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Original Research Article

# Average Length of Stay among Cardiac Patients in a Tertiary Care Hospital in Rural Southern Rajasthan: A Prospective Observational Study

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**Abstract**

**Background:** Length of stay (LOS) is a key indicator of hospital efficiency, resource utilization, and quality of care. Data on LOS patterns among cardiac patients in rural tertiary care settings in India remain limited.

**Objective:** To determine the average length of stay and its associated factors among patients admitted under cardiology services in a tertiary care hospital in rural southern Rajasthan.

**Methods:** A prospective observational study was conducted on consecutive patients admitted between 2 February 2025 and 15 April 2025. Demographic details, diagnosis, admission and discharge dates, and LOS were recorded. Descriptive statistics and subgroup analyses were performed.

**Results:** A total of 200 admissions involving 166 unique patients were analysed. Mean age was 58.6 ± 14.4 years; 69.5% were male. Overall mean LOS was 3.43 ± 2.07 days (median 3 days; range 1–12 days). Patients with rheumatic/valvular heart disease had the longest mean LOS (5.17 days), while those undergoing interventional procedures (coronary angiography [CAG]/percutaneous transluminal coronary angioplasty [PTCA]) had the shortest (1.33 days). Female patients had a slightly longer mean LOS than males (3.89 vs 3.22 days). All patients were discharged; no in-hospital mortality was recorded.

**Conclusion:** The average length of stay for cardiac patients in this rural tertiary care setting was relatively short (approximately 3.4 days), comparable to or shorter than several published Indian and international benchmarks. Diagnosis category, particularly valvular heart disease and heart failure, influenced LOS. Efficient triage, timely diagnostics, and protocol-driven care appear feasible even in resource-constrained rural environments.

**Keywords:** Length of stay; Average LOS; Cardiac patients; Tertiary care; Rural hospital; Rajasthan; Prospective observational study.

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## Introduction

Length of stay (LOS) is one of the most widely used metrics for assessing hospital performance, efficiency of care delivery, and resource utilization [1]. Internationally, average LOS is tracked as a core health-system indicator because prolonged hospital stays increase healthcare costs, the risk of hospital-acquired infections, and bed-occupancy pressure, while excessively short stays may compromise quality of care or increase readmission rates [1,2]. Cardiovascular diseases (CVDs) have become the leading cause of mortality in India, accounting for roughly one-quarter of all deaths nationally, with ischaemic heart disease and stroke together responsible for more than 80% of this burden [3,4]. The age-standardised CVD death rate in India (272 per 100,000 population) exceeds the global average, and the epidemic is characterised by an earlier age of onset and disproportionately high case fatality compared with high-income settings [3,5]. Analyses of the Global Burden of Disease Study further show substantial state-level heterogeneity in cardiovascular disease burden across India, with less-developed states carrying a relatively higher share of premature cardiovascular mortality [5]. In rural and semi-urban tertiary care centres, patients often present with advanced disease, limited prior evaluation, and greater comorbidity burden, all of which can influence duration of hospitalisation [6]. Prior Indian studies of general tertiary-care inpatient departments have reported a median LOS of around three days, with nutritional status, educational status, and insurance status significantly associated with prolonged stay [6]. Cardiac-specific data are more heterogeneous:

large registry-based analyses of non-ST-elevation myocardial infarction in Western settings report a median LOS of 3 days, with prolonged stay linked to older age, comorbidity, heart failure or shock on admission, female sex, and delays to catheterisation [7]. Contemporary hospital-based data from India on heart-failure admissions describe substantially longer stays (around 7 days), reflecting the additional complexity of decongestion, aetiological work-up, and multidisciplinary input required in this subgroup [8]. Conversely, coronary angiography and percutaneous coronary intervention are increasingly performed with same-day or next-day discharge protocols in appropriately selected patients, shortening LOS for purely interventional admissions [9].

Rheumatic heart disease (RHD) continues to contribute disproportionately to cardiac morbidity in India. Community and school-based screening studies report prevalence estimates ranging from roughly 1–5 per 1,000 by clinical criteria to as high as 20 per 1,000 by echocardiographic screening, with more than a million prevalent cases nationally and a persistently younger age of onset than in high-income countries [10–13]. Patients with valvular disease frequently require more prolonged medical optimisation before or after intervention, which may be expected to prolong LOS relative to other cardiac diagnoses [12,13].

Despite the growing burden of cardiac disease in India, published data on average length of stay specifically from rural tertiary care hospitals in Rajasthan are scarce. This study was undertaken to prospectively document the length of stay among consecutive cardiac admissions in a tertiary care hospital located in a rural area of southern Rajasthan, and to explore demographic and diagnostic factors associated with variation in LOS.

**Objectives**

**Primary Objective:**

1. To determine the average length of stay among patients admitted under cardiac/medical services during the study period.

**Secondary Objectives:**

1. To describe the demographic profile (age, sex) of the study population.
2. To analyse LOS according to major diagnostic categories.
3. To examine variation in LOS by age group and sex.
4. To identify factors associated with prolonged hospital stay.

**Materials and Methods**

**Study Design and Setting:** This was a prospective observational study conducted at a tertiary care hospital situated in a rural area of southern Rajasthan, India. The hospital provides specialty cardiac services including non-invasive evaluation, coronary angiography (CAG), and percutaneous coronary intervention (PTCA) in addition to medical management of acute and chronic cardiac conditions.

**Study Period and Population:** All consecutive patients admitted under cardiac or related medical services between 2 February 2025 and 15 April 2025 were included. Both first admissions and subsequent readmissions during the study window were recorded as separate episodes for LOS calculation. Patients who left against medical advice or were transferred out before completion of care were to be noted; however, in the present dataset all recorded outcomes were discharges.

**Data Collection:** For each admission the following variables were recorded prospectively: serial number and unique hospital identification number (AIMS No.); age (years) and sex; primary diagnosis/working diagnosis at admission or discharge; date of admission and date of discharge; length of stay (LOS) in days (calculated as discharge date minus admission date plus one, or as recorded); outcome (discharged/other); and relevant clinical remarks where available.

**Statistical Analysis:** Continuous variables are presented as mean ± standard deviation (SD) and median. Categorical variables are presented as frequencies and percentages. Subgroup comparisons of mean LOS were performed by age group, sex, and diagnostic category. No formal hypothesis testing was pre-specified; results are descriptive, consistent with methodology used in comparable Indian LOS studies [6,14]. Analysis was performed using standard statistical software.

**Ethical Considerations:** The study used routinely collected clinical data. Patient identifiers beyond the hospital number were not used for analysis. Institutional ethics approval and informed consent processes appropriate for observational studies using existing records were assumed to have been followed as per local institutional policy.

**Results**

**Overall Cohort Characteristics:** A total of 200 admission episodes were recorded during the study period, corresponding to 166 unique patients (32 patients had more than one recorded admission).

The mean age of the cohort was 58.63 ± 14.39 years (range 11–92 years). Males constituted 139 (69.5%) and females 61 (30.5%) of the admissions. All 200 episodes resulted in discharge; no deaths were recorded in the dataset.

**Table 1: Baseline demographic and clinical characteristics of the study cohort (N = 200 admissions)**

| Variable | Value | % / Range |
|---|---|---|
| Total admissions | 200 | — |
| Unique patients | 166 | — |
| Mean age ± SD (years) | 58.63 ± 14.39 | 11–92 |
| Male | 139 | 69.5% |
| Female | 61 | 30.5% |
| Mean LOS ± SD (days) | 3.43 ± 2.07 | 1–12 |
| Median LOS (days) | 3 | — |
| Outcome: Discharged | 200 | 100% |

**Distribution of Length of Stay:** LOS ranged from 1 to 12 days. The majority of patients (58.5%) had a stay of 1–3 days. Only 9 admissions (4.5%) exceeded 7 days. The distribution was right-skewed, consistent with most patients being discharged after a short period of evaluation and stabilisation — a pattern broadly similar to that reported for general Indian tertiary-care inpatients, where median LOS was also around 3 days [6].

**Table 2: Distribution of length of stay**

| LOS (days) | Number of admissions | Percentage (%) |
|---|---|---|
| 1 | 29 | 14.5 |
| 2 | 58 | 29.0 |
| 3 | 32 | 16.0 |
| 4 | 25 | 12.5 |
| 5 | 28 | 14.0 |
| 6 | 10 | 5.0 |
| 7 | 9 | 4.5 |
| 8 | 5 | 2.5 |
| ≥9 | 4 | 2.0 |
| Total | 200 | 100 |

**Length of Stay by Age Group and Sex:** Mean LOS was highest in patients aged >80 years (4.20 days) and those ≤40 years (4.00 days), and lowest in the 41–60-year group (3.00 days). Female patients had a higher mean LOS (3.89 ± 2.24 days) compared with males (3.22 ± 1.96 days), a pattern consistent with registry data linking female sex to longer LOS after acute coronary syndromes [7], and with reports of longer stays among women in other Indian inpatient cohorts [15].

**Table 3: Length of stay by age group and sex**

| Subgroup | N | Mean LOS | Median | SD |
|---|---|---|---|---|
| Age ≤40 years | 26 | 4.00 | 4.0 | 2.47 |
| Age 41–60 years | 75 | 3.00 | 3.0 | 1.88 |
| Age 61–80 years | 94 | 3.56 | 3.0 | 2.08 |
| Age >80 years | 5 | 4.20 | 4.0 | 1.48 |
| Male | 139 | 3.22 | 3.0 | 1.96 |
| Female | 61 | 3.89 | 4.0 | 2.24 |

**Length of Stay by Diagnostic Category:** Diagnoses were grouped into clinically meaningful categories. Acute myocardial infarction/acute coronary syndrome (ACS) with MI and coronary artery disease (CAD)/chest pain were the two most frequent categories (57 admissions each). Rheumatic and valvular heart disease and heart failure were associated with longer mean stays (5.17 and 4.90 days respectively), consistent with the more prolonged hospitalisation reported for heart-failure cohorts elsewhere in India [8] and with the added complexity of valvular disease management [12,13]. Patients admitted primarily for coronary angiography or PTCA had the shortest mean LOS (1.33 days), in keeping with contemporary same-day/next-day discharge pathways for uncomplicated interventional procedures [9].

**Table 4: Length of stay according to diagnostic category**

| Diagnostic Category | N | Mean | Median | SD |
|---|---|---|---|---|
| Acute MI / ACS with MI | 57 | 3.05 | 2.0 | 1.80 |
| CAD / Chest Pain | 57 | 3.14 | 3.0 | 1.73 |
| ACS (other) | 25 | 2.92 | 2.0 | 1.47 |
| Rheumatic / Valvular | 18 | 5.17 | 4.5 | 3.07 |
| Hypertension related | 17 | 3.53 | 2.0 | 2.55 |
| Heart Failure | 10 | 4.90 | 5.0 | 1.52 |
| Interventional (CAG/PTCA) | 6 | 1.33 | 1.0 | 0.52 |
| Others | 10 | 4.90 | 5.0 | 1.52 |

**Temporal Pattern:** Monthly mean LOS was 3.67 days in February (n=81), 3.00 days in March (n=71), and 3.65 days in April (n=48, up to 15 April). No marked seasonal variation was observed within the short study window.

## Discussion

In this prospective observational study of 200 consecutive cardiac admissions in a rural tertiary care hospital in southern Rajasthan, the overall mean length of stay was 3.43 days (median 3 days). This figure is relatively short and compares favourably with several published reports of cardiac LOS from Indian and international centres, including registry data from non-ST-elevation myocardial infarction patients with a median LOS of 3 days [7], general Indian tertiary-care inpatients with a median LOS of around 3 days [6], and cardiac LOS prediction cohorts from Gulf-region tertiary centres [16]. It is, however, appreciably shorter than the mean LOS reported for acute coronary syndrome admissions requiring coronary angiography at some other tertiary centres, where LOS in excess of 6–7 days has been described, particularly when multivessel disease or elevated left-ventricular filling pressures are present [17,18].

The predominance of short stays (nearly 60% of patients discharged within 3 days) suggests efficient initial evaluation, rapid decision-making regarding revascularisation or medical management, and effective discharge planning. The very short LOS among pure interventional admissions (CAG/PTCA) is consistent with same-day or next-day discharge protocols that are increasingly adopted for uncomplicated procedures [9]. Longer stays were observed in patients with rheumatic and valvular heart disease and those with heart failure. These conditions often require more prolonged medical optimisation, multidisciplinary input, and management of fluid status or arrhythmias. This mirrors Indian heart-failure registry data showing hospital stays several days longer than in Western heart-failure registries such as ADHERE and OPTIMIZE-HF [8], and reflects the continuing burden of rheumatic heart disease in India, which remains substantially higher than in high-income countries despite a gradual decline in some regions [10–13]. Remarks in the dataset occasionally noted accelerated hypertension, need for multidisciplinary opinions, and delayed investigations as contributors to extended stay. Female patients had a modestly longer mean LOS, consistent with findings from a large North American non-ST-elevation myocardial infarction registry in which female sex was independently associated with prolonged length of stay [7], and with reports from other Indian hospital-based cohorts describing longer stays among women, sometimes attributed to differences in presentation, comorbidity burden, or social factors affecting readiness for discharge [15]. These hypotheses require further investigation. The age extremes (very young and very elderly) also tended toward longer stays, reflecting either congenital/rheumatic pathology in the young or frailty and multi-morbidity in the elderly, in keeping with age-related associations reported in other LOS studies [7,14]. Importantly, the study was conducted in a rural tertiary care setting. Demonstration of an average LOS of approximately 3.4 days indicates that protocol-driven care, timely diagnostics, and appropriate case selection for intervention can achieve efficient throughput even outside metropolitan centres. This is a relevant finding given the disproportionately high and rising burden of cardiovascular disease across Indian states, including less-developed regions, documented in Global Burden of Disease analyses [3–5].

Emerging approaches to LOS prediction, including machine-learning models trained on large cardiac registries, may in future help hospitals of this type to further optimise bed utilisation and anticipate prolonged admissions before they occur [16].

Limitations of the present study include its single-centre design, relatively short observation period, lack of detailed comorbidity scoring (e.g., Charlson index), absence of formal cost analysis, and no post-discharge follow-up for early readmissions. Diagnosis coding was based on clinical entries and was not standardised to ICD codes. Nevertheless, the prospective consecutive nature of data collection reduces selection bias and provides a realistic snapshot of current practice.

## Conclusion

The average length of stay among cardiac patients admitted to this tertiary care hospital in rural southern Rajasthan was 3.43 ± 2.07 days. Diagnostic category, particularly valvular heart disease and heart failure, and to a lesser extent age and sex, influenced duration of hospitalisation. Efficient clinical pathways appear achievable in a rural tertiary setting. Future studies with larger sample sizes, standardised diagnosis coding, comorbidity adjustment, and linkage to readmission and cost data would further strengthen understanding of LOS determinants and opportunities for improvement.

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