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RESEARCH ARTICLE

PATIENT KNOWLEDGE AND PERCEPTION OF RADIATION RISK IN DIAGNOSTIC IMAGING

Mousami Pimpley[1], Sakshi Daga[2], Sridhar Reddy[3] and Jitendra Keshwani[4]

1. Postgraduate Student, Dept of Psychiatry, SAMC & PGI-Indore.
2. Assistant Professor Department of Radiology JLNMC Wardha.
3. Assistant Professor Department of Orthopaedics SAMC & PGI Indore.
4. Assistant Professor Department of Psychiatry SAMC & PGI-Indore.

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Abstract

Introduction:-

Currently the main stay of investigatory diagnosis for most of the conditions remains radio-imaging; hence a very large amount of population is being exposed to these modalities which come with a due risk.

X-rays and computed tomography (CT), imaging techniques employing ionizing radiation, carry a stochastic lifetime risk of inducing malignancy in accordance with the linear no threshold model [1,2]. Patient-centered care would dictate that patients appreciate the risks as well as the benefits of such imaging. A recent United Kingdom supreme court judgment [3]highlighted that this information, based on its material relevance to the patient, should be part of an informed consent process. The American College of Cardiology [4]developed a “patient centred imaging” framework, which incorporates a graded system for imaging consent based on level of risk. A study showed that patients tend to realize that CT scans involve radiation [5], while another showed patients don’t associate this with a cancer risk [6]. A lack of understanding has been demonstrated to exist between radiation dose and level of risk [7]. A study revealed that patients were aware that CT scans involved radiation [5], while another found that patients did not associate this with cancer risk [6]. Patients often inaccurately compare X-ray and CT radiation doses [7,8]. This may stem from inadequate risk communication by healthcare providers or their lack of knowledge [4,9]. Some patients expressed concern about CT imaging [5]; however, diagnosis remained their priority [5,7,10], with most wanting to be informed about risks [5]. This study aims to address knowledge gaps and misperceptions about the risks associated with diagnostic imaging.

Material and Methods:-

Study Design, Setting, and Duration

This cross-sectional study was conducted at the radiology department of the District Hospital in Dhar, Madhya Pradesh, from July to September 2023.

Selection of Participants

The minimum sample size required was estimated at 104 participants.

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Corresponding Author:- Mousami Pimpley
Address:- Postgraduate Student Department of Psychiatry Sri Aurobindo Medical College & PG Institute-Indore (M.P.).

Patients visiting the radiology department and consenting to participate were included in the study. Data were collected using a semi-structured questionnaire comprising sociodemographic details and knowledge/perception variables. A validated questionnaire from an online resource was piloted for this purpose.

Statistical analysis

Data were entered into Google Forms, and descriptive statistics were used to analyze variable frequencies. Chi-square and ANOVA tests were employed to identify associations between variables. Composite risk scores were calculated based on responses to risk perception questions and furtheranalysed for correlations with sociodemographic factors.

Results:-

The results showed that 54.8% of participants were male, and 45.2% were female, with most aged 18–60 years (74%), while 25% were above 60. Rural residents constituted 57.7%, with the remainder from urban areas.Health knowledge was predominantly sourced through word of mouth (40.4%) and general knowledge (27.9%). Awareness of radiation sources, such as CT scans (74.2%) and MRI (73.2%), was high. The majority overestimated cancer risks, perceiving a 1 in 100 chance of cancer, compared to the actual risk.

Demographic Data Table

Gender

	Frequency (n)	Percentage (%)
Male	57	54.8%
Female	47	45.2%

Age

	Frequency (n)	Percentage (%)
0-18	1	0.9%
18-40	39	37.5%
40-60	38	36.5%
>60	26	25.0%

Residence

	Frequency (n)	Percentage (%)
Rural	60	57.7%
Urban	44	42.3%

Occupation

	Frequency (n)	Percentage (%)
Unskilled	15	14.4%
Semi-skilled	47	45.2%
Professional	20	19.2%
Homemaker	22	20.2%
Retired	1	0.9%

Education

	Frequency (n)	Percentage (%)
No formal education	21	20.2%
Primary	19	18.3%
Secondary	18	17.3%

Higher secondary	24	23.1%
Graduation/Post-graduation	22	21.2%
Post-graduation	0	0.0%

Marital Status

	Frequency (n)	Percentage (%)
Unmarried	16	15.4%
Married	73	70.2%
Separated	10	9.6%
Divorced/Widowed	5	4.8%

Religion

	Frequency (n)	Percentage (%)
Hindu	78	75.0%
Muslim	21	20.2%
Sikh	2	1.9%
Christian	2	1.9%
Others	1	1.0%

Perceived pain in imaging :

Category	Frequency (n)	Percentage (%)
Low pain (0-3)	40	39.6
Moderate pain (4-6)	56	55.4
Severe pain (7-10)	5	5.0

Source of Health Knowledge:

	Frequency (n)	Percentage (%)
Doctor	7	7.7
General Knowledge	29	27.9
Reading	16	16.3
Taught Knowledge	8	7.7
Internet	8	7.7
TV	16	16.3
Word of Mouth	40	40.4

CT Scan Usage Data:

	Frequency (n)	Percentage (%)
Yes	13	12.7
No	89	87.3

Source of Health Knowledge

	Frequency (n)	Percentage (%)
Doctor	8	7.7
General Knowledge	29	27.9
Reading	17	16.3
Taught Knowledge	8	7.7
Internet	8	7.7

TV	16	16.3
Word of Mouth	42	40.4

CT Scan Usage

	Frequency (n)	Percentage (%)
Yes	13	12.7
No	89	87.3

Knowledge of Radiation Sources

Table: Nearest perceived Risk of Cancer from CT Scan

	Frequency (%)
1 in 3	7.7
1 in 10	18.3
1 in 100	19.2
1 in 1000	47.1
1 in 10,000	-
1 in 1 Lakh	-
1 in 10 Lakh	-
No chance	-
Don't know	7.7

Table: Nearest perceived Risk of Cancer from MRI

	Frequency (%)
1 in 3	8.7
1 in 10	14.4
1 in 100	22.1
1 in 1000	48.1
1 in 10,000	-
1 in 1 Lakh	-
1 in 10 Lakh	-
No chance	-
Don't know	8.7

Table: knowledge of Risk of Cancer in General

	Frequency (%)
1 in 3	6.7
1 in 10	34.6
1 in 100	45.2
1 in 1000	-
1 in 10,000	-
1 in 1 Lakh	-
1 in 10 Lakh	-
No chance	-

Don't know	6.7

Composite Risk Perception Scores by Age Group

Age Category	Mean Composite Risk Perception Score	P value
0-18	3.2	0.01
18-40	4.5	
40-60	4.1	
>60	5.0	

Composite Risk Perception Scores by Gender

Gender	Mean Composite Risk Perception Score	P Value
Male	3.5	
Female	4.5	

Composite Risk Perception Scores by Occupational Status

Occupation	Mean Composite Risk Perception Score	P value
Unskilled	3.0	0.015
Semi-skilled	4.0	
Professional	5.0	
Homemaker	6.0	
Retired	2.0	

Composite Risk Perception Scores by Background

Background	Mean Composite Risk Perception Score	P value
Urban	3.50	0.022
Rural	4.50	

Composite Risk Perception Scores by Educational Status

Education	Mean Composite Risk Perception Score	P value
No formal education	2.00	0.018
Primary	3.00	
Secondary	4.00	
Higher secondary	5.00	
Graduation/Post-graduation	6.00	

Composite Risk Perception Scores by Socio-Economic Status

Socio-Economic Status	Mean Composite Risk Perception Score	P value
Lower	2.00	0.021
Lower Middle	3.00	
Upper Middle	4.00	
Upper	5.00	

The study found variations in composite risk perception scores across demographic categories, with statistically significant differences in all groups. By age, the highest perception score was observed in individuals >60 years (5.0), while the lowest was in the 0-18 age group (3.2, p=0.01). Females had higher risk perception scores (4.5) compared to males (3.5). Among occupational groups, homemakers had the highest scores (6.0), while retirees had the lowest (2.0, p=0.015). Rural residents perceived higher risks (4.5) than urban residents (3.5, p=0.022). Educationally, those with graduation/post-graduation had the highest scores (6.0), while participants with no formal education had the lowest (2.0, p=0.018). Socio-economically, individuals from upper-class backgrounds scored highest (5.0), while those from lower-class backgrounds scored lowest (2.0, p=0.021). These results highlight

significant differences in risk perception across age, gender, occupation, background, education, and socio-economic status**.**

Discussion:-

The findings reveal substantial knowledge gaps and a misalignment between patient perceptions and actual risks of radiation from diagnostic imaging. The study aligns with existing literature, showing that higher education correlates with better understanding [11,12]. Emotional distress, more prevalent among females, indicates the need for tailored communication strategies [13].Despite concerns, most patients proceeded with imaging, valuing its diagnostic benefits. This highlights the necessity of balancing risk communication with the benefits of imaging to support informed decision-making.

Conclusion:-

The study underscores significant gaps in patient knowledge and risk perception regarding diagnostic imaging. Cancer risks were overestimated, particularly by individuals from rural and socio-economically disadvantaged backgrounds. Educational interventions can improve patient understanding and acceptance of imaging procedures, facilitating better-informed decisions.

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