Available online on 15.03.2025 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access Full Text Article

Research Article

Prevalence of chemotherapy-induced peripheral neuropathy in cancer patients in a tertiary care hospital of Mexico

Karen Patricia Segovia Sandoval, María del Rocío Guillén-Núñez *, Ángel Manuel Juárez-Lemus, Tania Helaine Ahuactzin Avendaño, Ana Lady Sánchez Ortega, Frida Paola Viveros Aguilar

Pain Clinic, National Cancer Institute, Mexico City

Article Info:

Article History:

Received 08 Jan 2025
Reviewed 13 Feb 2025
Accepted 02 March 2025
Published 15 March 2025

Cite this article as:

Segovia Sandoval KP, Guillén-Núñez MDR, Juárez-Lemus AM, Ahuactzin Avendaño TH, Sánchez Ortega AL, Viveros Aguilar FP, Prevalence of chemotherapy-induced peripheral neuropathy in cancer patients in a tertiary care hospital of Mexico, Journal of Drug Delivery and Therapeutics. 2025; 15(3):117-120
DOI: http://dx.doi.org/10.22270/jddt.v15i3.7048

*Address for Correspondence:

María del Rocío Guillén Núñez, San Fernando No. 22, Sección XVI, Tlalpan, Código Postal 14080, Ciudad de México, México.

Abstract

Objective: To determine the prevalence of chemotherapy-induced peripheral neuropathy in cancer patients in a tertiary care hospital of Mexico.

Design: A retrospective, cross-sectional, observational and descriptive study conducted from January 2018, to December 2022, by review of patients' medical records.

Main outcome measures: Identify the most associated oncologic diagnosis, chemotherapeutic agents, main clinical manifestations, pain intensity and the most frequently used therapeutic drugs. Descriptive data analysis was performed.

Results: A total of 250 patients were enrolled in this retrospective study, representing 29.65% of those treated at the Pain Clinic.. The mean age was 59 ± 11.3 years, and 84.4% were female. The most frequent diagnosis was breast cancer (n=126, 50.4%). Paresthesia was identified as the main symptom (53.2%). Paclitaxel was the chemotherapeutic agent most commonly used (55.2%), and pregabalin was the most prescribed treatment (39.6%). Fatigue was the most frequent comorbid symptom (26.4%, n=66).

Conclusion: The prevalence found was similar than reported in different studies. The distribution of sex, age, commonly used chemotherapeutic agents, and neuromodulatory treatment was similar to reports from other countries. The findings highlight the need for patient education and medical staff training to identify early signs of neuropathy and ensure timely referrals.

Keywords: Cancer pain, chronic pain, chemotherapy-induced peripheral neuropathy

INTRODUCTION

Pain is the most common symptom experienced by cancer patients. A systematic review reported that up to 44% of oncology patients suffer from pain, while other studies have found rates as high as 66% in cases of advanced, metastatic, or terminal disease.[1,2]

Chemotherapy-induced peripheral neuropathy (CIPN) is a common complication following systemic treatment for patient's oncologic disease. Recent publications estimate that it affects approximately 30–60% of cancer patients.[3]

Chemotherapeutic agents such as paclitaxel, cisplatin, and vincristine have been most strongly associated with the development of this neuropathy. Some of the potential mechanisms involved in its pathophysiology include direct nerve damage, which disrupts signal transmission and leads to clinical symptoms. Oxidative stress and inflammation contribute to nerve damage and plasticity within the peripheral nervous system. Additionally, disruptions in axonal transport can result in nerve degeneration, while microcirculatory alterations may deprive nerve cells of the oxygen and nutrients necessary for their survival and proper function.[4-6]

The primary neurotoxic mechanism of platinum-based antineoplastic agents in causing CIPN is the accumulation of platinum in the dorsal root ganglion and the trigeminal ganglion.[7,8] However, regardless of the chemotherapeutic agent used, the most impactful factor is the dosage: as higher doses increase the risk of developing CIPN. [9]

The symptoms of CIPN typically begin anywhere from a week to several months after starting chemotherapy. Patients may experience a range of symptoms primarily affecting the extremities, such as the hands and feet, a pattern known as "glove and stocking" neuropathy. The condition progresses in a distal-to-proximal manner, is usually bilateral, and is often accompanied by neuropathic pain symptoms, including allodynia, hyperalgesia, and hyperesthesia. However, motor and autonomic nerve fibers may also be affected.[6,10]

It is important to note that CIPN can vary in presentation and severity depending on the type of drug used, the

dosage, treatment duration, and the patient's individual susceptibility.

This painful condition disrupts chemotherapy continuity due to the patient's symptoms, sometimes even impairing mobility. As a result, chemotherapy doses often need adjustment, which can directly impact patient survival and quality of life, making this a major concern.

The treatment of CIPN focuses on symptom management and improving the patient's quality of life. While there is no specific treatment that can fully reverse this condition, various strategies can be used to alleviate symptoms. Duloxetine is a serotonin-norepinephrine reuptake inhibitor (SNRI) antidepressant recommended by the American Society of Clinical Oncology (ASCO) for the treatment of CIPN, considering it to provide moderate benefit. The recommended initial dose of duloxetine is 30 mg per day for one week, followed by an increase to 60 mg per day, with an average treatment duration of three months, supported by level II evidence.[11]

On the other hand, gabapentinoids have been recommended with level IV evidence for CIPN.[12] A 2021 study conducted in India showed that gabapentinoids improve the characteristic pain of this condition, with findings suggesting that pregabalin is superior to gabapentin.[13]

Objective

The main goal of this review is to determine the prevalence of chemotherapy-induced peripheral neuropathy in cancer patients in a tertiary care hospital of Mexico.

Determining the current prevalence of this complication will offer deeper insight into the sociodemographic factors and clinical features of this pain syndrome, as well as an evaluation of the strategies used for pain management.

MATERIAL AND METHODS

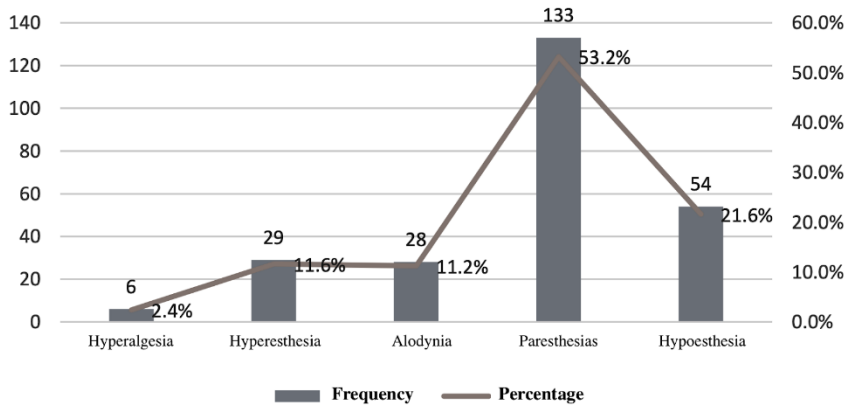
Subject to review and approval by the research and ethics committee, a study was conducted using an observational, descriptive, cross-sectional, and retrospective design. Medical records of patients with chemotherapy-induced peripheral neuropathy treated at the Pain Clinic of the National Cancer Institute treated between January 1, 2018, and December 31, 2022, were included in the study. Data on the following variables were collected from records: age, sex, oncologic diagnosis, pain diagnosis, neuropathy symptoms, pain assessment using the Visual Analog Scale (VAS), DN4 score, chemotherapeutic agent used, associated symptoms,and neuromodulatory drugs prescribed by the Pain Clinic. SPSS V.25.0 was used for descriptive analysis, including measures of central tendency and dispersion.

RESULTS

A total of 3,500 medical records were identified based on data provided by the hospital´s statistics service using the keyword “neuropathy” within the study period. Of these records, 1,646 patients were treated by the Pain Clinic service. After removing duplicate records from follow-up consultations, a total of 843 unique patients were identified. Of these, 250 patients were classified according to the pain diagnosis of chemotherapy-induced neuropathy, representing 29.65%. The 84.4% (n=212) were female, while 15.2% were male (n=38).

The mean age for the total sample was 59±11.3 years. The most frequent diagnosis was breast cancer (n=126), accounting for 50.4%. cervical cancer followed as the second most common (n=36, 14.4%), followed by ovarian cancer (n=23, 9.2%), multiple myeloma (n=17, 6.8%), prostate cancer (n=13, 5.2%)—equal in frequency to gastrointestinal tract cancer (n=13, 5.2%)—followed by lung cancer (n=13, 5.2%), lymphoma (n=6, 2.4%), soft tissue cancer (n=4, 1.6%), other cancers (n=3, 1.2%), and finally leukemia (n=1, 0.4%).

Regarding neuropathy symptoms, 196 patients (78.4%) reported positive symptoms, while 54 patients (21.6%) experienced non-painful or negative symptoms. None of the patients reported motor symptoms.



Graphic 1: Neuropathy symptoms of patients with chemotherapy-induced neuropathy

The Douleur Neuropathique-4 (DN4) questionnaire was used to assess the frequency of neuropathic pain components. The most common score was 4, reported by 22.4% (n=56) of the total sample, followed by a score of 5 (18.4%), a score of 2 (18%), and a score of 3 (15.8%).

Table 1. Chemotherapeutic agents used in patients with chemotherapy-associated neuropathy

	Frequency	Percentage %
Thalidomide	17	6.8
Vincristine	7	2.8
Paclitaxel	138	55.2
Docetaxel	37	14.8
Cisplatin	21	8.4
Carboplatin	25	10
Oxaliplatin	5	2
Total	**250**	**100**

Gabapentinoids were identified as the most common neuromodulators prescribed, with similar usage rates. Pregabalin was the most frequently prescribed at 39.6% (n=99), followed by gabapentin at 35.6%. Amitriptyline ranked third (9.6%, n=24), and duloxetine was fourth (2.8%, n=7). In 12% of patients, a combination of two neuromodulators was used. The average daily doses administered were: gabapentin 600 mg, pregabalin 150 mg, amitriptyline 20 mg, and duloxetine 45 mg.

A Numerical Analog Scale (NAS) score of 3 or lower was found in most patients. The majority reported a NAS score of 2 (25.6%, n=64), followed by a NAS score of 0 (19.6%, n=49). A total of 16% reported a score of 3, while 15.6% reported a NAS score of 1. Regarding the Verbal Analog Scale, we observed that the majority of patients reported a mild pain level (56.8%, n=142), while 22.8% reported a moderate level. A total of 18.4% had no pain, indicating good analgesic control, whereas only five patients (2%) reported severe pain.

The comorbid symptoms of patients were assessed, revealing that the most frequently associated symptom in patients with chemotherapy-induced neuropathy was fatigue, reported by 26.4% (n=66). This was followed by depressive symptoms in 15.2% (n=38), insomnia in 11.2% (n=28), anxiety in 10.4% (n=26). Meanwhile, the majority of patients (31.6%, n=79) reported no additional symptoms.

DISCUSSION

The prevalence of chemotherapy-induced peripheral neuropathy in cancer patients varies considerably. In our study, we found a prevalence of 26.65% and it has been described in the literature ranging from 19% to 85%. Seretny et al. reported that as the duration of chemotherapy treatment increases, so does the prevalence of neuropathic pain, with rates of 68.1%, 60%, and 30% at one month, three months, and more than six months, respectively. [14]

Sociodemographic variables in our study showed similar results to those reported in current research. The female gender accounted for the majority of the population (84.4%), similar to the findings of Molassiotis et al., who reported a higher prevalence in women (74.6%). The most frequent diagnosis was breast cancer, which aligns with previously reported statistics identifying it as the primary oncological diagnosis.[15]

Taxanes have been recognized as some of the most commonly used chemotherapeutic agents and are frequently associated with neuropathy. In a study by Molassiotis et al. on the prevalence of chemotherapy-induced neuropathy, taxanes were identified as the primary agents, a finding consistent with our study, in which paclitaxel was the most commonly used drug.[14]

Positive neuropathic symptoms have been reported as the main secondary effects of various chemotherapeutic agents, particularly taxanes. In our study, these symptoms were reported in 78.4% of patients, with paresthesias being the most common (53.2%), a finding similar to previous reports.[16]

Regarding pain assessment using the Numerical Rating Scale (NRS) after treatment initiation, most patients reported an NRS score of 2 (25.6% of the sample), while an NRS score of 8 was reported in only 0.8% of cases. Similarly, most patients reported a mild degree of pain when assessed with the Verbal Analog Scale, which is consistent with literature where the majority of patients report mild pain. [17]

The American Society of Clinical Oncology (ASCO) issued clinical practice guidelines in 2014 recommending duloxetine for chemotherapy-induced peripheral neuropathy. However, a wide range of treatments is used in clinical practice, including gabapentinoids and tricyclic antidepressants. In our study, gabapentinoids were the most frequently prescribed due to their good tolerability and broad availability, with pregabalin being the most commonly used.[4,18]

The main side effects of neuromodulators include sedation, drowsiness, insomnia, anxiety, and constipation, among others. In our study, we evaluated adverse effects and found fatigue to be the most frequently reported symptom. However, 31.6% of patients denied experiencing any symptoms, indicating good treatment tolerability.

CONCLUSIONS

Chemotherapy-induced peripheral neuropathy is a common and potentially debilitating complication of cancer treatment, with its prevalence increasing due to advancements in medicine and the resulting improvement in oncology patient survival rates.

The distribution of sex, age, commonly used chemotherapeutic agents, and neuromodulatory treatments in our study was similar to what has been reported in literature from other countries. This study highlights the prevalence of this condition, which aligns with findings from various studies. There is a clear need for patient education, as well as training for medical personnel, to facilitate the early identification of neuropathy symptoms and ensure timely referral, ultimately improving patients' quality of life.

Acknowledgments: None

Conflicts of Interest: None

Ethical approval: Ethical approval was obtained from Pain Clinic of the National Cancer Institute, Mexico City.

Source of Support: Nil

Funding: Nil

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

REFERENCES

1. Snijders RAH, Brom L, Theunissen M, van den Beuken-van Everdingen MHJ. Update on prevalence of pain in patients with cancer 2022: A systematic literature review and meta-analysis. Cancers (Basel). 2023;15(3):591. DOI: http://dx.doi.org/10.3390/cancers15030591
2. Evenepoel M, Haenen V, De Baerdemaecker T, Meeus M, Devoogdt N, Dams L, et al. Pain prevalence during cancer treatment: A systematic review and meta-analysis. J Pain Symptom Manage. 2022;63(3):e317–35. DOI: http://dx.doi.org/10.1016/j.jpainsymman.2021.09.011
3. Zhang S. "Chemotherapy-induced peripheral neuropathy and rehabilitation: A review." Semin Oncol, 2021;48(3): 193-207. DOI: http://dx.doi.org/10.1053/j.seminoncol.2021.09.004
4. Kachrani R, Santana A, Rogala B, Pawasauskas J. Chemotherapy-induced peripheral neuropathy: Causative agents, preventative strategies, and treatment approaches. J Pain Palliat Care Pharmacother. 2020;34(3):141–52. DOI: http://dx.doi.org/10.1080/15360288.2020.1734144
5. Jones MR, Urits I, Wolf J, Corrigan D, Colburn L, Peterson E, et al. Drug-Induced Peripheral Neuropathy: A narrative review. Curr Clin Pharmacol. 2020;15(1):38–48. DOI: http://dx.doi.org/10.2174/1574884714666190121154813
6. Bae EH, Greenwald MK, Schwartz AG. Chemotherapy-induced peripheral neuropathy: Mechanisms and therapeutic avenues. Neurotherapeutics [Internet]. 2021;18(4):2384–96. DOI: http://dx.doi.org/10.1007/s13311-021-01142-2
7. Kober KM, Olshen A, Conley YP, Schumacher M, Topp K, Smoot B, et al. Expression of mitochondrial dysfunction-related genes and pathways in paclitaxel-induced peripheral neuropathy in breast cancer survivors. Mol Pain [Internet]. 2018;14:1744806918816462. Available from: http://dx.doi.org/10.1177/1744806918816462
8. Viatchenko-Karpinski V, Ling J, Gu JG. Down-regulation of Kv4.3 channels and a-type K+ currents in V2 trigeminal ganglion neurons of rats following oxaliplatin treatment. Mol Pain [Internet]. 2018;14:1744806917750995. Available from: http://dx.doi.org/10.1177/1744806917750995
9. Cavaletti G, Alberti P, Argyriou AA, Lustberg M, Staff NP, Tamburin S, et al. Chemotherapy-induced peripheral neurotoxicity: A multifaceted, still unsolved issue. J Peripher Nerv Syst [Internet]. 2019;24 Suppl 2(S2):S6–12. Available from: http://dx.doi.org/10.1111/jns.12337
10. Desforges AD, Hebert CM, Spence AL, Reid B, Dhaibar HA, Cruz-Topete D, et al. Treatment and diagnosis of chemotherapy-induced peripheral neuropathy: An update. Biomed Pharmacother. 2022;147(112671):112671. DOI: http://dx.doi.org/10.1016/j.biopha.2022.112671
11. Hou S, Huh B, Kim HK, Kim KH, Abdi S. Treatment of Chemotherapy-Induced Peripheral Neuropathy: Systematic Review and Recommendations. *Pain Physician*. 2018;21(6):571-592.
12. Morawska M, Grzasko N, Kostyra M, Wojciechowicz J, Hus M. Therapy-related peripheral neuropathy in multiple myeloma patients: Peripheral neuropathy in MM patients. Hematol Oncol [Internet]. 2015;33(4):113–9. Available from: http://dx.doi.org/10.1002/hon.2149
13. Kim B-S, Jin J-Y, Kwon JH, Woo IS, Ko YH, Park S-Y, et al. Efficacy and safety of oxycodone/naloxone as add-on therapy to gabapentin or pregabalin for the management of chemotherapy-induced peripheral neuropathy in Korea. Asia Pac J Clin Oncol [Internet]. 2018;14(5):e448–54. Available from: http://dx.doi.org/10.1111/ajco.12822
14. Seretny M, Currie GL, Sena ES, Ramnarine S, Grant R, MacLeod MR, et al. Incidence, prevalence, and predictors of chemotherapy-induced peripheral neuropathy: A systematic review and meta-analysis. Pain [Internet]. 2014;155(12):2461–70. Available from: http://dx.doi.org/10.1016/j.pain.2014.09.020
15. Molassiotis A, Cheng HL, Lopez V, Au JSK, Chan A, Bandla A, et al. Are we mis-estimating chemotherapy-induced peripheral neuropathy? Analysis of assessment methodologies from a prospective, multinational, longitudinal cohort study of patients receiving neurotoxic chemotherapy. BMC Cancer [Internet]. 2019;19(1):132. Available from: http://dx.doi.org/10.1186/s12885-019-5302-4
16. Burgess J, Ferdousi M, Gosal D, Boon C, Matsumoto K, Marshall A, et al. Chemotherapy-induced peripheral neuropathy: Epidemiology, pathomechanisms and treatment. Oncol Ther [Internet]. 2021;9(2):385–450. Available from: http://dx.doi.org/10.1007/s40487-021-00168-y
17. Park SB, Kwok JB, Asher R, Lee CK, Beale P, Selle F, et al. Clinical and genetic predictors of paclitaxel neurotoxicity based on patient- versus clinician-reported incidence and severity of neurotoxicity in the ICON7 trial. Ann Oncol [Internet]. 2017;28(11):2733–40. Available from: http://dx.doi.org/10.1093/annonc/mdx491
18. Hershman DL, Lacchetti C, Dworkin RH, Lavoie Smith EM, Bleeker J, Cavaletti G, et al. Prevention and management of chemotherapy-induced peripheral neuropathy in survivors of adult cancers: American Society of Clinical Oncology clinical practice guideline. J Clin Oncol [Internet]. 2014;32(18):1941–67. Available from: http://dx.doi.org/10.1200/JCO.2013.54.0914