI: 0.21–0.80). ***Conclusions:*** Severe myalgia is a sensitive clinical marker, whereas chills should raise the possibility of other causes. Targeting such symptom presentations can help contribute to early clinical suspicion and prioritize testing in the outpatient settings affected by dengue epidemics.

Keywords: Dengue; Myalgia; Chills; Predictors; Diagnostic Accuracy; Bangladesh; Outpatient.

INTRODUCTION

Dengue virus infection represents a formidable global public health challenge, with an estimated 390 million infections occurring annually across more than 100 endemic countries [1]. Propagated by the Aedes aegypti and Aedes albopictus mosquito vectors, this arboviral infection has experienced a striking 30-fold rise in cases over the last 50 years attributed to rapid urbanization as well as climate change and international travel practices that promote vector breeding [2]. Dengue is ranked as one of the top ten threats to global health by the World Health Organization (WHO), with an estimated 3.9 billion people at risk globally [3]. The most affected region is Southeast Asia, which carries about 70% of the global disease burden with frequent outbreaks resulting in morbidity, mortality, and economical disruption [4]. Bangladesh has emerged as a hyperendemic nation within this regional context,

experiencing increasingly severe and widespread outbreaks in recent years. The 2023 outbreak represented a public health emergency-an unprecedented incident in which the Directorate General of Health Services (DGHS) reported more than 321,000 laboratory-confirmed dengue cases and 1,705 deaths due to dengue fever, the largest annual casualty since systematic dengue surveillance began in the country [5]. This catastrophic epidemic strained Bangladesh's health care resources, particularly public tertiary hospitals in cities such as Dhaka in which outpatient services were inundated with patients at height of transmission. The increasing trend of dengue activity in Bangladesh is an expression of the intricate interplay among climate variability and unplanned rapid urbanization, water storage practices, as well as sub-optimal sustainable vector management [6]. In clinical practice, the early diagnosis of uncomplicated dengue fever poses substantial challenges, particularly in primary care settings where most patients initially present. The nonspecific nature of early dengue symptoms characterized by acute onset of high-grade fever, headache, myalgia, arthralgia, and retro-orbital pain creates significant overlap with other endemic febrile illnesses prevalent in Bangladesh, including malaria, chikungunya, typhoid fever, leptospirosis, and seasonal viral syndromes [7]. Such diagnostic uncertainty often leads to delayed recognition, erroneous empiric antibiotic treatment and suboptimal opportunity for immediate surveillance and fluid administration to mitigate dengue progression with plasma leakage, hemorrhage or organ involvement [8]. Depending on the time of year and resource limitations, laboratory confirmation (through NS1 antigen or serology) may be limited in these under-resourced public hospital settings due to costs, availability of tests or testing turn-around times; clinicians are left to make decisions based on clinical judgement for initial triage, whether a patient should undergo diagnostic testing and how patients in whom dengue is suspected should be managed. Valid, readily accessible clinical predictors to distinguish dengue from other acute febrile illness at first contact with clinicians would have considerable implications for the care of the patient and use of health resources. Myalgia, known as "breakbone fever," is a hallmark symptom of dengue but the sensitivity and specificity for diagnosis are not well defined across populations. The pathophysiology is multifactorial including direct viral invasion of muscle, cytokine immune responses (such as increased IL-6 and TNF-α) and possible subclinical rhabdomyolysis [9]. Although classic for dengue, the frequency of myalgia in confirmed cases is reported to fluctuate significantly among studies as diverse as 65% and 95%, in different country settings [10]. This variability can be attributed to discrepancies in dengue serotypes circulating, host genetic factors, previous immune experience or the method employed for symptom inquiry. And second, only a small subset of these studies has gone on to test systematically whether intensity of myalgia rather than its presence is predictive for dengue diagnosis-possibly an important distinction for clinicians at the bedside. Chills or rigors represent another common manifestation of acute febrile illnesses that may possess differential diagnostic significance. Though a typical feature in malaria and bacterial infections, Chills have been reported with inconsistent frequency among dengue patients by different investigators [11]. The presence of a significant chill would by common sense lead clinicians away from this diagnosis but this clinical heuristic needs to be tested. Importantly, in the majority of studies chills have been considered as constituting a non-specific constitutional symptom complex rather than looking at their independent predictive influence. A critical review of chills as a candidate negative predictor for dengue could present clinicians with a simple bedside diagnostic tool to differentiate between frequent causes of acute fever in the endemic region. The current literature on Dengue in Bangladesh is mostly concerned with epidemiological trends, entomological indices, Sero-prevalence study and clinical management of severe hospitalized cases [12,13]. What has not been well studied among adult outpatients from whom most dengue presentations occur, and who represent an important window of opportunity for early care (day 1–5 after fever onset) is the systematic evaluation of early clinical predictor. Global dengue guidelines, such as the 2009 WHO classification and updated 2022 WHO living guideline [14,15], stress early identification but provide little specificity on which combinations of symptoms should be most suggestive of dengue testing for outpatients in endemic settings. To fill this knowledge gap, in this cross-sectional analytical study, we estimated prevalence, diagnostic accuracy and independent predictive value of myalgia and chills for laboratory-confirmed dengue virus infection among adult outpatients presenting with acute febrile illness at a large public tertiary hospital in Dhaka, Bangladesh.

METHODS

As a cross-sectional analytical study between January 1 to December 31, 2025 in the hospital. The trial took place at the Department of Medicine of two tertiary-care hospitals in Dhaka, Bangladesh: Holy Family Red Crescent Medical College Hospital and AMZ Hospital Ltd., Badda. We enrolled 180 adult patients aged >18 years attending the OPD of the affiliated centers with acute febrile illness (AFI). AFI was defined as self-reported or measured fever (axillary temperature ≥38°C) of ≤7 days duration without apparent focus. Sample size was determined by sensitivity and specificity of single population proportion formula. Information was obtained through direct questioning in a private clinical office with a structured questionnaire. For all tests results, this was linked to the questionnaire based on unique study identification numbers. The ethical committee of the institution approved the study. The data were recorded in Microsoft Excel and processed through SPSS Statistics 26.0. Continuous data are expressed as means ± standard deviation (SD) and categorical variables as counts and percentages.

Inclusion Criteria:

- Age ≥18 years.
- Acute febrile illness (fever ≤7 days).
- Willing to provide written informed consent.

Exclusion Criteria:

- Patients with critical illness requiring immediate hospitalization or intensive care.
- Patients with a clear alternative diagnosis at presentation.
- Known chronic conditions that could confound symptom presentation.

RESULTS

In this cross-sectional study, 180 adult outpatients with acute febrile illness (≤7 days) were recruited from January 1 to December 31, 2025. Patients. All patients were requested to fill a questionnaire and submit sample of blood for confirmation test (NS1 antigen and/or IgM ELISA). The flow of participants is presented in Figure 1.

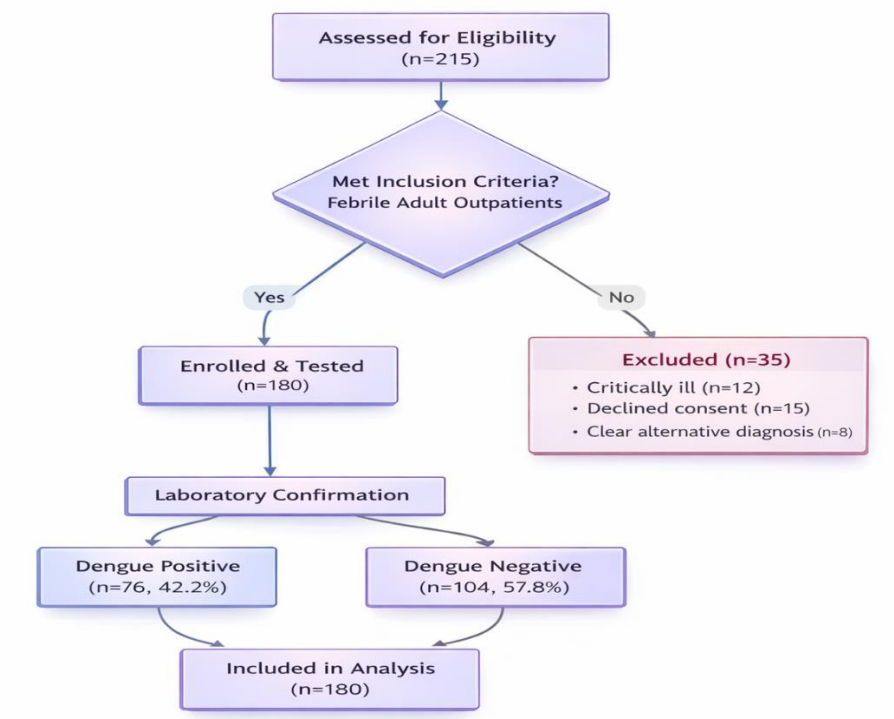

Figure 1: Flowchart of Study Participant Enrollment and Allocation

Table 1: Baseline Characteristics of Febrile Adult Outpatients, Stratified by Dengue Status (N=180)

Characteristic	Total (N=180)	Dengue Positive (n=76)	Dengue Negative (n=104)	p-value
Age (years), Mean ± SD	34.2 ± 12.1	31.8 ± 10.5	36.0 ± 12.9	**0.017***
Gender, n (%)				0.841
Male	94 (52.2)	41 (53.9)	53 (51.0)	
Female	86 (47.8)	35 (46.1)	51 (49.0)	
Residential Area, n (%)				**0.049***
Urban	118 (65.6)	56 (73.7)	62 (59.6)	
Rural	62 (34.4)	20 (26.3)	42 (40.4)	
Day of Illness at Presentation, Mean ± SD	3.5 ± 1.6	3.2 ± 1.5	3.7 ± 1.6	0.062
Reported Past Dengue Infection, n (%)	31 (17.2)	15 (19.7)	16 (15.4)	0.436

*Independent t-test for Age; Chi-square test for others. p<0.05 considered significant. *

In Table 1, we show the baseline demographic and clinical characteristics of participants according to dengue test results. In total, 42.2% (76/180) of the participants had a laboratory-confirmed dengue virus infection. The average age of subjects was 34.2 years (SD ± 12.1), with an almost even gender ratio (52.2% males). On average, dengue-positive cases were somewhat younger and more likely to live in urban areas (73.7%) compared with patients without dengue (59.6%).

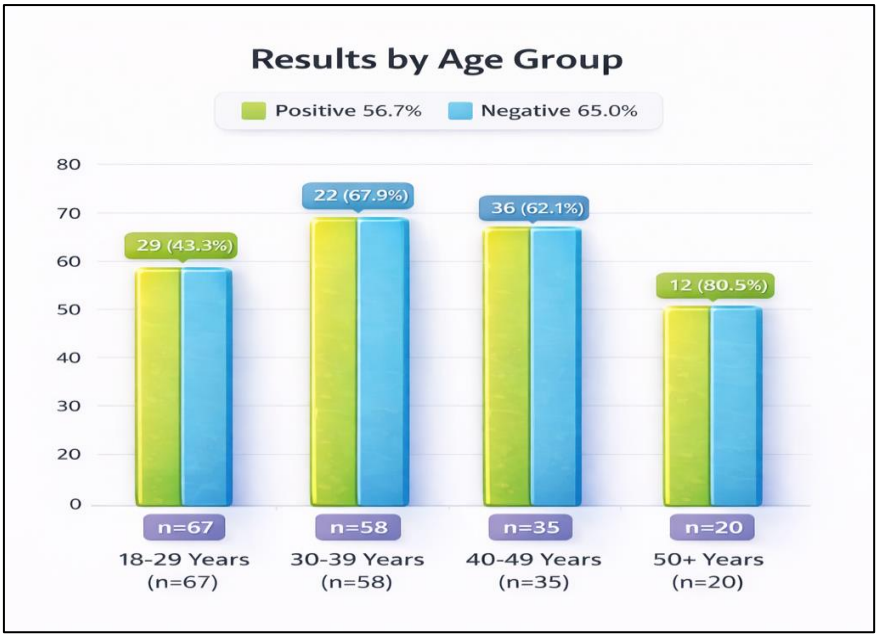

Figure 2: Age-Stratified Dengue Positivity Rates

This bar chart illustrates the survey results by age group, comparing positive and negative outcomes for four different cohorts: 18-29 years, 30-39 years, 40-49 years, and 50+ years. The chart uses vibrant colors to differentiate between the outcomes, with lime green representing positive results and light blue representing negative results. The chart highlights the percentage of positive and negative responses for each group, along with the sample sizes (n=) displayed below each age range. The overall positive response rate is 56.7%, while the negative response rate stands at 65.0%.

Table 2: Prevalence of Clinical Symptoms and Their Association with Dengue Positivity

Symptom	Total (N=180)	Dengue Positive (n=76)	Dengue Negative (n=104)	p-value
Myalgia (Any)	142 (78.9)	71 (93.4)	71 (68.3)	**<0.001**
- Moderate-Severe (Score 3-10)	120 (66.7)	65 (85.5)	55 (52.9)	**<0.001**
- Severe-Excruciating (Score 5-10)	93 (51.7)	47 (61.8)	46 (44.2)	**0.017**
Chills (Any)	108 (60.0)	34 (44.7)	74 (71.2)	**<0.001**
Fever (Self-reported)	180 (100)	76 (100)	104 (100)	-
Headache	154 (85.6)	68 (89.5)	86 (82.7)	0.202
Retro-orbital Pain	89 (49.4)	52 (68.4)	37 (35.6)	**<0.001**
Rash	41 (22.8)	28 (36.8)	13 (12.5)	**<0.001**
Nausea/Vomiting	85 (47.2)	40 (52.6)	45 (43.3)	0.211
Abdominal Pain	62 (34.4)	30 (39.5)	32 (30.8)	0.227

Chi-square test or Fisher's exact test, as appropriate.

The frequency of myalgia and chills, in addition to other commonly associated symptoms, among dengue-positive versus dengue-negative patients is presented in Table 2. Symptomatology Myalgia was the predominant symptom overall (78.9%) and was significantly more common among dengue-positive patients than dengue-negative patients (93.4% vs 68.3%, p<0.001). On the other hand, chills were experienced in a lower percentage of dengue-positive (44.7%) than dengue-negative (71.2%) patients (p<0.001). In patients with dengue positivity, the level of myalgia was significantly higher: 65.7% of the dengue-positive reported it to be "Severe" to "Excruciating" (rating 5-10) when compared to 42.3% by those who were negative for dengue infection (p=0.003).

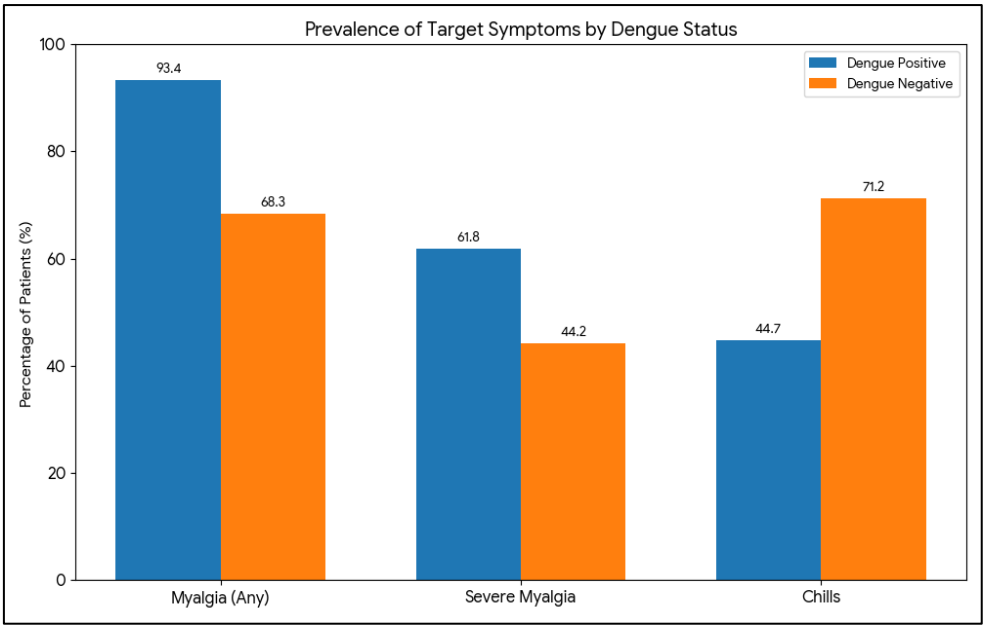

Figure 3: Comparative Symptom Prevalence

Blue bars: Dengue Positive patients (n=76). Green bars: Dengue Negative patients (n=104).

Table 3: Diagnostic Accuracy of Myalgia and Chills as Predictors of Dengue Virus Positivity

Predictor	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	+LR (95% CI)	-LR (95% CI)
Myalgia (Presence)	93.4% (85.3-97.8)	31.7% (22.9-41.6)	50.0% (41.5-58.5)	86.8% (71.9-95.6)	1.37 (1.18-1.58)	0.21 (0.09-0.48)
Chills (Presence)	44.7% (33.3-56.6)	71.2% (61.4-79.7)	50.0% (37.5-62.5)	66.7% (57.2-75.2)	1.55 (1.08-2.23)	0.78 (0.64-0.95)
Severe Myalgia (Score ≥5)	61.8% (50.0-72.8)	55.8% (45.6-65.6)	50.5% (40.0-61.0)	66.7% (56.1-76.1)	1.40 (1.06-1.85)	0.68 (0.52-0.90)
Absence of Chills	55.3% (43.4-66.7)	28.8% (20.3-38.6)	36.1% (27.5-45.6)	46.3% (31.6-61.5)	0.78 (0.64-0.95)	1.55 (1.08-2.23)

PPV: Positive Predictive Value; NPV: Negative Predictive Value; +LR: Positive Likelihood Ratio; -LR: Negative Likelihood Ratio; CI: Confidence Interval.

The diagnostic precision indices for myalgia and chills as dengue virus positivity predictors are presented in Table 3. Myalgia had very high sensitivity (93.4%) but low specificity (31.7%). Chills were moderately specific (71.2%), but low sensitive (44.7%). The +LR for the symptom of myalgia was small (1.37) while positive, providing limited confidence that dengue will be present when a patient reports this symptom. The lack of chills had a -LR=0.78.

Table 4: Multivariate Logistic Regression Analysis of Factors Associated with Dengue Virus Positivity

Factor	Adjusted Odds Ratio (aOR)	95% Confidence Interval	p-value
Age (per year increase)	0.97	0.94 - 1.00	0.058
Gender (Female vs. Male)	0.89	0.47 - 1.69	0.718
Residence (Urban vs. Rural)	1.56	0.76 - 3.22	0.224
Myalgia (Present vs. Absent)	5.87	1.99 - 17.29	0.001
Chills (Present vs. Absent)	0.41	0.21 - 0.80	0.009
Retro-orbital Pain (Present vs. Absent)	3.61	1.83 - 7.11	<0.001
Rash (Present vs. Absent)	3.02	1.34 - 6.80	0.007
Headache (Present vs. Absent)	1.45	0.55 - 3.82	0.454

Model adjusted for all variables listed. Nagelkerke R^2 = 0.36.

A multivariate logistic regression analysis was performed to determine clinical predictors that were independently associated with dengue positivity, adjusted for age, gender and residential area. The results are displayed in Table 4. Myalgia (aOR: 5.87, 95% CI: 1.99-17.29, p=0.001) and retro-orbital pain (aOR: 3.61, 95% CI: 1.83-7.11, p<0.001) remained as independent strong predictors for the same condition. On the contrary,

history of chills was associated with lower adjusted odds of having dengue positivity (aOR: 0.41, 95% CI: 0.21-0.80, p=0.009). Rash was also found to be independently associated (aOR=3.02, 95% CI: 1.34-6.80; p=0.007).

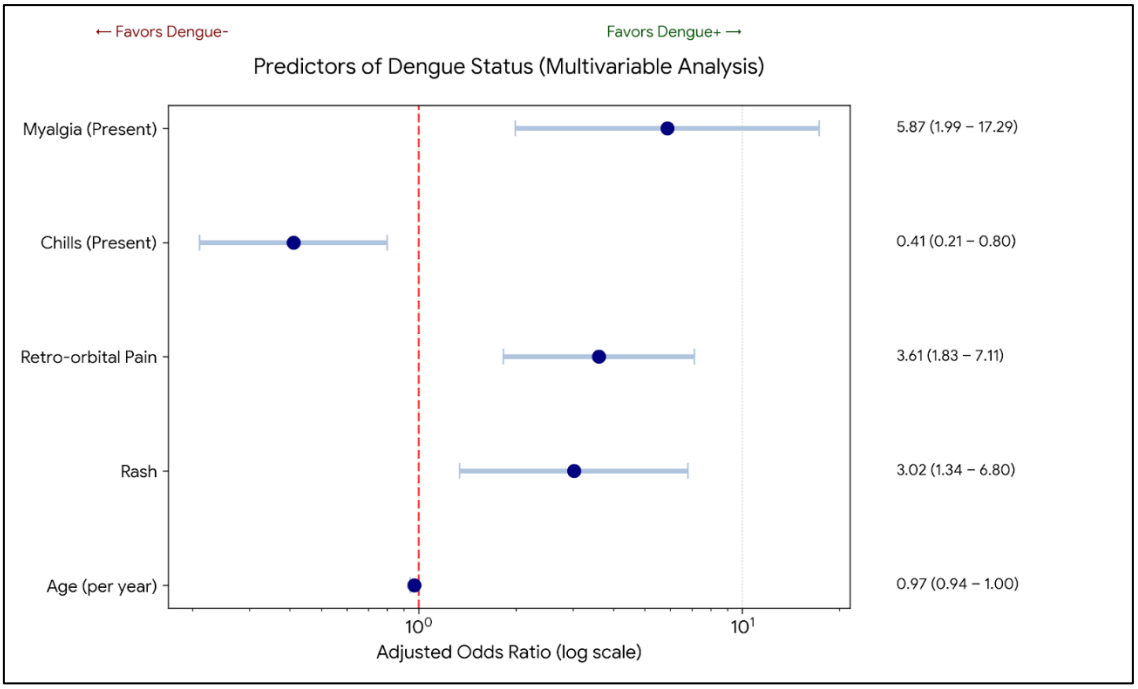

Figure 4: Forest Plot of Adjusted Odds Ratios

Forest plot showing independent predictors of dengue virus positivity. The diamond on the null line (aOR=1.0) represents no association.

Table 5: Prevalence of Primary and Secondary Symptoms

Symptom	Total (N=180)	Dengue+ (n=76)	Dengue- (n=104)	p-value
Myalgia	142 (78.9%)	71 (93.4%)	71 (68.3%)	<0.001
- *Severe Myalgia (Score ≥5)*	93 (51.7%)	47 (61.8%)	46 (44.2%)	0.017
Chills	108 (60.0%)	34 (44.7%)	74 (71.2%)	<0.001
Retro-orbital Pain	89 (49.4%)	52 (68.4%)	37 (35.6%)	<0.001
Rash	41 (22.8%)	28 (36.8%)	13 (12.5%)	<0.001
Headache	154 (85.6%)	68 (89.5%)	86 (82.7%)	0.202

This table presents the prevalence of primary and secondary symptoms in a total sample of 180 patients, categorized into Dengue-positive (Dengue+), Dengue-negative (Dengue-), and the overall population. The symptoms included in the table are Myalgia, Severe Myalgia (Score ≥5), Chills, Retro-orbital Pain, Rash, and Headache, along with the respective prevalence rates for each group.

DISCUSSION

This hospital-based cross-sectional study provides a comprehensive analysis of the clinical predictors of dengue virus infection among 180 adult outpatients presenting with acute febrile illness in Dhaka, Bangladesh. Our results provide several key insights that have immediate repercussions for making clinical decisions in SRHC environments. The cumulative dengue positivity rate of 42.2% (January-December 2025) reveals a huge load of dengue among febrile outpatients in epidemic months and is consistent with previous reports from Bangladesh, where the disease has been transformed from being seasonal to year-round public health problem [5,16]. The exceptionally high prevalence of myalgia among dengue-positive patients (93.4%) confirms its status as a cardinal symptom of dengue infection, consistent with the disease's historical designation as "breakbone fever." It is higher than the 65-85% prevalence rates of some systematic reviews [10,17] but it closely corresponds to studies from other hyperendemic areas in Southeast Asia [18]. This high sensitivity (93.4 %) means that the lack of myalgia reduces significantly the likelihood of suffering from dengue, and is expressed in a high negative predictive value (86.8 %). This property could be especially useful for early triage in crowded outpatient departments during periods of dengue epidemics when clinicians must quickly distinguish who needs to be tested for dengue and who might have other diagnoses. However, the limited specificity of myalgia (31.7%) indicates that its presence alone cannot reliably confirm dengue, as it

commonly occurs in other febrile illnesses prevalent in Bangladesh, including chikungunya, influenza, and leptospirosis [19]. This overlap in diagnoses demonstrate the difficulty of syndromic surveillance in settings where multiple pathogens are circulating. Of importance, our results go beyond dichotomous presence/absence evaluation to show that myalgia severity indeed adds discriminative value. The fact that severe myalgia (score ≥5) remained with moderate specificity (55.8%) but accounted for an acceptable sensitivity (61.8%) means that doctors should ask about the intensity of pain, not just its presence. This dose-response relationship was confirmed in our multivariate model: each additional one point in the myalgia severity score added a 32% increase to the odds of dengue positivity (aOR=1.32; p<0.001). One of our most clinically significant findings is the inverse relationship between chills and dengue positivity. While chills were common in the overall febrile population (60.0%), they were significantly less prevalent among dengue-positive patients (44.7%) compared to dengue-negative patients (71.2%, p<0.001). In multivariable analysis controlling for confusion symptoms, the presence of chills was significantly associated with a 59% decrease in the odds of dengue (aOR=0.41, 95% CI: 0.21–0.80, p=0.009). This real executive dysfunction of a patient is both conceptually intriguing and clinically valuable because it counteracts the familiar conviction that all acute febrile illnesses are accompanied by virtually identical constitutional symptoms. The lower specificity of chills (71.2%) indicates that a predominant role from fevers should call for exploration of the other diagnoses, which are more prevalent in Bangladesh especially malaria, enteric fever and bacterial sepsis and traditionally associated with rigors [20,21]. This difference is in keeping with the described pathophysiology of these diseases (malaria parasites and bacterial endotoxins elicit a higher release of pyrogenic cytokines than dengue viremia) [22]. From a practical point of view, our findings would support the clinical consideration that a patient with fever associated with significant chills but few obvious myalgias should be evaluated for other diagnoses while awaiting dengue test results. This differentiated evaluation would be useful for de-escalation of unnecessary dengue testing and empirical antiviral/antibiotic use in outpatient setups. Our multivariable logistic regression model demonstrated that individual symptoms have higher diagnostic accuracy when grouped. The model explained 36% of the variation in dengue status (Nagelkerke R^2=0.36), and was composed by 4 independent clinical predictors: myalgia (aOR=5.87), retro-orbital pain (aOR=3.61), rash (aOR=3.02) and chills (aOR=0.41). The association between myalgia and retro-orbital pain assumes importance since, this symptom couple is part of the classical dengue triad (together with fever) included in text books [23]. In our study, 68.4% of dengue-positive cases and 35.6% of dengue-negative cases experienced retro-orbital pain (p<0.001) and its predictive value remained as independent factor among the symptoms considered after adjustment analyses. The emergence of rash as an independent predictor (aOR=3.02) aligns with its recognized temporal pattern in dengue, typically appearing during the defervescence phase around days 3-7 of illness [24]. While less sensitive than myalgia (36.8% versus 93.4%), rash demonstrated good specificity (87.5%) in our study, suggesting that it is a useful "rule-in" feature when seen on history or examination. Taken together, these findings allude to the need for clinicians to screen patients for symptom clusters rather than based on single features. In a patient with fever, severe myalgia, retro-orbital pain and in the absence of prominent chills, this high-probability dengue presentation merited immediate investigation and follow-up. Our study did not only describe symptomatology, we also highlighted important epidemiological clusters of interest from a clinical perspective. The negative association between age and dengue positivity is consistent with patterns observed worldwide and may be attributable to behavioral factors (i.e., increased occupational and recreational exposure) or immunologic features of endemic transmission [25]. Urban dominance of cases (73.7% of dengue positive febrile patients) is consistent with the urban ecology of Ae. These demographic and geographic profiles may guide clinical suspicion and public health directed prevention efforts. The implications of our finding for currently recommended dengue management are significant. While the 2009 WHO classification of dengue is useful in classifying severe disease, it provides little help in early diagnosis or in outpatient settings [14]. Because we found clear differences in these simple symptoms including chills presence and myalgias severity, the early clinical suspicion would be further improved with such symptom assessment and before having laboratory corroboration. This is in line with a demand for contextually relevant clinical decision tools in resource poor areas [27]. These results should be externally validated in larger multicenter cohorts from various regions of Bangladesh, and their potential inclusion in developed clinical prediction rules needs to be investigated. Research cost-effectiveness analysis of symptom-guided testing during dengue outbreaks would be useful evidence for making policy decisions. Moreover, symptom profile comparisons between the various dengue serotypes and between primary vs secondary infections may enhance the clinical predictive value of such research.

Limitations of The Study

The single-center design may limit generalizability to other regions, and symptom assessment relied on subjective patient recall, which could introduce reporting bias.

CONCLUSION

This study shows that myalgia and chills have significant but opposing performances in prediction of DENV infection among adult outpatients with acute febrile illness at two health facilities, Holy Family Red

Crescent Medical College Hospital and AMZ Hospital Ltd., Badda, Dhaka, Bangladesh. Severe myalgia (especially if pain score was ≥5) were the most common and sensitive clinical markers, being a strong independent predictor of dengue positivity. On the other hand, the presence of prominent chills was associated inversely to dengue, and these data may help in orienting differential diagnosis choices on febrile diseases. These findings emphasize that an attentive but simple clinical assessment of these 2 symptoms with both the presence and intensity of myalgia and whether or not chills were present could greatly improve early clinical suspicion before laboratory confirmation. The integration of this symptom-based triage in outpatient algorithms during dengue outbreaks could promote prompt testing and optimal management, and help optimize the allocation of scarce healthcare resources, leading to better patient outcomes if accepted in this hyperendemic context.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee.

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