

Prospective Analysis of Chemotherapy-Induced Peripheral Neuropathy and Its Effect on Quality of Life in Patients with Solid Malignancies: An Institutional Based Study

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ABSTRACT

Background: Chemotherapy-induced peripheral neuropathy (CIPN) is a common neurological complication of neurotoxic anticancer agents, affecting sensory, motor, and autonomic functions. It may impair daily activities, compromise treatment tolerance, and adversely affect health-related quality of life among patients with solid malignancies.

Aim: To prospectively analyze chemotherapy-induced peripheral neuropathy and its effect on quality of life in patients with solid malignancies.

Materials and Methods: This prospective observational study included 68 patients with histopathologically confirmed solid malignancies receiving neurotoxic chemotherapy at Department of Medical Oncology, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India. Neuropathy severity was assessed using NCI-CTCAE version 5.0, while neurological symptoms and quality of life were evaluated using EORTC QLQ-CIPN20 and EORTC QLQ-C30 questionnaires, respectively. Assessments were performed at baseline, after the second chemotherapy cycle, and at final evaluation. Statistical analysis was performed using SPSS version 28.0, with $p < 0.05$ considered statistically significant.

Results: The mean age was 50.97 ± 13.89 years, with 51.47% males. CIPN incidence increased from 32.35% after the second cycle to 61.76% at final assessment ($p < 0.001$). Clinically significant neuropathy (Grade ≥ 2) occurred in 36.76% of patients. Tingling (85.71%) and numbness (80.95%) were the predominant symptoms among affected patients. CIPN was significantly associated with chemotherapy regimen ($p = 0.027$), ECOG performance status ($p = 0.035$), and chemotherapy cycles ($p = 0.012$). Patients with CIPN demonstrated significantly lower global health status scores (48.50 ± 10.72 versus 65.06 ± 7.39 ; $p < 0.001$), along with impaired physical functioning and increased fatigue and pain.

Conclusion: Chemotherapy-induced peripheral neuropathy was associated with cumulative treatment exposure and significantly reduced quality of life. Early detection, regular neurological monitoring, and appropriate supportive interventions are essential for improving treatment tolerability and patient well-being.

KEYWORDS: Chemotherapy-Induced Peripheral Neuropathy; Quality of Life; Solid Malignancies; Neurotoxicity; EORTC QLQ-CIPN20.

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INTRODUCTION

Chemotherapy has remained an essential component of multidisciplinary cancer management, contributing substantially to improved treatment outcomes and prolonged survival among patients with solid malignancies. However, its therapeutic benefits have frequently been accompanied by adverse effects that negatively influence physical functioning, psychological

well-being, and overall quality of life. Chemotherapy-induced peripheral neuropathy (CIPN) is an important neurological complication associated with several commonly administered antineoplastic agents. It primarily affects the peripheral sensory nerves but may also involve motor and autonomic nerve fibres. Patients commonly experience numbness, tingling, burning sensations, neuropathic pain, and impaired coordination,

which may interfere with routine daily activities. Persistent neuropathic symptoms can significantly increase patient discomfort and complicate supportive cancer care. Early recognition and systematic evaluation of CIPN are therefore essential for preserving neurological function and maintaining quality of life during chemotherapy.¹

The development of CIPN is influenced by several treatment-related and patient-specific factors, including the type of chemotherapeutic agent, cumulative drug exposure, treatment intensity, age, pre-existing neurological vulnerability, and associated comorbidities. Taxanes, platinum-based compounds, and vinca alkaloids are particularly recognized for their potential to cause peripheral neurotoxicity. These agents produce neurological damage through different mechanisms, including disruption of microtubule function, mitochondrial dysfunction, oxidative stress, and injury to dorsal root ganglion neurons. Such alterations may impair axonal transport, neuronal metabolism, and peripheral nerve conduction. The severity and clinical presentation of neuropathy may vary considerably between individuals receiving similar chemotherapy regimens. Consequently, identifying factors associated with neuropathy development is important for individualized treatment planning and appropriate neurological surveillance.²

The clinical manifestations of chemotherapy-induced peripheral neuropathy predominantly involve sensory disturbances affecting the distal extremities in a characteristic stocking-and-glove distribution. Tingling, numbness, altered temperature perception, hypersensitivity, and burning pain may initially develop in the fingers and toes before progressing proximally. Motor involvement can produce muscular weakness, reduced grip strength, difficulty walking, and impaired fine motor coordination. Autonomic disturbances may occasionally contribute to gastrointestinal dysfunction, postural symptoms, and other abnormalities involving autonomic regulation. Neuropathic symptoms may develop during the early stages of chemotherapy or become more prominent with successive treatment cycles. Importantly, patients may experience substantial sensory impairment without accompanying severe pain, making comprehensive neurological assessment necessary. Evaluation of individual symptom domains can facilitate recognition of clinically important neurological dysfunction.³ Health-related quality of life represents a fundamental consideration in contemporary oncology because cancer treatment outcomes extend beyond tumour control and survival. Chemotherapy-induced peripheral neuropathy can adversely affect physical independence, emotional stability, social participation, and the ability to perform occupational responsibilities. Difficulties with walking, dressing, writing, handling small objects, and maintaining balance

may considerably restrict daily functioning. Persistent discomfort and functional limitations may also contribute to sleep disturbances, psychological distress, fatigue, and reduced treatment satisfaction. The burden of neuropathy may become particularly important among patients receiving prolonged chemotherapy or those already experiencing functional limitations related to advanced malignancy. Therefore, evaluating neuropathy alongside standardized quality-of-life parameters provides a more comprehensive understanding of treatment-related morbidity and patient-centred outcomes.⁴

Chemotherapy-induced peripheral neuropathy also has important implications for the continuity and effectiveness of anticancer treatment. Progressive neurological toxicity may necessitate chemotherapy dose reduction, treatment postponement, modification of therapeutic regimens, or premature discontinuation of potentially beneficial treatment. Such modifications may complicate the delivery of planned chemotherapy and create challenges in balancing treatment efficacy against unacceptable toxicity. Although supportive medications and symptomatic interventions may alleviate selected neuropathic complaints, complete prevention and reversal of CIPN remain difficult. Regular assessment of neurological symptoms during chemotherapy can assist clinicians in recognizing progressive toxicity before severe functional impairment develops. Understanding the relationship between neuropathy severity, treatment exposure, and chemotherapy-related modifications is therefore important for optimizing treatment tolerability and maintaining appropriate supportive care.⁵

Accurate assessment of CIPN remains challenging because its clinical presentation is heterogeneous and neurological complaints are frequently subjective. Conventional toxicity grading systems, including the National Cancer Institute Common Terminology Criteria for Adverse Events (NCI-CTCAE), provide standardized methods for classifying the severity of treatment-related neuropathy. Nevertheless, clinician-based assessments may not fully capture the frequency, intensity, and functional consequences of symptoms experienced by patients. Incorporating patient-reported outcome measures alongside clinical neurological examination offers a more comprehensive evaluation of peripheral neurotoxicity. Standardized assessment can also facilitate comparisons between chemotherapy regimens and support identification of progressive neurological impairment. Serial neurological monitoring is particularly valuable in prospective studies because it allows changes in symptom severity and functional status to be evaluated throughout treatment.⁶

MATERIALS & METHODS

Present study was designed as a prospective observational study conducted at Department of Medical

Oncology, Geetanjali Medical College and Hospital, Udaipur, Rajasthan (India) to analyze chemotherapy-induced peripheral neuropathy and its effect on quality of life in patients with solid malignancies. A total of 68 patients receiving neurotoxic chemotherapy were included. Patients were prospectively assessed for neurological symptoms, functional impairment, chemotherapy-related factors, and changes in health-related quality of life using standardized clinical assessment tools and validated questionnaires. The study included 68 adult patients with histopathologically confirmed solid malignancies who were scheduled to receive chemotherapy regimens associated with peripheral neurotoxicity. Patients were recruited through consecutive sampling based on predefined eligibility criteria. Demographic characteristics, clinical history, cancer-related characteristics, chemotherapy details, neurological findings, and quality-of-life parameters were recorded using a structured study proforma.

Inclusion Criteria: Patients aged 18 years and above with histopathologically confirmed solid malignancies who were receiving neurotoxic chemotherapeutic agents, including taxanes, platinum compounds, and vinca alkaloids, were considered eligible. Patients with an Eastern Cooperative Oncology Group (ECOG) performance status of 0–2, adequate cognitive ability to complete questionnaires, and willingness to provide written informed consent were included.

Exclusion Criteria: Patients with pre-existing peripheral neuropathy, central or peripheral neurological disorders significantly affecting sensory or motor function, previous chemotherapy-induced neuropathy, uncontrolled diabetes mellitus with neuropathic complications, severe vitamin B12 deficiency, or other established causes of peripheral neuropathy were excluded. Patients with severe cognitive impairment, critical illness, or inability to complete the required clinical assessments were also excluded.

Baseline Clinical and Demographic Assessment

Baseline information included age, gender, body mass index (BMI), smoking history, alcohol consumption, comorbidities, and ECOG performance status. Cancer-related parameters included primary tumour site, histopathological diagnosis, clinical stage, metastatic status, and treatment intent. Chemotherapy-related information included drug combination, individual drug dosage, number of cycles, cumulative dose, and concurrent anticancer treatment. Baseline neurological examination included assessment of pain, paraesthesia, numbness, muscle weakness, deep tendon reflexes, vibration sensation, and functional limitations.

Assessment of Chemotherapy-Induced Peripheral Neuropathy

Chemotherapy-induced peripheral neuropathy was assessed using the National Cancer Institute Common Terminology Criteria for Adverse Events (NCI-

CTCAE), version 5.0. Neuropathy severity was graded from Grade 1 (mild symptoms) to Grade 4 (life-threatening consequences). Sensory and motor neuropathy were evaluated separately. Symptoms including tingling, burning sensations, numbness, neuropathic pain, impaired balance, muscle weakness, and difficulty performing routine activities were systematically documented. Grade 2 or higher neuropathy was considered clinically significant.

Evaluation Using EORTC QLQ-CIPN20

The European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire–Chemotherapy-Induced Peripheral Neuropathy 20 (EORTC QLQ-CIPN20) was used to evaluate patient-reported neuropathic symptoms. The questionnaire assessed sensory, motor, and autonomic manifestations of CIPN. Individual responses were recorded on a four-point Likert scale ranging from 1 (not at all) to 4 (very much). Scores were transformed according to the recommended scoring procedure, with higher scores indicating greater neuropathic symptom burden.

Assessment of Health-Related Quality of Life

Health-related quality of life was assessed using the EORTC QLQ-C30 questionnaire. The instrument evaluated global health status, physical functioning, role functioning, emotional functioning, cognitive functioning, social functioning, and symptom-related domains. The questionnaire also assessed fatigue, pain, nausea, sleep disturbances, appetite loss, and financial difficulties. Scores were transformed to a 0–100 scale according to EORTC guidelines. Higher functional and global health scores indicated better quality of life, whereas higher symptom scores indicated greater symptom severity.

Prospective Follow-Up and Outcome Assessment

Patients underwent baseline evaluation before chemotherapy initiation, followed by neurological assessment during successive chemotherapy cycles. Detailed CIPN and quality-of-life assessments were performed after the second cycle and at completion of the planned chemotherapy course. The onset, progression, and severity of neuropathy were documented. Chemotherapy dose reduction, treatment delay, treatment discontinuation, and requirement for symptomatic management due to neuropathy were also recorded.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 28.0. Continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range, while categorical variables were presented as frequencies and percentages. The Shapiro–Wilk test assessed normality. Chi-square or Fisher's exact tests were used for categorical comparisons. Independent-samples t-tests or Mann–Whitney U tests compared continuous variables between

groups. Paired t-tests or Wilcoxon signed-rank tests assessed changes between two time points, while repeated-measures ANOVA or Friedman tests were applied for multiple assessments, as appropriate. Spearman's correlation examined associations between CIPN severity and quality-of-life scores. Multivariable regression was considered where sample size and event frequency permitted. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Demographic, Clinical, and Chemotherapy-Related Characteristics of Study Participants (N=68)

The mean age of participants was 50.97 ± 13.89 years, with the majority belonging to the 41–60 years age group (48.53%), followed by those aged above 60 years (29.41%) and 18–40 years (22.06%). Males constituted 51.47% of the study population, while females accounted for 48.53%, and the mean body mass index was 24.67 ± 3.64 kg/m². Breast carcinoma was the most common malignancy (32.35%), followed by colorectal carcinoma (27.94%), lung carcinoma (20.59%), head and neck carcinoma (11.76%), and other solid malignancies (7.35%). Regarding clinical staging, 41.18% of patients had Stage III disease, 30.88% had Stage IV disease, and 27.94% had Stage I–II disease. An ECOG performance status of 1 was observed in 50.00% of patients, while taxane-based and platinum-based regimens were each administered to 41.18% of participants, and combination therapy was administered to 17.65%. Furthermore, 61.76% of patients received six or more chemotherapy cycles, and diabetes mellitus was present in 22.06% of the study population.

Table 2: Incidence, Severity, Clinical Manifestations, and Treatment-Related Consequences of Chemotherapy-Induced Peripheral Neuropathy

The incidence of CIPN increased from 32.35% after the second chemotherapy cycle to 61.76% at the final assessment, representing a statistically significant increase ($p < 0.001$). According to NCI-CTCAE version 5.0 grading, 38.24% of patients had no neuropathy, while 25.00%, 26.47%, and 10.29% developed Grade 1, Grade 2, and Grade 3 neuropathy, respectively, with no Grade 4 cases observed. Clinically significant neuropathy (Grade ≥ 2) was identified in 36.76% of the total study population. Among the 42 patients who developed CIPN, tingling or paraesthesia was the most frequently reported manifestation (85.71%), followed by numbness of extremities (80.95%), burning or neuropathic pain (57.14%), muscle weakness (40.48%), and impaired balance or gait disturbance (35.71%). Regarding treatment-related consequences, chemotherapy dose reduction was required in 30.95% of patients with CIPN, treatment delay occurred in 19.05%, and treatment discontinuation was reported in 7.14%.

Additionally, 54.76% of patients with CIPN required symptomatic medication for neuropathy-related complaints.

Table 3: Association of Demographic and Clinical Factors with Development of Chemotherapy-Induced Peripheral Neuropathy

The occurrence of CIPN increased across age groups, from 40.00% among patients aged 18–40 years to 60.61% in those aged 41–60 years and 80.00% among patients older than 60 years; however, this association did not reach statistical significance ($p = 0.054$). CIPN was observed in 65.71% of males and 57.58% of females, with no statistically significant gender difference ($p = 0.619$). Regarding clinical stage, neuropathy was reported in 42.11% of patients with Stage I–II disease, 64.29% with Stage III disease, and 76.19% with Stage IV disease, although the association was not statistically significant ($p = 0.081$). ECOG performance status showed a statistically significant association with CIPN ($p = 0.035$), with neuropathy occurring in 38.89%, 64.71%, and 81.25% of patients with ECOG scores of 0, 1, and 2, respectively. Chemotherapy regimen was also significantly associated with neuropathy ($p = 0.027$), with the highest occurrence among patients receiving combined taxane and platinum therapy (83.33%), followed by platinum-based therapy (71.43%) and taxane-based therapy (42.86%). Furthermore, CIPN occurred in 73.81% of patients receiving six or more chemotherapy cycles compared with 42.31% of those receiving fewer than six cycles, demonstrating a statistically significant association ($p = 0.012$).

Table 4: Changes in EORTC QLQ-CIPN20 Sensory, Motor, and Autonomic Neuropathy Scores During Chemotherapy (N=68)

The mean sensory neuropathy score increased from 2.82 ± 1.96 at baseline to 15.71 ± 13.31 after the second cycle and further increased to 37.56 ± 22.68 at the final assessment, demonstrating a statistically significant change ($p < 0.001$). Similarly, the mean motor neuropathy score increased progressively from 1.85 ± 1.80 at baseline to 10.59 ± 9.33 after the second cycle and 25.52 ± 17.44 at the final assessment ($p < 0.001$). Autonomic neuropathy scores also increased from 2.88 ± 1.49 at baseline to 7.95 ± 5.85 after the second chemotherapy cycle and 14.66 ± 9.44 at the final assessment, with a statistically significant difference ($p < 0.001$). Among the three domains, sensory neuropathy demonstrated the greatest absolute increase in mean score, followed by motor and autonomic neuropathy. The SD also increased across successive assessments, indicating greater variability in neuropathic symptom severity among participants. Overall, all three neuropathy domains demonstrated progressive increases in symptom burden during chemotherapy, with statistically significant differences between baseline and final assessment.

Table 5: Comparison of Health-Related Quality of Life Between Patients with and Without Chemotherapy-Induced Peripheral Neuropathy Using EORTC QLQ-C30

At baseline, the mean global health status scores were comparable between the CIPN and non-CIPN groups (72.66 ± 9.20 versus 72.77 ± 10.65), with no statistically significant difference ($p=0.964$). At the final assessment, patients with CIPN had significantly lower global health status scores than those without neuropathy (48.50 ± 10.72 versus 65.06 ± 7.39 ; $p<0.001$). The mean decline in global health status was greater among patients with CIPN (-24.15 ± 15.33) compared with those without CIPN (-7.71 ± 13.36), and the difference was

statistically significant ($p<0.001$). Physical functioning (53.92 ± 8.21 versus 78.59 ± 6.37), role functioning (52.28 ± 7.96 versus 73.52 ± 8.86), and social functioning (58.78 ± 10.10 versus 73.73 ± 9.81) were significantly lower among patients with neuropathy (all $p<0.001$).

In contrast, the mean fatigue score was significantly higher in the CIPN group (53.62 ± 10.89) than in the non-CIPN group (33.87 ± 10.41 ; $p<0.001$). Similarly, patients with CIPN reported significantly higher pain scores (49.56 ± 8.61) compared with patients without CIPN (31.99 ± 8.82 ; $p<0.001$), demonstrating an association between neuropathy and poorer health-related quality-of-life outcomes.

Table 1: Baseline Demographic, Clinical & Chemotherapy-Related Characteristics of Study Participants (N=68)

Parameters	Frequency (n)	Percentage (%)
Age (years)		
18–40	15	22.06
41–60	33	48.53
>60	20	29.41
Mean age (years)	50.97 ± 13.89	—
Gender		
Male	35	51.47
Female	33	48.53
Body mass index (kg/m²)		
Mean $\pm$ SD	24.67 ± 3.64	—
Primary malignancy		
Breast carcinoma	22	32.35
Colorectal carcinoma	19	27.94
Lung carcinoma	14	20.59
Head and neck carcinoma	8	11.76
Other solid malignancies	5	7.35
Clinical stage		
Stage I–II	19	27.94
Stage III	28	41.18
Stage IV	21	30.88
ECOG performance status		
ECOG 0	18	26.47
ECOG 1	34	50.00
ECOG 2	16	23.53
Chemotherapy regimen		
Taxane-based	28	41.18
Platinum-based	28	41.18
Taxane + platinum combination	12	17.65
Number of chemotherapy cycles		
<6 cycles	26	38.24
≥ 6 cycles	42	61.76
Diabetes mellitus		
Present	15	22.06
Absent	53	77.94

Table 2: Incidence, Severity, Clinical Manifestations, and Treatment-Related Consequences of Chemotherapy-Induced Peripheral Neuropathy

Parameters	Frequency (n)	Percentage (%)	p-value
Incidence of CIPN (N=68)			
After second chemotherapy cycle	22	32.35	<0.001
At final assessment	42	61.76	
Severity according to NCI-CTCAE v5.0 (N=68)			
Grade 0 (No neuropathy)	26	38.24	—
Grade 1 (Mild)	17	25.00	—
Grade 2 (Moderate)	18	26.47	—
Grade 3 (Severe)	7	10.29	—
Grade 4 (Life-threatening)	0	0.00	—
Clinically significant CIPN (Grade ≥2)	25	36.76	—
Clinical manifestations among CIPN patients (n=42)			
Tingling or paraesthesia	36	85.71	—
Numbness of extremities	34	80.95	—
Burning or neuropathic pain	24	57.14	—
Muscle weakness	17	40.48	—
Impaired balance or gait disturbance	15	35.71	—
Treatment-related consequences among CIPN patients (n=42)			
Chemotherapy dose reduction	13	30.95	—
Treatment delay	8	19.05	—
Treatment discontinuation	3	7.14	—
Requirement for symptomatic medication	23	54.76	—

Table 3: Association of Demographic and Clinical Factors with Development of Chemotherapy-Induced Peripheral Neuropathy

Parameters	CIPN Present (n=42)	CIPN Absent (n=26)	p-value
Age group (years)			0.054
18–40 (n=15)	6 (40.00%)	9 (60.00%)	
41–60 (n=33)	20 (60.61%)	13 (39.39%)	
>60 (n=20)	16 (80.00%)	4 (20.00%)	
Gender			0.619
Male (n=35)	23 (65.71%)	12 (34.29%)	
Female (n=33)	19 (57.58%)	14 (42.42%)	
Clinical stage			0.081
Stage I–II (n=19)	8 (42.11%)	11 (57.89%)	
Stage III (n=28)	18 (64.29%)	10 (35.71%)	
Stage IV (n=21)	16 (76.19%)	5 (23.81%)	
ECOG performance status			0.035
ECOG 0 (n=18)	7 (38.89%)	11 (61.11%)	
ECOG 1 (n=34)	22 (64.71%)	12 (35.29%)	
ECOG 2 (n=16)	13 (81.25%)	3 (18.75%)	
Chemotherapy regimen			0.027
Taxane-based (n=28)	12 (42.86%)	16 (57.14%)	
Platinum-based (n=28)	20 (71.43%)	8 (28.57%)	
Taxane + platinum (n=12)	10 (83.33%)	2 (16.67%)	
Chemotherapy cycles			0.012
<6 cycles (n=26)	11 (42.31%)	15 (57.69%)	
≥ 6 cycles (n=42)	31 (73.81%)	11 (26.19%)	

Table 4: Changes in EORTC QLQ-CIPN20 Sensory, Motor, and Autonomic Neuropathy Scores During Chemotherapy (N=68)

EORTC QLQ-CIPN20 domains	Baseline (Mean ± SD)	After Second Cycle (Mean ± SD)	Final Assessment (Mean ± SD)	p-value
Sensory neuropathy score	2.82 ± 1.96	15.71 ± 13.31	37.56 ± 22.68	<0.001
Motor neuropathy score	1.85 ± 1.80	10.59 ± 9.33	25.52 ± 17.44	<0.001
Autonomic neuropathy score	2.88 ± 1.49	7.95 ± 5.85	14.66 ± 9.44	<0.001

Table 5: Comparison of Health-Related Quality of Life Between Patients With and Without Chemotherapy-Induced Peripheral Neuropathy Using EORTC QLQ-C30

Quality-of-Life Parameters	CIPN Present (n=42) Mean ± SD	CIPN Absent (n=26) Mean ± SD	p-value
Global health status at baseline	72.66 ± 9.20	72.77 ± 10.65	0.964
Global health status at final assessment	48.50 ± 10.72	65.06 ± 7.39	<0.001
Change in global health score from baseline	-24.15 ± 15.33	-7.71 ± 13.36	<0.001
Physical functioning	53.92 ± 8.21	78.59 ± 6.37	<0.001
Role functioning	52.28 ± 7.96	73.52 ± 8.86	<0.001
Social functioning	58.78 ± 10.10	73.73 ± 9.81	<0.001
Fatigue score	53.62 ± 10.89	33.87 ± 10.41	<0.001
Pain score	49.56 ± 8.61	31.99 ± 8.82	<0.001

DISCUSSION

The present prospective observational study included 68 patients with solid malignancies receiving neurotoxic chemotherapy, with a mean age of 50.97 ± 13.89 years. The majority of patients belonged to the 41–60 years age group (48.53%), while males constituted 51.47% and females 48.53% of the study population. Breast carcinoma (32.35%) and colorectal carcinoma (27.94%) were the most common malignancies, and 41.18% of patients had Stage III disease. Tofthagen et al. (2013), in a study involving 111 colorectal cancer survivors treated with oxaliplatin, reported a higher mean age of 61 ± 11.7 years, with 51.40% male participants and approximately 71% having Stage III disease. The gender distribution was therefore comparable, although the present study included younger patients and a heterogeneous population of solid malignancies. The differences in clinical characteristics may reflect variations in the cancer types, disease stages, and treatment regimens included in the two studies.⁷

The incidence of chemotherapy-induced peripheral neuropathy increased significantly from 32.35% after the second chemotherapy cycle to 61.76% at the final assessment ($p < 0.001$), indicating progressive neuropathic symptom development during treatment. Among the 68 patients, 42 developed CIPN, while 26 remained free from clinically detectable neuropathy. Argyriou et al. (2013), in a prospective multicentre study involving 170 patients with colorectal cancer receiving oxaliplatin-based chemotherapy, reported acute oxaliplatin-induced neurotoxicity in 146 patients (85.90%). Among affected patients, 95.20% experienced

cold-induced perioral dysaesthesia, while 91.80% reported pharyngolaryngeal dysaesthesia. Severe acute symptoms requiring prolongation of oxaliplatin infusion occurred in 21.90% of affected patients. Although the reported incidence was higher than the 61.76% observed in the present study, the earlier investigation specifically assessed acute oxaliplatin neurotoxicity, whereas the present study included multiple neurotoxic chemotherapy regimens and assessed neuropathy across treatment cycles. Both studies demonstrated that peripheral neurotoxicity represented an important complication of anticancer chemotherapy.⁸

Regarding neuropathy severity, the present study demonstrated Grade 1 neuropathy in 25.00%, Grade 2 neuropathy in 26.47%, and Grade 3 neuropathy in 10.29% of patients, while no Grade 4 neuropathy was observed. Clinically significant neuropathy of Grade 2 or higher occurred in 36.76% of the total study population. André et al. (2004), in the randomized MOSAIC trial involving 2,246 patients with resected Stage II or III colon cancer, reported peripheral neuropathy in 92.10% of patients receiving oxaliplatin combined with fluorouracil and leucovorin. Grade 3 sensory neuropathy occurred in 12.40% during treatment, subsequently declining to 1.10% at one-year follow-up. The incidence of Grade 3 neuropathy in the present study (10.29%) was relatively comparable to the 12.40% reported by André et al., although the overall neuropathy incidence was lower. Differences in chemotherapy exposure, neuropathy assessment methods, and patient characteristics may account for the variation in overall incidence. These findings highlighted the importance of

recognizing moderate and severe neuropathy during anticancer treatment.⁹ The present study demonstrated a statistically significant association between chemotherapy regimen and CIPN development ($p=0.027$). Neuropathy occurred in 83.33% of patients receiving combined taxane and platinum therapy, compared with 71.43% receiving platinum-based chemotherapy and 42.86% receiving taxane-based chemotherapy. Argyriou et al. (2012), in a prospective investigation of 150 colorectal cancer patients receiving oxaliplatin-containing chemotherapy, compared peripheral neurotoxicity between FOLFOX-4 and XELOX regimens. Chronic peripheral neurotoxicity developed in 64 of 77 patients receiving FOLFOX-4 (83.12%), compared with 44 of 73 receiving XELOX (60.27%), demonstrating a statistically significant difference ($p=0.002$). Both studies indicated that neuropathy occurrence varied according to the chemotherapy regimen administered. However, the specific drug combinations differed, and the results should not be interpreted as demonstrating equivalent neurotoxic risks across these regimens. The findings supported careful neurological assessment when selecting and administering potentially neurotoxic chemotherapeutic combinations.¹⁰

The development of chemotherapy-induced peripheral neuropathy was also associated with increasing chemotherapy exposure and poorer functional status. In the present study, CIPN occurred in 73.81% of patients receiving six or more chemotherapy cycles compared with 42.31% receiving fewer than six cycles ($p=0.012$). Similarly, neuropathy was observed in 38.89% of patients with ECOG performance status 0, increasing to 81.25% among those with ECOG status 2 ($p=0.035$). Patients older than 60 years demonstrated a higher incidence of neuropathy (80.00%) than those aged 18–40 years (40.00%), although the association did not reach statistical significance ($p=0.054$). Park et al. (2011), in a study evaluating long-term oxaliplatin-induced neuropathy, reported that 79.20% of 24 evaluated patients continued to experience neuropathic symptoms at a median follow-up of 25 months after treatment. Loss of pinprick sensation was observed in 58.30%, while impaired vibration sensation was documented in 83.30% of patients. Neuropathy symptom severity was also significantly correlated with cumulative oxaliplatin dose. These findings were consistent with the association between greater chemotherapy exposure and neuropathy observed in the present study, although the number of treatment cycles was not equivalent to cumulative drug dose.¹¹

The assessment of neuropathy using the EORTC QLQ-CIPN20 demonstrated progressive deterioration in sensory, motor, and autonomic symptoms during chemotherapy. In the present study, the mean sensory neuropathy score increased from 2.82 ± 1.96 at baseline

to 37.56 ± 22.68 at the final assessment ($p<0.001$). Similarly, motor neuropathy scores increased from 1.85 ± 1.80 to 25.52 ± 17.44 , while autonomic neuropathy scores increased from 2.88 ± 1.49 to 14.66 ± 9.44 , with statistically significant changes in both domains ($p<0.001$). Loprinzi et al. (2011), in a prospective study involving 94 patients receiving weekly paclitaxel, reported that sensory neuropathy was more pronounced than motor and autonomic neuropathy. Over 12 weeks, sensory function scores declined by 23.4 points ($p<0.001$), compared with reductions of 11.5 points in motor function ($p<0.001$) and 5.8 points in autonomic function ($p=0.01$). The earlier study used a scoring orientation in which declining function scores indicated worsening neuropathy, whereas higher scores indicated greater symptom burden in the present study. Despite this difference in score direction, both investigations demonstrated predominantly sensory neuropathy with progressive deterioration during chemotherapy.¹²

The present study demonstrated a significant association between chemotherapy-induced peripheral neuropathy and deterioration in health-related quality of life. Patients with CIPN had significantly lower global health status scores at final assessment than those without neuropathy (48.50 ± 10.72 versus 65.06 ± 7.39 ; $p<0.001$). Physical functioning (53.92 ± 8.21 versus 78.59 ± 6.37) and role functioning (52.28 ± 7.96 versus 73.52 ± 8.86) were also significantly impaired among patients with neuropathy (both $p<0.001$). Driessen et al. (2012), in a study comparing 88 patients exposed to neurotoxic chemotherapy with 43 patients who had not yet received these treatments, reported significantly poorer quality-of-life outcomes in chemotherapy-exposed patients. Mean FACT/GOG scores were 110 versus 124 ($p<0.001$), while FACT/GOG-Neurotoxicity scores were 33 versus 41 ($p<0.001$). The investigators also reported a strong negative correlation between chemotherapy-induced neurotoxicity scores and quality of life ($r=-0.73$; $p<0.001$). These observations were consistent with the poorer physical functioning, role functioning, and global health status associated with CIPN in the present study, although the comparison groups and assessment instruments differed.¹³ The detrimental impact of chemotherapy-induced peripheral neuropathy on quality of life was further demonstrated by significantly greater fatigue, pain, and social functioning impairment among affected patients. In the present study, the mean fatigue score was 53.62 ± 10.89 among patients with CIPN compared with 33.87 ± 10.41 among those without neuropathy ($p<0.001$), while the corresponding pain scores were 49.56 ± 8.61 and 31.99 ± 8.82 ($p<0.001$). Social functioning was also significantly lower among patients with CIPN (58.78 ± 10.10 versus 73.73 ± 9.81 ; $p<0.001$). Mols et al. (2013), in a population-based study involving 1,643 colorectal cancer survivors, reported that patients previously

treated with oxaliplatin experienced tingling in the toes or feet more frequently than those who had not received chemotherapy (29% versus 8%; $p=0.001$). Numbness (17% versus 5%; $p=0.005$) and aching or burning pain (13% versus 6%; $p=0.03$) were also more common among oxaliplatin-treated patients. Furthermore, survivors with a high neuropathy symptom burden demonstrated significantly poorer health-related quality of life across all EORTC QLQ-C30 domains (all $p<0.01$). These findings supported the association observed in the present study between neuropathic symptom burden and reduced quality of life, although the earlier study evaluated long-term cancer survivors rather than patients undergoing active chemotherapy.¹⁴

CONCLUSION

Present study demonstrated that chemotherapy-induced peripheral neuropathy was a common complication among patients with solid malignancies, affecting 61.76% of participants. Neuropathy was significantly associated with chemotherapy regimen, increasing treatment cycles, and poorer ECOG performance status, with sensory symptoms being the most prominent. Patients developing CIPN experienced significantly impaired physical, role, and social functioning, along with increased fatigue, pain, and reduced overall quality of life. Early identification, regular neurological assessment, and appropriate supportive management are essential to minimize neuropathic complications, improve treatment tolerability, and preserve patients' quality of life.

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