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# Determinants of Prolonged Hospitalization among Dengue Patients in Nepal: A Multicenter Retrospective Study

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## Abstract

Though dengue causes a high burden of hospitalizations in tropical regions, little is known about predictors of length stay (LOS) among dengue patients in Nepal. This study aims to determine demographic, clinical and laboratory predictors of prolonged hospitalisation for dengue patients in tertiary hospitals of Nepal. This was a hospital based designed as retrospective cross-sectional study consisting of data from January 1 to December 31, 2024 (twelve months) from three hospitals in Kathmandu, Bharatpur and Pokhara with sample size of 529 total dengue inpatients. Data were extracted from patients' files, such as socio-demographics, co-morbidities, admission laboratory data and length of stay. Statistical analyses using nonparametric tests, chi-square statistics, Fisher's exact tests, and logistic regression identified significant predictors.

Of the total 529 patients, 90 have been identified as having prolonged hospitalization (17.0%). The majority of the patients who suffered prolonged hospitalization lived in urban areas (AOR 1.74, 95% CI 1.00-3.04; p=0.05), had several underlying conditions (AOR 2.04, 95% CI 1.18-3.53; p=0.01), and presented with high levels of direct bilirubin (AOR 4.93, 95% CI 1.34-18.12; p=0.02). A borderline correlation was identified with lower packed cell volume (AOR 0.95, 95% CI 0.90-1.00; p=0.05), while platelet count was considered to have borderline significance. Sex, age, and levels of prolonged hospitalization experienced were found to have no correlation with the disease. The model showed an 84.5% accuracy.

In the context of Nepal, the prolonged hospitalization of patients with dengue fever was found to be associated with the patient's urban residency, underlying conditions and abnormalities of the blood and liver. These findings insist on the importance of early risk stratification to improve the targeted allocation of limited hospital resources, during an outbreak of dengue fever.

**Keywords:** *Dengue, Prolonged Hospitalization, Length of Stay, Nepal, Retrospective Study*



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## 1. Introduction

Dengue fever is a rapidly spreading mosquito-borne viral disease that causes concern for public health in tropical and subtropical areas (Abbasi, 2025). The spread of dengue has increased dramatically over the decades and is a consequence of urban sprawl, a burgeoning population, and changes in the climate along with the increasing frequency of travel internationally. An enormous number of people are infected with the disease per year and a large percentage of these infected people are in need of hospitalization as well as the provision of supportive care (Akinsulie & Idris, 2024; Naji, 2023; Pandey, 2025). Dengue disease, in the absence of a more serious complication, has a low rate of mortality (Khetarpal & Khanna, 2016). However, it does create a disproportionate burden to the health care system, especially in developing countries.

A prolonged stay in the hospital created an increased cost to healthcare, utilized more hospital infrastructure and created an opportunity cost in the ability to treat other patients in a disease outbreak scenario (Hick et al., 2004). Severe complications from dengue such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) require further hospital stays to manage these complications. The length of stay in a hospital has been studies in the past. These studies found that older patients with elevated temperature upon admission, a delayed presentation to the hospital, laboratory abnormalities and the presence of comorbidal diseases were all found to be statistically significant. For example, a study conducted in Vietnam Recker et al. (2024) found that age, fever and a higher neutrophil to lymphocyte ratio were significant predictors of a longer hospital stay.

Research conducted in Malaysian and Indian hospitals revealed that comorbidities such as diabetes mellitus and specific types of infections (e.g., DENV-2) contribute to longer durations of hospitalization; meanwhile, the use of advanced predictive modeling based on laboratory parameters and techniques such as logistic regression and random forests has been shown to effectively predict length of stay (Shahid Ansari et al., 2021; Willeam Peter et al., 2019). Likewise, Indonesian and South Asian studies demonstrate that patients with hematological disorders and chronic organs' dysfunctions and abnormalities were more likely to experience longer stays (Lien et al., 2021; Mauleti et al., 2025).

There are literature from around the world that demonstrates the risk factors for lengthened hospital stays, however, that is almost completely absent in reference to Nepal, particularly with the increasing incidences of dengue (Kunti & Suryana, 2024; Mallhi et al., 2017a; Recker et al., 2024). Determining factors contributing to the length of hospitalization for patients in Nepal will assist in targeting efforts for more effective clinical management as well as allocation of hospital resources and plan to meet the challenges in public health.

## 2. Literature review

Dengue fever remains a significant global health challenge, particularly in tropical and subtropical regions where the burden on healthcare systems is exacerbated by large numbers of hospitalizations during outbreaks. The length of hospitalization in dengue patients has been a subject of investigation, as prolonged stays can place substantial strain on health resources. Several studies have identified various factors influencing prolonged hospitalization, including clinical, demographic, and laboratory markers, which have significant implications for patient management and healthcare planning.

### 2.1 Clinical and Laboratory Predictors of Prolonged Hospitalization

Several studies have examined clinical and laboratory factors associated with prolonged hospitalization in dengue patients. Recker et al. (2024) conducted a retrospective analysis in Vietnam, highlighting the critical role of symptom duration prior to hospitalization

in predicting hospital stay length. After adjusting for symptom duration, they found that age, admission temperature, and elevated neutrophil-to-lymphocyte ratios were predictive of longer hospitalization periods. This study underscores the variability in hospital stay duration based on clinical presentation and the importance of adjusting for pre-admission symptoms.

Similarly, Mallhi et al. (2017) in their cross-sectional study identified several factors associated with prolonged hospitalization in dengue patients, including dengue hemorrhagic fever (DHF), elevated liver enzymes, prolonged prothrombin time (PT), and multi-organ dysfunction. These factors were found to independently contribute to extended hospital stays, with the authors suggesting that early identification of these risk factors could optimize clinical management in high-dependency units. The study also revealed a notable association between mortality and prolonged hospitalization, reinforcing the importance of early intervention for patients at higher risk.

In a cohort study by Willeam et al. (2019) in Malaysia, the clinicopathological factors linked to prolonged hospitalization included the DENV-2 serotype and diabetes mellitus. Their analysis revealed that comorbid conditions, particularly diabetes, were strongly associated with extended stays. Interestingly, factors such as platelet count, hematocrit, and liver enzyme levels were not correlated with prolonged hospitalization, indicating that other clinical variables may play a more prominent role in predicting hospital stay duration.

The study by Ansari et al. (2021) also identified significant markers associated with prolonged hospitalization using data mining techniques. Blood transfusion, emergency admissions, and abnormalities in blood counts (e.g., low hemoglobin, high total leucocyte count) were identified as key predictors. This study provides valuable insights into how data-driven approaches can complement traditional clinical evaluations in predicting hospital stay length.

### 2.2 Socioeconomic and Comorbidity Factors

Chronic comorbid conditions have been shown to significantly affect the clinical outcomes of dengue patients, including the length of hospitalization. Lien et al. (2021) conducted a population-based cohort study in Taiwan to evaluate the impact of chronic non-communicable diseases (NCDs) on dengue outcomes. Their findings indicated that patients with conditions such as chronic kidney disease and diabetes faced a higher risk of prolonged hospitalization, intensive care unit (ICU) admission, and mortality. This underscores the heightened vulnerability of patients with underlying NCDs, which may delay recovery and extend hospital stays.

Similarly, in Indonesia, a study by Tiga-Loza et al. (2020) demonstrated that comorbidities, particularly low platelet counts and low white blood cell counts, were significant predictors of prolonged hospitalization. Their research highlighted the importance of closely monitoring these patients upon admission, as early recognition of these factors may improve clinical outcomes and reduce healthcare costs associated with extended stays.

### 2.3 Persistent Symptoms and Long-Term Burden

Beyond the immediate duration of hospitalization, the long-term recovery from dengue can also impose significant burdens on both patients and healthcare systems. Tiga-Loza et al. (2020) further explored the persistence of symptoms in dengue patients and identified factors such as severe tissue damage, abdominal pain, and hepatomegaly as predictors of prolonged symptom duration. They found that approximately 55% of patients continued to experience symptoms a month after initial diagnosis, with longer recovery periods observed in patients with pre-existing health conditions.

This persistent burden of symptoms aligns with findings from a study by Ng et al. (2016) on prolonged and saddle back fever in dengue patients. Their study

revealed that patients with prolonged fever, especially those with severe forms of dengue, had more frequent complications and longer hospital stays. The association between prolonged fever and more severe dengue subtypes like DHF and DSS further emphasizes the need for careful clinical monitoring of fever duration as an indicator of potential complications.

### 2.4 Cost of Care and Healthcare Implications

Prolonged hospitalization due to dengue not only strains health systems but also leads to significant economic costs. Bajwala et al. (2019) conducted a study in Surat, India, to estimate the costs associated with hospitalization in both public and private hospitals. Their findings revealed a stark contrast in the cost of care, with private hospitals charging significantly higher than government facilities. They argued that improving the triage system and implementing cost-capping measures in the private sector could help make hospitalization more affordable, thus reducing the economic burden on patients and health systems.

### 2.5 Research Gap

While previous research has identified clinical and laboratory predictors of prolonged hospitalization in dengue patients, significant gaps remain, particularly in the context of Nepal. Existing studies, such as those by Recker et al. (2024) and Mallhi et al. (2017), have focused on factors like age, fever duration, and comorbidities, but most were conducted in regions with differing dengue transmission dynamics and healthcare infrastructures. Additionally, the role of dengue serotype variations and socio-economic factors in predicting hospital stay length remains underexplored, especially in low-resource settings. There is also limited research on the economic impact of prolonged hospitalization in such settings. This underscores the need for the present study, which aims to provide a multicenter analysis of the determinants of prolonged hospitalization in Nepal, filling these gaps and offering insights for better resource management and patient care in the region.

## 3. Objectives

This study aims to analyze the demographic, clinical, and laboratory determinants of extended stays in hospitals by dengue patients. The specific objectives of the study are to:

i. Analyze the demographic and clinical profiles of dengue patients at selected tertiary care hospitals.

ii. Examine the relationship of the patient's age, gender, presence of comorbidities, and laboratory findings to the likelihood of extended hospital stay.

iii. Contribute to the body of knowledge to enhance clinical risk stratification and better management of hospital resources for dengue patients.

## 3. Methods

### 3.1Study setting

We used a retrospective, multicentric, hospital-based method using data from the three tertiary hospitals situated at the major urban centers of Nepal, namely, Kathmandu, Bharatpur, and Pokhara. Since these centers of Nepal have a high population density(NSO, 2022) and high reported burden of dengue (EDCD, 2023), these sites capture a representative sample of the dengue hospitalization burden in urban Nepal.

### 3.2 Study Period

We considered all patients who were admitted to the hospitals between the 1st of January 2024, and the 31st of December 2024 to take into account the seasonal variations of the transmission of the dengue.

### 3.3 Study Population

Only laboratory-confirmed cases of dengue who were admitted to the hospital for inpatient services within the specified period were considered for the study. Case confirmation was done in accordance to hospital protocols using the NS1 antigen and IgM antibody tests.

### 3.4 Inclusion and Exclusion Criteria

Inclusion criteria: laboratory-confirmed cases of

dengue infection, inpatient management and hospital admission during the specified study period, and, presence of medical and laboratory records.

Exclusion criteria: patients who have records with less than 50% of the laboratory data and those who were discharged from the hospital against medical advice prior to the completion of their treatment.

### 3.5 Data Collection

Data were collected from hospital records and laboratory management data, using a structured Excel-based abstraction form. The following variables were considered: demographic data (age, sex, and residence), dates of admission and discharge from the hospital, and laboratory admission parameters: Sodium, Potassium, Blood Urea, Creatinine, total/direct Bilirubin, SGPT/SGOT, Alkaline Phosphatase; complete blood count, and related hematological parameters.

### 3.6 Outcome Variable

The primary outcome was defined as length of stay (LOS) in which it was calculated as the number of days from admission to discharge. Prolonged stay was defined as LOS >5 days, based on the study median LOS (4 ± 3 days) and LOS per Mallhi et al., 2017.

### 3.7 Statistical Analysis

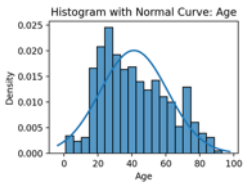
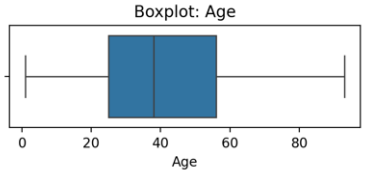
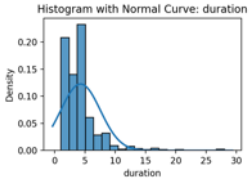
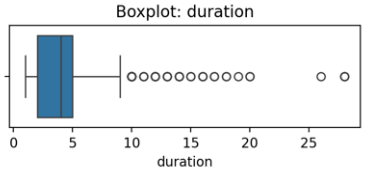
The data was cleaned in Microsoft Excel and analyzed in SPSS version 27. Continuous variables were checked for normality and it was found that the variables were non-normal. Categorical variables were expressed as frequencies and in percentages. For continuous variables difference in LOS was analyzed using Wilcoxon rank-sum tests (Median test) and for categorical variables, Chi-square and Fisher's exact tests were used. The categorical variables found significant or having p-value less than 0.25 were included in the logistic regression model and were used to establish the independent predictors of the prolonged hospital stay. The performance of logistic regression is evaluated using The Cox and Snell R square and Nagelkerke R square. In the logistic regression model adjusted odd ratio (AOR) and unadjusted odd ratio (UOR) were reported with their 95% confidence interval.

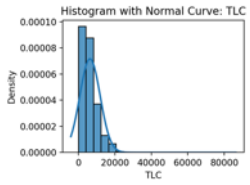
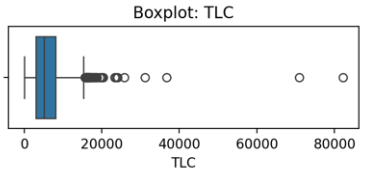
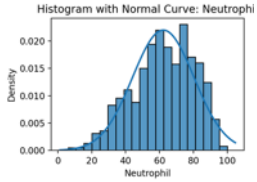
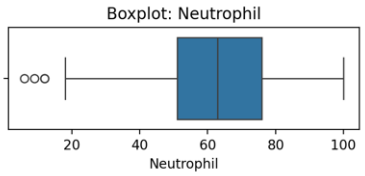
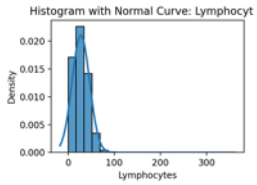
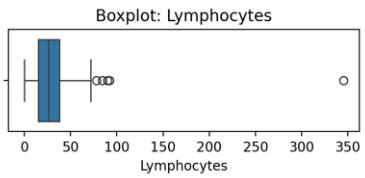
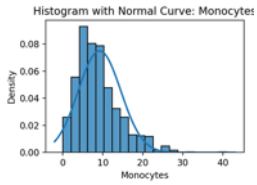
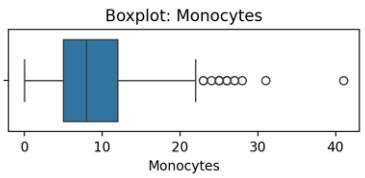
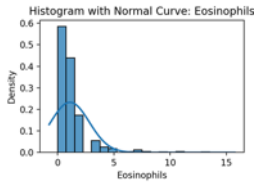
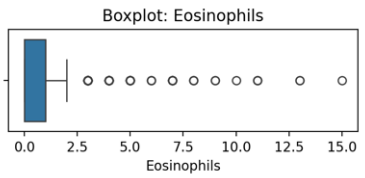
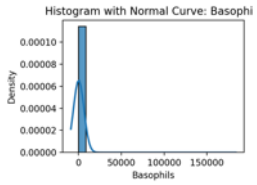
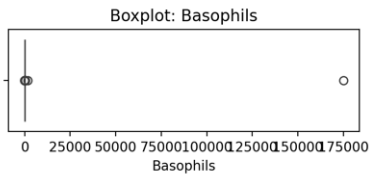
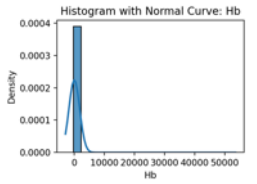
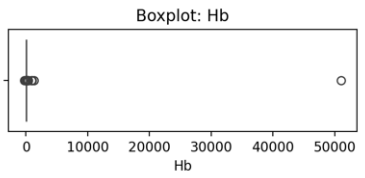
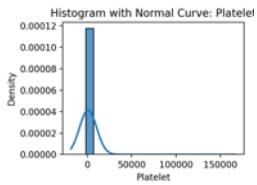
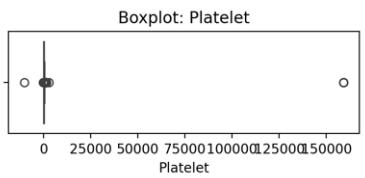
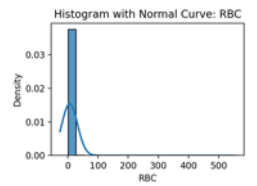
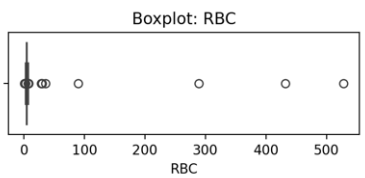
### 3.8 Handling Missing Values

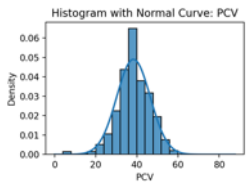
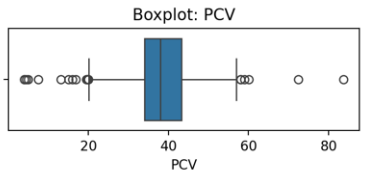
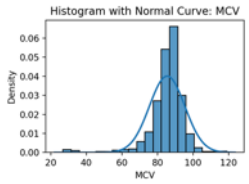
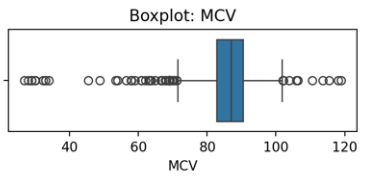
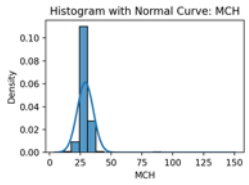
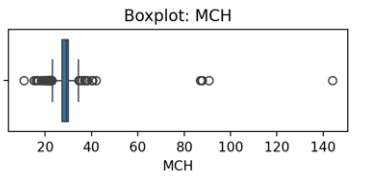
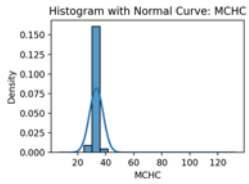
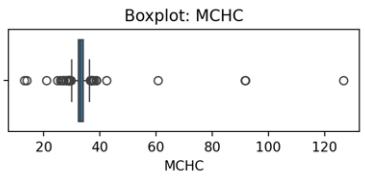
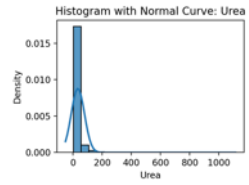
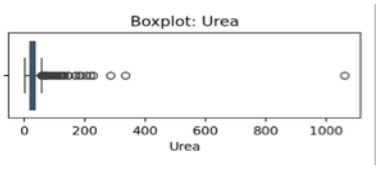
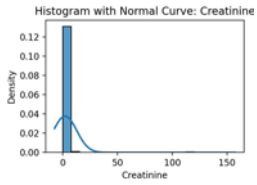
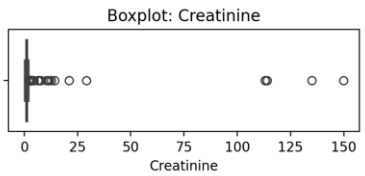
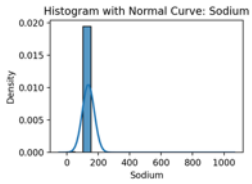
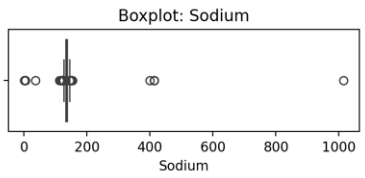
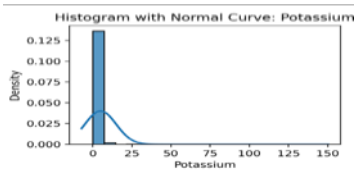
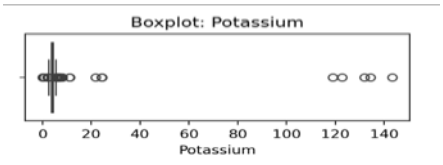
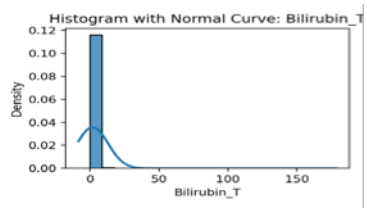
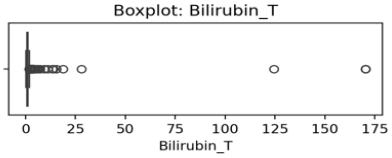
To handle missing values, frequency distribution of missing values is studied using SPSS as shown in Table 1. Ansari et al. (2021) had omitted the variables having more than 50% missing cases; however, Lu et al. (2025) removed the variables having more than 20% missing cases.

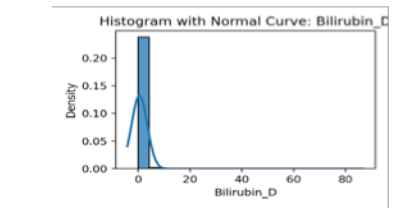
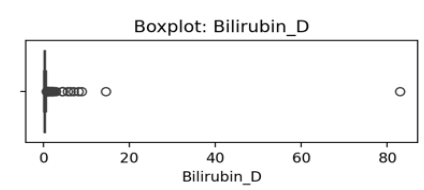
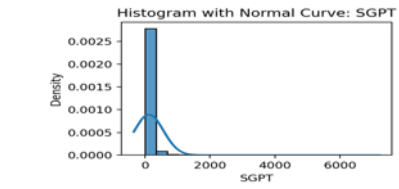
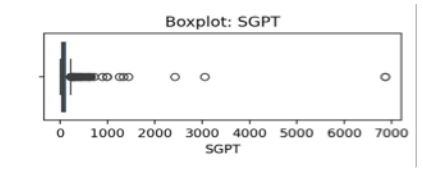
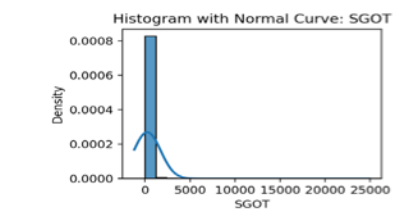
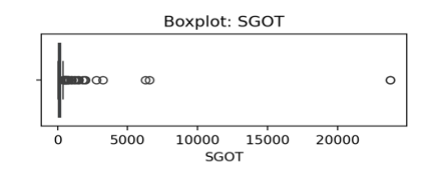
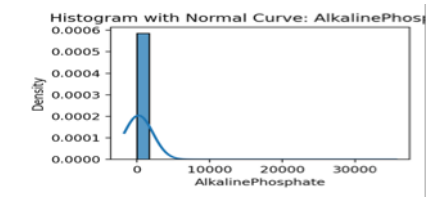
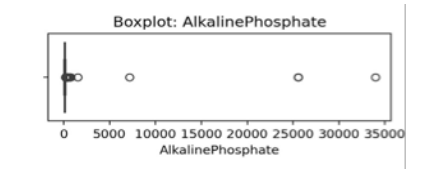
The current study shows the maximum of 24.06% values of missing case for Alkaline Phosphate which is as low as the rule used by Ansari et al. (2021).

**Table 1:** Missing value percentage and nature of the Distribution of the Quantitative Variables used in the Study

| Variables | Missing values % | Normal Curve | Box and whisker |
|---|---|---|---|
| Age | 0 |   |   |
| Residence | 0 | | |
| Duration | 0 |   |   |

| | | | |
|---|---|---|---|
| TLC | 1.7 |  |  |
| Neutrophil | 1.7 |  |  |
| Lymphocytes | 1.7 |  |  |
| Monocytes | 1.7 |  |  |
| Eosinophils | 1.7 |  |  |
| Basophils | 1.7 |  |  |
| Hemoglobin | 1.7 |  |  |
| Platelet | 9.11 |  |  |
| RBC | 2.31 |  |  |

| | | | |
|---|---|---|---|
| PCV | 6.44 |   |   |
| MCV | 2.19 |   |   |
| MCH | 2.07 |   |   |
| MCHC | 3.28 |   |   |
| Urea | 20.53 |   |   |
| Creatinine | 20.05 |   |   |
| Sodium | 20.41 |   |   |
| Potassium | 20.78 |   |   |
| Bilirubin Total | 23.82 |   |   |

| | | | |
|---|---|---|---|
| Bilirubin Direct | 24.06 |  |  |
| SGPT | 18.59 |  |  |
| SGOT | 18.83 |  |  |
| Alkaline Phosphate | 24.06 |  |  |

So, all the variables taken in the study are included for further data analysis. Lu et al. (2024) found that IterativeImputer method is best among the other imputation methods. So we used IterativeImputer method to replace the missing values using Python. The distribution of all most variables under study are non-Normal (Table 1) which justifies the use of IterativeImputer. This imputation method based iterative imputation, estimates missing values based on regression model, where BayesianRidge is used for estimation due to its highest performance (scikit-learn, 2025).

### 3.9 Ethical Considerations

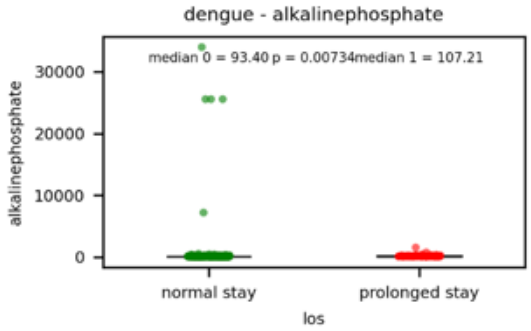
Ethical clearance was obtained from the Nepal Health Research Council (NHRC Ref. 1853, January 2025). Data used was retrospective and anonymized so informed consent was not required. Patient's identity was kept confidential by excluding patient identifiers.

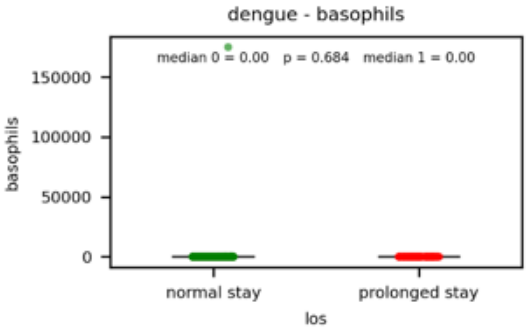
## 4. Findings

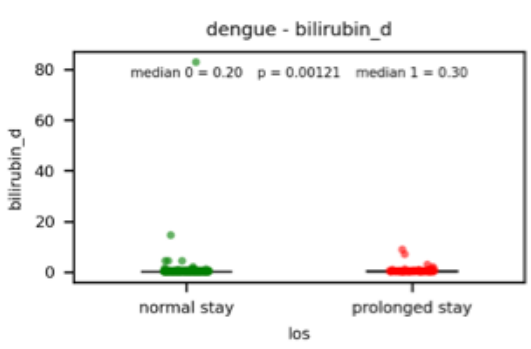
To test whether demographic and clinical factors are associated prolonged hospital stay for dengue patient, Chi-square test of independence is carried.

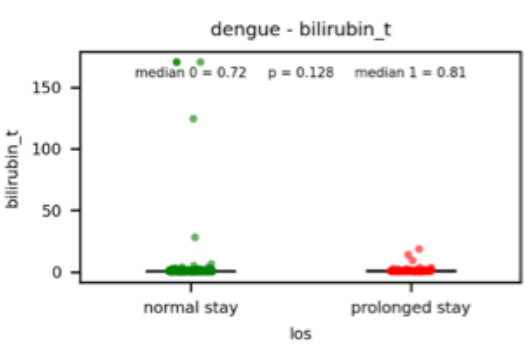
***Table 2: Test of Association between Hospital Stay and Related Factors of Dengue (n= 529)***

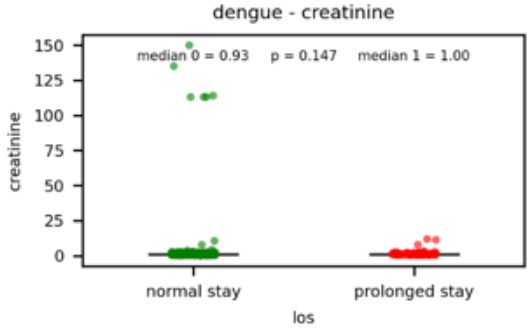
| Variables | Categories | Hospital Stay | | Total | P-value |
|---|---|---|---|---|---|
| | | *Normal* | *Prolonged* | | |
| Sex | Female | 215(35.71%) | 37(6.15%) | 252(41.86%) | 0.174 |
| | Male | 224(37.21%) | 53(8.8%) | 277(46.01%) | |
| Residence | Rural | 101(16.78%) | 34(5.65%) | 135(22.43%) | 0.003 |
| | Urban | 338(56.15%) | 56(9.3%) | 394(65.45%) | |
| Age | Children | 35(5.81%) | 14(2.33%) | 49(8.14%) | 0.138 |
| | Young Adults | 165(27.41%) | 29(4.82%) | 194(32.23%) | |
| | Middle-aged Adults | 141(23.42%) | 25(4.15%) | 166(27.57%) | |
| | Older Adults | 65(10.8%) | 12(1.99%) | 77(12.79%) | |
| | Elders | 33(5.48%) | 10(1.66%) | 43(7.14%) | |

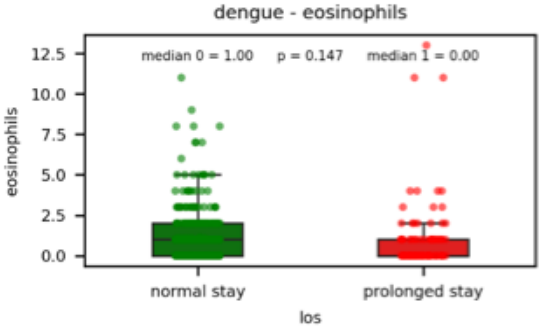

dengue - alkalinephosphate
median 0 = 93.40 p = 0.00734median 1 = 107.21
alkalinephosphate
30000
20000
10000
0
normal stay
prolonged stay
los

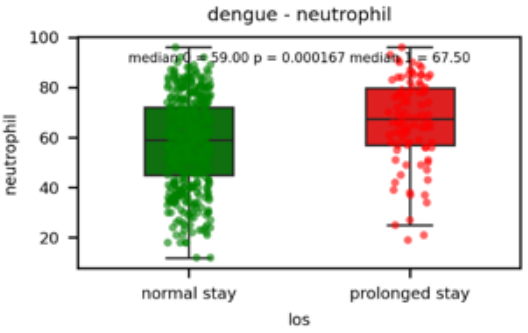

dengue - basophils
median 0 = 0.00 p = 0.684 median 1 = 0.00
basophils
150000
100000
50000
0
normal stay
prolonged stay
los

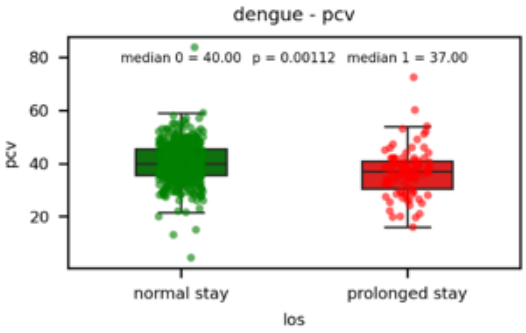

dengue - bilirubin_d
median 0 = 0.20 p = 0.00121 median 1 = 0.30
bilirubin_d
80
60
40
20
0
normal stay
prolonged stay
los

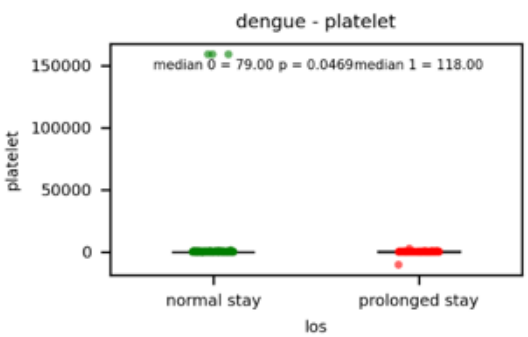

dengue - bilirubin_t
median 0 = 0.72 p = 0.128 median 1 = 0.81
bilirubin_t
150
100
50
0
normal stay
prolonged stay
los

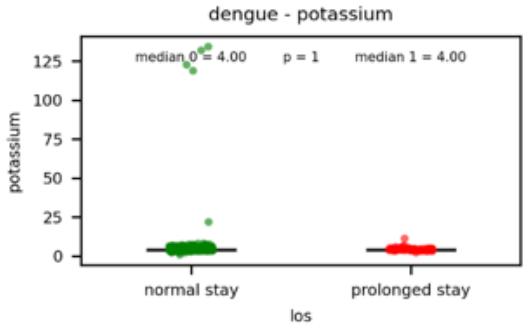

dengue - creatinine
median 0 = 0.93 p = 0.147 median 1 = 1.00
creatinine
150
125
100
75
50
25
0
normal stay
prolonged stay
los


dengue - eosinophils
median 0 = 1.00 p = 0.147 median 1 = 0.00
eosinophils
12.5
10.0
7.5
5.0
2.5
0.0
normal stay
prolonged stay
los


dengue - neutrophil
median 0 = 59.00 p = 0.000167 median 1 = 67.50
neutrophil
100
80
60
40
20
normal stay
prolonged stay
los


dengue - pcv
median 0 = 40.00 p = 0.00112 median 1 = 37.00
pcv
80
60
40
20
normal stay
prolonged stay
los


dengue - platelet
median 0 = 79.00 p = 0.0469median 1 = 118.00
platelet
150000
100000
50000
0
normal stay
prolonged stay
los


dengue - potassium
median 0 = 4.00 p = 1 median 1 = 4.00
potassium
125
100
75
50
25
0
normal stay
prolonged stay
los

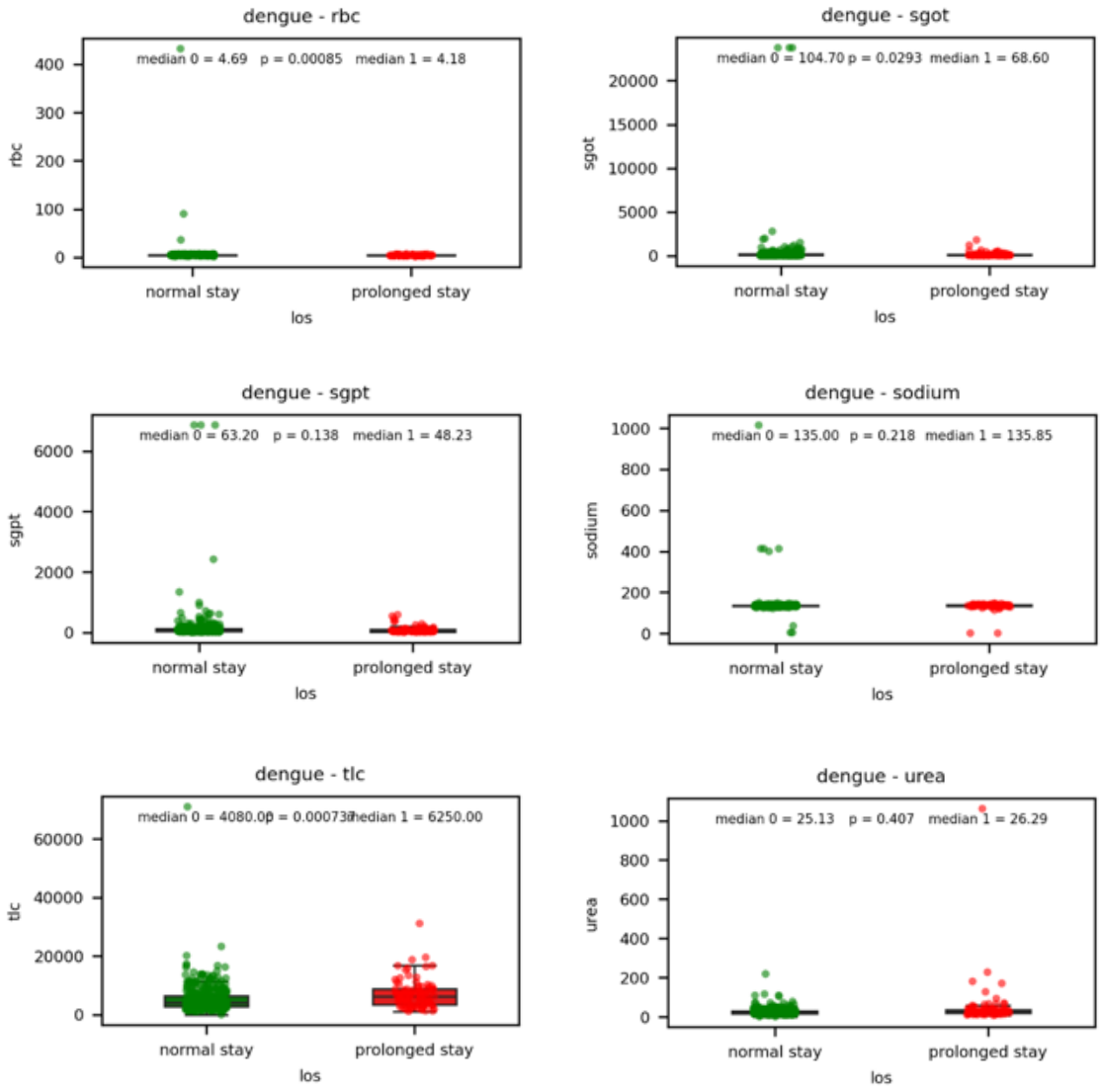



**Figure 1**: Box and Whisker Plot with Overlaid Jittered Dot Showing Median of the two Groups and p-value for Median Test

Findings from the Mann-Whitney U tests for the laboratory variables between the normal stay group and prolonged stay group, it was determined that there was a significant difference in alkaline phosphatase, direct bilirubin, neutrophil count, platelet count, and TLC (P-value < 0.05), that had higher median value for prolonged stay patients out of the group. However, in normal stay patients, there was a higher median value of hemoglobin, lymphocytes, monocytes, PCV, RBC and SGOT ($p < 0.05$). The variables that were found out to be significantly different were these and used in the subsequent analyses using logistic regression (Figure 1).

***Table 3: Logistic Regression to Identify Significant Factors for Prolonged Hospital Stay***

| Variables | AOR (95% CI) | P-value | UOR (95% CI) | P-value |
|---|---|---|---|---|
| **Sex** | | | | |
| Female | | | | 0.17 |
| Male | 0.61(0.35,1.07) | 0.08 | 0.73(0.46,1.15) | |
| **Residence** | | | | |
| Rural | | | | 0.001 |
| Urban | 1.74(1,3.04) | 0.05 | 2.03(1.26,3.29) | |
| **Age** | | | | |
| Children | 0(0,0) | 0.41 | 1.32(0.52,3.38) | 0.56 |
| Young Adults | 0.91(0.3,2.74) | 0.87 | 0.58(0.26,1.3) | 0.19 |

| | | | | |
|---|---|---|---|---|
| Middle-aged Adults | 0.59(0.24,1.44) | 0.24 | 0.59(0.26,1.34) | 0.2 |
| Older Adults | 0.5(0.2,1.26) | 0.14 | 0.61(0.24,1.56) | 0.3 |
| Elders | 0.46(0.16,1.33) | 0.15 | 1.98(1.24,3.18) | 0 |
| **Plural** | | | | |
| No | | | | |
| Yes | 2.04(1.18,3.53) | 0.01 | 1.98(1.24,3.18) | 0 |
| **Neutrophil** | 0.97(0.87,1.07) | 0.5 | 1.03(1.01,1.04) | 0 |
| **Lymphocytes** | 0.94(0.84,1.04) | 0.22 | 0.97(0.95,0.98) | 0 |
| **Monocytes** | 0.95(0.85,1.07) | 0.38 | 0.92(0.88,0.97) | 0 |
| **Hemoglobin** | 1(0.99,1.01) | 0.65 | 1(1,1) | 0.82 |
| **Platelet** | 1(1,1) | 0.03 | 1(1,1) | 0.56 |
| **RBC** | 0.92(0.66,1.29) | 0.64 | 0.62(0.48,0.8) | 0 |
| **PCV** | 0.95(0.9,1) | 0.05 | 0.94(0.91,0.97) | 0 |
| **Creatinine** | 0.98(0.91,1.05) | 0.55 | 0.99(0.95,1.02) | 0.43 |
| **Sodium** | 0.98(0.96,1) | 0.09 | 0.99(0.98,1) | 0.15 |
| **Bilirubin Total** | 0.67(0.32,1.41) | 0.3 | 0.99(0.97,1.02) | 0.58 |
| **Bilirubin Direct** | 4.93(1.34,18.12) | 0.02 | 1(0.95,1.06) | 0.9 |
| **SGPT** | 1(0.99,1) | 0.57 | 1(1,1) | 0.28 |
| **SGOT** | 1(1,1) | 0.69 | 1(1,1) | 0.54 |
| **Alkaline Phosphate** | 1(1,1) | 0.07 | 1(1,1) | 0.503 |
| **Constant** | 3950.2(0,0) | 0.14 | | |

The logistic regression output provides insights into the significant risk factors for prolonged hospital stay, with overall predictive accuracy of 84.5%, as indicated by the percentage classification.

The Chi-square statistic (P-value<0.01) suggests that the model is statistically significant, meaning it can reliably identify factors associated with prolonged stays. The Cox and Snell R square (0.141) and Nagelkerke R square (0.235) suggest a moderate model fit, with Nagelkerke R square explaining approximately 23.5% of the variance in prolonged hospital stays.

Chi-square test analysis in Table 2 shows that residence of the patients and having plural effect in them are significantly associated with hospital stay (P-value<0.05). Although, age and sex are found insignificantly associated with hospital stay but they have p-value less than 0.25 (Hosmer et al., 2013; Zhang, 2016), so they are also included for further analysis of logistic regression.

To test whether the median value of continuous variable (laboratory test variables) are different between the normal and prolonged stayed patients, Median test is carried. The null hypothesis of this test was there is no significant difference in median between the normal and prolonged stayed patients. P-value of Median and Median values are shown in the Box and Whisker with overlaid jittered dot points (Figure 1).

Male patients showed a reduced odds of prolonged hospital stays compared to females, with an Adjusted Odds Ratio (AOR) of 0.61 (95% CI: 0.35–1.07) for the logistic regression model, though the association was not statistically significant (P=0.08). The Unadjusted Odds Ratio (UOR) was also not significant (P=0.17). Patients from urban areas had a significantly higher odds of prolonged hospital stays compared to those from rural areas, with both AOR (1.74, 95% CI: 1.0–3.04, P=0.05) and UOR (2.03, 95% CI: 1.26–3.29, P<0.01) being statistically significant, indicating urban residence as a risk factor for prolonged stays. None of the age groups showed statistically significant associations with prolonged hospital stays, although elderly patients (aged >65) exhibited a borderline significance in the UOR (1.98, 95% CI: 1.24–3.18, P<0.01), suggesting that elderly individuals may

have higher odds of prolonged stays, but this was not consistent across both models. Patients with plural conditions had significantly higher odds of prolonged hospital stays, with both AOR (2.04, 95% CI: 1.18–3.53, P=0.01) and UOR (1.98, 95% CI: 1.24–3.18, P<0.01) being statistically significant, indicating that comorbidities or multiple diagnoses are associated with prolonged stays. The AOR for platelet count was statistically significant (AOR = 1.0, P=0.03), suggesting a potential association with prolonged hospital stays, though the effect size was marginal. Monocyte count demonstrated an inverse relationship with prolonged hospital stays, with an AOR of 0.92 (95% CI: 0.88–0.97, P<0.01), indicating that higher monocyte levels may be protective against prolonged stays. Bilirubin direct had a significant AOR (4.93, 95% CI: 1.34–18.12, P=0.02), showing that elevated bilirubin levels are associated with an increased likelihood of prolonged hospital stays. The AOR for PCV (0.94, 95% CI: 0.91–0.97, P=0.05) and UOR (0.94, 95% CI: 0.91–0.97, P<0.01) suggest that lower PCV levels may be associated with prolonged hospital stays. Many variables such as neutrophil count, hemoglobin levels, creatinine levels, and sodium levels were not found to have significant associations with prolonged hospital stays (P<0.05). Findings from Table 3 shows significant factors associated with prolonged hospital stays include urban residence, plural conditions, platelet count, monocyte count, and bilirubin direct levels, while factors such as age, sex, and various blood markers were not consistently found to be significant in the adjusted model

## 5. Discussion

Dengue in the present study demonstrated a distinct seasonal pattern, with cases rising sharply during October and November, consistent with previously reported post-monsoon transmission trends in Nepal (Sharma et al., 2020; Shrestha, 2000). This pattern is epidemiologically plausible, as monsoon-related water accumulation creates favorable breeding conditions for Aedes mosquitoes and facilitates intensified transmission in densely populated settings.

The predominance of dengue among young and middle-aged adults from urban areas is also consistent with earlier studies conducted in urban cohorts (Du et al., 2021; Samiul Bashir et al., 2025). High population density, unplanned urbanization, and increased availability of artificial vector breeding sites likely contribute to this distribution. In our analysis, urban residence emerged as a significant predictor of prolonged hospitalization, indicating that environmental exposure and healthcare-seeking dynamics in urban settings may influence disease burden and clinical progression. Similarly, the presence of multiple comorbidities was associated with greater odds of extended hospital stay, supporting prior evidence that pre-existing health conditions may worsen clinical outcomes in dengue patients (Du et al., 2021; Samiul Bashir et al., 2025).

In contrast, no significant associations were noted with prolonged length of stay for sex, age, or routine hematologic parameters such as neutrophil, lymphocyte, or hemoglobin levels. This observation contradicts Mallhi et al. (2017) study which reported some associations for routine lab/demographic factors, this could be due to variability in clinical severity, immune response, and timing of presentation. The moderate explanatory power of the logistic regression model suggests other factors such as nutritional status, medical treatment, and socioeconomic factors as some contributors to the duration of hospitalization, similar to Kunti and Suryana (2024) study. These findings emphasize the need for seasonal monitoring and targeted clinical care for urban dengue patients with comorbidities.

## 6. Conclusion

The aim of this study was to analyze the demographic, clinical, and laboratory determinants for extended hospital stays among patients with dengue. The present analysis demonstrates that prolonged hospital stay is influenced by a limited but clinically meaningful set

of demographic, clinical, and laboratory factors. The logistic regression model showed good classification performance and overall statistical significance, indicating its utility in identifying patients at greater risk of extended hospitalization, although its moderate explanatory power suggests that additional unmeasured determinants may also contribute. Among the evaluated predictors, urban residence and the presence of plural conditions emerged as robust risk factors, underscoring the importance of both contextual and clinical complexity in shaping hospitalization outcomes. Similarly, higher direct bilirubin levels were strongly associated with prolonged stay, while lower monocyte count and reduced PCV were linked to greater hospitalization burden, suggesting that specific hematologic and biochemical disturbances may reflect more severe or complicated clinical courses. Although platelet count reached statistical significance, its marginal effect size indicates limited standalone clinical relevance. By contrast, sex, age, and several routinely assessed blood and biochemical markers were not consistently associated with prolonged hospitalization after adjustment. Taken together, these findings highlight the need for early risk stratification frameworks that prioritize patients from urban settings, those with multiple coexisting conditions, and those presenting with adverse hematologic or hepatic profiles, thereby supporting more targeted monitoring and efficient hospital resource allocation.

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**Declaration of Competing Interest**

The author states that there are no conflicts of interest.

**Data Availability**

The data that underlie the findings of this research can be provided by reaching out to the author.

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