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Original Research Article

Evaluation of the Effectiveness of Different Strategies for Managing Chemotherapy-Related Adverse Events

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Abstract

Background: Chemotherapy is a primary treatment for cancer but is frequently associated with a variety of adverse events (AEs) that can hinder treatment efficacy, affect patient quality of life, and compromise adherence to treatment regimens. Effective management of these AEs is essential for optimizing patient outcomes. Despite the widespread use of pharmacological and non-pharmacological interventions, the real-world effectiveness of these strategies, particularly in tertiary care settings in India, remains under-explored.

Objectives: The objective of this study was to evaluate the effectiveness of different pharmacological and non-pharmacological strategies for managing chemotherapy-induced AEs at Patna Medical College & Hospital (PMCH), Patna, Bihar, and to assess the impact of these strategies on symptom severity, patient well-being, and treatment adherence.

Methods: This was a prospective observational study conducted from January 2025 to June2025. The study involved 100 patients undergoing chemotherapy for various types of cancer, including breast, lung, and colorectal cancers. Data were collected using structured questionnaires, AE grading scales (CTCAE v5.0), and patient interviews over three chemotherapy cycles. Pharmacological interventions (antiemetics, G-CSF, analgesics) and non-pharmacological interventions (nutritional counseling, yoga, psychological support, acupuncture) were assessed for their effectiveness in managing AEs.

Results: The study found that pharmacological strategies, particularly antiemetics and G-CSF, significantly reduced the severity of nausea, vomiting, and neutropenia ($p < 0.001$ and $p < 0.01$, respectively). Non-pharmacological strategies, including nutritional therapy and yoga, also showed significant reductions in AE severity ($p < 0.05$). Psychological support, while modest in statistical impact, contributed to improved patient morale and adherence.

Conclusion: This study concludes that a combined approach involving both pharmacological and non-pharmacological interventions is effective in managing chemotherapy-related AEs. The integration of supportive care alongside conventional treatments improves patient comfort, enhances adherence, and may lead to better clinical outcomes. The study recommends adopting a holistic management protocol at tertiary care centers in India to improve cancer care.

Keywords: Chemotherapy, Adverse Events, Pharmacological Strategies, Non-Pharmacological Strategies, G-CSF, Antiemetics, Nutritional Counseling, Yoga, Psychological Support, Cancer Care, India, Integrated Care, Oncology.

Introduction

Cancer, including solid and haematological cancers, is still treated with chemotherapy. Its proven efficacy in reducing tumour burden, halting disease progression, and improving survival underpins its standard treatment [1]. Even while chemotherapy has many therapeutic benefits, its high rate of adverse events (AEs) can harm patients' physical and mental health. These adverse effects influence quality of life and cancer treatment success [2]. They make it tougher for patients to follow their treatment goals, resulting in lower doses or early chemotherapy discontinuation. Chemotherapies can induce minor to severe side effects depending on the patient's health, dosage, delivery method, and medication [3]. Most common side effects include nausea, vomiting, haematological toxicities such neutropenia, anaemia, and thrombocytopenia, mucositis,

alopecia, peripheral neuropathy, fatigue, and immunosuppression. These AEs that cause fatalities or hospital readmissions may burden healthcare systems and patient families. These adverse effects can cause depression, anxiety, and poor emotional health, which can make it hard for patients to take their prescription [4].

In response to these concerns, many methods have been developed and used worldwide to reduce chemotherapy side effects. These therapies are classed as pharmacological or non-pharmacological [5]. Antiemetics, colony-stimulating factors, haematopoietic agents, painkillers, antidiarrheals, mucosal protectants, aprepitant, dexamethasone, and ondansetron cure nausea and vomiting. Clinical trials and real-world applications have proven that these drugs have varying efficacy [6]. Nutritional therapies, exercise programs, psychotherapy, alternative medicine (acupuncture, aromatherapy, yoga, and dietary supplements), and patient information campaigns are non-pharmacological approaches. Integrative oncology utilises pharmaceutical and non-pharmacological ways to treat patients holistically, and more cancer institutes are acknowledging its usefulness [7]. Research shows that combining techniques improves adverse event mitigation, gives patients coping skills, reduces hospital stays, and improves treatment outcomes. These interventions' evidence base in low- and middle-income countries like India often lacks diversity of sample, geographical representation, and applicability to local healthcare settings [8].

Due to its large and diverse population, chemotherapy-induced toxicities are difficult to manage in India [9]. Different healthcare infrastructures, a lack of patient education on adverse event therapy, and difficulty with ongoing monitoring and follow-up are some of these concerns. Tertiary care facilities like Patna Medical College & Hospital attract cancer patients from Bihar and nearby states. With a high patient load, limited resources, and sociocultural factors affecting medication adherence, current AE management strategies must be evaluated [10]. Understanding how therapies work outside of clinical trials is crucial to optimising treatment pathways and allocating resources efficiently. Indian cancer patients and their families often experience significant financial and emotional burdens. Due to limited public healthcare coverage and high out-of-pocket costs, many chemotherapy patients struggle to buy supportive medications. Finding efficient and cost-effective ways to manage unfavourable events is crucial [11]. Most Indian patients' families are carers, which adds complexity because patients' perspectives, availability, and information about their condition affect treatment decisions and outcomes. The need of understanding management theories and their efficacy in India is highlighted [12].

We analyse several techniques to managing chemotherapy-induced side effects in 100 PMCH-treated cancer patients to fill this information gap. The study examines how pharmaceutical and non-pharmaceutical interventions affect patient adverse events (AEs) across three months. Another goal is to discover the best ways to treat symptoms, make patients happy, and keep them on therapy. This evidence will assist build a local patient-centered adverse event management strategy that improves outcomes and guides policy at institutional and regional levels. Another reason this study is relevant is that it may help Indian public hospitals standardise adverse event management. The study records the real-world efficacy of different medicines to produce evidence-based guidance for the Indian healthcare system. The data can also inform healthcare worker education programs, especially for paramedical and nursing staff who protect patients from chemotherapy side effects.

Another highlight is the study's focus on patient input and experience. Clinical assessments of adverse events often ignore patient subjective experiences in favour of physician interpretation and laboratory measures. Reported outcomes from patients assist researchers understand chemotherapy side effects and the perceived benefit of different methods. This strategy follows the global trend of incorporating patient perspectives into healthcare delivery and clinical research to create a more inclusive and responsive cancer care system. To conclude, chemotherapy is still necessary for cancer treatment, but side effects prevent optimal care. There are several therapeutic choices, but their efficacy in tertiary care in India has not been adequately studied. This Patna Medical College & Hospital study compares pharmaceutical and non-pharmacological adverse event management methods to fill that gap.

This targeted observational study provides actionable insights supported by evidence to improve cancer care at PMCH and other nearby hospitals. The findings may stimulate supportive cancer care research and innovation in India while increasing patient outcomes and generating more sustainable cancer treatment paradigms.

Methodology

Study Design and Setting: This prospective observational study examined cancer care at Patna Medical College & Hospital in Bihar. Bihar and nearby residents visit PMCH, a large tertiary care teaching hospital. Due to its diverse patient mix and large number of cancer patients, this institution was ideal for testing chemotherapy-related adverse event (AE) management approaches. The study

was done from January to June 2025 to evaluate AE management over several treatment cycles.

Study Population and Sampling: Purposive sampling selected 100 chemotherapy participants for the trial. The trial required participants to be 18 years old, have a cancer diagnosis, be undergoing chemotherapy, and have had at least one chemotherapy-related adverse event. Before giving informed consent, participants had to understand the study's goals and methodology. The study excluded patients receiving just palliative care, those with severe psychiatric condition that could impair the assessment, and pregnant or lactating women to ensure data quality and ethics.

Data Collection Tools and Procedure: To ensure accurate data collection, standardised questionnaires, patient interviews, record checks, and adverse event grading were used. To identify and rate AEs, the CTCAE Version 5.0, an internationally recognised method for tracking and recording treatment-related toxicities, was utilised.

We collected gender, age, cancer type, treatment regimen, and performance status at enrolling. Patients' reported and observed adverse effects were recorded during each of the three treatment rounds to evaluate if they worsened or disappeared. Each adverse event (AE) was systematically recorded for pharmaceutical and non-pharmacological therapies, such as nutritional counselling, hydration therapy, psychological support, yoga, and acupuncture. Interviews with patients and physicians collected qualitative variables such perceived relief, contentment, and compliance with supportive care.

Interventions Observed: This observational study documented PMCH staff procedures rather than imposing a new therapy or approach. Antiemetics (ondansetron, aprepitant), analgesics (NSAIDs, opioids), colony-stimulating factors (G-CSF) for neutropenia, and opioids were also given. Allied healthcare personnel provided food advising, hydration therapy, psychological support, psychotherapy, and, in rare cases, integrative therapies including yoga, acupressure, and acupuncture. We monitored severity grade and patient-reported outcomes to evaluate each adverse event (AE) and its management approach.

Statistical Analysis: Data was coded and entered into IBM SPSS Statistics for analysis. Frequencies, percentages, averages, and standard deviations were used to summarise demographic data and adverse event categories and severity. We applied chi-square tests on categorical variables and one-way ANOVA to evaluate the mean changes in severity scores across intervention groups to see if pharmacological or non-pharmacological strategies reduced AE severity. A p-value below 0.05 was statistically significant.

Results

Table 1: Demographic Characteristics of Study Participants (n = 100)

Variable	Value
Mean Age (years)	52.4
Gender	Male: 58%, Female: 42%
Common Cancer Types	Breast: 22%
	Lung: 20%
	Colorectal: 18%
	Others: 40%

Table shows demographics of 100 Patna Medical College & Hospital cancer patients who participated in the study.

In line with India's cancer prevalence, most participants were middle-aged, with a mean age of 52.4 years. This group had 58% men and 42% women. Since there are more women in that group and breast cancer screening rates are rising, breast cancer (22% of all cancers) is the most common. Lung (20%) and colorectal (18%) cancers were also common, following national and global trends.

The remaining 40%, which included ovarian, head and neck, cervical, and haematologic tumours, showed a heterogeneous oncology population and a broad base for investigating chemotherapy-induced side effects.

Table 2: Frequency of Common Chemotherapy-Related Adverse Events (AEs)

Adverse Event	Frequency (%)
Nausea/Vomiting	80%
Fatigue	70%
Neutropenia	35%
Mucositis	25%
Peripheral Neuropathy	18%

In this table, important chemotherapy adverse effects and their incidence in the study population are listed. Most patients (80%) had nausea and vomiting. It was strongly related with platinum-based and anthracycline regimens. Fatigue in 70% of patients may have been caused by disease burden, anaemia, and treatment-related systemic effects. G-CSF is needed to prevent infections since bone marrow suppression caused neutropenia in 35% of individuals. Along with peripheral neuropathy (18%) and mucositis (25%), high-dose chemotherapy and neurotoxic medicines such taxanes and platinum compounds increased. These findings emphasise the multifaceted burden of chemotherapy and the importance of symptom monitoring and management.

Table 3: Effectiveness of Different AE Management Strategies

Management Strategy	Mean AE Severity Score (Pre)	Mean AE Severity Score (Post)	P-value
Antiemetics	3.4	1.2	<0.001
G-CSF for Neutropenia	3.7	1.5	<0.01
Nutritional Therapy	2.5	1.7	0.04
Psychological Support	2.2	1.6	0.07
Acupuncture/Yoga	2.6	1.4	0.03

The study's primary findings, which compared adverse event severity scores before and after management strategies, are shown in this table. We provided the p-value to show how significant the changes were. After using antiemetics like ondansetron, aprepitant, and dexamethasone, the severity score decreased considerably from 3.4 to 1.2 ($p < 0.001$). These drugs have been shown to reduce chemotherapy-induced nausea and vomiting, supporting their use in clinical practice. Using G-CSF to control and prevent neutropenia reduced severity levels from 3.7 to 1.5 ($p < 0.01$). Statistical evidence supports G-CSF's role in reducing infection risks and helping patients stick to chemotherapy. After nutritional therapy, including diet and supplements, the score improved from 2.5 to 1.7 ($p = 0.04$). This emphasises the role of nutrition in minimising treatment-related fatigue and maintaining health. Psychological treatment, including counselling and stress management, improved non-significantly (2.2 to 1.6, $p = 0.07$). The trend seemed promising, but the results weren't statistically significant, so either the subgroup's sample size was too small or more follow-up is needed. After acupuncture and yoga, adverse event severity decreased from 2.6 to 1.4 ($p = 0.03$). This suggests that integrative therapies should be included of supportive cancer therapy to improve patient-reported outcomes like anxiety, pain, and health. All of these readings contextualise the evidence-based understanding of how different therapies manage chemotherapy-induced side effects in hospitals.

Discussion

Chemotherapy-induced adverse events (AEs) impair patients' physical function, mental health, and treatment compliance, hindering cancer treatment. This study examined pharmaceutical and non-pharmacological methods for minimising adverse events (AEs) at Patna Medical College & Hospital (PMCH), Patna, and Bihar. The results show how to optimise AE management in real-life tertiary care and the need for a multi-pronged approach.

Comparison of Findings with Other Studies: This study supports integrative management strategies, as has been shown by the National Cancer Institute and others. [13] Study found that antiemetics, notably 5-HT3 receptor antagonists, significantly reduced chemotherapy-induced nausea and vomiting. G-CSF's significant improvement matches ASCO and ESMO's chemotherapy-induced neutropenia standards. Yoga and acupuncture, formerly considered complementary, are now used to cure cancer. Our results showed a statistically significant reduction in AE severity with yoga and meditation programs ($p = 0.03$), consistent with a randomised trial in [14] showing improved emotional resilience and fatigue. Psychological support improved patients' emotional well-being and adherence, but only slightly reduced AE severity ($p = 0.07$) in our trial. [15] Study has demonstrated that mental health care can reduce chemotherapy-related anxiety, melancholy, and symptom burden.

Interpretation of Significant Associations: Pharmaceutical approaches reduced AE severity the most, according to our statistical analysis. For instance, antiemetic medicine is recommended as a first treatment for nausea and vomiting due to its significant p-value (<0.001). G-CSF exhibits substantial connection ($p < 0.01$) with neutropenia reduction, indicating its potential for prevention and treatment. Yoga and acupuncture were the only non-pharmacological therapy to attain statistical significance ($p = 0.03$), showing that they work well together than alone. Nutritional support was somewhat significant ($p = 0.04$) due to its long-term impacts on strength and immune response. Even though it was not statistically significant, psychological assistance affected patient satisfaction and compliance. These associations suggest the need for individualised treatment plans that consider the patient's cultural background,

psychiatric condition, socioeconomic level, and AEs. In fact, customised techniques may yield the best outcomes.

Implications: This research has broad implications. First, it emphasises the importance of including pharmaceutical and non-pharmacological approaches in chemotherapy treatment for cancer patients. Unlike medications, which address symptoms quickly and precisely, supportive therapies improve resilience, quality of life, and treatment adherence. These findings may influence cancer treatment at PMCH and other Indian tertiary care centres due to funding restrictions and a lack of holistic treatment. Second, the study prepares cancer departments to expand supportive care. Registered nutritionists, psychologists, and physiotherapists, as well as yoga and wellness programs, can improve patient outcomes. Thirdly, the data show that politicians must adopt comprehensive supportive care models to address cancer patients' multifaceted needs beyond tumour suppression.

Strengths of the Study: In Eastern India, systematic evaluation of AE management choices in real-world settings is rare, and this study from PMCH, a public tertiary care hospital, is significant. Prospective design and three treatment cycles ensured consistent and dynamic data. ANOVA and Chi-square testing allowed robust association interpretation, and CTCAE v5.0 ensured reliable AE severity rating. By tracking pharmaceutical and non-pharmacological therapies, the study provides a complete view of AE management. The vast demographic representation and diversity of malignancies may make results more applicable to comparable hospital settings in India.

Limitations: This study has benefits and weaknesses. First, the three-month duration may make it difficult to detect delayed adverse events or chronic symptoms, limiting long-term outcome assessment. Second, because the study was conducted at one location, the results may not apply to private hospitals or other areas with different clinical practices and patient groups. We sought to measure quantitative and qualitative patient-reported outcomes and psychological well-being, but there were few methods. Validated QoL measures like the EORTC QLQ-C30 could be used in future studies. Patient self-reporting biases and chemotherapy regimen variances may have altered adverse event patterns and therapy efficacy. Because the interventions were observed rather than randomised, confounding variables may have altered the results. If patients who received psychological therapy had better family networks or higher health literacy, the results may have been skewed.

Conclusion

Effective chemotherapy adverse event (AE) management improves therapeutic outcomes, patient quality of life, and treatment adherence. This study from Patna Medical College & Hospital (PMCH) in Bihar found that a full, multi-modal strategy controlled chemotherapy-induced AEs well. AE severity improved significantly with antiemetics for vomiting and nausea and G-CSF for neutropenia. These medications' data-backed results and fast impacts make them critical frontline options. Despite their importance, non-pharmacological interventions are often overlooked. Nutritional therapy, yoga, acupuncture, and psychological counselling increased patients' well-being and resilience, but statistical significance varied. These approaches dramatically affected treatment compliance, especially with long-term chemotherapy. Integrated medical and supportive care reduced therapy interruption and enhanced tolerance. This study suggests PMCH and other cancer centres take a more holistic and patient-centered approach. Oncologists and supportive care experts could enhance patient outcomes by implementing an integrated management regimen that frequently assessed and responded for adverse events. In addition, institutional adoption will require supportive care infrastructure and complementary therapy training for healthcare personnel. Finally, treating chemotherapy-related AEs, which are more than symptoms, is essential to humanised cancer care. This study lays the framework for institutionalising integrative care methods in Indian oncology.

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