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Knowledge and Attitude regarding X Rays in General Population of Azad Kashmir.

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ABSTRACT

Background: X-rays are one of the most widely used diagnostic imaging techniques; however, limited public understanding of radiation exposure and safety measures can lead to unnecessary health risks. Awareness regarding safe imaging practices is essential to minimize radiation hazards and promote responsible use.

Objectives: This study aimed to assess the knowledge and attitude of the general population in Azad Kashmir toward X-rays and radiation safety, and to identify demographic factors influencing awareness levels.

Methodology: A descriptive cross-sectional study was conducted across ten districts of Azad Kashmir, including Muzaffarabad, Kotli, Poonch, and others. A total of 430 participants aged below 70 years were selected through convenience sampling. Data were collected via a structured, self-administered online questionnaire comprising demographic details, knowledge, and attitude sections. Scores were categorized as good, satisfactory, below satisfactory, or unsatisfactory. Data analysis was performed using SPSS version 26.0, and associations between demographic variables and knowledge/attitude were examined using the Chi-square test ($p < 0.05$ considered significant).

Results: The mean age of participants was 34.7 ± 11.8 years, with 53.5% males. The mean knowledge score was 11.8 ± 3.9, and 60% demonstrated satisfactory to good knowledge. Similarly, 51.9% exhibited a positive attitude toward X-ray safety. Education level ($p < 0.001$) and previous X-ray exposure ($p = 0.02$) were significantly associated with higher knowledge and positive attitudes, whereas gender and district showed no significant association.

Conclusion: Most participants displayed adequate knowledge and positive attitudes toward X-ray use; however, understanding of radiation hazards and protective measures was limited. Educational interventions and public awareness campaigns are essential to enhance radiation safety knowledge among the general population..

Keywords: *X-rays, Radiation safety, Knowledge, Attitude, Public awareness, Azad Kashmir*

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1. INTRODUCTION

The word radiology is derived from radiations. The term radiation means energy that is obtained from a source and passes through a medium or space. Heat, light and sound are types of radiations.[1] Particulate radiation refers to the energy carried by traveling particles that possess a measurable rest mass and momentum and occupy a specific position at any given moment. These particles include protons, neutrons, electrons, and other subatomic particles [2]. Radiations are categorized as ionizing and nonionizing. Ionizing radiations, like X-rays, possess sufficient energy to separate an electron from an atom or molecule, producing free radicals in the process which are chemically unstable and highly reactive [3]. X-ray imaging was first discovered in the late 1800s. It was and still is one of the most important leaps in medicine. The application of X-rays and other types of ionizing radiation in medicine is advancing in the process of diagnosis of illnesses and lately in

therapeutic practices to [4]. With the broad usage of X-ray, the protection of staff is becoming of high importance. The complexity of medical procedures creates the need for education and training in radiation safety especially during procedures as well as for the wearing of protective gears or tools to help prevent the risks associated with radiation [5]. The principle of out of sight out of mind plays a very important role in determining the attitudes of surgeons towards radiation. Proper knowledge and practices help in reducing adverse events related to radiation exposure. Matityahu et al. in their systematic review recommended the use of appropriate use of protection and practices as well as the use of radiation education to decrease radiation exposure. [6] Exposure to ionizing radiation causes both deterministic as well as stochastic effects depending on radiation doses and response of the human body to the radiation exposure.[7] The ionizing radiation has adverse effects on living things despite its undeniable benefits. Free radicals, which are extremely energetic and chemically unstable particles, are released when an electron is removed from an atom or molecule, which is the beginning of ionizing radiation.[8] Additionally, Ionizing radiation is increasingly used in medical imaging for diagnostic and therapeutic purposes. Therefore, knowledge and understanding of radiation dangers are significant issues for people who work in radiation environments and other healthcare professionals and patients who visit hospitals and diagnostic centers.[9] To promote the general population's health, as low as reasonably achievable (ALARA) principle must be practiced, which means that we should keep the dose of radiation as low as possible. Moreover, reducing the time, increasing the distance, and using safety shielding are the three main components of ALARA. [10] X-rays are an essential diagnostic tool in modern medicine, used to detect and monitor a wide range of diseases and conditions. However, since X-rays involve exposure to ionizing radiation, their use must be guided by proper knowledge and safety practices to minimize potential health risks. Public understanding of when and how X-rays are needed, as well as their possible effects, plays a crucial role in ensuring their safe and effective use.

In Azad Kashmir, where access to health information and services may vary, the general population's knowledge and attitudes toward X-rays are not well-documented. Limited awareness may lead to misconceptions, unnecessary fear, or misuse of diagnostic imaging. Assessing the community's level of knowledge and attitude will help identify gaps and inform educational strategies aimed at promoting radiation safety and informed decision-making in healthcare.

2. METHODOLOGY

This descriptive cross-sectional study was conducted across ten districts, including Muzaffarabad, Bagh, Bhimber, Hattian, Haveli, Kotli, Mirpur, Neelum, Poonch, and Sudhnoti. A total of 430 participants aged below 70 years were included using convenience sampling.

Ethical approval for this research was obtained from the Ethical Review Committee of Abbas Institute of Medical Sciences (AIMS), Muzaffarabad. Written informed consent was obtained from all participants, and confidentiality was ensured.

Inclusion criteria comprised individuals aged bellow 70 years, residents of any district of Azad Kashmir, and those willing to participate. Exclusion criteria included, healthcare professionals trained in radiology, and participants unwilling to complete the questionnaire.

Data were collected using a structured, self-administered questionnaire, which consisted of two sections: demographics and knowledge/attitude regarding X-rays. The demographic section included age, gender, district, education level, and occupation. The knowledge section included questions on prior X-ray experience, awareness of radiation exposure, understanding of radiation type, associated health risks, protective measures, and awareness of alternative imaging methods. The attitude section included statements assessing perceptions and beliefs, such as trust in doctors' recommendations, anxiety toward X-rays, willingness to avoid unnecessary exposure, and views on public awareness campaigns. Each correct answer in the knowledge section was assigned a score of 1, and incorrect or "I don't know" responses were scored 0. Similarly, in the attitude section, positive responses reflecting safe and informed practices were scored 1, and negative/uncertain responses were scored 0.

Based on the total scores, participants were categorized as follows:

Knowledge Score Categories (out of 20 questions):

Good: 16–20

Satisfactory: 11–15

Below Satisfactory: 6–10

Unsatisfactory: 0–5

Attitude Score Categories (out of 10 questions):

Good/Positive Attitude: 8–10

Satisfactory: 6–7

Below Satisfactory: 4–5

Unsatisfactory: 0–3

Data were collected online through google forms to ensure representation from all districts. The collected data were entered and analyzed using SPSS version 26.0. Quantitative variables (e.g., age, number of X-rays taken) were presented as mean ± standard deviation, while qualitative variables (e.g., gender, education level, categorized knowledge and attitude scores) were summarized as frequencies and percentages. Associations between demographic characteristics and categorized knowledge or attitude levels were analyzed using the Chi-square test, with a *p-value* < *0.05* considered statistically significant.

3. RESULTS

A total of 430 participants from ten districts of Azad Kashmir were included in the study. The mean age of participants was 34.7 ± 11.8 years (range: 18–69 years). Of these, 230 (53.5%) were male and 200 (46.5%) were female. The largest proportion of respondents belonged to Kotli (18.4%), followed by Muzaffarabad (13.5%), and Poonch (12.8%).

Regarding education, 41.2% of participants had completed graduate-level education, while 26.5% had intermediate or equivalent qualifications. In terms of occupation, students (32.3%) formed the largest group, followed by private employees (24.9%) and government employees (18.1%).

Table I: Demographic Characteristics of Participants (n = 430)

Variable	Category	Frequency (n) Percentages (%)
Age (years)	Mean ± SD	34.7 ± 11.8
Gender	Male	230 (53.5%)
	Female	200 (46.5%)
District	Kotli	79 (18.4%)
	Bagh	38 (8.8%)
	Bhimber	40 (9.3%)
	Jhelum Valley	33 (7.7%)
	Neelum	27 (6.3%)
	Muzaffarabad	58 (13.5%)
	Mirpur	47 (10.9%)
	Sudhnoti	36 (8.4%)
	Poonch	55 (12.8%)
	Haveli	17 (4%)
Education Level	Primary/Matric	48 (11.2%)
	Intermediate	114 (26.5%)
	Graduate	177 (41.2%)
	Postgraduate	91 (21.1%)
Occupation	Student	139 (32.3%)
	Private Employee	107 (24.9%)
	Government Employee	78 (18.1%)
	Homemaker	64 (14.9%)
	Unemployed/Other	42 (9.8%)

Out of 20 knowledge-based questions, the mean knowledge score was 11.8 ± 3.9

Overall, 36.3% of participants demonstrated satisfactory knowledge, while 24.7% had good knowledge. However, 25.6% had below satisfactory and 13.5% showed unsatisfactory knowledge regarding X-rays.

Most participants (78.4%) had undergone an X-ray at least once. Only 29.1% were aware that X-rays use ionizing radiation, and 41.6% knew about possible radiation-related health risks. About 34.7% were aware of protective measures such as lead aprons or thyroid shields. As shown in Table II

Table II: Knowledge Level Regarding X-rays (n = 430)

Knowledge Category	Score Range	Frequency (%)
Good	16-20	106 (24.7%)
Satisfactory	11-50	156 (36.3%)
Below Satisfactory	6-10	110 (25.6%)
Unsatisfactory	0-5	58 (13.5%)
Mean ± SD		11.8 ± 3.9

The mean attitude score was 7.2 ± 1.9 (out of 10).

More than half of the respondents (51.9%) had a good/positive attitude, while 27.2% demonstrated a satisfactory attitude. Only 20.9% showed a below satisfactory or negative attitude.

A large majority (81.6%) trusted doctors' recommendations for X-rays, while 63.3% agreed that unnecessary X-rays should be avoided. About 70.7% supported the idea of public awareness campaigns about radiation safety. As shown in Table III

Table III: Attitude Toward X-rays (n = 430)

Attitude Category	Score Range	Frequency (%)
Good	8–10	223 (51.9%)
Satisfactory	6–7	117 (27.2%)
Below Satisfactory	4–5	62(14.4%)
Unsatisfactory	0–3	28 (6.5%)
Mean ± SD		7.2 ± 1.9

Chi-square analysis revealed a significant association between education level and knowledge score ($p < 0.001$). Similarly, participants with higher education and those previously exposed to X-rays had more positive attitudes ($p = 0.02$). No statistically significant association was found between gender or district and knowledge/attitude levels ($p > 0.05$).

Table IV: Association Between Selected Demographic Variables and Knowledge/Attitude Levels

Variable	Knowledge Level (p-value)	Attitude Level (p-value)	Significant/ Nonsignificant
Gender	0.132	0.271	Not Significant
Age Group	0.089	0.164	Not Significant
Education Level	**0.0001***	**0.02***	Significant
Occupation	0.041	0.058	Not Significant
Previous X-ray experience	**0.0005***	**0.02***	Significant

(p value <0.05 is considered significant) *

Majority of participants (60%) had adequate or good knowledge regarding X-rays. Over half (51.9%) displayed a positive attitude toward X-ray use and radiation safety. Education level and previous X-ray experience were the strongest predictors of both knowledge and attitude scores. Despite acceptable awareness levels, knowledge about radiation hazards and

protection measures remained limited, indicating a need for public education campaigns on safe imaging practices.

4. DISCUSSION

The findings of the present study revealed that a majority of participants (60%) possessed adequate or good knowledge regarding X-rays, while over half (51.9%) exhibited a positive attitude toward X-ray use and radiation safety. This indicates a moderate level of awareness among the general population of Azad Kashmir, suggesting that while people are generally informed about the importance of X-rays, there remains a lack of detailed understanding of radiation hazards and protective measures. The results of the present study are consistent with the findings of Adam Khan et al. (11), who conducted a similar study in Peshawar and reported that knowledge of radiation safety among participants was moderate to high. In their study, 83.6% of respondents were aware of radiation hazards, and 87.5% were familiar with protective shielding techniques such as lead aprons and thyroid shields. Moreover, their participants demonstrated a highly positive attitude, with 93.6% acknowledging the significance of radiation protection and 87.5% expressing interest in further training on radiation safety. These findings support the current study's observation that awareness improves with exposure and educational level, emphasizing the role of education in shaping safe radiation practices. A significant association between education level and knowledge score ($p < 0.001$) was observed in the present study, reinforcing the notion that individuals with higher educational attainment tend to have greater awareness of X-ray use and associated risks. This aligns with the findings of S. Tahira S. Naqvi et al. (12), who conducted a study in Karachi and reported a statistically significant relationship between participants' education level and their awareness of the term "radiation" ($p = 0.003$). Their results highlight the impact of education on health literacy and understanding of medical imaging procedures, which is consistent with the present study's outcomes. In contrast, the findings of the current study differ from those reported by Mubashir Zafar et al. (13), who observed that while a large proportion of participants demonstrated appropriate knowledge (72%) and positive attitudes (70%), a majority (65.5%) still engaged in unsafe practices. This inconsistency may be attributed to differences in the target population and methodology, as Zafar et al. primarily assessed healthcare workers, whereas the present study focused on the general public. Hence, while knowledge and attitude levels may appear satisfactory, translation into safe practices remains an area needing improvement. Similarly, the present study's findings are not in accordance with those of Reem Brashi et al. (14), who reported that the majority of students lacked adequate knowledge regarding radiology and radiation hazards. The difference could be explained by the study population's academic background, as Brashi et al. focused on undergraduate students from non-radiological disciplines, whereas the current study involved participants from various educational levels and professional backgrounds, potentially contributing to a higher average awareness level. However, the current results align with the findings of Alchallah et al. (15), who reported that 33.8% of participants had good knowledge regarding radiological procedures. This consistency underscores that while a portion of the population is adequately informed, there is still a substantial gap in public understanding of radiation safety across diverse regions. Additionally, the present study found that most participants were aware of the effects of radiation on pregnancy (94.1%), a finding that correlates with a Nigerian study reporting similar awareness levels (89.9%) (16). This suggests that certain aspects of radiation safety, particularly concerning vulnerable populations such as pregnant women, are relatively well understood across different societies.

5. CONCLUSION

The study revealed that most participants possessed adequate knowledge and a positive attitude toward X-ray use; however, awareness of radiation risks and protective measures was limited. Education level and prior X-ray experience were key factors influencing both knowledge and attitude. These findings highlight the importance of incorporating radiation safety education into public awareness initiatives to promote safer imaging practices

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