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Original Research Article

# Etiology, Clinical Feature and Outcome in acute febrile illness patients with Multiple Organ Dysfunction Syndrome: A Observational study

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**Abstract**

**Background:** Even with normal treatment in intensive care units, acute febrile illness associated with Multi Organ Dysfunction Syndrome (MODS) carries a high morbidity and fatality rate. The most frequent cause of MODS is infection, which is followed by polytrauma. The current study examined the aetiology and outcome of patients with acute febrile illness who developed MODS in medical intensive care units of a tertiary hospital. Aims of this study to the etiology of acute febrile illness in patients developing MODS and the final outcome among these patients.

**Methods:** This prospective study was carried out in Darbhanga Medical College and Hospital in Laheriasarai, Bihar, from July 2024 to June of 2025. Patients with AFI and MODS (≥2 organ dysfunctions) were evaluated for demographic, clinical, laboratory, and microbiological parameters. Disease severity was assessed using SOFA score.

**Results:** Dengue, malaria, leptospirosis, rickettsial infections, and bacterial sepsis were common causes. Mortality correlated with elevated creatinine, bilirubin, CNS involvement, low MAP, and thrombocytopenia. Mixed infections increased mortality risk.

**Conclusion:** MODS due to AFI poses a critical care challenge. Early identification of high-risk patients using simple markers can guide timely management and improve outcomes, particularly in resource-limited settings.

**Keywords:** Acute Febrile Illness, Multi-Organ Dysfunction Syndrome, Tropical Infections, Critical Care, SOFA Score, Mortality Predictors.



## Introduction

In medical practice, fever is still one of the most common clinical presentations, especially in developing nations like India where tropical infections are common and frequently manifest as undifferentiated feverish disorders.[1]

While many of these conditions resolve on their own, a sizable portion of patients experience a sharp decline in health, eventually developing multi-organ dysfunction syndrome (MODS), a complicated and potentially fatal sickness characterized by the breakdown of two or more organ systems.[2]

Pathogen virulence, host immune response, and comorbidities are all factors in the shift from acute febrile illness to MODS; dengue virus, plasmodium species, salmonella typhi, and leptospira are commonly implicated.[3] MODS still has a high morbidity and mortality rate, with rates as high as 100% in severe cases, despite advancements in critical care.[4] Although they help in prognosis, tools such as the Sequential Organ Failure Assessment (SOFA) and APACHE IV scores have limits in environments with limited resources.[5] The prevalence of tropical diseases such as severe dengue, complicated malaria, leptospirosis, and enteric fever in India makes management even more difficult and presents significant healthcare and economic obstacles.[6]

Prospective studies that thoroughly assess the etiology and consequences of acute febrile diseases worsened by MODS are desperately needed in light of these inadequacies, especially in the Indian context.[7] By methodically examining the etiological variables and prognostic markers in patients admitted with febrile illness that progresses to MODS, this study seeks to meet this requirement.

## Materials and Methods

From July 2024 to June 2025, this prospective observational study was carried out at the intensive care unit (ICU) of the general medicine department at Darbhanga Medical College and Hospital in Laheriasarai, Bihar. Included were consecutive patients who were admitted with acute febrile illness (AFI) and later developed multi-organ dysfunction syndrome (MODS). Fever with two or more organ system dysfunction lasting longer than 24 hours was a requirement for inclusion; patients who were pregnant, had chronic illnesses, had just undergone major surgery, or had organ dysfunction lasting less than 24 hours were not included.

A total of 82 patients were enrolled by consecutive sampling. Patients were managed according to standard protocols without intervention by the study team. Clinical, laboratory, and radiological data were collected prospectively using a structured proforma. Parameters included demographic details, clinical findings, serial laboratory tests (CBC, LFT, RFT, pathogen-specific tests), and relevant imaging. Patients were stratified retrospectively by etiology and severity (SOFA score) for analysis.

Data were analyzed using standard statistical methods. Descriptive statistics, subgroup comparisons, and regression analyses were performed to identify prognostic factors.

## Results

A total of 82 patients diagnosed with acute febrile illness (AFI) with multi-organ dysfunction syndrome (MODS) admitted to the ICU were included in the study.

**Table 1: Age distribution of patients in ICU with acute febrile illness and MODS**

| Age (in years) | No. of cases | Percentage |
|---|---|---|
| <20 | 3 | 3.7% |
| 21-30 | 8 | 9.8% |
| 31-40 | 16 | 19.5% |
| 41-50 | 15 | 18.3% |
| 51-60 | 15 | 18.3% |
| >60 | 25 | 30.5% |
| Total | 82 | 100.0% |

Age distribution (Table 1) showed most patients were above 60 years (30.5%), followed by 31–40 years (19.5%) and 41–50 years (18.3%).

**Table 2: White blood cell (WBC) count distribution in ICU patients with acute febrile illness and MODS**

| WBC | No. of cases | Percentage |
|---|---|---|
| <4000 | 25 | 30.5% |
| 4000-10000 | 2 | 2.4% |
| >10000 | 55 | 67.1% |
| Total | 82 | 100.0% |

WBC count distribution (Table 2) showed 67.1% had WBC >10,000, indicating inflammatory response. 30.5% had WBC <4000 indicating increased severity.

**Table 3: WBC count and mortality outcome in ICU patients with acute febrile illness and MODS**

| | | | WBC Count | | | |
|---|---|---|---|---|---|---|
| | | | <4000 | 4000-10000 | >10000 | Total |
| Death | No | Count | 19 | 2 | 40 | 61 |
| | | % | 76.0% | 100.0% | 72.7% | 74.4% |
| | Yes | Count | 6 | 0 | 15 | 21 |
| | | % | 24.0% | 0.0% | 27.3% | 25.6% |
| Total | | Count | 25 | 2 | 55 | 82 |
| | | % | 100.0% | 100.0% | 100.0% | 100.0% |
| | Chi-sq(p value) | | 0.802 (0.670) | | | |

No significant correlation between WBC count and mortality (p = 0.670)

**Table 4: Platelet count distribution in ICU patients with acute febrile illness and MODS**

| Platelet count | No. of cases | Percentage |
|---|---|---|
| <1.5 lakhs | 66 | 80.5% |
| >1.5 lakhs | 16 | 19.5% |
| Total | 82 | 100.0% |

Platelet count distribution (Table 4) shows 80.5% had platelets <1.5 lakhs, indicating thrombocytopenia.

**Table 5: Platelet count and mortality outcome in patients with acute febrile illness and MODS**

| | | | Death | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Platelet count | <1.5lakhs | Count | 46 | 20 | 66 |
| | | % | 75.4% | 95.2% | 80.5% |
| | >1.5lakhs | Count | 15 | 1 | 16 |
| | | % | 24.6% | 4.8% | 19.5% |
| Total | | Count | 61 | 21 | 82 |
| | | % | 100.0% | 100.0% | 100.0% |
| | Chi-sq (p value) | | 4.829(0.028) | | |

Table 5 shows significant association between thrombocytopenia and mortality (p = 0.028)

**Table 6: Creatinine level distribution in ICU patients with acute febrile illness and MODS**

| Creatinine level | | |
|---|---|---|
| **Creatinine** | **No. of cases** | **Percentage** |
| <1.2 | 23 | 28.0% |
| >1.2 | 59 | 72.0% |
| Total | 82 | 100.0% |

Table 6 shows 72% had serum creatinine >1.2, indicating renal dysfunction.

**Table 7: Creatinine level and mortality outcome in ICU patients with acute febrile Illness and MODS**

| Death and creatinine Cross-tabulation | | | | | |
|---|---|---|---|---|---|
| | | | Creatinine | | |
| | | | <1.2 | >1.2 | Total |
| Death | No | Count | 22 | 39 | 61 |
| | | % | 95.7% | 66.1% | 74.4% |
| | | | | | |
| | Yes | Count | 1 | 20 | 21 |
| | | % | 4.3% | 33.9% | 25.6% |
| Total | | Count | 23 | 59 | 82 |
| | | % | 100.0% | 100.0% | 100.0% |
| | Chi-sq (p value) | | 7.585(0.006) | | |

Table 7 shows high creatinine significantly associated with mortality (p = 0.006).

**Table 8: Bilirubin level distribution in ICU patients with acute febrile illness and MODS**

| Bilirubin level distribution | | | |
|---|---|---|---|
| | **Bilirubin** | **No. of cases** | **Percentage** |
| Valid | <1.2 | 32 | 39.0% |
| | >1.2 | 50 | 61.0% |
| | Total | 82 | 100.0% |

Table 8 shows 61% had bilirubin >1.2mg/dL, suggesting liver dysfunction.

**Table 9: Bilirubin level and mortality outcome in ICU patients with acute febrile illness and MODS**

| | | | Bilirubin | | Total |
|---|---|---|---|---|---|
| | | | <1.2 | >1.2 | |
| Death | No | Count | 31 | 30 | 61 |
| | | % | 96.9% | 60.0% | 74.4% |
| | Yes | Count | 1 | 20 | 21 |
| | | % | 3.1% | 40.0% | 25.6% |
| Total | | Count | 32 | 50 | 82 |
| | | % | 100.0% | 100.0% | 100.0% |

Table 9 shows high bilirubin strongly correlated with mortality.

**Table 10: Mean arterial pressure (MAP) distribution in ICU patients with acute febrile illness and MODS**

| MAP | No. of cases | Percentage |
|---|---|---|
| >70mmHg | 22 | 26.8% |
| <70mmHg | 60 | 73.2% |
| Total | 82 | 100.0% |

Table 10 shows 73.2% had MAP <70mmHg (hypotension)

**Table 11: Mean arterial pressure (MAP) and mortality outcome in ICU patients with acute febrile illness and MODS**

| | | | MAP | | Total |
|---|---|---|---|---|---|
| | | | >70mmHg | <70mmHg | |
| Death | No | Count | 22 | 39 | 61 |
| | | % | 100.0% | 65.0% | 74.4% |
| | Yes | Count | 0 | 21 | 21 |
| | | % | 0.0% | 35.0% | 25.6% |
| Total | | Count | 22 | 60 | 82 |
| | | % | 100.0% | 100.0% | 100.0% |
| | Chi-sq(p value) | | 10.351 (0.001) | | |

Table 11 shows low MAP highly associated with mortality (p=0.001)

**Table 12: Respiratory distress in ICU patients with acute febrile illness and MODS**

| Respiratory Distress | No. of cases | Percentage |
|---|---|---|
| Yes | 47 | 57.3% |
| No | 35 | 42.7% |
| Total | 82 | 100.0% |

Table 12 shows 57.3% had respiratory distress.

**Table 13: Respiratory distress and mortality outcome in ICU patients with acute febrile illness and MODS**

| Death Respiratory Distress Cross-tabulation | | | | | |
|---|---|---|---|---|---|
| | | | Respiratory Distress | | Total |
| | | | Yes | No | |
| Death | No | Count | 26 | 35 | 61 |
| | | % | 55.3% | 100.0% | 74.4% |
| | Yes | Count | 21 | 0 | 21 |
| | | % | 44.7% | 0.0% | 25.6% |
| Total | | Count | 47 | 35 | 82 |
| | | % | 100.0% | 100.0% | 100.0% |

Table 13 shows Respiratory distress significantly associated with mortality

**Table 14: Distribution of neurological status among patients**

| | Neurological status | No. of cases | Percentage |
|---|---|---|---|
| Valid | <15 | 36 | 43.9% |
| | 15 | 46 | 56.1% |
| | Total | 82 | 100.0% |

Table 14 shows 43.9% had impaired neurological status (GCS<15).

**Table 15: Association between neurological status and mortality**

| | | | Neurological Status | | Total |
|---|---|---|---|---|---|
| | | | <15 | 15 | |
| Death | No | Count | 15 | 46 | 61 |
| | | % | 41.7% | 100.0% | 74.4% |
| | Yes | Count | 21 | 0 | 21 |
| | | % | 58.3% | 0.0% | 25.6% |
| Total | | Count | 36 | 46 | 82 |
| | | % | 100.0% | 100.0% | 100.0% |

Table 15 shows neurological impairment strongly correlated with mortality

**Table 16: IgM Dengue test results in ICU patients with acute febrile illness and MODS**

| | IgM Dengue | No. of cases | Percentage |
|---|---|---|---|
| Valid | Negative | 59 | 72.0% |
| | Positive | 23 | 28.0% |
| | Total | 82 | 100.0% |

Table 16 shows 28% had positive IgM Dengue.

**Table 17: IgM Dengue test results and mortality outcome in ICU patients with acute febrile illness and MODS**

| IgM Dengue Cross-tabulation | | | | | |
|---|---|---|---|---|---|
| - | | | IgM Dengue | | Total |
| | | | Negative | Positive | |
| Death | No | Count | 42 | 19 | 61 |
| | | % | 68.9% | 31.1% | 100.0% |
| | Yes | Count | 17 | 4 | 21 |
| | | % | 81.0% | 19.0% | 100.0% |
| Total | | Count | 59 | 23 | 82 |
| | | % | 72.0% | 28.0% | 100.0% |
| | | Chi-sq(p value) | 1.14 (0.287) | | |

Table 17 shows no significant association (p= 0.287)

**Table 18: IgM Leptospirosis test results in ICU patients with acute febrile illness and MODS**

| IgM Leptospirosis | | | |
|---|---|---|---|
| | IgM Leptospirosis | No. of cases | Percentage |
| Valid | Negative | 76 | 92.7% |
| | Positive | 6 | 7.3% |
| | Total | 82 | 100.0% |

Table18 shows 7.3% positive IgM Leptospirosis

**Table 19: IgM Leptospirosis test results and mortality outcome in ICU patients with acute febrile illness and MODS**

| IgM Leptospirosis Cross-tabulation | | | | | |
|---|---|---|---|---|---|
| | | | IgM Leptospirosis | | Total |
| | | | Negative | Positive | |
| Death | No | Count | 59 | 2 | 61 |
| | | % | 96.7% | 3.3% | 100.0% |
| | Yes | Count | 17 | 4 | 21 |
| | | % | 81.0% | 19.0% | 100.0% |
| Total | | Count | 76 | 6 | 82 |
| | | % | 92.7% | 7.3% | 100.0% |
| | | Chi-sq(p value) | 5.728 (0.017) | | |

Table 19 shows significant association with mortality (p= 0.017)

**Table 20: Weil-Felix test results in ICU patients with acute febrile illness and MODS**

| | Weil-Felix | No. of cases | Percentage |
|---|---|---|---|
| Valid | Negative | 77 | 93.9% |
| | Positive | 5 | 6.1% |
| | Total | 82 | 100.0% |

Table 20 shows 6.1% Positive for Weil-Felix test

**Table 21: Weil-Felix test results and mortality outcome in ICU patients with acute febrile illness and MODS**

| Weil-Felix Cross-tabulation | | | | | |
|---|---|---|---|---|---|
| | | | Weil-Felix | | Total |
| | | | Negative | Positive | |
| Death | No | Count | 57 | 4 | 61 |
| | | % | 93.4% | 6.6% | 100.0% |
| | Yes | Count | 20 | 1 | 21 |
| | | % | 95.2% | 4.8% | 100.0% |
| Total | | Count | 77 | 5 | 82 |
| | | % | 93.9% | 6.1% | 100.0% |
| | | Chi-sq(p value) | 0.088 (0.767) | | |

Table 21 shows no significant association with mortality (p= 0.767)

**Table 22: QBC test results in ICU patients with acute febrile illness and MODS**

| | QBC | No. of cases | Percentage |
|---|---|---|---|
| Valid | Negative | 80 | 97.6% |
| | Positive | 2 | 2.4% |
| | Total | 82 | 100.0% |

Table 22 shows 2.4% positive QBC (malaria)

**Table 23: QBC test results and mortality outcome in ICU patients with acute febrile illness and MODS**

| QBC Cross-tabulation | | | | | |
|---|---|---|---|---|---|
| | | | QBC | | Total |
| | | | Negative | Positive | |
| Death | No | Count | 59 | 2 | 61 |
| | | % | 96.7% | 3.3% | 100.0% |
| | Yes | Count | 21 | 0 | 21 |
| | | % | 100.0% | 0.0% | 100.0% |
| Total | | Count | 80 | 2 | 82 |
| | | % | 97.6% | 2.4% | 100.0% |
| | | Chi-sq (p value) | 0.706 (0.401) | | |

Table 23 shows QBC result not associated with mortality (p=0.401).

**Table 24: Widal test results in ICU patients with acute febrile illness and MODS**

| | Widal | No. of cases | Percentage |
|---|---|---|---|
| Valid | Negative | 79 | 96.3% |
| | Positive | 3 | 3.7% |
| | Total | 82 | 100.0% |

Table 24 shows 3.7% positive Widal (enteric fever)

**Table 25: Widal test results and mortality outcome in ICU patients with acute febrile illness and MODS**

| Widal Cross-tabulation | | | | | |
|---|---|---|---|---|---|
| | | | Widal | | Total |
| | | | Negative | Positive | |
| Death | No | Count | 58 | 3 | 61 |
| | | % | 95.1% | 4.9% | 100.0% |
| | Yes | Count | 21 | 0 | 21 |
| | | % | 100.0% | 0.0% | 100.0% |
| Total | | Count | 79 | 3 | 82 |
| | | % | 96.3% | 3.7% | 100.0% |
| | | Chi-sq (p value) | 1.072 (0.300) | | |

Table 25 Widal not associated with mortality (p=0.300)

**Discussion**

The majority of MODS cases in the intensive care unit (30.5%) were in older persons (≥60 years). This is consistent with the findings of Ray et al. and Nayak et al., who also discovered that older patients had a greater mortality rate.[8][9] Comorbidities, delayed presentation, and age-related immunological senescence may all contribute to this group's heightened susceptibility. The fact that middle-aged adults made up a sizable share further highlights the fact that MODS is not just a problem among the elderly.

In 67.1% of patients, elevated WBC (>10,000/μL) denotes a strong inflammatory response, which is a feature of sepsis and SIRS. This characteristic is still a frontline marker even though it is vague. However, no direct mortality link was shown by Koike et al. or Tang et al.[11][12] Significant predictive value for unfavorable outcomes was shown by Talmor et al. [13].

80.5% of cases had thrombocytopenia (<150,000/μL), which was substantially linked to death. This data supports the predictive significance of dynamic platelet patterns in critical disease and supports research by Khurana & Deoke and Moreau et al. [14][15]

In 72% of patients, renal impairment is manifested by increased creatinine, which highlights the kidney's early role in MODS. The findings from Maheswari & Mandal and Ray et al., which emphasize the significance of renal function monitoring in critically ill febrile patients, are supported by these data.In [9][10]

Hepatic involvement, a feature of MODS, is indicated by elevated bilirubin in 61% of patients. Its independent association with ICU mortality is confirmed by literature (Zheng et al., Shastri et al.), indicating that it could be used as a routine prognostic biomarker.[16][17]

According to Ko et al. and Lehman et al., a MAP <70 mmHg in 73.2% of cases demonstrates circulatory shock and is a reliable indicator of mortality.[18] [19] Aggressive hemodynamic support is necessary when there is persistent hypotension since it aggravates organ damage.

57.3% of patients had respiratory compromise. According to research like Varmudy et al. and Li et al., it is linked to MODS and mortality, which emphasizes its dual function as a cause and an effect of systemic failure.[20][21]

The mortality rate was significantly greater (58.3%) for patients with GCS <15. This validates the neurological status predictive dominance seen by Bastos et al. and Knox et al..[22][23] Thus, GCS continues to be a crucial early prognostic predictor.

Dengue IgM, which was detected in 28% of cases, did not significantly correlate with death. According to Shastri et al., the prognosis for dengue-related MODS is determined by comorbidities (shock, hepatic failure) rather than IgM status.[17]

A substantial mortality correlation (p=0.017) was found for leptospirosis (7.3%), which was consistent with high-risk profiles reported by Karnik & Patankar and Chawla et al..[25] [26] In MODS settings, leptospirosis should be identified and treated as soon as possible.

There was no correlation with death, even though the positive rate was 6.1%. Research demonstrates that although the Weil-Felix test helps with rickettsial diagnosis, it is not a reliable indicator of outcome and has low sensitivity.[27]

Malaria is a small factor to MODS in this group, as indicated by the low positive rate (2.4%). Similar patterns are reported by other research, which emphasize the decline in malaria-related MODS in intensive care units.[28]

Widal testing is still not very useful for MODS prediction, with a positive rate of only 3.7%. Mariraj et al. provide evidence for this, indicating that enteric fever is a rare cause of severe organ failure.[29]

## Conclusion

In patients with acute febrile illness and MODS in the intensive care unit, this study emphasizes the predictive significance of important clinical markers, including creatinine, bilirubin, platelet count, and mean arterial pressure. The necessity of early detection and intervention was highlighted by the substantial correlation between these variables and death. Despite the identification of illnesses such as dengue and leptospirosis, many cases lacked a clear cause, indicating a wider range of pathophysiological factors. Although further study is required to examine non-infectious causes to MODS, these findings support the adoption of focused diagnostics and management techniques to enhance outcomes.

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