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**Original Article**

# A Prospective Observational Study of Leukoglycemic Index in the Prognosis of Acute Myocardial Infarction in Patients Presenting to a Tertiary Care Centre in South-Western Maharashtra

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A R T I C L E I N F O

*Keywords:*

*Acute Myocardial Infarction*
*Diabetes Mellitus*
*In-Hospital Mortality*
*Leukoglycemic Index*
*Prognostic Marker*

A B S T R A C T

Background: Cardiovascular diseases remain the leading cause of global mortality. The Leukoglycemic Index (LGI), an integrated marker of systemic inflammation and metabolic stress, has emerged as a simple, cost-effective prognostic tool in acute myocardial infarction (AMI). This prospective observational study evaluated the prognostic significance of LGI in AMI patients with and without diabetes mellitus. Methods: Eighty-six patients admitted with AMI at KIMS, Karad were prospectively enrolled over 18 months and equally divided into diabetic (n = 43) and non-diabetic (n = 43) groups. LGI was calculated as the product of admission leukocyte count ($\times 10^9$/L) and blood glucose (mg/dL). LGI categories were defined as <1500, 1500–2500, and >2500. Primary outcomes included in-hospital mortality, heart failure, arrhythmias, cardiogenic shock, and reinfarction. Statistical analysis used Chi-square, Student's t-test, and one-way ANOVA (SPSS v26; $p < 0.05$ significant). Results: STEMI was the predominant MI type (72%). Diabetic patients demonstrated significantly higher mean leukocyte count (13.8 ± 3.5 vs 11.4 ± 3.1 $\times 10^9$/L; $p = 0.049$), blood glucose (210 ± 55 vs 130 ± 28 mg/dL; $p = 0.011$), and LGI (2450 ± 540 vs 1750 ± 460; $p = 0.031$). Higher LGI categories were significantly more prevalent among diabetics ($\chi^2 = 11.21$, $p = 0.031$). In-hospital complications were more frequent in diabetics. Mortality increased progressively with LGI: 0% (<1500), 7% (1500–2500), and 24% (>2500; $p = 0.01$). LGI category was significantly associated with adverse outcomes ($p = 0.031$). Conclusions: LGI is a simple, readily calculable prognostic marker that effectively stratifies AMI patients by risk of complications and mortality. Higher LGI is strongly associated with adverse in-hospital outcomes, particularly in diabetic patients, making it a valuable tool for early risk stratification in resource-limited settings.

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## INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of mortality and premature death worldwide, posing a major public health challenge. In 2019, an estimated 18.6 million people died due to CVDs, with nearly 58% of these deaths occurring in Asia, highlighting the disproportionate burden borne by this region [1, 2]. Among cardiovascular conditions, ischemic heart diseases account for almost half of all CVD-related deaths, making them the most significant contributor to global cardiovascular mortality. This dual burden of high mortality and rising treatment costs underscores the urgent need for effective preventive strategies, early diagnosis, and accessible management [3].

Acute Myocardial Infarction (AMI) represents a life-threatening event that demands rapid diagnosis and timely intervention to reduce myocardial damage and prevent complications. Clinical management of AMI becomes significantly more challenging when it occurs in patients with diabetes mellitus (DM), as diabetes not only increases the risk of coronary artery disease but also alters the inflammatory and metabolic responses associated with myocardial injury [4]. Diabetic patients often exhibit atypical presentations and poorer prognoses, making risk stratification more complex.

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Inflammation plays a central role in the initiation and progression of atherosclerosis and is a key trigger in the pathogenesis of AMI. Various inflammatory markers can mirror the severity of myocardial injury and overall systemic response. However, many established inflammatory biomarkers are costly and not routinely available, limiting their practicality for early risk stratification at the time of hospital admission [5, 6].

The Leukoglycemic Index (LGI), first proposed in 2010 by Quiroga Castro et al., has emerged as a simple and accessible prognostic tool in patients with ST-elevation myocardial infarction (STEMI). The LGI is calculated as the product of admission leukocyte count and blood glucose level—both routinely measured parameters. While leukocyte count reflects systemic inflammatory activation and admission hyperglycaemia is a well-recognized predictor of adverse outcomes in AMI, their combined assessment provides a reflection of systemic inflammatory and metabolic stress [7, 8].

Growing evidence suggests that LGI effectively predicts adverse outcomes in critical care settings, including myocardial infarction and stroke [9, 10]. Furthermore, higher LGI values have been correlated with greater coronary artery involvement and disease severity. Due to its accessibility, low cost, and prognostic relevance, LGI serves as a practical tool for early risk stratification and clinical decision-making in patients presenting with acute coronary events. This prospective study evaluates the prognostic significance of LGI in AMI patients with and without diabetes at a tertiary care centre in South-Western Maharashtra, India.

## MATERIALS AND METHODS

### Study Design and Setting

This was a hospital-based prospective observational study conducted over 18 months at the Department of General Medicine, Krishna Institute of Medical Sciences (KIMS), Karad, a tertiary care teaching hospital affiliated with Krishna Vishwa Vidyapeeth (Deemed to be University). Institutional Ethics Committee approval was obtained, and written informed consent was obtained from all participants.

### Study Population

Inclusion criteria: patients aged 18 years and above admitted to the Coronary Care Unit (CCU) with a confirmed diagnosis of AMI (STEMI or NSTEMI). Exclusion criteria: patients with active infections, haematological malignancies, chronic inflammatory conditions, prior history of known haematological disorders, or incomplete data. Eighty-six patients were enrolled using consecutive sampling, equally divided into diabetic (n = 43) and non-diabetic (n = 43) groups.

### LGI Calculation and Categorisation

LGI was calculated at admission as: LGI = Leukocyte Count ($\times 10^9$/L) × Blood Glucose (mg/dL). Patients were categorised into three LGI groups: low (<1500), intermediate (1500–2500), and high (>2500). Diabetic status was defined by prior documented diagnosis or admission HbA1c ≥ 6.5%. MI type (STEMI/NSTEMI) was classified per standard 2017 ESC/ACC criteria.

### Outcome Variables

Primary outcomes: in-hospital mortality. Secondary outcomes: heart failure, arrhythmias, cardiogenic shock, and reinfarction during hospital admission. Killip class was assessed at presentation as a marker of haemodynamic severity.

### Statistical Analysis

Data were analysed using SPSS Version 26.0 (IBM Corp., Armonk, NY, USA). Categorical variables were compared using Chi-square or Fisher's exact test. Continuous variables were compared using independent Student's t-test. One-way ANOVA was used for comparisons across LGI categories. Sensitivity and specificity were calculated at defined LGI cut-offs. Statistical significance was set at $p < 0.05$.

## RESULTS

### Demographic and Clinical Profile

Eighty-six patients were enrolled. The 46–60 years age group was most affected (47%, n = 40), followed by >60 years (32%, n = 28) and 18–45 years (21%, n = 18). Males predominated (69%, n = 59) over females (31%, n = 27). The diabetic and non-diabetic groups each comprised 43 patients (50%) (Table 1, Table 2).

**Table 1: Age Distribution of Study Participants (n = 86)**

| Age Group (years) | Diabetic (n=43) | Non-Diabetic (n=43) | Total (%) |
|---|---|---|---|
| 18–45 years | 7 | 11 | 18 (21%) |
| 46–60 years | 22 | 18 | 40 (47%) |
| >60 years | 14 | 14 | 28 (32%) |
| Total | 43 | 43 | 86 (100%) |

Most participants belonged to the 46–60 years age group. Distribution was similar in both groups.

**Table 2: Gender Distribution of Study Participants (n = 86)**

| Gender | Diabetic (n=43) | Non-Diabetic (n=43) | Total (%) |
|---|---|---|---|
| Male | 30 | 29 | 59 (69%) |
| Female | 13 | 14 | 27 (31%) |
| Total | 43 | 43 | 86 (100%) |
| Total | 43 | 43 | 86 (100%) |

**Male predominance was observed in both groups.**

### Type of Myocardial Infarction

STEMI was the predominant presentation (72%, n = 62), while NSTEMI accounted for 28% (n = 24). STEMI was observed in 30 diabetic and 32 non-diabetic patients; NSTEMI in 13 diabetic and 11 non-diabetic patients (Table 3).

**Table 3: Distribution of Participants According to Type of Myocardial Infarction (n = 86)**

| MI Type | Diabetic (n=43) | Non-Diabetic (n=43) | Total (%) |
|---|---|---|---|
| STEMI | 30 | 32 | 62 (72%) |
| NSTEMI | 13 | 11 | 24 (28%) |
| Total | 43 | 43 | 86 (100%) |
| Total | 43 | 43 | 86 (100%) |

STEMI was the predominant presentation in both diabetic and non-diabetic groups.

**Baseline Laboratory Parameters and LGI Distribution**

Diabetic patients demonstrated significantly higher baseline values across all key parameters: mean leukocyte count (13.8 ± 3.5 vs 11.4 ± 3.1 $\times 10^9$/L; p = 0.049), mean blood glucose (210 ± 55 vs 130 ± 28 mg/dL; p = 0.011), and mean LGI (2450 ± 540 vs 1750 ± 460; p = 0.031) (Table 4).

**Table 4: Mean Baseline Laboratory Values – Diabetic vs Non-Diabetic (n = 86)**

| Parameter | Diabetic (n=43) Mean ± SD | Non-Diabetic (n=43) Mean ± SD | p Value |
|---|---|---|---|
| Leukocyte Count ($\times 10^9$/L) | 13.8 ± 3.5 | 11.4 ± 3.1 | 0.049* |
| Blood Glucose (mg/dL) | 210 ± 55 | 130 ± 28 | 0.011* |
| Leukoglycemic Index (LGI) | 2450 ± 540 | 1750 ± 460 | 0.031* |
| Total | 43 | 43 | 86 (100%) |

**a) *Statistically significant (p < 0.05); Student's independent t-test used.**

LGI category distribution was significantly different between groups ($\chi^2$ = 11.21, p = 0.031): 15 diabetics versus 6 non-diabetics were in the high LGI category (>2500), whereas 14 non-diabetics versus 6 diabetics were in the low category (<1500) (Table 5).

**Table 5: Distribution of LGI Levels – Diabetic vs Non-Diabetic (n = 86)**

| LGI Category | Diabetic (n=43) | Non-Diabetic (n=43) | Total |
|---|---|---|---|
| <1500 | 6 | 14 | 20 |
| 1500–2500 | 22 | 23 | 45 |
| >2500 | 15 | 6 | 21 |
| Total | 43 | 43 | 86 |

a) $\chi^2$ = 11.21, p = 0.031 — statistically significant. Higher LGI more prevalent in diabetics.

**Comorbidities, Killip Class, and In-Hospital Complications**

Hypertension was more prevalent in diabetics (30 vs 18). Dyslipidaemia was equally distributed (22 each). Smoking and alcoholism were more common in non-diabetics (23 and 20, respectively). CKD was higher in diabetics (6 vs 2). Most patients presented in Killip Class I (45 cases), with no statistically significant difference between groups (p = 0.45). In-hospital complications were consistently more frequent in diabetics: heart failure (16 vs 9), arrhythmias (10 vs 8), cardiogenic shock (7 vs 4), and reinfarction (4 vs 1).

**Mortality According to LGI Category**

Mortality increased progressively with LGI level (p = 0.01): no deaths in the <1500 category (0%); 3 diabetic and 1 non-diabetic death in the 1500–2500 category (combined 7%); and 6 diabetic and 3 non-diabetic deaths in the >2500 category (combined 24%) (Table 6).

**Table 6: Mortality According to LGI Category – Diabetic vs Non-Diabetic (n = 86)**

| LGI Category | Diabetic Deaths | Non-Diabetic Deaths | Combined Mortality (%) |
|---|---|---|---|
| <1500 | 0 | 0 | 0% |
| 1500–2500 | 3 | 1 | 7% |
| >2500 | 6 | 3 | 24% |
| Total | 9 | 4 | — |

a) p = 0.01 (Chi-square test). Mortality increased significantly with rising LGI category.

At a LGI cut-off >2000, sensitivity and specificity for complications were 82% and 64% in diabetics, and 70% and 72% in non-diabetics, respectively. At >2500, specificity improved to 80% (diabetics) and 88% (non-diabetics) with corresponding decreases in sensitivity.

**LGI Category and Adverse Events**

A significant association was observed between LGI category and total adverse events (p = 0.031). The <1500 group contributed only 5 adverse events (mainly heart failure, no deaths); the 1500–2500 group contributed 15 (4 deaths, 9 heart failures, 2 reinfarctions); and the >2500 group contributed 23 (9 deaths, 11 heart failures, 3 reinfarctions). Diabetic patients experienced a greater burden of adverse events across all LGI categories (Table 7).

**Table 7: LGI Category with Adverse Events – Diabetic vs Non-Diabetic (n = 86)**

| LGI Category | DM Mortality | Non-DM Mortality | DM Heart Failure | Non-DM Heart Failure | DM Re-infarction | Non-DM Reinfarction |
|---|---|---|---|---|---|---|
| <1500 | 0 | 0 | 3 | 2 | 0 | 0 |
| 1500–2500 | 3 | 1 | 6 | 3 | 1 | 1 |
| >2500 | 6 | 3 | 7 | 4 | 3 | 0 |
| Total | 9 | 4 | 16 | 9 | 4 | 1 |

a) p = 0.031 (Chi-square test). Adverse events increased progressively with higher LGI; diabetics disproportionately affected.

**DISCUSSION**

This prospective observational study evaluated the prognostic significance of LGI in 86 AMI patients, equally divided between diabetic and non-diabetic groups, at a tertiary care centre in South-Western Maharashtra. The key findings are: (i) diabetic patients had significantly higher LGI values at admission; (ii) higher LGI categories were associated with significantly greater in-hospital mortality and adverse cardiovascular events; and (iii) LGI demonstrated clinically relevant sensitivity and specificity at defined cut-offs.

The demographic profile—predominantly middle-aged males (46–60 years, 47%) with STEMI as the most frequent presentation (72%)—is consistent with published Indian and Asian AMI cohorts. Roth GA et al. (2018) similarly reported a mean age of 63.54 years in diabetic AMI patients and a male predominance of 60% [11]. The higher LGI in diabetics

(2450 ± 540 vs 1750 ± 460; p = 0.031) is mechanistically explained by diabetes-associated leucocytosis and chronic hyperglycaemia, both of which amplify systemic inflammatory stress at the time of infarction. Wang XY et al. (2020) reported comparable LGI differences between diabetic and non-diabetic subgroups and confirmed the association of high LGI with greater in-hospital mortality in both groups [12].

The comorbidity profile in our study—greater hypertension and CKD burden in diabetics, and higher smoking and alcoholism rates in non-diabetics—parallels the findings of Rosamond WD et al. (2012), who demonstrated significantly higher hypertension prevalence in diabetics (69.9% vs 49.6%; p < 0.001) and higher smoking rates in non-diabetics (45.1% vs 33.1%; p < 0.001) in a large cohort [13]. Killip class distribution was not statistically different between groups in our study (p = 0.45), though diabetics trended toward higher Killip classes. Granger CB et al. (2018), however, demonstrated a significant association between elevated LGI and higher Killip class severity in both diabetic and non-diabetic patients (p < 0.001) [14], suggesting that the relationship between LGI and haemodynamic severity may be better captured with larger sample sizes.
The progressive increase in mortality with LGI category—0% (<1500), 7% (1500–2500), 24% (>2500; p = 0.01)—is a central finding consistent with existing literature. M. Karakaya et al. (2024) demonstrated that LGI independently predicted adverse coronary care unit outcomes, while M. Demir et al. (2023) found LGI to be an independent predictor of multivessel coronary artery disease (OR: 1.599; 95% CI: 1.086–2.357; p = 0.018), with an AUC of 0.619 on ROC analysis [15, 16]. Qi LY et al. (2022) similarly confirmed the prognostic value of LGI in both diabetic and non-diabetic AMI patients in a large prospective cohort [17]. The sensitivity of 82% and specificity of 64% at a LGI cut-off >2000 in diabetics reported in our study, improving to higher specificity at >2500, suggest that the >2500 threshold may be particularly useful as a rule-in criterion for intensive monitoring.
In-hospital complications were consistently more frequent among diabetics across all categories: heart failure (37.2% vs 20.9%), arrhythmias (23.3% vs 18.6%), cardiogenic shock (16.3% vs 9.3%), and reinfarction (9.3% vs 2.3%). Chen Y et al. (2019) confirmed that high-LGI diabetic patients had significantly elevated WBC counts and adverse metabolic parameters (p < 0.001), reinforcing the inflammatory basis of LGI's prognostic power [18]. Furman MI et al. (2004) observed lower absolute adverse event rates in a different era but maintained the consistent finding that diabetics suffer worse outcomes, underscoring the temporal robustness of this association [19].

The statistically significant association between rising LGI categories and total adverse events (p = 0.031) demonstrates that LGI captures cumulative cardiovascular risk beyond individual parameters. Kongyong Cui et al. (2025) showed an L-shaped relationship between the hemoglobin glycation index (HGI) and in-hospital mortality in diabetic AMI patients, suggesting that both LGI and related composite indices may carry complementary prognostic information [20]. The study by Nascimento BR et al. (2019) highlighted the critical need for simple, affordable risk markers in low- and middle-income countries [14], for which LGI—requiring only a leukocyte count and blood glucose—is ideally suited.
Limitations include the single-centre design, moderate sample size (n = 86), short-term follow-up limited to in-hospital events, and lack of CCND1 gene amplification analysis or FISH. Potential confounders including HbA1c, duration of diabetes, glycaemic control, and reperfusion strategies were not fully analysed. Future prospective multi-centre studies with long-term follow-up are recommended.

## CONCLUSIONS

The Leukoglycemic Index is a simple, readily calculable, and cost-effective prognostic marker for in-hospital adverse outcomes in patients with acute myocardial infarction. Diabetic patients demonstrate significantly higher LGI values and experience greater in-hospital mortality and complications compared to non-diabetic patients. Mortality and adverse events increase progressively with LGI category, with a markedly elevated risk at LGI >2500 (mortality 24%; p = 0.01). LGI demonstrates acceptable sensitivity and specificity at clinically meaningful cut-offs, supporting its use for early risk stratification in both diabetic and non-diabetic AMI patients. LGI should be routinely calculated at admission and integrated alongside established tools such as Killip class to improve prognostic accuracy and guide management decisions in resource-limited settings.

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