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Adverse effects associated with radiotherapy: a study on cancer patients from Hillah (Iraq)

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ABSTRACT

Radiopharmaceuticals play a critical role in the treatment of both malignant and benign tumours. The present study is a retrospective cross-sectional analysis based on a paper-based questionnaire administered to cancer patients undergoing radiotherapy at the Oncology Center of the Imam Sadiq Teaching Hospital and at the Marjan Medical City Hospital in Hillah, Iraq, between November 15, 2022 and March 15, 2023. Fifty patients aged 1–80 years participated in the study, with the most common age group being 51–60 years (26.56%). Females constituted the majority of the participants (N=38; 76%). A range of cancer types was documented, including breast cancer, brain cancer, lymphoma, uterine cancer, cancers of the mouth and pharynx, stomach cancer, hip cancer, bone cancer, rectal cancer, shoulder cancer, skin cancer, and pilonidal carcinoma. Twenty-one adverse effects were reported, the most common being fatigue, exhaustion, and loss of energy (80%), followed by drowsiness and prolonged sleep (74%), as well as muscle and bone pain (74%). Several adverse effects of radiotherapy demonstrated a statistically significant association with age and sex, occurring more frequently in patients over 40 years of age and in females. Among breast cancer patients who had undergone surgery, neck pain and cramps, breast pain, and chest pain were the most commonly reported adverse effects associated with radiotherapy.

1. Introduction

Radiotherapy constitutes a vital component of comprehensive cancer treatment protocols, employed for localized management, symptom palliation, and disease control in refractory malignancies. Its inte-

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gration with breast-conserving surgery significantly reduces the risk of local recurrence over a ten-year period, irrespective of tumour size, histological grade, margin width, or patient age[1,2]. Despite efforts to maximize precision and minimize collateral damage, healthy tissues adjacent to the tumour may be affected by radiotherapy, resulting in unpleasant and sometimes complex adverse effects that can be both acute (early-onset) and delayed[2,3]. Improving clinical outcomes requires optimization of the therapeutic ratio: increasing the likelihood of tumour control while minimizing complications in normal tissues. Although radiation-induced side effects vary depending on the cancer type and anatomical site, certain common reactions are frequently observed[3,4].

Ionizing radiation generates free radicals that induce DNA breaks, chromosomal aberrations, and potentially apoptosis due to damaged genetic material or inadequate chromosomal repair. Additionally, radiation may trigger signalling pathways that activate pro-inflammatory and pro-fibrogenic cytokines, initiate the coagulation cascade, and inflict vascular injury. It may also elevate the risk of secondary malignancies within the irradiated field[3–5]. In light of the paucity of published Iraqi data on the adverse effects of radiotherapy, this study aimed at documenting the most frequently reported side effects in cancer patients undergoing radiotherapy in Hillah, Iraq.

2. Methodology

A retrospective cross-sectional study was conducted by using a paper-based questionnaire targeting cancer patients receiving radiotherapy at the Oncology Centers of the Imam Sadiq Teaching Hospital and at the Marjan Medical City Hospital in Hillah, Iraq, between November 15, 2022 and March 15, 2023. The chi-squared test was applied in order to examine any statistically significant associations among the variables. Questionnaire data were collected prior to the initiation of the radiotherapy doses, from patients who provided oral consent. Particular attention was paid to the patients' psychological state during data collection. Individuals receiving concurrent anticancer treatments (e.g., immunotherapy or chemotherapy) were excluded in order to eliminate potential confounding due to overlapping side effects. Ethical approval was obtained from the Ethics Committee of the College of Pharmacy of the University of Babylon (approval number: A-0047; date: February 9, 2025).

3. Results and Discussion

Although most cancer patients worldwide receive radiotherapy as a core component of their treatment, it is associated with a range of side effects. These adverse effects can be reduced in both severity and frequency through the use of newer, more precise techniques that lower the dose of radiation administered. These techniques may also allow for dose escalation in cases of radioresistant cancers without increasing the risk of additional side effects[6,7].

The current study included 50 patients undergoing radiotherapy, ranging in age from 1 to 80 years. The most common age group was the 51–60-years one, accounting for 20 patients (40%), while females constituted the majority of the participants of the study (38 patients; 76%). The number of radiotherapy sessions ranged from 10 to 40, with 27 patients (54%) receiving between 11 and 20 sessions.

A wide range of cancer types was recorded: breast cancer (27 patients; 54%), brain cancer (4 patients; 8%), lymphoma (3 patients; 6%), uterine cancer (3 patients; 6%), mouth and pharyngeal cancer (3 patients; 6%), stomach cancer (3 patients; 6%), hip cancer (2 patients; 4%), and one case (2%) each of bone cancer, rectal cancer, shoulder cancer, skin cancer, and pilonidal carcinoma.

Twenty-one adverse effects related to radiotherapy were documented and are presented in Table 1. The most frequently reported were fatigue, exhaustion, and loss of energy (80%), followed by drowsiness and prolonged sleep (74%), as well as muscle and bone pain (74%). Some adverse effects showed statistically significant correlations with patient age, occurring more frequently in individuals over 40 (Table 1). Moreover, most adverse effects manifested directly at the site of radiation exposure, primarily as dermatological changes, including discoloration, itching, peeling, redness, swelling, ulceration, irrita-

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Table 1. Adverse effects associated with radiotherapy among the patients participating in our study. Notes: *, signifies a statistically significant relationship; #, the total number of the participating patients in the current study was 50.

Adverse effects of radiotherapy	Frequency (%) #	Age		Sex	
		1–40 years	>40 years	male	female
Fatigue, exhaustion, and loss of energy	40 (80%)	11	29 *	10	30
Drowsiness and prolonged sleep	37 (74%)	12	25 *	8	29 *
Muscle and bone pain	37 (74%)	11	26 *	9	28 *
Dry mouth	32 (64%)	10	22	9	23
Skin discoloration at the treatment site (dark)	32 (64%)	11	21	7	25 *
Sleep disturbances	30 (60%)	11	19	5	25 *
Fever and chills	30 (60%)	9	21	6	24
Nervousness and agitation	29 (58%)	9	20 *	6	23
Pain at the treatment site	28 (56%)	8	20	6	22 *
Headache	28 (56%)	8	20	6	22 *
Change in the sense of taste	26 (52%)	10	16	7	19
Hair loss	26 (52%)	9	17	6	20 *
Itching and peeling of the skin at the treatment site	25 (50%)	7	18 *	5	20
Blurred vision	25 (50%)	10	15	6	19
Redness of the skin at the treatment site	23 (46%)	9	14	2	21 *
Swelling at the treatment site	22 (44%)	6	16 *	3	19
Depression	22 (44%)	9	13 *	6	16 *
Ulceration and irritation of the skin at the site of treatment	16 (32%)	7	9	4	12
Ulceration of the mouth and gums	14 (28%)	6	8	2	12
Tooth decay	13 (26%)	2	11	4	9
Nail loss	5 (10%)	3	2	1	4 *

Breast cancer patients (N=27)		
Number of women who underwent breast surgery	lumpectomy	14 (51.9%)
	mastectomy	13 (48.1%)

Adverse effects of radiotherapy and their relationship with age in breast cancer patients that have undergone surgery

Adverse effects	Total	Age		*p*-value	Adverse effects	Total	Age		*p*-value
		1–40 years	>40 years				1–40 years	>40 years	
Neck pain and cramps	25	9	16	0.77	Shoulder pain and stiffness	14	4	10	0.01 *
Breast pain	25	8	17	0.02 *	Cough with phlegm	13	3	10	0.21
Chest pain	24	7	17	0.06	Stiffness of the jaw	10	4	6	0.01 *
Rib pain	20	5	15	0.04 *	Swelling in the upper arm	10	2	8	0.05 *
Swelling under the armpit	17	3	14	0.05 *	Shortness of breath	10	2	8	0.05 *
Difficulty in swallowing	14	4	10	0.01 *	Earache	8	3	5	0.02 *

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tion, and pain (Table 1).

Given the predominance of breast cancer cases in this cohort, the study included a dedicated section on this group (Table 1). All 27 breast cancer patients (100%) in our study underwent breast surgery: 14 (51.9%) had lumpectomies and 13 (48.1%) underwent mastectomies. Twelve adverse effects associated with radiotherapy were reported among breast cancer patients who had undergone surgery, as presented in Table 1; most of these effects were significantly more prevalent in patients aged over 40.

Adverse effects in normal tissues may appear either early or late. Early (acute) effects occur during or shortly after radiotherapy and can develop within weeks, whereas late effects tend to be progressive and chronic, emerging months or years after treatment[3,8]. Research indicates that the severity and probability of acute side effects depend on the total radiation dose, duration of exposure, the specific body parts irradiated, and other contributing factors. While early adverse effects often resolve over time, some may progress to complications that impede treatment and pose considerable challenges for both patients and clinicians. The timely identification and management of these effects are critical to improving patient outcomes and quality of life, especially in paediatric patients who may live for decades with long-term consequences of radiotherapy and its associated morbidities[7,9]. Finally, although advances in radiotherapy have led to better long-term survival rates, cancer survivors remain at elevated risk for late-onset radiotherapy-associated side effects, including cardiovascular, neurological, and reproductive complications, as well as the potential development of secondary radiation-induced malignancies[9,10].

4. Conclusion

Radiotherapy-related side effects exhibit considerable variation among Iraqi patients and are significantly influenced by individual factors such as age and sex. The majority of these effects are localized to the irradiated site.

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Conflicts of interest

None exist.

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References

1. Jaffray D.A., Knaul F.M., Atun R., Adams C., Barton M.B., Baumann M., *et al.* Global Task Force on Radiotherapy for Cancer Control. *Lancet Oncol.* 16(10), 1144–1146, 2015. DOI: 10.1016/S1470-2045(15)00285-5
2. Loibl S., André F., Bachelot T., Barrios C.H., Bergh J., Burstein H.J., *et al.* Early breast cancer: ESMO Clinical Practice Guideline for diagnosis, treatment and follow-up. *Ann. Oncol.* 35(2), 159–182, 2024. DOI: 10.1016/j.annonc.2023.11.016
3. De Ruysscher D., Niedermann G., Burnet N.G., Siva S., Lee A.W.M., Hegi-Johnson F. Radiotherapy toxicity. *Nat. Rev. Dis. Primers* 5(1), 13, 2019. DOI: 10.1038/s41572-019-0064-5
4. Leonardi M.C., Zerella M.A., Lazzeroni M., Fusco N., Veronesi P., Galimberti V.E., *et al.* Tools to guide radiation oncologists in the management of DCIS. *Healthcare (Basel)* 12(7), 795, 2024. DOI: 10.3390/healthcare12070795
5. Lee S.F., Kennedy S.K.F., Caini S., Wong H.C.Y., Yip P.L., Poortmans P.M., *et al.* Randomised controlled trials on radiation dose fractionation in

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breast cancer: systematic review and meta-analysis with emphasis on side effects and cosmesis. *BMJ* 386, e079089, 2024. DOI: 10.1136/bmj-2023-079089

6. Majeed H., Gupta V. Adverse effects of radiation therapy. In: StatPearls [Internet]. Treasure Island, FL: *StatPearls Publishing*, 2025.
7. Barazzuol L., Coppes R.P., van Luijk P. Prevention and treatment of radiotherapy-induced side effects. *Mol. Oncol.* 14(7), 1538–1554, 2020. DOI: 10.1002/1878-0261.12750
8. Brook I. Early side effects of radiation treatment for head and neck cancer. *Cancer Radiother.* 25(5), 507–513, 2021. DOI: 10.1016/j.canrad.2021.02.001
9. Riva G., Cravero E., Pizzo C., Briguglio M., Iorio G.C., Cavallin C., *et al.* Sinonasal side effects of chemotherapy and/or radiation therapy for head and neck cancer: a literature review. *Cancers (Basel)* 14(9), 2324, 2022. DOI: 10.3390/cancers14092324
10. Newhauser W.D., Berrington de Gonzalez A., Schulte R., Lee C. A review of radiotherapy-induced late effects research after advanced technology treatments. *Front. Oncol.* 6, 13, 2016. DOI: 10.3389/fonc.2016.00013

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