Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i18.3114

KNOWLEDGE, ATTITUDE, AND PRACTICES OF ANTI-NEOPLASTIC DRUG WASTE DISPOSAL IN TERTIARY HOSPITALS OF KARACHI

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Abstract

Background: In order to attain persistent environmental sustainability and safeguard public health, it is imperative to implement suitable management practices for healthcare waste. Consequently, healthcare personnel must be adequately trained in the proper handling of chemical waste arising from anti-neoplastic chemotherapy, as it presents potential risks to the well-being of both staff members, patients, and the surrounding environment.

Aims: The aim of this study is to assess the level of knowledge and attitudes regarding waste management practices for anti-neoplastic drugs in tertiary hospitals located in Karachi.

Methods: A questionnaire was developed with the purpose of assessing individuals' knowledge and awareness regarding the management of anti-neoplastic waste. Data was obtained from the oncology departments of all the hospitals involved in the study. A comprehensive analysis was undertaken to summarize the findings of the survey.

Results: The findings indicate a notable deficiency in the participants' understanding of appropriate management of waste contaminated with anti-neoplastic drugs, as well as their attitudes towards the utilization of Personal Protective Equipment (PPE). When queried about the proper disposal of waste products contaminated with anti-neoplastic drugs, only 22% of the respondents expressed agreement with the necessity of segregating and individually packaging all the contaminated materials.

Conclusion: The findings of this survey provide evidence in favor of implementing a more extensive waste management programme that would be sustained through regular training and supervision.

Keywords: Anti-neoplastic drugs, waste management, tertiary hospitals.

Introduction

The toxicity associated with antineoplastic drugs has been widely recognized since their initial introduction in the 1940s. Due to the nonselective mechanism of action exhibited by the majority of antineoplastic drugs, both cancerous and noncancerous cells are impacted, leading to the occurrence of well-documented side effects. In the 1970s, evidence emerged suggesting that health care workers could potentially face adverse effects due to occupational exposure to antineoplastic drugs (Usman *et al.*, 2022). Antineoplastic drugs are classified as "hazardous drugs" within a broader

category (NIOSH, *et al.,* 2004). A hazardous substance refers to any drug or substance that has the capacity to pose a risk to an individual's health when they are exposed to it. A hazardous drug is defined as a substance that exhibits one or more of the following characteristics in humans: genotoxicity, carcinogenicity, reproductive toxicity, teratogenicity, or other developmental toxicity. Therapeutic agents, such as antineoplastic and cytotoxic agents, fall under the classification of hazardous drugs. These drugs have the potential to cause risks to human health (Yasir *et al.,* 2021).

The proper management of anti-neoplastic waste necessitates the establishment of specific requirements by assisting units. These requirements encompass various aspects such as classification, segregation, packaging, storage, collection, transportation, treatment, and final disposal, taking into account the physico-chemical and biological nature of the waste. Additionally, it is advisable to priorities the reduction or pre-treatment of potential hazards in order to minimize the negative impact on the well-being of workers and the environment (Sial *et al.,* 2022).

In relation to the health of workers, it is important to note that exposure to waste from these drugs has the potential to cause mutagenic, carcinogenic, and teratogenic effects (Kyprianou *et al.,* 2010; Yanqin *et al.,* 2012). On top of that, instances of contact dermatitis, skin local reactions, abdominal pain, headache, dizziness, nausea, and alopecia associated with exposure to anti-neoplastic drugs (Krstev *et al.,* 2003). The observed effects are often similar to those experienced by patients themselves. These effects have been noted in healthcare workers who are involved in the preparation, administration, or handling of these drugs. It is particularly observed when they fail to utilize personal and collective protective equipment.

The commonly encountered pathways of exposure to this waste include inhalation, dermal contact, oral ingestion, and injuries caused by sharps. The primary pathways of exposure to anti-neoplastic drugs encompass the inhalation of aerosolized droplets, absorption through the skin, ingestion, and needle stick injuries that may occur during the handling process (Ziegler *et al.,* 2002; Turk *et al.,* 2004; Sial *et al.,* 2021). Some of the potentially hazardous activities involved in the handling of cytotoxic drugs include drug transportation, preparation, administration, storage, management of cytotoxic spillage, waste disposal, and handling of patient excreta (Ahmad, 2001; Sial *et al.,* 2021). Nurses who were involved in occupational activities in healthcare settings exhibited higher levels of mutagenic substances in their urine compared to other workers (Sial *et al.,* 2021).

Hence, the aims of this study are to examine the current state and identify any deficiencies in the management of waste associated with anti-neoplastic drugs. This will be achieved by evaluating the knowledge, awareness, and experience of personnel in relation to the disposal procedures for anti-cancer drugs implemented by oncology departments in hospitals.

Material and Methods

A survey was conducted to assess the knowledge and attitudes of a group of 87 nurses working in oncology departments at various tertiary care hospitals. The individuals were the designated nurses assigned to these specific wards, responsible for administering chemotherapy treatments to patients with various malignant diseases. The survey questionnaire was developed by the investigator with reference to multiple guidelines and prior studies. The questions were designed to gather information about participants' understanding, awareness, and personal experiences regarding the disposal of anti-neoplastic drugs. The data was gathered via in-person interviews with the participants. The responses collected from the questionnaire were recorded and processed utilizing Microsoft Excel, specifically version 2010. Descriptive statistics were employed to analyse the data, and the results were presented in the form of frequencies and percentages.

Results

The Sociodemographic data collected from the initial section of the questionnaire included information on gender, age, education level, professional category, and years of experience in the field. The majority of individuals 72% were female, as expected, since nursing is traditionally a profession dominated by women. The remaining 28% were male. The age range of the individuals varied from 25 to 45 years. In relation to the duration of practice in the anti-neoplastic

chemotherapy service, it was found that 53% of the professionals had more than eight years of experience. Additionally, 21% had tenure of less than four years, while 26% had worked for less than two years. In terms of education, 69% of individuals had successfully obtained a bachelor's degree, while the remaining 31% had completed their education at the higher school level.
In relation to waste management, the participants have identified specific items that are of concern. These include saline drips containing chemotherapeutic drugs, which were identified by all respondents. Additionally, gloves and catheters used during chemotherapy administration were mentioned by 36% of respondents. Furthermore, materials such as syringes, needles, needle covers, caps, tape, cotton, and gauze contaminated by chemotherapy were highlighted by 42% of respondents. Only 22% of respondents expressed the necessity of segregating and individually packaging all materials that have been contaminated by chemotherapy (Figure: 1).

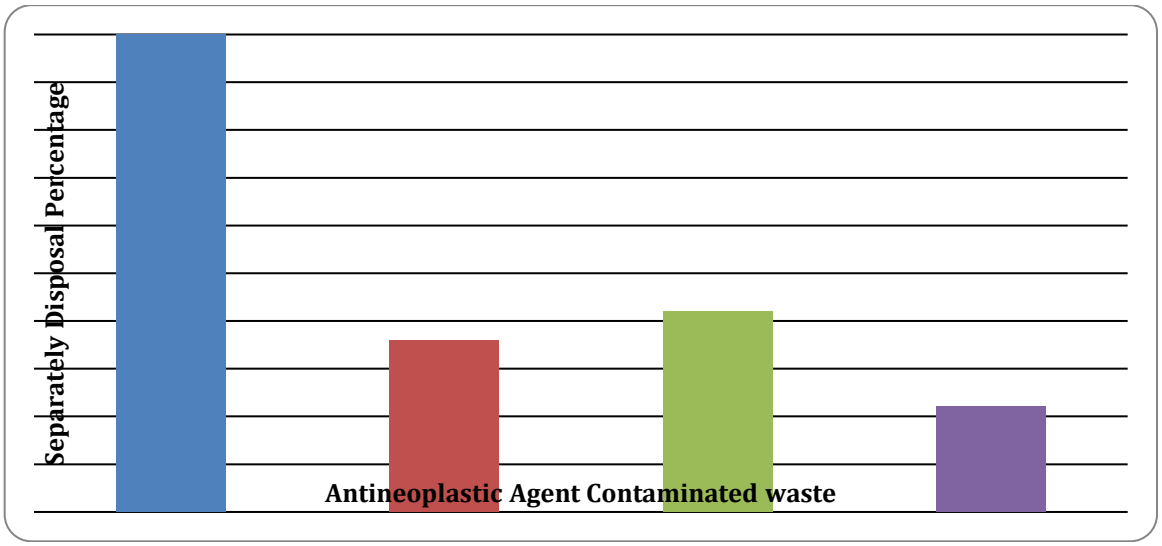

Figure: 1. Knowledge to separately dispose the waste contaminated by anti-neoplastic agents.

Regarding the understanding of safe handling practices and the corresponding attitudes, it was found that 41% of individuals expressed the belief that utilizing complete personal protective equipment (PPE) is unnecessary. 72% individuals were known regarding proper spillage management. A total of 83% of the staff has received training through various sessions on the proper handling and waste management of anti-neoplastic agents. Only 56% of the staff is correctly disposing of anti-neoplastic contaminated waste. (Figure: 2).

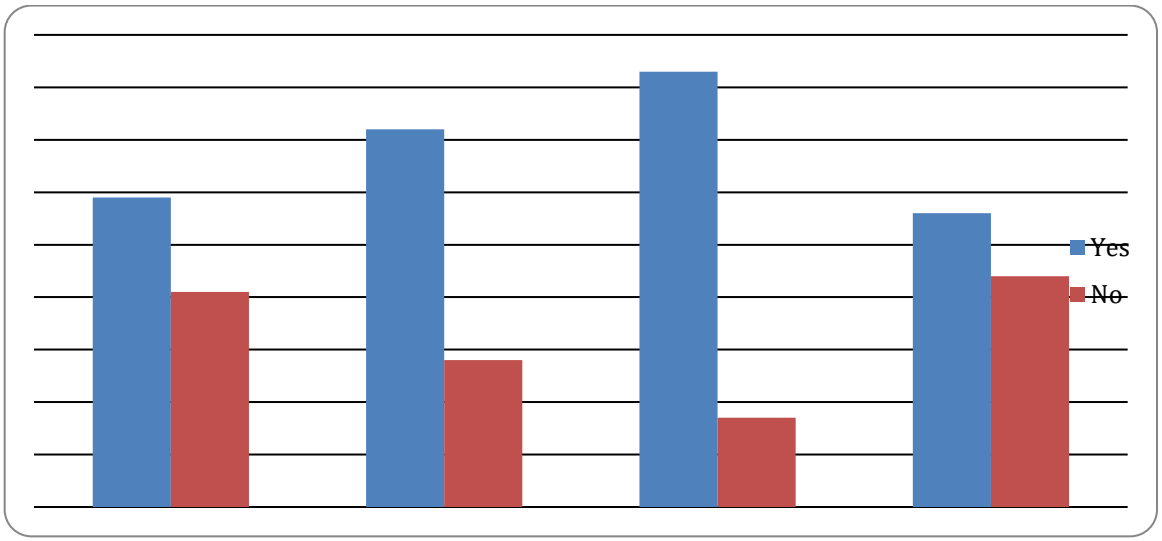

Figure: 2. Attitude and knowledge about the safe handling of waste contaminated by anti-neoplastic agents.

Discussion

The respondents' knowledge was found to be inadequate in terms of establishing appropriate attitudes towards waste management in care practice. Upon analyzing the data pertaining to the packaging of sharp waste contaminated with chemotherapeutic drugs, it was observed that professionals possessed only a limited understanding of this practice. The accuracy of this situation has been confirmed through on-site observation. In addition to the aforementioned responses, it is worth noting that two pieces of evidence obtained from the field observation provided further confirmation of the discrepancy between the statements made by the staff and their actual implementation. It was first realized that the receptacle for general waste contained substances that were contaminated with Anti-neoplastic agents. It is common practice to dispose of empty bottles of anticancer chemotherapy, saline bottles, catheters, gauze, cotton and gloves that have been contaminated by these substances. These items should be placed in plastic bags and appropriately disposed of in containers specifically designated for toxic materials. According to a previous study, there is a need for increased promotion of medical waste management education and training in economically deprived countries. The utilisation of cutting-edge technologies in the management of hospital waste, specifically biomedical waste, has the potential to revolutionise waste disposal practises in hospitals across both developed and developing nations (Farooqi et al., 2022).

It is crucial for nurses to possess a high level of knowledge in order to enhance their compliance with safety protocols and promote their overall well-being. However, it should be noted that while knowledge is important, it may not guarantee complete adherence to precautionary measures (Turk *et al.,* 2004; Kyprianou *et al.,* 2010; Sial *et al.,* 2021). In addition to enhancing individual knowledge and attitudes, the implementation of safety measures and the improvement of organizational safety climate are contingent upon various management actions. These actions encompass safety policies, procedures, reinforcement, and support for safety programmes (Polovich and Clark, 2010).

Conclusion

The inadequate management of waste anti-neoplastic agents by nursing staff may predispose them to occupational risks (cytotoxic, carcinogenic, mutagenic and teratogenic effects), as well as other members of the healthcare team, the patient, and the environment. The results of this study indicate a need of improvement of knowledge, attitude and practices among the nurses handling cytotoxic anti-neoplastic drugs. On top of that, sufficient education and training as well as hospital policy are effective tools to improve the safety climate in a hospital catering anti-neoplastic therapy actively.

Reference

1. Ahmad, A. (2001). Managing cytotoxic drugs. Malaysian J Pharm, 1, 63-8.
2. Sial, N., Ahmad, M., Hussain, M. S., Iqbal, M. J., Hameed, Y., Khan, M., ... & Asif, H. M. (2021). CTHRC1 expression is a novel shared diagnostic and prognostic biomarker of survival in six different human cancer subtypes. Scientific reports, 11(1), 19873.
3. Farooqi, U. G., Shahbaz, N., Khan, F. A., Aleem, S. A., Ali, M., & Kaleem, U. (2022). Investigating Healthcare Waste Regulation: Employees' Knowledge, Perceptions and Practices with Regard to Recycling. *Annals of the Romanian Society for Cell Biology*, *26*(01), 1189-1195.
4. Sial, N., Saeed, S., Ahmad, M., Hameed, Y., Rehman, A., Abbas, M., ... & Khan, M. R. (2021). Multi-omics analysis identified TMED2 as a shared potential biomarker in six subtypes of human cancer. International Journal of General Medicine, 7025-7042.
5. Krstev, S., Perunicić, B., & Vidaković, A. (2003). Work practice and some adverse health effects in nurses handling antineoplastic drugs. *La Medicina del lavoro*, *94*(5), 432-439.
6. Kyprianou, M., Kapsou, M., Raftopoulos, V., & Soteriades, E. S. (2010). Knowledge, attitudes and beliefs of Cypriot nurses on the handling of antineoplastic agents. *European Journal of Oncology Nursing*, *14*(4), 278-282.
7. NIOSH, B. G., Connor, T., & McDiarmid, M. (2004). NIOSH alert: preventing occupational exposures to antineoplastic and other hazardous drugs in health care settings. *Inst Occup*, *58*(6).

8. Usman, M., Okla, M. K., Asif, H. M., AbdElgayed, G., Muccee, F., Ghazanfar, S., ... & Hameed, Y. (2022). A pan-cancer analysis of GINS complex subunit 4 to identify its potential role as a biomarker in multiple human cancers. American Journal of Cancer Research, 12(3), 986.
9. Polovich, M. (2010). Nurses' use of hazardous drug safe handling precautions.
10. Hameed, Y., Usman, M., Liang, S., & Ejaz, S. (2021). Novel diagnostic and prognostic biomarkers of colorectal cancer: capable to overcome the heterogeneity-specific barrier and valid for global applications. Plos one, 16(9), e0256020.
11. Sial, N., Rehman, J. U., Saeed, S., Ahmad, M., Hameed, Y., Atif, M., ... & Ambreen, A. (2022). Integrative analysis reveals methylenetetrahydrofolate dehydrogenase 1-like as an independent shared diagnostic and prognostic biomarker in five different human cancers. Bioscience Reports, 42(1), BSR20211783.
12. Turk, M., Davas, A., Çiçeklioglu, M., Saçaklioglu, F., & Mercan, T. (2004). Knowledge, attitude and safe behaviour of nurses handling cytotoxic anticancer drugs in Ege University Hospital. *Asian Pac J Cancer Prev*, *5*(2), 164-8.
13. Yanqin, Y., Dezhong, X., Bo, W., Xianni, W., Xiaoli, Q., & Xianghai, M. (2012). An investigation into the occupational protection status of clinical nursing staff exposed to anti-tumor drugs. *Journal of Medical Colleges of PLA*, *27*(2), 113-119.
14. Ziegler, E., Mason, H. J., & Baxter, P. J. (2002). Occupational exposure to cytotoxic drugs in two UK oncology wards. *Occupational and environmental medicine*, *59*(9), 608-612.