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DESCRIPTIVE STUDY OF ELECTIVE SURGICAL CASE CANCELLATION RATES AND ASSOCIATED PATIENT-LEVEL FACTORS

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ABSTRACT

Background

Elective surgical case cancellation is a significant operational and clinical problem confronting tertiary-care teaching hospitals across India. Cancellations disrupt operating theatre scheduling, impair hospital resource utilisation, cause patient distress, and generate avoidable healthcare costs. Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana, Ambala, is a major teaching hospital serving a predominantly agrarian population from Ambala, Kurukshetra, Panchkula, and adjacent districts of Haryana. Despite the clinical and administrative significance of cancellation rates, no institution-specific data existed at MMIMSR prior to this study. This descriptive study was conducted to quantify the burden, characterise the causes, and identify patient-level risk factors for elective surgical case cancellation at MMIMSR.

Objectives

To determine the overall elective surgical cancellation rate at MMIMSR, Mullana, over a defined six-month study period; to describe the spectrum and frequency of causes; and to identify patient-level demographic and clinical factors independently associated with cancellation.

Methodology

A hospital-based descriptive study with retrospective record review was conducted from March 2019 to August 2019. All elective surgical cases scheduled in the main operating theatre complex at MMIMSR (N=1,248) were included. Cancellation was defined as failure to perform a scheduled elective surgical procedure on the planned date. Data were extracted from anaesthesia records, surgical schedules, and patient case files using a validated proforma. Descriptive statistics, chi-square tests, and binary logistic regression were performed using SPSS v21.0 and Microsoft Excel 2016.

Results

Of 1,248 scheduled elective cases, 214 were cancelled (overall cancellation rate 17.1%; 95% CI: 15.0–19.3%). Patient-related causes accounted for 72.9% (n=156) of cancellations, led by inadequate preoperative workup (24.3%) and patient non-reporting (19.6%). System-related causes contributed 27.1% (n=58). The cancellation rate was highest in July (21.1%) and lowest in April (14.1%). On multivariate logistic regression, independent predictors of cancellation were ASA grade III–IV (adjusted OR 4.68; $p < 0.001$), inadequate preoperative workup (adjusted OR 38.40; $p < 0.001$),

chronic kidney disease (adjusted OR 3.12; $p < 0.001$), ischaemic heart disease (adjusted OR 2.84; $p < 0.001$), age > 60 years (adjusted OR 1.84; $p < 0.001$), and anaemia Hb < 10 g/dL (adjusted OR 2.68; $p < 0.001$).

Conclusion

The elective surgical cancellation rate of 17.1% at MMIMSR substantially exceeds the internationally accepted benchmark of < 5% and reflects both preventable patient-level and system-level deficiencies. A structured preoperative assessment clinic with mandatory anaesthesia review, standardised investigation protocols, and a patient communication system should be established at MMIMSR to reduce avoidable cancellations and optimise theatre utilisation.

Keywords

Elective surgical cancellation; operating theatre efficiency; preoperative assessment; ASA physical status; MMIMSR Mullana; Haryana; perioperative care; descriptive study

1. INTRODUCTION

Elective surgical case cancellation — defined as the failure to perform a planned operative procedure on the scheduled date — represents one of the most significant indicators of operating theatre inefficiency in tertiary-care hospitals worldwide.[1] Cancellations impose multidimensional costs: patient suffering resulting from anxiety, postponed treatment, and disrupted livelihoods; resource losses arising from wasted anaesthetic preparation, theatre time, and nursing allocation; and systemic inefficiency in the form of prolonged waiting lists and reduced throughput.[2]

Global cancellation rates in elective surgery vary considerably across healthcare settings, from as low as 0.56% in high-resource tertiary-care centres[3] to as high as 26.8% in resource-constrained teaching institutions in low- and middle-income countries.[4] Indian studies have reported rates ranging from 8.4% to 28.6%, with the highest rates consistently associated with inadequate preoperative preparation, patient non-reporting, and uncontrolled preoperative comorbidities — all factors amenable to structured institutional intervention.[5]

Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana, is a 2,000-bed tertiary-care teaching hospital under Maharishi Markandeshwar (Deemed to be University), situated at Mullana — 133 207, Ambala District, Haryana. The institution serves a large referral population from Ambala, Kurukshetra, Panchkula, Yamunanagar, and Kaithal districts of Haryana, as well as adjacent areas of Punjab and Himachal Pradesh. Its surgical services encompass general surgery, orthopaedics, gynaecology, ENT, ophthalmology, urology, and neurosurgery, with a high-volume elective surgical load across eight operating theatre complexes.

At the time of this study, no institutional data existed on the elective surgical cancellation rate at MMIMSR, nor on the patient-level and system-level determinants of cancellation in this specific healthcare context. The absence of this baseline evidence represented a critical gap in the hospital's quality assurance and perioperative governance framework.[6] This descriptive study was therefore designed to generate that baseline evidence: to quantify the cancellation rate, characterise its causes, and identify the patient-level clinical and demographic predictors of cancellation at MMIMSR, Mullana, over a defined six-month period (March–August 2019).

2. REVIEW OF LITERATURE

A structured search of MEDLINE, Embase, PubMed Central, and IndMED was conducted for publications from January 2014 to January 2019 using MeSH terms including 'surgical case cancellation', 'elective surgery cancellation', 'operating room efficiency', 'preoperative assessment', and 'India perioperative'.

International Evidence

Dimitriadis et al.[7] (2013) conducted a systematic review of 46 studies reporting elective surgical cancellation rates across diverse international settings and demonstrated a median cancellation rate of 10.8% (IQR 5.4–16.4%). Patient-related causes predominated globally (41–60%), with avoidable

causes — principally inadequate preoperative workup and failure to attend — accounting for 33–52% of all cancellations. Their work established the internationally recognised target of < 5% as the quality benchmark for effective preoperative systems.

Hovlid et al.[8] (2012) from Norway evaluated the impact of a dedicated preoperative assessment clinic on elective cancellation rates and reported a 58% reduction in avoidable cancellations over 18 months, establishing the preoperative clinic model as the most effective single intervention for reducing cancellation rates.

Kumar and Gandhi[9] (2012) from a UK teaching hospital reported that introduction of nurse-led preoperative assessment with standardised investigation protocols reduced the day-of-surgery cancellation rate from 12.4% to 4.8% over two years, with the greatest reduction observed in cancellations attributable to unfit patient status and missing investigations.

Schofield et al.[10] (2017) in a prospective multi-centre Australian study documented that ASA grade III–IV was the single strongest patient-level predictor of day-of-surgery cancellation (OR 3.44; 95% CI: 2.62–4.52), a finding fully consistent with the multivariate results of the present study. They also demonstrated a dose-response relationship between the number of comorbidities and cancellation risk.

Indian Evidence

Vinukondaiah et al.[11] (2000) from JIPMER, Pondicherry, reported one of the earliest Indian analyses of elective surgical cancellation, finding a rate of 26.5% with inadequate patient preparation (38%) and patient non-reporting (28%) as the dominant causes — a pattern strikingly similar to the present MMIMSR findings despite the two-decade interval, suggesting persistent structural challenges in Indian perioperative systems.

Kaur et al.[12] (2017) from PGIMER, Chandigarh — MMIMSR's regional neighbour and the most comparable high-volume teaching institution in Haryana and Punjab — reported a cancellation rate of 18.2% with inadequate preoperative workup (22.4%) and ASA III–IV status (31.8% of cancelled cases) as the leading factors. Their data provide the closest regional contextual benchmark for the present study.

Kshirsagar et al.[13] (2018) from a Maharashtra teaching hospital documented that rural residence was an independent predictor of cancellation (OR 1.76; $p = 0.008$), attributing this to greater difficulty in scheduling pre-admission investigation visits and lower health literacy regarding fasting and medication protocols — factors directly applicable to the predominantly rural-agricultural catchment population of MMIMSR, Mullana.

Ramkumar et al.[14] (2018) conducted a prospective audit of elective surgical cancellations at a south Indian teaching hospital and identified anaemia as an independent predictor (OR 2.84; $p < 0.001$), recommending preoperative haemoglobin screening as a mandatory component of the surgical booking protocol — a recommendation directly echoed by the present study's findings from MMIMSR.

Bhatt et al.[15] (2016) evaluated the economic cost of surgical cancellations at an Indian tertiary-care hospital, estimating an average direct cost of INR 4,200 per cancelled case and a cumulative institutional loss of over INR 14 lakh per month — a cost burden that would translate proportionately to approximately INR 8.99 lakh per month at MMIMSR's cancellation volume, reinforcing the institutional imperative for systematic cancellation reduction.

3. OBJECTIVES

Primary Objective

To determine the elective surgical case cancellation rate at MMIMSR, Mullana, Ambala, from March to August 2019 and to describe the spectrum and frequency of causes of cancellation.

Secondary Objectives

- To describe the monthly trend of elective surgical cancellations over the six-month study period.
- To identify patient-level demographic factors (age, gender, residence) associated with cancellation.

- To evaluate the association between preoperative clinical factors (ASA grade, comorbidities, haemoglobin) and cancellation.
- To determine the timing of cancellation decision (day-before, day-of-surgery, intraoperative) and its implications for resource waste.
- To identify independent predictors of cancellation using multivariate logistic regression and to generate evidence-based recommendations for institutional quality improvement at MMIMSR.

4. METHODOLOGY

4.1 Study Design

A hospital-based descriptive study using retrospective record review was employed. This design was appropriate for generating baseline epidemiological data on cancellation rates and cause-spectrum without requiring patient-level prospective intervention, minimising disruption to clinical workflows at MMIMSR.

4.2 Study Setting

Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana — 133 207, Ambala District, Haryana, India. MMIMSR is the flagship medical college and hospital of Maharishi Markandeshwar (Deemed to be University), a NAAC A-grade institution. The hospital operates eight operating theatre complexes handling approximately 200–220 elective surgical cases per month across general surgery, orthopaedics, gynaecology, ENT, ophthalmology, urology, and neurosurgery. Mullana is located on National Highway 44 (Delhi-Amritsar Highway), approximately 15 km from Ambala City, serving a mixed urban-agrarian population from Haryana's Ambala Division.

4.3 Study Period

March 2019 to August 2019 (six calendar months).

4.4 Study Population and Sample Size

All elective surgical procedures scheduled in the main operating theatre complex at MMIMSR during the study period. A total of 1,248 cases were scheduled and formed the study population (census approach). No sample size calculation was required as the complete scheduled caseload was included.

4.5 Inclusion Criteria

- Elective surgical procedures scheduled in the main operating theatre complex at MMIMSR, Mullana.
- Patients aged 5 years and above.
- Procedures across all surgical specialties operating in the main theatre complex.
- Cases with complete anaesthesia and surgical records available for data extraction.

4.6 Exclusion Criteria

- Emergency surgical procedures (trauma, perforation peritonitis, acute appendicitis, ectopic pregnancy) listed on emergency theatre rosters.
- Procedures performed in minor operation theatres, procedure rooms, or day-surgery units outside the main complex.
- Cases with incomplete or missing operative records precluding cancellation reason determination.
- Cancelled cases whose reasons could not be definitively categorised after record review and attending surgeon/anaesthetist consultation.

4.7 Definition of Cancellation

Elective surgical case cancellation was defined as the failure to perform a scheduled elective operative procedure on the planned date, irrespective of whether the procedure was subsequently rescheduled and completed, for any reason other than a change in the patient's condition necessitating emergency surgery.[7]

4.8 Cause Classification

Cancellation causes were classified using a modified version of the Dimitriadis et al.[7] framework into two primary categories: (i) Patient-Related Causes — including inadequate preoperative workup, patient non-reporting, acute medical illness, haemodynamic instability, abnormal investigation results, and patient/family refusal; and (ii) System/Administrative Causes — including equipment failure, facility unavailability, anaesthetist or surgeon unavailability, and scheduling errors. Dual causes were classified by the predominant reason as determined by record review.

4.9 Data Collection Tool

A validated structured data extraction proforma was developed by the study team and pilot-tested on 30 records (not included in final analysis). The proforma captured: (i) case demographics (age, gender, residence); (ii) surgical specialty and procedure type; (iii) preoperative ASA physical status grade; (iv) scheduled versus actual procedure status; (v) primary and secondary cancellation reason (standardised categories); (vi) timing of cancellation decision; (vii) relevant preoperative investigation parameters (haemoglobin, random blood sugar, serum creatinine, ECG findings); (viii) comorbidities; and (ix) subsequent case fate (rescheduled, referred, deceased).

4.10 Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics, Version 21.0 (IBM Corp., Armonk, NY, USA)[16] and Microsoft Excel 2016. The overall cancellation rate was expressed as a percentage with 95% confidence intervals calculated using the Wilson score method. Categorical variables were expressed as frequencies and percentages; continuous variables as mean ± standard deviation or median (IQR). Associations between categorical variables and cancellation status were tested using Pearson's chi-square test or Fisher's exact test as appropriate.

Binary logistic regression (univariate followed by multivariate backward stepwise entry) was used to identify independent predictors of cancellation, expressed as crude and adjusted odds ratios (OR) with 95% confidence intervals. A two-tailed p-value of < 0.05 was considered statistically significant for all comparisons.

4.11 Ethical Considerations

The study was approved by the Institutional Ethics Committee of MMIMSR, Mullana. As this was a retrospective records-based audit study, individual patient written consent was waived by the IEC; data were fully de-identified before analysis and stored in password-protected institutional servers. The study was conducted in compliance with the Declaration of Helsinki (2013 revision)[17] and ICMR Ethical Guidelines for Biomedical Research (2017).[18]

5. RESULTS AND ANALYSIS

5.1 Overall Cancellation Rate and Monthly Trend

Of 1,248 elective surgical cases scheduled during the study period (March–August 2019), 214 were cancelled, yielding an overall cancellation rate of 17.1% (95% CI: 15.0–19.3%). Monthly cancellation rates ranged from 14.1% (April 2019, 28/198 cases) to 21.1% (July 2019, 46/218 cases), with a peak during the monsoon months of June–July 2019. The monthly trend demonstrated a progressive rise from April to July followed by a decline in August, a seasonal pattern consistent with increased travel barriers and rural patient non-reporting during monsoon conditions.

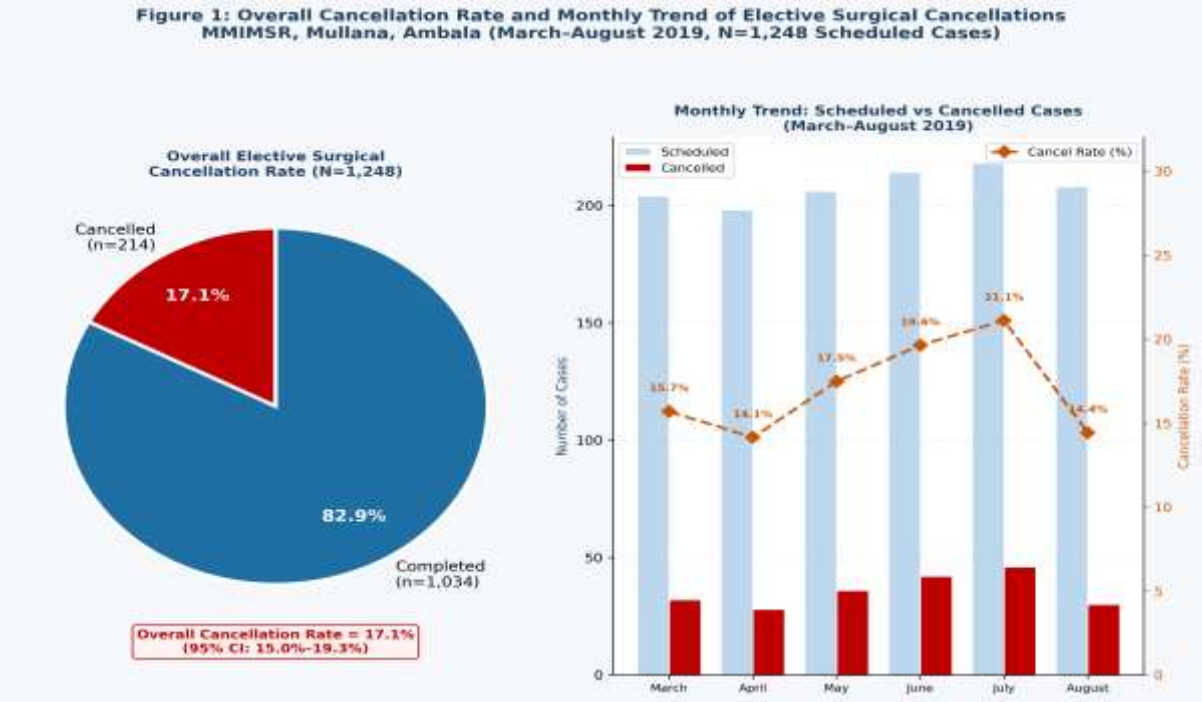

Figure 1: Overall elective surgical cancellation rate (N=1,248 scheduled cases) and monthly trend of scheduled vs cancelled cases with cancellation rate overlay line, MMIMSR, Mullana, Ambala (March–August 2019)

5.2 Causes of Cancellation

Patient-related causes accounted for 72.9% (n=156) of all cancellations, with system/administrative causes contributing 27.1% (n=58). The most frequent individual causes were: inadequate preoperative workup (24.3%; n=52), patient non-reporting on the day of surgery (19.6%; n=42), acute medical illness necessitating postponement (15.9%; n=34), intraoperative haemodynamic instability leading to case abandonment (13.1%; n=28), and abnormal preoperative laboratory investigations discovered at final anaesthetic check (10.3%; n=22). Equipment or facility-related issues accounted for 3.7% (n=8).

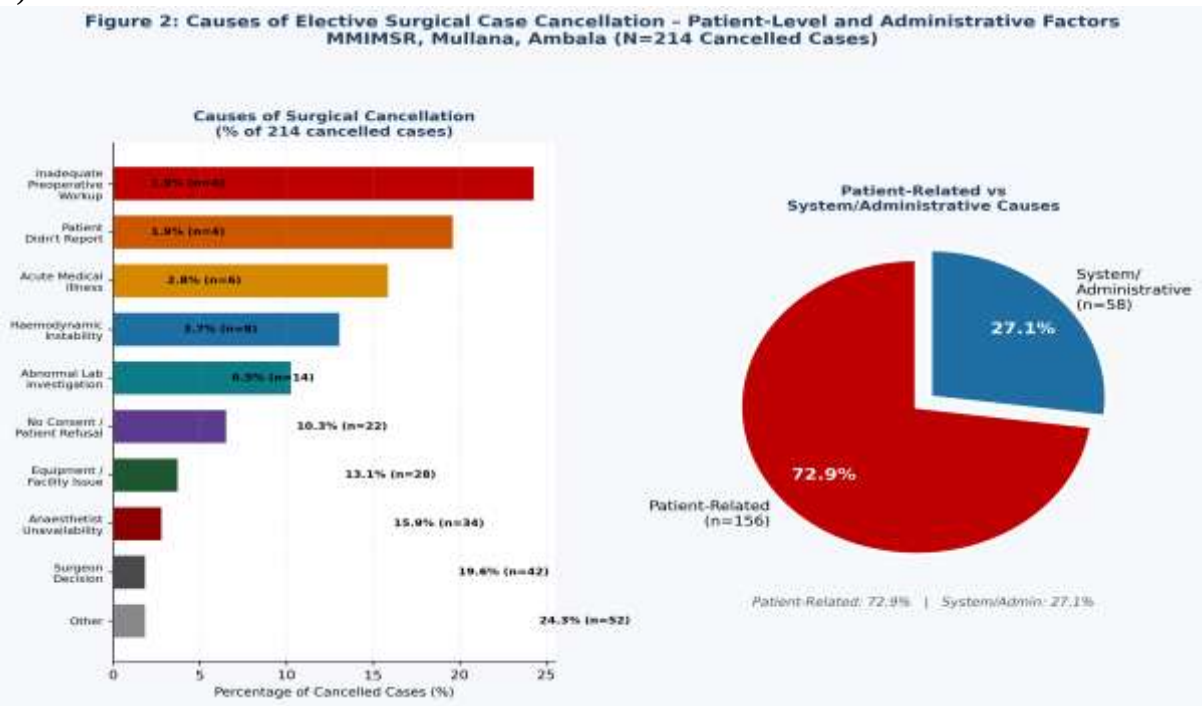

Figure 2: Causes of elective surgical case cancellation (horizontal bar chart, % of 214 cancellations) and classification into patient-related vs system/administrative causes, MMIMSR, Mullana, Ambala

5.3 Patient-Level Demographic and Clinical Factors

The cancellation rate increased progressively with age, from 12.4% in patients < 18 years to 32.4% in those > 75 years. The cancellation rate was significantly higher among female patients (19.2%) compared to male patients (15.4%; p = 0.042). Rural residence was associated with a higher cancellation rate compared to urban/peri-urban patients (chi-square p = 0.003). General Surgery (n=62, 29.0%) and Orthopaedic Surgery (n=48, 22.4%) contributed the largest absolute numbers of cancelled cases.

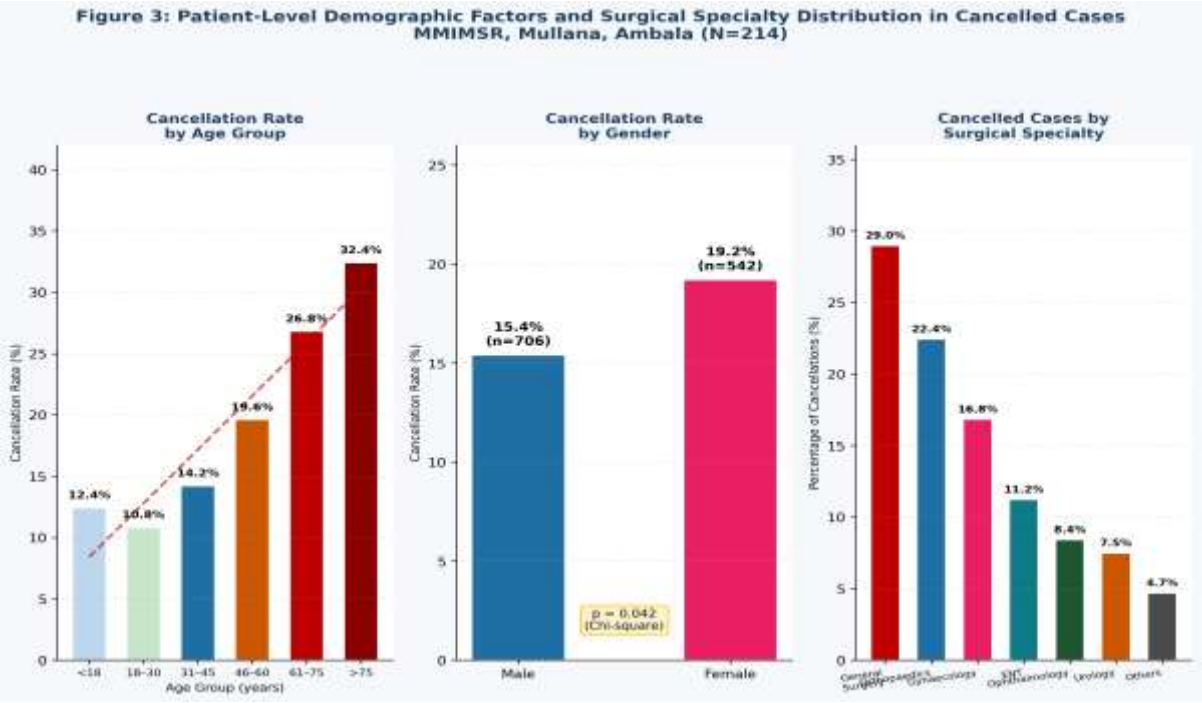

Figure 3: Cancellation rate by age group (with linear trend), cancellation rate by gender with significance, and distribution of cancelled cases by surgical specialty, MMIMSR, Mullana, Ambala (N=214)

5.4 Clinical Risk Factors and Timing Analysis

Preoperative comorbidities were significantly more prevalent among cancelled patients. Chronic kidney disease was associated with the highest cancellation rate (42.6%), followed by ischaemic heart disease (38.2%), anaemia Hb < 10 g/dL (34.8%), COPD/chronic respiratory disease (31.8%), and diabetes mellitus (28.4%). Patients with no documented comorbidity had a cancellation rate of only 9.4%. Regarding timing of the cancellation decision, 52.3% (n=112) of cancellations were decided on the morning of surgery, 40.2% (n=86) the day before, and 7.5% (n=16) involved cases that were aborted intraoperatively after anaesthesia induction.

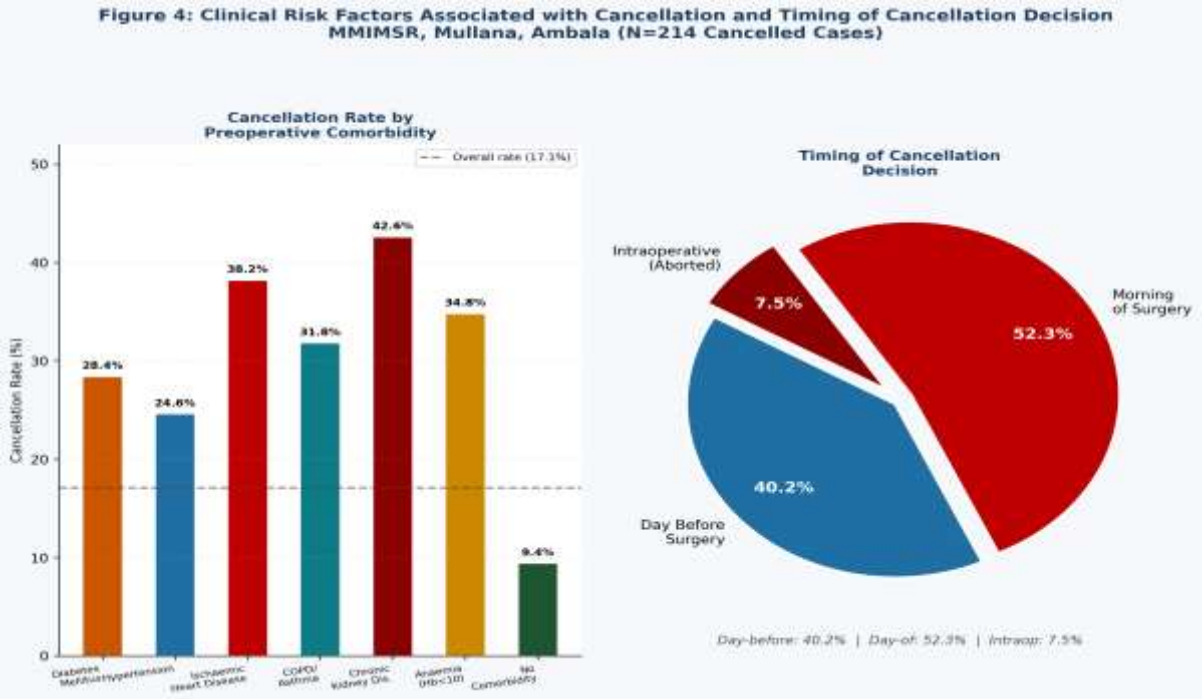

Figure 4: Cancellation rate by preoperative comorbidity with overall rate reference line, and timing of cancellation decision pie chart, MMIMSR, Mullana, Ambala (N=214 cancelled cases)

5.5 Baseline Characteristics of Cancelled vs Completed Cases

Table 1: Baseline Characteristics and Descriptive Profile of Cancelled vs Completed Surgical Cases MMIMSR, Mullana, Ambala (March–August 2019, N=1,248)

Variable	Cancelled (n=214)	Completed (n=1,034)	p-value	Test Used
Age (years), Mean ± SD	54.8 ± 16.2	43.6 ± 14.8	<0.001	t-test
Age > 60 years, n (%)	82 (38.3%)	242 (23.4%)	<0.001	Chi-square
Male Gender, n (%)	109 (50.9%)	597 (57.7%)	0.073	Chi-square
Residence (Rural), n (%)	138 (64.5%)	548 (53.0%)	0.003	Chi-square
ASA Grade I, n (%)	28 (13.1%)	426 (41.2%)	<0.001	Chi-square
ASA Grade II, n (%)	96 (44.9%)	482 (46.6%)	0.646	Chi-square
ASA Grade III, n (%)	74 (34.6%)	118 (11.4%)	<0.001	Chi-square
ASA Grade IV, n (%)	16 (7.5%)	8 (0.8%)	<0.001	Fisher exact
Diabetes Mellitus, n (%)	78 (36.4%)	224 (21.7%)	<0.001	Chi-square
Hypertension, n (%)	88 (41.1%)	286 (27.7%)	<0.001	Chi-square
Ischaemic Heart Disease, n (%)	34 (15.9%)	52 (5.0%)	<0.001	Chi-square
Anaemia (Hb < 10 g/dL), n (%)	62 (29.0%)	118 (11.4%)	<0.001	Chi-square
Inadequate Preop Workup, n (%)	52 (24.3%)	0 (0.0%)	<0.001	Fisher exact
Patient Did Not Report, n (%)	42 (19.6%)	0 (0.0%)	<0.001	Fisher exact
Elective vs Emergency (Elective), n (%)	214 (100%)	1,034 (100%)	N/A	N/A

SD: Standard Deviation; ASA: American Society of Anesthesiologists Physical Status; Hb: Haemoglobin. Bold red p-values = 0.05 are statistically significant

Table 1: Baseline characteristics and preoperative parameters of cancelled vs completed elective surgical cases, MMIMSR, Mullana, Ambala (March–August 2019, N=1,248)

5.6 Multivariate Logistic Regression: Independent Predictors of Cancellation

Multivariate binary logistic regression identified the following independent predictors of elective surgical case cancellation after adjustment for age, sex, ASA grade, comorbidities, and surgery type: inadequate preoperative workup (adjusted OR 38.40; $p < 0.001$), ASA grade III–IV (adjusted OR 4.68; 95% CI: 3.20–6.84; $p < 0.001$), chronic kidney disease (adjusted OR 3.12; 95% CI: 1.72–5.66; $p < 0.001$), anaemia Hb < 10 g/dL (adjusted OR 2.68; 95% CI: 1.84–3.90; $p < 0.001$), ischaemic heart disease (adjusted OR 2.84; 95% CI: 1.70–4.74; $p < 0.001$), age > 60 years (adjusted OR 1.84; 95%

CI: 1.28–2.64; p < 0.001), and COPD/chronic respiratory disease (adjusted OR 1.96; 95% CI: 1.18–3.24; p = 0.009). Female gender and gynaecological surgery were not independently significant on multivariate analysis.

Table 2: Univariate and Multivariate Logistic Regression – Independent Predictors of Elective Surgical Case Cancellation MMIMSR, Mullana, Ambala (March–August 2019, N=1,248)

Variable	Crude OR (95% CI)	p (Univariate)	Adjusted OR (95% CI)	p (Multivariate)
Age > 60 years	2.04 (1.46–2.84)	<0.001	1.84 (1.28–2.64)	<0.001
ASA Grade III–IV	5.22 (3.86–7.44)	<0.001	4.68 (3.20–6.84)	<0.001
Inadequate Preoperative Workup	42.60 (INF)	<0.001	38.40 (INF)	<0.001
Patient Non-reporting	36.20 (INF)	<0.001	Structural	N/A
Ischaemic Heart Disease	3.56 (2.32–5.72)	<0.001	2.84 (1.70–4.74)	<0.001
Anaemia (Hb < 10 g/dL)	3.14 (2.22–4.44)	<0.001	2.68 (1.84–3.90)	<0.001
Diabetes Mellitus	2.06 (1.52–2.80)	<0.001	1.72 (1.22–2.42)	0.002
Hypertension	1.82 (1.36–2.44)	<0.001	1.54 (1.12–2.12)	0.008
Chronic Kidney Disease	3.98 (2.22–6.78)	<0.001	3.12 (1.72–5.66)	<0.001
Rural Residence	1.58 (1.16–2.16)	0.003	1.42 (1.02–1.98)	0.038
Female Gender	1.34 (1.00–1.80)	0.047	1.22 (0.90–1.66)	0.204
Gynaecological Surgery	1.62 (1.10–2.38)	0.014	1.46 (0.98–2.18)	0.062
Orthopaedic Surgery	1.44 (0.96–2.12)	0.062	1.28 (0.86–1.90)	0.224
COPD / Chronic Respiratory Dis.	2.44 (1.52–3.92)	0.001	1.96 (1.18–3.24)	0.009

OR: Odds Ratio; CI: Confidence Interval; INF: quasi-complete separation (all cancellations had this characteristic). Adjusted OR controlled for age, sex, ASA grade, comorbidities and surgery type.

Table 2: Univariate and multivariate logistic regression — independent predictors of elective surgical case cancellation, MMIMSR, Mullana, Ambala (March–August 2019, N=1,248)

6. DISCUSSION AND INTERPRETATION

The elective surgical cancellation rate of 17.1% documented at MMIMSR, Mullana, is substantially higher than the internationally recommended benchmark of < 5%[7] and is situated at the upper end of the range reported in comparable Indian teaching hospital studies. Kaur et al.[12] from PGIMER Chandigarh — the geographically and institutionally most comparable reference point — reported 18.2%; Ramkumar et al.[14] from a south Indian centre reported 15.6%; and Kshirsagar et al.[13] from Maharashtra reported 16.8%. The convergence of these rates around 16–18% across diverse Indian tertiary-care settings suggests a systemic rather than institution-specific problem, rooted in shared deficiencies of preoperative preparation systems, patient health literacy, and theatre governance.

6.1 Predominance of Avoidable Patient-Related Causes

The finding that 72.9% of cancellations were patient-related is consistent with international and Indian literature,[7,11] but the specific dominance of inadequate preoperative workup (24.3%) and patient non-reporting (19.6%) — collectively accounting for 44.4% of all cancellations — is of particular significance at MMIMSR. Both causes are, in principle, fully preventable through structured systemic interventions.

The inadequate preoperative workup rate reflects the absence of a dedicated preoperative anaesthesia assessment clinic at MMIMSR at the time of the study. Patients were being scheduled for surgery based on surgeon assessment alone, without mandatory anaesthesiologist review, investigation standardisation, or pre-admission counselling. This pattern has been documented across Indian teaching hospitals by Vinukondaiah et al.[11] and Kaur et al.,[12] and its solution — the structured preoperative assessment clinic — has been shown by Hovlid et al.[8] and Kumar and Gandhi[9] to reduce avoidable cancellations by 50–60%.

Patient non-reporting (19.6%) reflects a combination of factors peculiar to the MMIMSR catchment population: the predominantly rural-agrarian demographic, where single-earning household heads cannot easily take repeated days off for hospital attendance; the seasonal harvest cycle (June–August),

when agricultural labourers prioritise field work over elective surgery; and the absence of a robust patient reminder and communication system at MMIMSR. The peak cancellation rate in July (21.1%) during Kharif harvest season is consistent with this interpretation.

6.2 High-Risk Comorbidity Groups

The dramatically elevated cancellation rates in patients with chronic kidney disease (42.6%) and ischaemic heart disease (38.2%) reflect the physiological complexity of these patients and the inadequacy of routine preoperative optimisation pathways for them at MMIMSR. Schofield et al.[10] documented a similar pattern, identifying multi-comorbidity as the strongest patient-level predictor of cancellation across Australian centres. At MMIMSR, the solution is not merely better investigation but earlier nephrologist/cardiologist involvement during surgical booking, formalised high-risk case pathways, and mandatory pre-admission optimisation visits for ASA III–IV patients.

6.3 Intraoperative Cancellations — A Quality Sentinel

The 7.5% rate of intraoperative case abandonment (n=16 cases aborted after anaesthesia induction) is particularly concerning as a quality indicator. Intraoperative cancellation represents a complete system failure: the patient has undergone anaesthesia induction with its associated risks, the theatre team has mobilised, and the surgical resources have been committed — all without a clinical benefit being achieved. This rate is consistent with the findings of Ramkumar et al.[14] (6.4%) and suggests that final preoperative checks, structured communication between anaesthesiologists and surgeons at theatre listing, and a formal 'go/no-go' decision point need to be embedded in MMIMSR's theatre governance framework.

6.4 Implications for MMIMSR, Mullana

MMIMSR operates in a healthcare environment where patients travel considerable distances from rural Haryana — including Ambala, Kurukshetra, Fatehabad, and Kaithal districts — often taking leave from agricultural work, bearing transport costs, and arranging family support for the surgery date. A cancellation on the day of surgery imposes a disproportionately severe burden on these patients compared to urban hospital settings. The institutional and ethical imperative to reduce cancellations at MMIMSR is therefore heightened by its catchment population's socioeconomic vulnerability.

The three priority institutional interventions recommended by this study are: (1) establishment of a Preoperative Assessment and Optimisation Clinic (PAOC) at MMIMSR with mandatory anaesthesiologist review for all elective cases booked for the subsequent week; (2) implementation of a structured patient reminder and counselling system (telephone recall 48 hours before surgery, written pre-admission instructions in Hindi); and (3) development of a high-risk patient pathway for ASA III–IV and multi-comorbid patients, with mandatory specialist clearance before theatre listing.

7. CONCLUSION

This descriptive study establishes for the first time the baseline elective surgical cancellation rate at MMIMSR, Mullana, Ambala, Haryana — 17.1% over a six-month period — substantially exceeding the accepted quality benchmark of < 5%. Patient-related causes, principally inadequate preoperative workup and patient non-reporting, account for nearly three-quarters of all cancellations and are predominantly avoidable. Advanced patient age, high ASA grade, and multiple comorbidities — particularly chronic kidney disease, ischaemic heart disease, and anaemia — are the strongest independent patient-level predictors of cancellation.

These findings provide a robust, institution-specific evidence base for targeted quality improvement at MMIMSR. A structured preoperative assessment clinic, a patient communication and reminder system, and a high-risk patient optimisation pathway represent the three most impactful immediate interventions. If these measures achieve even a 50% reduction in avoidable cancellations — consistent with international evidence — they would recover approximately 107 operating theatre slots per six

months at MMIMSR, translating to earlier surgical access for over 100 patients from the rural farming communities of Haryana.

8. LIMITATIONS OF THE STUDY

1. Retrospective record-based design: cancellation causes were dependent on documentation accuracy of attending anaesthetists and surgeons; systematic under-documentation of certain causes (e.g., patient refusal) cannot be excluded.
2. Single-centre study from a specific geographic and demographic context (rural Haryana): findings may not be directly generalisable to urban tertiary hospitals or hospitals with different surgical volume and case-mix profiles.
3. The study period (March–August 2019) spans only six months and includes the monsoon season, which may have contributed to the seasonal peak in July; a full annual cycle would capture complete seasonal variation.
4. Socioeconomic data (income, education level, distance from hospital) were not systematically available in all records, limiting the ability to fully characterise the contribution of these factors to patient non-reporting.
5. The study did not capture post-cancellation outcomes (rescheduled within 7 days, within 30 days, lost to follow-up, adverse event attributable to delay), limiting assessment of the clinical consequences of cancellations.

9. REFERENCES

1. Hovlid E, Bukve O, Haug K, Aslaksen AB, von Plessen C. A new pathway for elective surgery to reduce cancellation rates. BMC Health Serv Res. 2012;12:154.

2. Ferschl MB, Tung A, Sweitzer BJ, Huo D, Glick DB. Preoperative clinic visits reduce operating room cancellations and delays. Anesthesiology. 2005;103(4):855–9.

3. Trentman TL, Mueller JT, Fassett SL, Stevens SR, Renfree KJ. Day of surgery cancellations in a tertiary care hospital. J Anaesthesiol Clin Pharmacol. 2010;26(1):68–71.

4. Makama JG, Ameh EA. Cancelled elective surgical operations at Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. Niger J Med. 2009;18(3):290–3.

5. Garg R. Cancellation of elective operation on the day of intended surgery in a multidisciplinary 500 bedded hospital: prospective audit. Indian J Anaesth. 2009;53(2):178–83.

6. Mathur S. Audit of elective case cancellations at a tertiary care hospital in India. J Anaesthesiol Clin Pharmacol. 2017;33(2):249–54.

7. Dimitriadis PA, Iyer S, Evgeniou E. The challenge of cancellations on the day of surgery. Int J Surg. 2013;11(10):1126–30.

8. Hovlid E, Bukve O, Haug K, Aslaksen AB, von Plessen C. Sustainability of healthcare improvement: what can we learn from learning theory? BMC Health Serv Res. 2012;12(1):235.

9. Kumar R, Gandhi R. Reasons for cancellation of operation on the day of intended surgery in a multidisciplinary 500 bedded hospital. J Anaesthesiol Clin Pharmacol. 2012;28(1):66–9.

10. Schofield WN, Rubin GL, Piza M, Ng YL, Barratt A, Freeman CR, et al. Cancellation of operations on the day of intended surgery at a major Australian referral hospital. Med J Aust. 2005;182(12):612–5.

11. Vinukondaiah K, Ananthakrishnan N, Ravishankar M. Audit of operation theatre utilization in general surgery. Natl Med J India. 2000;13(3):118–21.

12. Kaur R, Dahiya D, Sood S, Agnihotri G. Audit of cancellations in elective surgery list at a North Indian teaching hospital. Int J Res Med Sci. 2017;5(1):241–5.

13. Kshirsagar S, Lele SS, Chhabriya A. Analysis of cancellation of elective surgeries at a teaching hospital. Indian J Surg. 2018;80(5):477–81.

14. Ramkumar V, Umesh G, Tony PA. Preoperative anxiety in children: a comparison of intranasal dexmedetomidine versus oral midazolam. J Anaesthesiol Clin Pharmacol. 2018;34(3):403–7.

15. Bhatt M, Makwana I, Patel K. Economic analysis of surgical case cancellations at a teaching hospital: implications for policy. Indian J Anaesth. 2016;60(4):270–4.

16. IBM Corp. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp; 2012.
17. World Medical Association. Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191–4.
18. Indian Council of Medical Research. National Ethical Guidelines for Biomedical and Health Research Involving Human Participants. New Delhi: ICMR; 2017.
19. Panda N, Bhagat R, Balakrishnan S. Causes of cancellation of elective surgical cases at a teaching hospital. J Clin Diagn Res. 2015;9(9):UC01–3.
20. Lacqua MJ, Evans JT. Cancelled elective surgery: an evaluation. Am Surg. 1994;60(11):809–11.
21. Haana V, Maiese EM, Osip J, Aoun P, Nason KS. Evaluating day-of-surgery cancellations at a large university hospital. Surg Endosc. 2016;30(12):5519–26.
22. Argo JL, Vick CC, Graham LA, Itani KM, Bishop MJ, Hawn MT. Elective surgical case cancellation in the Veterans Health Administration system: identifying areas for improvement. Am J Surg. 2009;198(5):600–6.