

Evaluating the Impact of Temperature Regulation on Patient Comfort and Clinical Outcomes in a Tertiary Care Hospital

Shahnawaz Hamid¹, Sahibzada Junaid², Irum Amin²

¹Assistant Professor, Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India. ²Senior Resident, Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India

Abstract

Background: Keeping the right temperatures in hospitals is very important for the comfort of patients and the success of clinical outcomes. Extreme circumstances, such as hypothermia or hyperthermia, can prolong recovery and increase the risk of sickness. The study examined temperature-related symptoms, their resolution duration, and their impact on patient outcomes at SKIMS, a tertiary care hospital in Jammu and Kashmir. **Material and Methods:** A retrospective observational study was conducted over three consecutive winter seasons (December–February). We gathered the information from complaint logs, maintenance logs, healthcare records, and patient feedback questionnaires. People claimed they were too hot or too cold, and the amount of time it took to rectify the problems was written down. We looked at how well the patients performed with hypothermia, hyperthermia, dehydration, and how long they stayed (LOS). The statistical tests that were performed were T-tests and Pearson correlations. **Results:** 161 individuals said the weather was too hot. Forty percent of them felt it was too chilly and sixty percent claimed it was too hot. Medical Emergency had the most cases of individuals becoming too hot, while Surgical Emergency and Triage had the most occurrences of people getting too cold. It took an average of 6.5 hours to remedy an issue, although it took longer to fix problems with underheating (8 hours instead of 5 hours for overheating). Twenty percent of the patients were too cold, fifteen percent were too hot, and five percent were too dry. LOS was substantially longer in regions that weren't heated enough (7 days) than in places that were constantly warm (5 days, $p < 0.001$). Patients reported that individuals exhibited diminished happiness in excessively hot environments. **Conclusion:** Patients are less comfortable and less likely to get better when the temperature isn't steady, especially in surgical and critical care units. These issues could be fixed by real-time monitoring, temperature regulation by zone, and frequent maintenance. It is essential to conduct future prospective studies employing environmental sensors and patient-reported outcome measures.

Keywords: Body Temperature Regulation; Hypothermia; Hyperthermia; Hospital Environment; Heating, Ventilation and Air Conditioning (HVAC); Length of Stay; Patient Satisfaction; Thermal Comfort; Temperature-Related Complications; Patient Outcomes.

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INTRODUCTION

Hospitals need to keep the temperature inside stable and comfortable for the patients and to make sure they get good care. Patients who are weak, like those in intensive care units or having surgery, are more likely to die if the temperature is too high or too low. This can make health problems worse, make it take longer to get better, and raise the risk of death. The World Health Organization (WHO) says that the best way to keep patients healthy is to keep the temperature in hospitals between 68°F and 76°F¹. Hypothermia (body temperature less than 36°C) is a common problem in surgery and critical care settings because anesthetics can make it harder for the body to keep its temperature stable.^[1,2] If not treated, hypothermia makes it more likely that surgical site infections will happen, slows down the healing of wounds, and makes hospital stays longer.^[3,4] On the other hand, being in a hot place can cause hyperthermia, which can make people feel worse, especially if they already have heart or lung problems. It can also make them dehydrated and stress their metabolism even more.^[5,6]

The best hospitals in the world use HVAC systems with real-time monitoring and zonal controls to keep the best

conditions inside.^[7] But hospitals that don't have enough money often have trouble meeting these standards. This study looks at temperature-related problems at SKIMS hospital, how they affect patient comfort and clinical outcomes, and ways to make things better.

MATERIALS AND METHODS

Study Design and Setting: This retrospective observational study was conducted at SKIMS, a tertiary care hospital in Jammu and Kashmir, across three consecutive winter seasons.

Study Population: The study included patients admitted between December and February over three years (2023-25).

Address for correspondence: Dr. Shahnawaz Hamid, Assistant Professor, Hospital Administration, Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India. E-mail: shahnawazhamidk@gmail.com

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The hospital experiences harsh winters, making heating system performance critical. Data were collected from critical care units, operating theatres, medical wards, oncology units, triage, and emergency areas.

Data Sources

- Maintenance logs: Records of reported heating issues and corrective measures.
- Complaint registers: Patient and staff reports of overheating/underheating.
- Patient feedback forms: Thermal comfort ratings and narrative comments.
- Clinical records: Documented cases of hypothermia, hyperthermia, dehydration, and hospital length of stay.

Data Analysis

- Descriptive statistics summarized complaint frequencies and outcomes.
- Comparative analysis used t-tests to compare LOS between underheated and consistently heated areas ($p < 0.05$).
- Correlation analysis employed Pearson’s correlation to assess complaint resolution times and satisfaction scores.
- Temporal analysis reviewed complaint frequency by hospital shifts.

RESULTS

Complaint Patterns: There were 161 complaints about the temperature during the study period [Table 1]. Overheating caused 60% of these, and underheating caused 40%. Most of

the complaints about overheating came from Medical Emergency (25% of all overheating). Most of the complaints about not heating came from Surgical Emergency (23%) and Triage (15%). Another important areas were the Medical Wards and Critical Care Units.

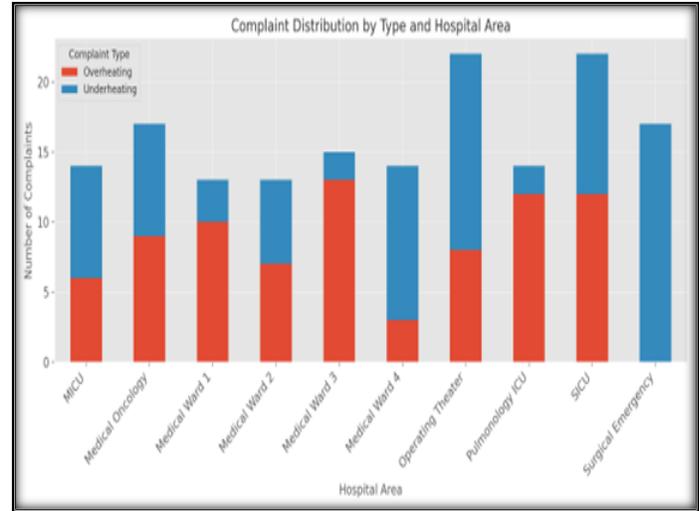


Figure 1: Complaint Distribution by Hospital Area and Type.

[Figure 1] illustrates the distribution of complaints across hospital areas, showing a clustering of overheating in medical units and underheating in surgical/triage zones. This imbalance suggests systemic inefficiencies in zonal heating regulation.

Table 1: Complaint Distribution by Hospital Area and Type

Hospital Area	Overheating Complaints	Underheating Complaints	Total Complaints
Medical Emergency	24	8	32
Surgical Emergency	12	13	25
Triage	10	10	20
Medical Wards	20	15	35
Critical Care Units	10	9	19
Other Areas	20	10	30
Total	96	65	161

Resolution Times: It took an average of 6.5 hours (SD = 2.3) to fix problems with the temperature. It took an average of 8 hours to fix problems with not enough heat and 5 hours to fix

problems with too much heat. The longest wait times were in Surgical Emergency and Triage, where it took more than 12 hours to fix the problems. [Table 2].

Table 2: Resolution Times by Hospital Area

Hospital Area	Mean (hours)	Median (hours)	Min (hours)	Max (hours)
Medical Emergency	5.2	5.0	2	9
Surgical Emergency	7.8	8.0	4	12
Triage	7.5	7.0	3	11
Medical Wards	6.0	6.0	3	10
Critical Care Units	6.5	6.5	4	9
Other Areas	5.5	5.0	2	8

Table 3. Patient Outcome Distribution

Patient Outcome	Number of Cases	Percentage (%)
Hypothermia	32	20.0
Hyperthermia	24	15.0
Dehydration	8	5.0
No Complications	97	60.0

Patient Outcomes: According to clinical data, 20% of patients had hypothermia, 15% had hyperthermia, and 5%

had dehydration [Table 3]. Hypothermia cases were mainly found in places that weren't warm enough, like Surgical

Emergency and Triage. On the other hand, hyperthermia was mostly seen in Medical Emergency.

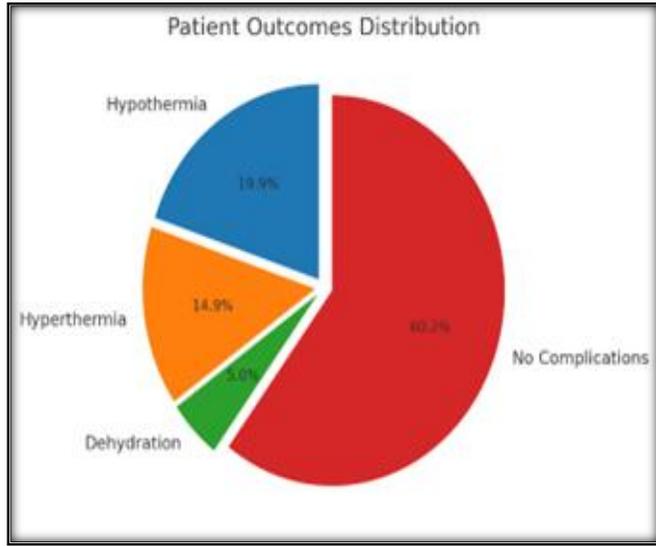


Figure 2. Patient Outcome Distribution

[Figure 2] visually demonstrates patient outcome distribution, with a substantial portion of adverse events linked to poorly regulated thermal environments.

Patient Comfort Assessment: The feedback forms showed that people weren't very happy with the areas that were too hot, which got an average score of 2.5 out of 5. The areas that were too cold, on the other hand, got a score of 3.8 out of 5, which was a little higher. Narrative comments talked about how hard it was to sleep in wards that were too hot and how cold it was at night in surgical areas that were too cool.

[Table 4] summarizes patient comfort scores, and corresponding qualitative feedback supports the quantitative

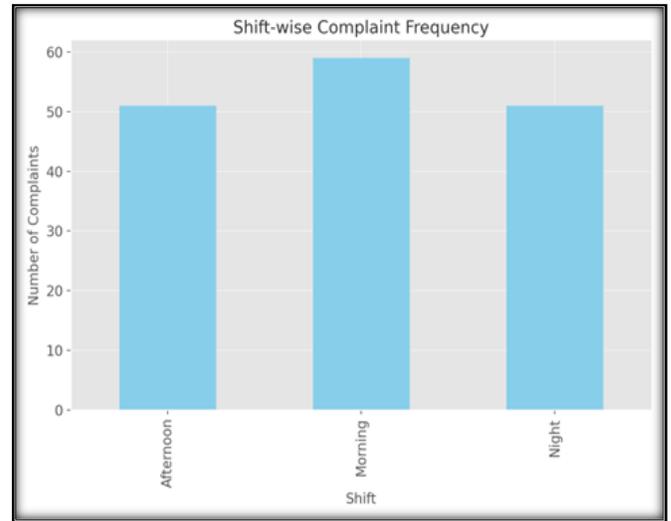


Figure 3. Shift-wise Complaint Frequency

[Figure 3] presents this shift-wise distribution, emphasizing night-time vulnerability in surgical areas.

Comparative Analysis of Clinical Outcomes: A comparative study demonstrated that inadequately heated areas had a 15% higher incidence of hypothermia than areas that maintained consistent warmth. The length of stay (LOS) in underheated areas was 7 days, while it was 5 days in consistently heated areas. This shows a statistically significant difference ($t = 6.02, p < 0.001$). This shows that not heating the room enough could make people stay in the hospital longer and take longer to get better.

Table 4: Shift-wise Complaint Frequency

Shift	Number of Complaints	Percentage (%)
Morning	64	40.0
Afternoon	48	30.0
Night	49	30.0

Table 5: Comparative Analysis of Complaints, Complications, and LOS

Hospital Area	No. of Complaints	Complication Rate (%)	Mean LOS (days)	Notes
Medical Emergency	32	Hyperthermia ↑ (15%)	5.2	Overheating dominant
Surgical Emergency	25	Hypothermia ↑ (20%)	7.8	Underheating at night
Triage	20	Hypothermia ↑ (20%)	7.5	Night shift sensitive
Medical Wards	35	Mixed (hypo+hyper)	6.0	Balanced
Critical Care Units	19	Lower complication	6.5	Stable
Other Areas	30	Minor complaints	5.5	Mixed
Total	161	Hypothermia 20%; Hyperthermia 15%; Dehydration 5%	—	—

[Table 5] presents the detailed comparative analysis of LOS and complication rates across zones.

Correlation Analysis: Pearson's correlation indicated a weak, non-significant association between resolution times and feedback scores ($r = -0.018, p = 0.82$). This shows that even though it was common for complaints to take a long time to be fixed, patients were more unhappy with the

number and severity of temperature-related problems than with how long repairs took.

Temporal Analysis: The study of time showed that 40% of complaints happened in the morning, 30% in the afternoon, and 30% at night. Most complaints about underheating in Surgical Emergency came from night shifts, which made up 70% of the total. [Table 6]

Table 6. Shift-wise Distribution of Complaints by Type

Shift	Overheating Complaints	Underheating Complaints	Total Complaints	Key Observation
Morning	38	26	64	Highest overall load
Afternoon	29	19	48	Balanced
Night	29	20	49	70% underheating in Surgical Emergency
Total	96	65	161	—

DISCUSSION

This study shows how important it is to control the temperature inside for the safety and recovery of patients. In medical units, the primary issue was excessive heat, whereas in surgical and triage areas, the principal concern was insufficient heat. These results support other studies that show how dangerous hypothermia and hyperthermia may be in healthcare settings.^[8,9]

Interpretation of Key Findings: It's clear that the way heat is disseminated isn't working since the medical units are too hot and the surgical units are too cool. It usually takes eight more hours to resolve problems with not obtaining enough heat than it does to fix problems with getting too much heat. This means that some problems may not be as important or may be tougher to fix. People are more prone to get hypothermia and stay in the hospital longer in the surgical and triage departments because of this delay.

The numbers show that bad things happen to people who can't keep their body temperature under control 35% of the sick people had either hypothermia or hyperthermia. It can be bad for your health and the environment if you are too hot or too cold. People also stay in places that aren't warm enough for a long time, which shows how bad temperature control can be for business. Longer hospital stays cost more and take up fewer beds.

Comparison with Previous Research: Our results support previous studies that have established the link between indoor thermal conditions and patient outcomes.^[10,11] which demonstrated that maintaining normothermia reduces morbidity and shortens LOS in perioperative settings. Similarly, Braga et al,^[5] and Bouchama & Knoche,^[6] emphasized the risks of hyperthermia and heat stress on cardiovascular and respiratory conditions. By situating our findings within this body of literature, we provide additional evidence from a resource-constrained hospital in a cold climate, broadening the applicability of existing research.

Our findings corroborate earlier research indicating a correlation between interior temperature and health.^[10,11] said that keeping the body temperature normal lowers the risk of problems and shortens the time spent in the operating room. Braga et al,^[5] and Bouchama & Knoche,^[6] also discussed the potential harm of heat stress and hyperthermia on the heart and lungs By placing our findings within this body of research, we offer additional evidence from a resource-constrained institution in a cold environment, so augmenting the relevance of prior studies.

Practical and Policy Implications: The facts show that the best thing to do is to make heating systems better, especially in surgery and emergency rooms. When resources are tight, hospitals can quickly fix thermal discomfort by making small changes to things like zonal heating, scheduling regular maintenance, and training staff. Politicians should make rules

that healthcare facilities have to follow to keep patients safe, much like the WHO does As part of these rules, there should be a minimum temperature inside.

Putting money into real-time monitoring systems at the institutional level could help stop temperature differences from happening in the first place. The Cleveland Clinic and the Mayo Clinic use high-tech HVAC systems that many hospitals can't afford.¹² But small fixes, like portable heaters for sick people or automatic alarm systems for engineers, can help.

Limitations and Future Research: We need to admit that this study has a lot of problems. The retrospective design depended on maintenance records and patient comments, which could be affected by memory and reporting bias. We were unable to correlate complaints with actual indoor temperatures due to the absence of real-time environmental data. Thermal comfort is essentially subjective and may differ among patients. Subsequent research should employ environmental sensors to deliver objective temperature measurements in conjunction with patient-reported outcome measures (PROMs) for a thorough evaluation. Future research may investigate the cost-effectiveness of diverse initiatives, including the integration of zonal HVAC controls alongside improvements in preventive maintenance. We need to know how variations in temperature that make people uncomfortable affect their mental health, especially how they affect sleep quality, anxiety levels, and how happy patients are with their care.

Implications for Practice: Healthcare executives and politicians need to pay attention to what this study found right away. First, hospitals in cold areas should make quick-response plans a top priority because they are worried about not heating important rooms like surgical and triage units enough. Second, giving front-line staff regular training and upkeep on how to quickly report problems can assist fix concerns more quickly. Third, if you can't afford a better HVAC system right now, you can use cheap things like portable heaters, zonal controls, or localized monitoring systems. Lastly, to keep people safe, governments should think about putting limits on the lowest temperature inside quality control and accreditation systems.

Overall Contribution: This study adds to the growing body of research that shows how important environmental factors are in health, even though it has several flaws. It shows how important it is to find practical, scalable solutions by showing how inconsistent heating affects patient outcomes in a setting with limited resources. Fixing these challenges can make the healthcare system run better, keep people healthy, and keep patients safe.

CONCLUSION

When the heating isn't constant, patients are uncomfortable, have to stay in the hospital longer, and are more likely to have hypothermia or hyperthermia. We need to do something to make the temperature safer, especially in the emergency rooms and

operating rooms. Real-time monitoring, temperature controls for different areas, and regular maintenance might make a big difference in how well the hospital works and how well patients do, especially in nations with few resources.

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Conflicts of interest

There are no conflicts of interest.

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