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RESEARCH ARTICLE
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IMPACT OF OBESITY AND METABOLIC SYNDROME ON CLINICAL PROFILE AND SHORT-TERM OUTCOMES IN HOSPITALIZED MEDICAL PATIENTS.

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ABSTRACT

Background: Obesity and metabolic syndrome (MetS) are increasingly prevalent in hospitalized medical patients and contribute to adverse clinical outcomes. Despite global evidence, data from Indian tertiary care settings assessing clinical profiles and short-term outcomes remain limited.

Material and Methods: A cross-sectional observational study was conducted in the Department of General Medicine at a tertiary care teaching hospital over 12 months. One hundred consecutive adult patients (aged ≥ 18 years) admitted to medical wards were enrolled by non-probability consecutive sampling. MetS was diagnosed using International Diabetes Federation (IDF) 2006 criteria. Anthropometric, clinical, biochemical data, and short-term outcomes — length of hospital stay (LOS), complications (acute kidney injury, infections, arrhythmias), ICU transfer, and mortality — were recorded. Analysis used Student's t-test and Chi-square/Fisher's exact test ($p < 0.05$ significant).

Results: MetS prevalence was 46% (n = 46). MetS patients were older (56.2 ± 11.4 vs. 49.1 ± 12.9 years, $p = 0.004$), had higher BMI (30.2 ± 4.1 vs. 23.9 ± 3.6 kg/m², $p < 0.001$), and waist circumference (97.3 ± 8.2 vs. 83.2 ± 8.8 cm, $p < 0.001$). Hypertension (82.6% vs. 33.3%), T2DM (73.9% vs. 18.5%), dyslipidemia (78.3% vs. 25.9%), and ischemic heart disease (34.8% vs. 11.1%) were significantly higher (all $p < 0.01$). LOS was longer in MetS (7.6 ± 2.1 vs. 5.1 ± 1.8 days, $p < 0.001$). ICU transfers (30.4% vs. 11.1%, $p = 0.018$), infections (21.7% vs. 7.4%, $p = 0.042$), AKI (26.1% vs. 7.4%, $p = 0.013$), and arrhythmias (17.4% vs. 3.7%, $p = 0.028$) were elevated. Complete recovery was lower (65.2% vs. 88.9%, $p = 0.007$); mortality trended higher (8.7% vs. 3.7%, $p = 0.283$).

Conclusion: MetS affects nearly half of hospitalized medical patients and associates with greater comorbidities, prolonged LOS, increased complications, and poorer recovery. Routine screening and multidisciplinary care are recommended.residencyadvisor+1

Keywords: Metabolic syndrome; obesity; hospitalized patients; clinical outcomes; length of stay; India

Introduction

Obesity has emerged as one of the most significant public health challenges of the 21st century, with its prevalence rising sharply across both developed and developing nations, including India.[1] The World Health Organization (WHO) estimates that over 650 million adults worldwide were obese in 2016, and projections suggest continued increase in the coming decades. Metabolic syndrome (MetS) — a cluster of interrelated cardiometabolic risk factors including central obesity, hypertension, hyperglycemia, and dyslipidemia — amplifies the risks associated with obesity alone and is independently associated with cardiovascular disease, type 2 diabetes mellitus (T2DM), and increased all-cause mortality.[2]

The International Diabetes Federation (IDF) defines MetS as central obesity (waist circumference ≥ 90 cm in Asian men and ≥ 80 cm in Asian women) plus any two of the following: raised triglycerides (≥ 150 mg/dL), reduced HDL cholesterol (< 40 mg/dL in men, < 50 mg/dL in women), raised blood pressure (systolic ≥ 130 or diastolic ≥ 85 mmHg), and fasting plasma glucose ≥ 100 mg/dL or previously diagnosed T2DM.[3] Using these criteria, the prevalence of MetS in India has been reported between 25% and 40% in urban populations, with even higher rates among hospitalized patients with chronic disease.[4]

The clinical significance of obesity and MetS in the inpatient medical setting is profound. Obese and metabolically dysregulated patients tend to have greater comorbidity burden, increased susceptibility to infections, deranged glucose homeostasis, and higher risk of organ system complications during hospitalization.[5] Studies have reported that MetS is associated with prolonged hospital stay, increased need for intensive care, and higher in-hospital mortality across various medical conditions including acute coronary syndrome (ACS), heart failure, and respiratory disorders.[6] Lee et al. [7]demonstrated that obesity and MetS influence clinical outcomes in ischemic heart disease patients, with MetS conferring worse prognoses independent of obesity status. Similarly, Alexopoulos et al. [8] observed that inpatient hyperglycemia, often a feature of MetS, was independently associated with poor outcomes in hospitalized diabetic patients.

Despite growing global evidence, there is a paucity of studies from Indian tertiary care settings that comprehensively assess the clinical profile and short-term outcomes of hospitalized medical patients with concomitant obesity and MetS. Understanding this relationship is critical for early identification of high-risk patients, resource allocation, and targeted therapeutic interventions. This study was therefore designed to evaluate the clinical profile, comorbidity burden, and short-term inpatient outcomes among hospitalized medical patients stratified by the presence or absence of MetS.

Material and Methods

Study Design and Setting

This was a cross-sectional observational study conducted in the Department of General Medicine at a tertiary care teaching hospital over a period of 12 months. The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants.

Study Population

A total of 100 consecutive adult patients (aged ≥ 18 years) admitted to the medical wards were enrolled using non-probability consecutive sampling. Patients admitted for elective procedures, surgical conditions, psychiatric disorders, pregnancy, end-stage renal or hepatic disease (on dialysis or awaiting transplant), and those who declined consent were excluded.

Data Collection

Demographic data including age, sex, socioeconomic status, and dietary habits were recorded. Anthropometric measurements — height, weight, waist circumference (WC), and hip circumference — were taken on the day of admission. Body mass index (BMI) was calculated as weight

(kg)/height² (m²). BMI was classified per WHO Asia-Pacific guidelines: underweight < 18.5, normal 18.5–22.9, overweight 23.0–24.9, and obese ≥ 25 kg/m².
Blood pressure was measured using a calibrated aneroid sphygmomanometer after 5 minutes of rest. Fasting blood glucose, lipid profile (total cholesterol, LDL, HDL, triglycerides), serum creatinine, liver function tests, and complete blood count were obtained within 24 hours of admission.

Diagnostic Criteria
MetS was diagnosed using the IDF (2006) criteria as described above. Hypertension was defined as blood pressure ≥ 140/90 mmHg or current antihypertensive medication use. T2DM was diagnosed per ADA 2020 criteria (fasting glucose ≥ 126 mg/dL on two occasions or HbA1c ≥ 6.5%). Dyslipidemia was defined as total cholesterol > 200 mg/dL, LDL > 130 mg/dL, HDL < 40 mg/dL (men) or < 50 mg/dL (women), or triglycerides > 150 mg/dL, or current lipid-lowering therapy.

Outcome Variables
Short-term outcomes assessed were: (1) length of hospital stay (LOS in days), (2) in-hospital complications (new-onset acute kidney injury, respiratory failure requiring ventilatory support, hospital-acquired infections, arrhythmias), (3) need for ICU transfer, and (4) in-hospital mortality. Patients were followed from admission until discharge or death.

Statistical Analysis
Data were entered into Microsoft Excel and analyzed using SPSS version 20.0. Continuous variables were expressed as mean ± standard deviation (SD) and compared using Student's unpaired t-test. Categorical variables were expressed as frequencies and percentages and compared using Chi-square test or Fisher's exact test as appropriate. A p-value of < 0.05 was considered statistically significant.

Results
Of 100 hospitalized medical patients, 46 (46%) had metabolic syndrome (MetS). MetS patients were significantly older (56.2 ± 11.4 vs 49.1 ± 12.9 years, p=0.004), had higher BMI (30.2 ± 4.1 vs 23.9 ± 3.6 kg/m², p<0.001) and waist circumference (97.3 ± 8.2 vs 83.2 ± 8.8 cm, p<0.001), with obesity in 91.3% vs 25.9% (Table 1). Comorbidities were markedly higher: hypertension (82.6% vs 33.3%), T2DM (73.9% vs 18.5%), dyslipidemia (78.3% vs 25.9%), ischemic heart disease (34.8% vs 11.1%), NAFLD (30.4% vs 7.4%), with worse metabolic parameters including fasting glucose (162.4 ± 48.6 vs 98.2 ± 18.4 mg/dL), HbA1c (8.2 ± 1.6 vs 5.6 ± 0.6%), triglycerides (196.4 ± 52.4 vs 128.6 ± 36.2 mg/dL), and creatinine (1.42 ± 0.68 vs 0.98 ± 0.32 mg/dL; all p<0.001) (Table 2). MetS patients presented more with metabolic emergencies (uncontrolled diabetes 26.1%, hypertensive crisis 17.4%) vs respiratory conditions in non-MetS group (Table 3). Clinical outcomes showed prolonged LOS (7.6 ± 2.1 vs 5.1 ± 1.8 days, p<0.001), higher ICU transfers (30.4% vs 11.1%, p=0.018), infections (21.7% vs 7.4%, p=0.042), AKI (26.1% vs 7.4%, p=0.013), arrhythmias (17.4% vs 3.7%, p=0.028), lower recovery (65.2% vs 88.9%, p=0.007), and mortality trend (8.7% vs 3.7%, p=0.283) (Table 4).

Table 1: Baseline Demographic and Anthropometric Profile of Study Patients (N = 100)

Parameter	Total (N=100)	MetS Present (n=46)	MetS Absent (n=54)	p-value
Age (years), mean ± SD	52.4 ± 12.6	56.2 ± 11.4	49.1 ± 12.9	0.004
Sex: Male, n (%)	58 (58%)	24 (52.2%)	34 (63.0%)	0.276
Sex: Female, n (%)	42 (42%)	22 (47.8%)	20 (37.0%)	0.276
BMI (kg/m²), mean ± SD	26.8 ± 4.7	30.2 ± 4.1	23.9 ± 3.6	<0.001
Obese (BMI ≥ 25 kg/m²), n (%)	56 (56%)	42 (91.3%)	14 (25.9%)	<0.001
Waist circumference (cm), mean	89.6 ± 10.4	97.3 ± 8.2	83.2 ± 8.8	<0.001

± SD				
Systolic BP (mmHg), mean ± SD	138.4 ± 18.6	148.2 ± 16.8	130.1 ± 16.2	<0.001
Diastolic BP (mmHg), mean ± SD	86.3 ± 10.2	92.4 ± 9.6	81.2 ± 8.9	<0.001

Table 2: Comorbidity Profile and Biochemical Parameters

Parameter	MetS Present (n=46)	MetS Absent (n=54)	p-value
Hypertension, n (%)	38 (82.6%)	18 (33.3%)	<0.001
Type 2 Diabetes Mellitus, n (%)	34 (73.9%)	10 (18.5%)	<0.001
Dyslipidemia, n (%)	36 (78.3%)	14 (25.9%)	<0.001
Ischemic Heart Disease, n (%)	16 (34.8%)	6 (11.1%)	0.006
NAFLD/Fatty liver, n (%)	14 (30.4%)	4 (7.4%)	0.004
Fasting blood glucose (mg/dL), mean ± SD	162.4 ± 48.6	98.2 ± 18.4	<0.001
HbA1c (%), mean ± SD	8.2 ± 1.6	5.6 ± 0.6	<0.001
Total cholesterol (mg/dL), mean ± SD	218.6 ± 34.2	176.4 ± 28.6	<0.001
Triglycerides (mg/dL), mean ± SD	196.4 ± 52.4	128.6 ± 36.2	<0.001
HDL cholesterol (mg/dL), mean ± SD	36.8 ± 6.4	48.6 ± 7.2	<0.001
LDL cholesterol (mg/dL), mean ± SD	138.4 ± 30.6	104.2 ± 24.8	<0.001
Serum creatinine (mg/dL), mean ± SD	1.42 ± 0.68	0.98 ± 0.32	<0.001

Table 3: Distribution of Primary Diagnosis at Admission

Primary Diagnosis	MetS Present (n=46)	MetS Absent (n=54)	Total
Acute coronary syndrome / Chest pain	10 (21.7%)	6 (11.1%)	16 (16%)
Uncontrolled diabetes / Hyperglycemia	12 (26.1%)	4 (7.4%)	16 (16%)
Hypertensive urgency/emergency	8 (17.4%)	4 (7.4%)	12 (12%)
Community-acquired pneumonia	6 (13.0%)	12 (22.2%)	18 (18%)
Acute exacerbation of COPD	2 (4.3%)	8 (14.8%)	10 (10%)
Cerebrovascular accident	4 (8.7%)	4 (7.4%)	8 (8%)
Urinary tract infection / Urosepsis	2 (4.3%)	8 (14.8%)	10 (10%)
Others	2 (4.3%)	8 (14.8%)	10 (10%)

Table 4: Short-Term Clinical Outcomes

Outcome Parameter	MetS Present (n=46)	MetS Absent (n=54)	p-value
Length of hospital stay (days), mean ± SD	7.6 ± 2.1	5.1 ± 1.8	<0.001
LOS > 7 days, n (%)	28 (60.9%)	12 (22.2%)	<0.001
ICU transfer required, n (%)	14 (30.4%)	6 (11.1%)	0.018
Hospital-acquired infection, n (%)	10 (21.7%)	4 (7.4%)	0.042
Acute kidney injury (new onset), n (%)	12 (26.1%)	4 (7.4%)	0.013
Respiratory failure (ventilatory support)	6 (13.0%)	2 (3.7%)	0.082
New-onset arrhythmia, n (%)	8 (17.4%)	2 (3.7%)	0.028
In-hospital mortality, n (%)	4 (8.7%)	2 (3.7%)	0.283
Discharge with complete recovery, n (%)	30 (65.2%)	48 (88.9%)	0.007

Discussion

The present study evaluated the clinical profile and short-term outcomes of 100 consecutively hospitalized medical patients and found that MetS was present in 46% of the study population, a prevalence consistent with figures reported from Indian tertiary care settings. Patients with MetS were significantly older (56.2 ± 11.4 vs. 49.1 ± 12.9 years, p = 0.004) and had markedly higher BMI and waist circumference, validating central adiposity as the hallmark driver of metabolic dysregulation in this population.[4]

The comorbidity burden in the MetS group was substantially higher compared to those without MetS. Hypertension was present in 82.6% of MetS patients versus 33.3% in the non-MetS group ($p < 0.001$), and T2DM was noted in 73.9% versus 18.5% ($p < 0.001$). This concurs with findings by Kant et al. [4] from a North Indian cohort, who reported MetS prevalence of 50.5% in newly diagnosed hypertensives using IDF criteria, with comorbid diabetes and dyslipidemia being significantly more common in MetS patients. The strikingly higher serum triglycerides, lower HDL, and elevated LDL in our MetS cohort (196.4 vs. 128.6 mg/dL for triglycerides; 36.8 vs. 48.6 mg/dL for HDL, both $p < 0.001$) reflect the atherogenic dyslipidemia characteristic of this syndrome.[9]

Ischemic heart disease was significantly more prevalent in the MetS group (34.8% vs. 11.1%, $p = 0.006$). This is consistent with Zhou et al.[10], who demonstrated that MetS patients with heart failure had significantly worse cardiac function and higher rates of hospitalization compared to those without MetS. Non-alcoholic fatty liver disease (NAFLD) was present in 30.4% of MetS patients versus 7.4% in non-MetS patients ($p = 0.004$), highlighting the hepatic manifestations of metabolic dysregulation that compound the systemic burden during hospitalization.[2]

Serum creatinine was significantly elevated in the MetS group (1.42 ± 0.68 vs. 0.98 ± 0.32 mg/dL, $p < 0.001$), suggesting subclinical or overt chronic kidney disease as a frequent accompaniment. The interconnected triad of obesity, hypertension, and hyperglycemia imposes a chronic hyperfiltration and inflammatory burden on the kidney, predisposing these patients to acute-on-chronic deterioration during intercurrent illness.[5]

Patients with MetS were predominantly admitted with metabolic emergencies — uncontrolled diabetes (26.1%) and hypertensive urgency/emergency (17.4%) — compared to the non-MetS group, where respiratory illnesses (community-acquired pneumonia 22.2%, COPD exacerbation 14.8%) and infections (14.8%) dominated. This suggests that MetS patients present with complications of their underlying metabolic derangements rather than independent acute conditions, a pattern that inherently requires longer and more complex management.[6]

One of the most clinically significant findings of our study was the substantially longer LOS in MetS patients (7.6 ± 2.1 days) compared to non-MetS patients (5.1 ± 1.8 days, $p < 0.001$). Furthermore, 60.9% of MetS patients had LOS exceeding 7 days versus only 22.2% in the non-MetS group ($p < 0.001$). This is consistent with Fanta et al.[6], who reported that MetS was associated with significantly prolonged hospitalization and worse prognosis in ACS patients. The prolonged LOS in our cohort likely reflects the greater physiological complexity of managing interacting metabolic derangements glycemic instability, renal compromise, cardiovascular stress, and infection susceptibility simultaneously.

ICU transfer was required in 30.4% of MetS patients compared to 11.1% of non-MetS patients ($p = 0.018$), reflecting the greater hemodynamic and metabolic instability encountered in the former group. Hospital-acquired infections occurred in 21.7% of MetS patients versus 7.4% in the control group ($p = 0.042$). Obesity impairs neutrophil function, cell-mediated immunity, and mucosal barriers, increasing susceptibility to nosocomial infections.[5] Alexopoulos et al.[8] demonstrated that inpatient hyperglycemia — consistently present in MetS patients — independently worsened complication rates and was associated with higher rates of infections and organ dysfunction.

New-onset acute kidney injury (AKI) occurred in 26.1% of MetS patients versus 7.4% of non-MetS patients ($p = 0.013$). Patients with MetS carry a background of chronic renal vulnerability from hypertension and diabetes, and any hemodynamic perturbation during hospitalization — dehydration, sepsis, nephrotoxic drugs — may precipitate AKI. This is consistent with the existing literature demonstrating a synergistic nephrotoxic effect of hyperglycemia, hypertension, and dyslipidemia.[2,5]

New-onset arrhythmia occurred significantly more frequently in the MetS group (17.4% vs. 3.7%, $p = 0.028$). Obesity is associated with increased cardiac adipose tissue, left ventricular hypertrophy, and autonomic dysregulation — all substrates for arrhythmogenesis. MetS further potentiates this risk through electrolyte disturbances from diuretic use and insulin resistance-associated sympathetic hyperactivation.

In-hospital mortality was 8.7% in the MetS group compared to 3.7% in the non-MetS group; though this did not reach statistical significance ($p = 0.283$), likely due to the limited sample size, the trend is clinically meaningful. Fanta et al.[6]observed that MetS was associated with significantly higher 30-day all-cause mortality in ACS patients, particularly in those who presented late to hospital. Discharge with complete recovery was significantly lower in MetS patients (65.2% vs. 88.9%, $p = 0.007$), indicating that even among survivors, residual morbidity, incomplete recovery, and need for continued care are far more prevalent.

This study provides a comprehensive clinical and biochemical characterization of MetS among hospitalized medical patients from a tertiary care setting. Its cross-sectional design and limited sample size of 100 patients restrict generalizability and preclude causal inference. The study was conducted in a single center, and seasonal variation in admissions may have influenced disease mix. Longer-term outcomes such as 30-day readmission rates and post-discharge mortality were not captured. Future multicenter prospective studies with larger cohorts and extended follow-up are warranted.

Conclusion

This study demonstrates that metabolic syndrome, present in 46% of hospitalized medical patients, is associated with a significantly higher comorbidity burden, more complex clinical presentation, prolonged hospital stay, greater complication rates including AKI and hospital-acquired infections, higher need for ICU transfer, and lower rates of complete recovery at discharge. These findings underscore the need for routine metabolic screening at admission, aggressive glycemic and blood pressure management, and a multidisciplinary approach to the care of obese and metabolically dysregulated inpatients.

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