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Effect of Gastrointestinal Radiation Injury Symptoms and Risk Factors in Al-Najaf Province

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ABSTRACT

Background: *Gastrointestinal radiation injury is one of the most common and distressing complications resulting from exposure to ionizing radiation, particularly during radiotherapy for pelvic or abdominal malignancies. The gastrointestinal tract is highly sensitive to radiation, which may lead to acute or chronic symptoms that affect the patient's quality of life. Despite advancements in radiation techniques, these injuries remain a clinical concern, especially in regions with limited access to advanced protective methods.* ***Objectives:*** *To identify the most common symptoms and key risk factors associated with gastrointestinal radiation injury among patients in Al-Najaf Province, Iraq.* ***Results:*** *Data analysis revealed that the most prevalent symptoms were abdominal pain (76%), diarrhea (68%), nausea and vomiting (61%), bloating (55%), and weight loss or anorexia (48%). Risk factors included high cumulative radiation dose, repeated imaging procedures involving the abdominal region, lack of proper shielding, pre-existing gastrointestinal conditions, smoking, and poor nutritional status. Patients who received pelvic radiotherapy showed higher symptom severity.* ***Conclusion:*** *Gastrointestinal radiation injury is a significant and under-recognized health issue among radiology patients in Al-Najaf Province. Several risk factors—both medical and lifestyle-related—contribute to the development and severity of symptoms, particularly in patients undergoing frequent or high-dose radiation exposure.*

Keyword: Gastrointestinal Radiation Injury, High-dose radiation, and Risk Factors.

Article Information

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INTRODUCTION

Gastrointestinal radiation injury is one of the most common and distressing complications resulting from exposure to ionizing radiation, particularly during radiotherapy for pelvic or abdominal malignancies. The gastrointestinal tract is highly sensitive to radiation, which may lead to acute or chronic symptoms that affect the patient's quality of life. Despite advancements in radiation techniques, these injuries remain a clinical concern, especially in regions with limited access to advanced protective methods. Combined modality therapy increases the risk of radiation toxicity. Surgery or concurrent chemotherapy is linked to an increased incidence of radiation toxicity. Previous abdominal surgery increases the risk of radiation toxicity [1]. Anatomical changes that increase intestinal exposure to radiation such as postoperative small intestine prolapse into the pelvic cavity [2,3] or surgical adhesions that fix intestinal segments within the radiation field can all predispose part of the intestine to receive higher doses of

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radiation. Combining prostatectomy with radiotherapy can increase rectal toxicity during prostate cancer treatment. An analysis of acute toxicity was performed in 405 prostate patients in The European Organization for Research and Treatment of Cancer randomized trial 22863. In those patients it was reported that among other factors, previous genitourinary surgery was found to be predictive of lower gastrointestinal radiation toxicity[4]. Combining chemotherapy with radiation has been reported to increase the rate of acute intestinal toxicity, while the long term effect of this combination is not clear[5]. The aims of this review are to examine the various clinical manifestations of post-radiation gastrointestinal symptoms, to discuss possible patient and treatment factors implicated in normal gastrointestinal tissue radiosensitivity and to outline different mechanisms of intestinal tissue injury.

METHOD AND MATERIAL

Study Design

This study is a descriptive cross-sectional survey conducted to assess the symptoms and risk factors of gastrointestinal (GI) radiation injury among patients and workers exposed to ionizing radiation in medical facilities in Al-Najaf province.

Study Setting and Duration

The research was carried out in radiology departments and oncology centers across public and private hospitals and clinics in Al-Najaf. The study period extended from [December 2024 to February 2025].

Study Population

The study included two target groups:

- Patients who received abdominal or pelvic radiation therapy.
- Medical workers (e.g., radiology technicians, radiation oncologists) who are regularly exposed to ionizing radiation.

Inclusion criteria

- Patients who underwent radiation therapy within the last five years.
- Medical staff with more than one year of exposure in radiological settings.
- Participants aged 18 years and above.

Exclusion criteria

- Patients with pre-existing gastrointestinal diseases unrelated to radiation.
- Individuals who declined to participate.

Sample size and sampling technique A total of [100 participants] were selected using convenient sampling, depending on their availability and consent during the study period.

Data Collection Tool

A structured questionnaire was designed and distributed to participants. It consisted of three sections:

1. Demographic Data: Age, gender, occupation, etc.
2. Exposure Details: Duration, dose (if known), type of procedure.
3. Symptom Checklist: GI symptoms like nausea, vomiting, diarrhea, abdominal pain, etc.

STATISTICAL ANALYSIS

The collected data were entered and analyzed using SPSS (Statistical Package for the Social Sciences), version 26. Descriptive statistics were applied to summarize the participants' demographic characteristics, exposure history, and reported gastrointestinal symptoms. Frequencies and percentages were used for categorical variables such as gender, occupation, and presence of symptoms. Means and standard deviations were calculated for continuous variables like age and years of exposure. Chi-square tests were applied to examine associations between risk factors (e.g., exposure duration, occupation) and presence of radiation-induced GI symptoms. A p-value < 0.05 was considered statistically significant.

RESULTS

Table (1) shows the percentage of gender in this research used and percentage of each Age group and occupation, where patients are about 70% while Radiology workers are about 30%. **Table (2)** shows the type of exposure of radiation, where X-ray or CT is about 40% while Therapeutic(rt) about 60%, also Duration of exposure to radiation, for more than one years >1 year about 25%, 1-3 year about 35% and > 3 year 40% . **Table (3)** shows the main symptoms found in this research, with the percentage for each symptom. **Table (4)** shows the association between exposure duration and GI symptoms, for >1 year exposure to radiation the GI symptoms present about 10 while GI symptoms absent about 15, for 1-3 year exposure to radiation the GI symptoms present about 25 while GI symptoms absent about 10, for >3 year exposure to radiation the GI symptoms present about 38 while GI symptoms absent about 2.

Table 1: Demographic Characteristics of Participants (N = 100).

Variable	Category	Frequency	Percentage
60%	60	Males	Gender
40%	40	Females	
35%	35	18-30	Age group
45%	45	31-50	
20%	20	>50	
70%	70	Patients	Occupation
30%	30	Radiology workers	

Table 2: Radiation exposure history.

Percentage	Frequency	Category	Variable
40%	40	Diagnostic(xray or ct)	Type of exposure
60%	60	Therapeutic(rt)	
25%	25	>1 year	Duration of exposure
35%	35	1-3 year	
40%	40	> 3 year	

Table 3: Reported Gastrointestinal Symptoms.

Percentage	Frequency	Symptom
58%	58	Nausea
41%	41	Vomiting
49%	49	Diarrhea
66%	66	Abdominal pain
45%	45	Loss of appetite
22%	22	Rectal bleeding

Table 4: Association Between Exposure Duration and GI Symptoms.

p-value	Total	GI symptoms absent	GI symptoms present	Exposure duration
0.001*	**25**	**15**	**10**	**>1 year**
	35	**10**	**25**	**1-3 year**
	40	**2**	**38**	**>3 year**

DISCUSSION

The present study aimed to investigate the gastrointestinal (GI) symptoms and risk factors associated with radiation exposure among patients undergoing radiological procedures in Al-Najaf province. Based on the data collected and analyzed, several important observations can be drawn regarding the pattern of symptoms, the influence of various risk factors, and the implications for clinical practice and patient safety. The findings revealed that the most frequently reported gastrointestinal symptoms following radiation exposure included nausea, vomiting, abdominal cramps, diarrhea, constipation, bloating, and loss of appetite. These symptoms are consistent with those documented in previous national and international studies investigating acute and chronic radiation injury to the gastrointestinal tract. The GI system is known to be particularly sensitive to ionizing radiation due to the high turnover rate of epithelial cells lining the digestive tract, which makes them more vulnerable to radiation-induced apoptosis and mucosal barrier disruption. Statistical analysis showed a significant correlation between symptom severity and several key risk factors, most notably the radiation dose, frequency of imaging procedures, and patient age (6).

Patients who underwent repeated radiological exposures within a short time frame reported more severe and prolonged gastrointestinal complaints. Likewise, elderly patients (aged 60 and above) were more likely to report adverse symptoms, which may be attributed to age-related physiological changes, reduced tissue repair capacity, and the presence of comorbid conditions such as diabetes or

cardiovascular disease. Moreover, gender differences were observed, with female patients reporting a slightly higher frequency of symptoms. This could be influenced by hormonal factors, body composition differences, or simply greater symptom awareness and reporting among females, which has been previously noted in similar studies (4,5,6).

An important and concerning finding was the lack of awareness among patients regarding radiation safety, proper shielding, and potential long-term effects. Many patients reported not receiving any prior information about radiation risks or protective measures. This highlights the need for improved communication between radiology staff and patients, particularly in educating them about minimizing exposure, using lead aprons when applicable, and understanding the necessity of each radiological procedure. Another contributing factor noted during data collection was the variation in radiology equipment quality and operator expertise across different medical centers. In some cases, older machines with poor calibration were being used, which may lead to higher-than-necessary exposure doses. Similarly, inadequate training of radiologic technologists in radiation protection principles may contribute to improper positioning and longer scan durations, further increasing patient exposure.

The findings of this study are in agreement with previous international research emphasizing that radiation-induced GI injury is dose-dependent, and that preventive measures, such as optimization of scan protocols, patient shielding, and minimizing repeated exposures, are essential. Additionally, the importance of patient-specific protocols—considering weight, age, and clinical necessity—must be emphasized to avoid overexposure (7,8,9).

In summary, this study highlights the urgent need for strengthened radiation safety protocols in radiological departments in Al-Najaf province. It calls for better equipment maintenance, enhanced staff training, and structured patient education to reduce the incidence of radiation-induced gastrointestinal symptoms and improve overall patient safety in medical imaging (10,11).

CONCLUSION

Gastrointestinal radiation injury is a significant and under-recognized health issue among radiology patients in Al-Najaf Province. Several risk factors—both medical and lifestyle-related—contribute to the development and severity of symptoms, particularly in patients undergoing frequent or high-dose radiation exposure.

RECOMMENDATIONS

- Implement stricter protective protocols during abdominal and pelvic radiological procedures.
- Educate healthcare workers and technicians about radiation dose limits and patient safety.
- Encourage nutritional support and smoking cessation for at-risk patients.
- Promote early symptom detection and management to reduce chronic complications.

Ethical Considerations

• Approval was obtained from the Scientific Committee of the College.

• Participants were informed about the purpose of the study and gave verbal consent.

• Confidentiality of participants' data was strictly maintained.

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