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A DESCRIPTIVE STUDY TO ASSESS THE IMPACT OF ARTIFICIAL INTELLIGENCE ON RADIOLOGY

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Introduction

Artificial intelligence (AI) has been defined by some because the "branch of computing handling the simulation of intelligent behavior in computers" however, the precise definition is really a matter of debate among experts. An alternative definition is that the branch of computing dedicated to making algorithms which will solve problems without being explicitly programmed for all the specificities of the issues. Artificial Intelligence algorithms and especially deep learning (part of machine learning) aim to either assist humans with solving a drag or solve the matter without human input (fig 1a). The exponential increase in computational processing and memory capability has opened up the potential for AI to handle much larger datasets, including those required in radiology [1]

The term Artificial Intelligence encompasses numerous specific areas and approaches, including:

Computer-aided diagnosis/detection (CAD)

Machine learning

Natural language processing

Rule-based expert systems

Radiomics

Reduction of noise (noise reduction) and optimization of image acquisition

The term artificial intelligence is credited to John McCarthy [2], a mathematician (and the creator of the LISP programming language) who proposed and organized a summer research conference that happened in 1956 at Dartmouth on Artificial Intelligence, who used the term. The conference is taken into account by many to be the instant that AI was founded as a neighborhood of educational research, however, it might be argued that the creation of the field began earlier with Alan Turing, who developed the Turing test, or even before.

Artificial intelligence is that the next big thing in radiology. Artificial intelligence will change everything about the radiology field, from the way reports are reviewed to patient care. Patient care will be at the forefront of the artificial intelligence movement. Data patterns in studies analyzed by artificial intelligence algorithms will give preliminary reports to the radiologist. Along with preliminary reports [3], AI are going to be ready to keep track of a patients' medical record. The future is here and only beginning. Artificial intelligence is moving from a testing phase to now being implemented into the medical field. Artificial intelligence ranges from algorithms trained to detect abnormalities on images to keeping a full medical record on a patient [4]. According to Merriam-Webster dictionary, AI is: (a) a branch of computing handling the simulation of intelligent behavior in computers, and (b) the potential of a machine to imitate intelligent human behavior (2018)[5] Dr. Schier stated "intelligence refers to the ability to solve problems" (2018). To understand artificial intelligence and what it means for the future, we have to understand how artificial intelligence works. There are many various branches and kinds of Artificial Intelligence. 6 King and King (2018) reported the following: a serious component of AI is machine learning, which may be a subfield of computing that permits computers to find out without being explicitly programmed. This exciting technology incorporates computational models and algorithms that are almost like the structure and performance of our brain's biologic neural networks. These computational models are often referred to as "artificial neural networks [6]." When these artificial neural networks process information (digital data) from numerous input flows, they have the ability to "learn" and alter their structure in much the same way the neurons in our brain are altered with memory (p501). Deep learning is an in-depth network of machine learning, with data recognizing objects in images. Radiology is all about what's within the image. Neural networks are algorithms designed to research thousands and thousands of images, taking the info and organizing it to reveal patterns.

Combining physicians with AI will impact the sector of radiology. Artificial intelligence software generates a preliminary report of the scan, allowing the radiologist to review the scan and increase the report. Any critical findings will be reported and alarm the reading radiologist of an emergent case. Artificial intelligence software will review a study and choose where on the list the exam should be placed, whereas now PACS dictates the work list based off the time a scan is ordered. "Artificial intelligence not only provides your preliminary reports with findings but can also actively scan your report as you dictate for errors of context (right versus left discrepancy) [7] (Sana, 2018). Artificial intelligence will provide recommended follow-ups supported protocols, making it easier for the radiologist. Mohan states the pros of this approach would be dramatically improving the skewed ratio of the number of scans to the number of radiologists available (2018). When used correctly, AI are going to be ready to decrease the turn-around time for reports.

Although there are many goodies about AI, there also are flaws. At this time, AI algorithms are powerful but fragile and any noise within the image can disrupt the findings. When scans are not of technical quality due to incapacitated patients breathing or patients with large body habitus, artificial intelligence will not be able to analyze the study. Another flaw is earning the patient's trust with a machine. Will they trust a machine to supply a report for potentially life-threatening results? Next, will insurance pay to possess a machine analyze a costly study. Mohan poses a question to the artificial intelligence algorithm developers asking, "Are there software's good enough to not "miss" anything "and if at all there is a "miss," who is responsible- is it the software developers, the institute administration or the treating physicians who will follow the results to plan the patient's treatments (2018). Radiologists and AI machines still have guidelines to follow, and an ethical duty to the patient. Artificial intelligence has the capability to not only analyze a patient's scan but also keep up with said patient's medical history over time. There needs to be a balance between maintaining personal information privacy and the advancement of intelligent machines (Kohli & Geis, 2018)[8] . Patients can sign a waiver allowing a third-party to review and contribute to their health records (Kohli & Geis, 2018). According to Miller and Brown, simple neural networks are utilized in medicine since the primary 1990s to interpret electro cardiograms and diagnose myocardial infarction (2018). Artificial intelligence within the radiology field is starting to be used. Sana reports GE has partnered with MGH and IBM Watson's partnership with Radiology Partners (2018) [9]. Artificial intelligence is that the way forward for the radiology field. Will artificial intelligence eliminate the need for radiologists? No, it'll not, but AI will greatly enhance a patient's medical aid. Radiologists can let developers know where and the way AI is often of benefit to them. Radiologist and computer developers can work together to really make artificial intelligence great and effective. Faster report turns around, notifying the ordering physician, and keeping track of a patient's care are all ways in which AI will benefit the radiology field and therefore the patient [10].

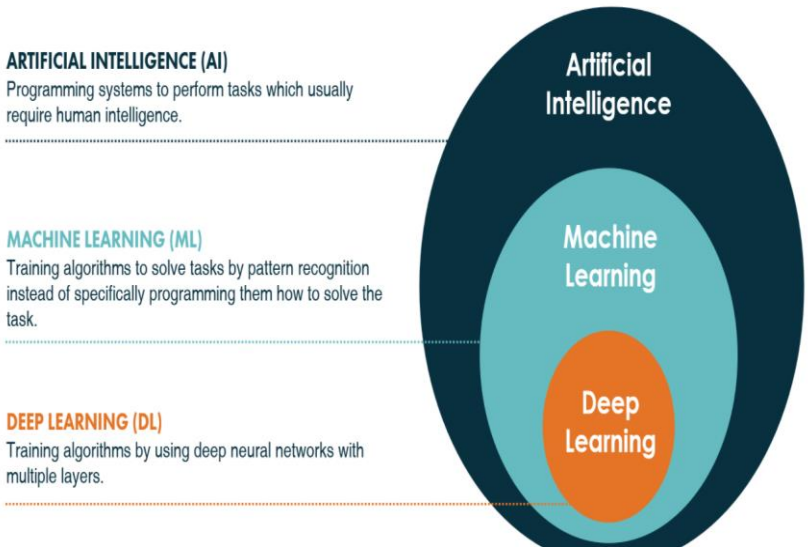


Figure 1a: Artificial intelligence covers all programming systems that can perform tasks which usually require human intelligence. Machine learning and deep learning have the same capabilities, but use specific methods with machine learning being a subfield of AI and deep learning being a subfield of machine learning.

Need of the study

This study will help in assessing the knowledge about artificial intelligence uses in radiology and make radiology residents and technologists aware about the benefits and use.

Aim and Objectives

- The Aim and Objective of the study is to determine the knowledge about artificial intelligence in radiology.

- To assess the knowledge about Artificial Intelligence and spread awareness about it on Radiology Residents, Radiological technologists and Trainees.

Assumption of the study

As per the previous study done on the Impact of Artificial Intelligence In radiology considering this lack of adequate research, the importance of the subject, and the discrepant results of the few available studies it is being assumed in the study that there is a fear in the radiology residents and technicians that Artificial Intelligence may Impact their career.

Operational Definition

Artificial Intelligence (AI) is the ability of computers or computer-controlled robots to perform tasks normally performed by humans, because they require human intelligence and discrimination.

Radiology is the science involving X-rays and other forms of high-energy radiation, especially the science of using such radiation to diagnose and treat diseases.

Methodology

Research approach:

Quantitative approach

Research design:

Cross sectional

Sampling technique:

Convenience sampling technique

Statistical method:

Descriptive statistical method

Research setting:

Multiple Hospitals of Kashmir (Department of Radio Diagnosis and Imaging Sher- I-Kashmir institute of medical sciences (SKIMS), S.M.H.S Srinagar and Its Associated Hospitals).

Sample size:

150

Sampling criteria:

Inclusion criteria:

Radiology residents, Radiology Technologists, and trainees working in radiology department

Exclusion criteria:

Residents, technologists, trainees working other than radiology department.

Method

The Questionnaire based survey entitled "Your expectations about AI in radiology", was conducted among radiologists, radiology technologists, and trainees working in radiology department and the study was carried out Multiple Hospitals of Kashmir (Sher-I-Kashmir Institute of Medical Sciences Soura Srinagar, Shri Maharaja Hari Singh/Headwin Hospital and its Associated Hospital's). The questionnaire was self-structured, and was examined and approved by the ETHICAL committee of JAMIA HAMDARD (Deemed to be University). The questionnaire related to the Impact of Artificial Intelligence on Radiology was in the form of multiple choice and was given to each participant. The questions of the questionnaire were divided into three sections.

1. The first section consists of questions related to respondent age, sex, radiology subspecialty and working status, type of institution, no personal identifying data will be collected.
2. The second section consisted of 15 multiple choice questions about user feelings/forecasts in respect to the advent of AI applications in radiological practice in the next 5–10 years.
3. The Third section, which consisted of questions on awareness about Artificial Intelligence, and the Habitual use of Artificial Intelligence.

The participants were informed that their participation in this study will be entirely on a voluntary basis and their privacy will be confidential before responding to the questionnaires

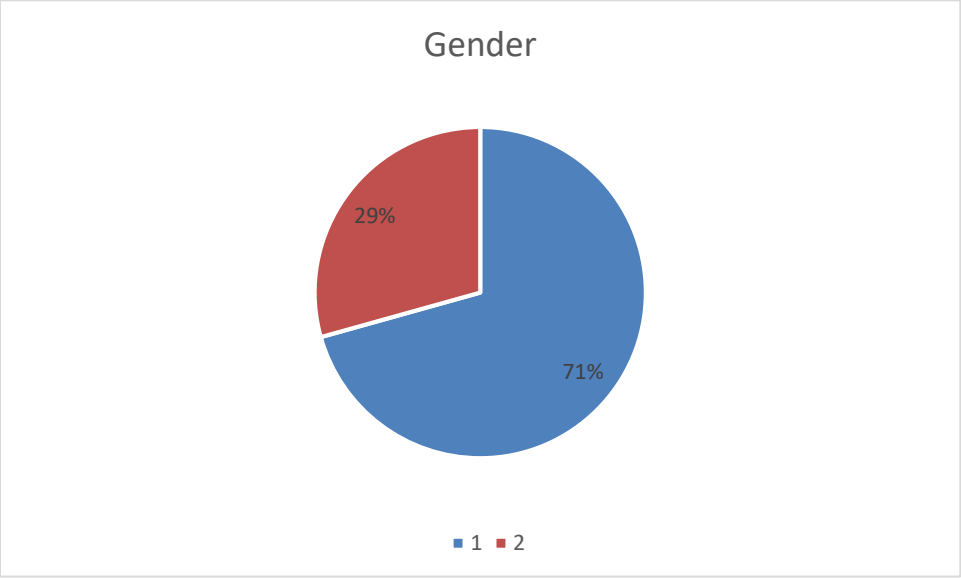
Results

Table No. 1

Distribution of Respondents According to Gender

S. No	Gender	Count (Out of 150)	Percentage
1	Male	106	71%
2	Female	44	29%
Total		150	100%

Figure No. 1



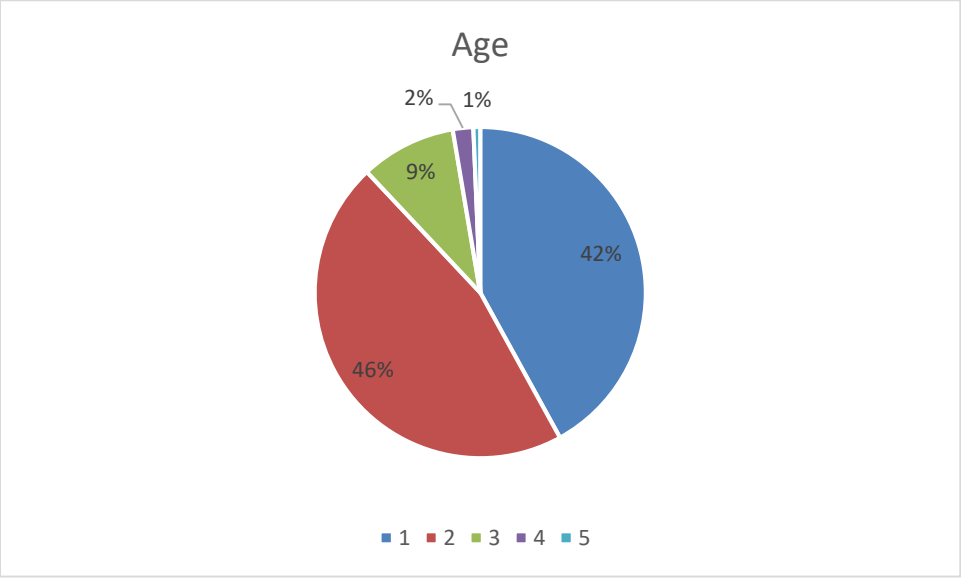
All respondents were allocated in two groups. Out of total Respondents ,29 % were females, and 71% of respondents were males.

Table No. 2

Distribution of Respondents According of Age (n=150)

S. No	Age	Count (Out of 150)	Percentage
1	20-29	63	42%
2	30-39	69	46%
3	40-49	14	9%
4	50-59	3	2%
5	60-69	1	1%
Total		150	100%

Figure No. 2



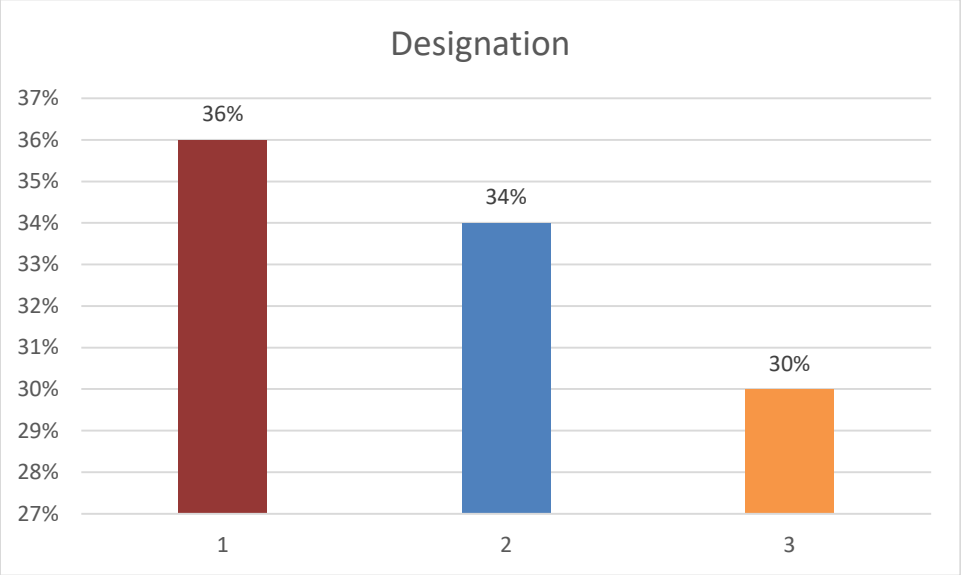
All respondents were allocated into five groups. Out of total respondents 1% were observed in age group 60-69, Age group 50-59 were 2 %, Age group 40-49 were 9%, Age group 20-29 were 42%, Age group of 30-39 were 46%.

Table No. 3

Distribution of patients According to professional position/Designation.

S. No	Designation	Count (Out of 100)	Percentage
1	Trainee	54	36%
2	Radiology Resident	51	34%
3	Radiology technologist	45	30%
Total		150	100%

Figure No. 3



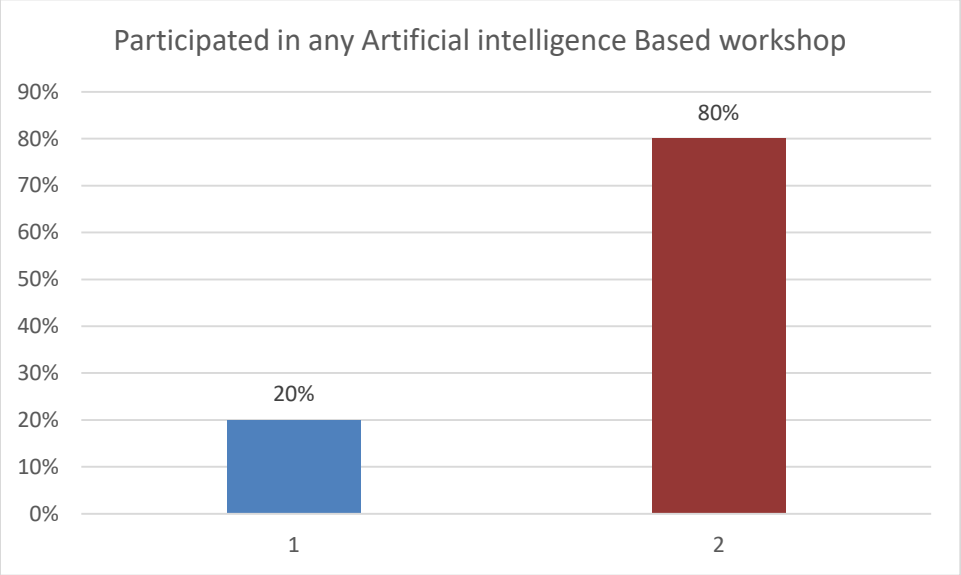
All respondents were distributed according to their professional/designation position. Out of 150 respondents 36% were Trainee,34 % were Radiology residents and 30 % were Radiology Technologists.

Table No. 4

Have you ever participated in any Artificial intelligence Based workshop?

S. No	Participated in any Artificial intelligence Based workshop	Count (Out of 150)	Percentage
1	YES	30	20%
2	NO	120	80%
Total		150	100%

Figure No. 4



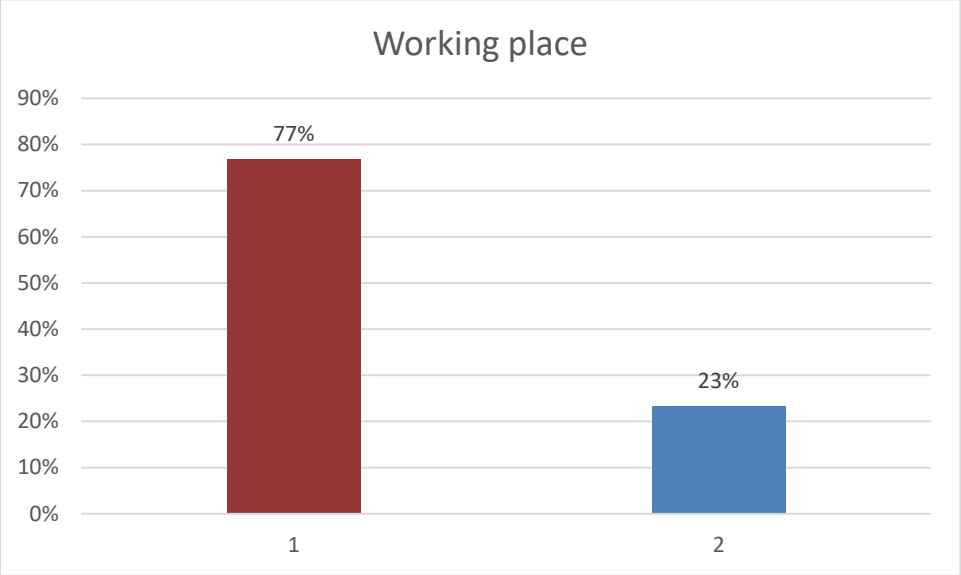
Out of 150 respondents,20 % of respondents have participated in any AI based workshop while as 80 % of the respondents have not attended AI based workshop.

Table No. 5

Working place

S. No	Working place	Count (Out of 150)	Percentage
1	HOSPITAL	115	77%
2	UNI/HOSPITAL	35	23%
Total		150	100%

Figure No. 5



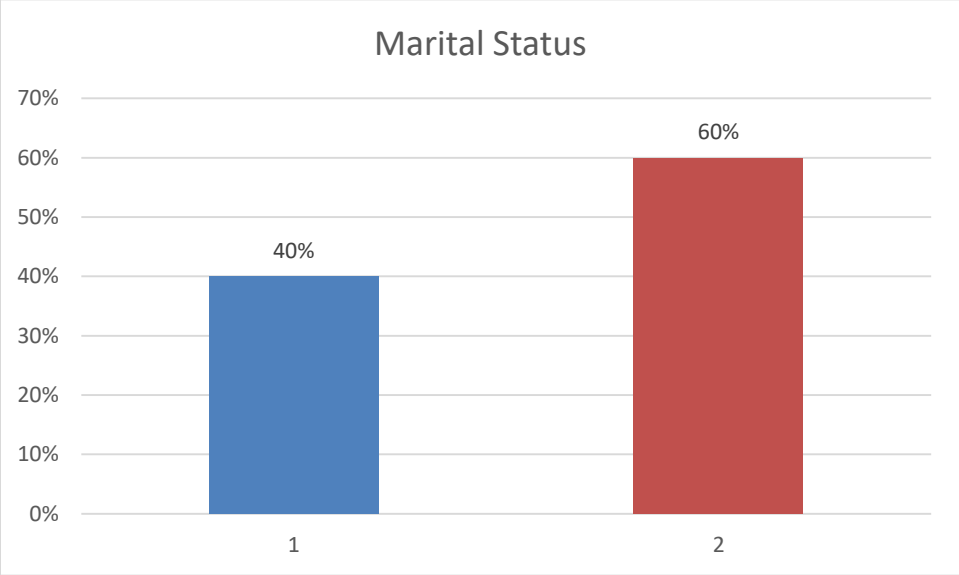
All respondents were asked about their working status. Out of 150 Respondents 77% are working in Hospitals were as 23 % of the respondents are working in UNI/Hospitals.

Table No. 6

Marital Status

S. No	Marital Status	Count (Out of 150)	Percentage
1	Married	60	40%
2	Unmarried	90	60%
Total		150	100%

Figure No. 6



Out of 150 respondents 40 % were married and 60 % were unmarried.

Table No. 7

Education Status

S. No	Education Status	Count (Out of 150)	Percentage
1	MBBS-MD	63	42%
2	MBBS-DNB	2	1%
3	B.SC RADIOLOGY	79	53%
4	M.SC RADIOLOGY	6	4%
Total		150	100%

Figure No. 7

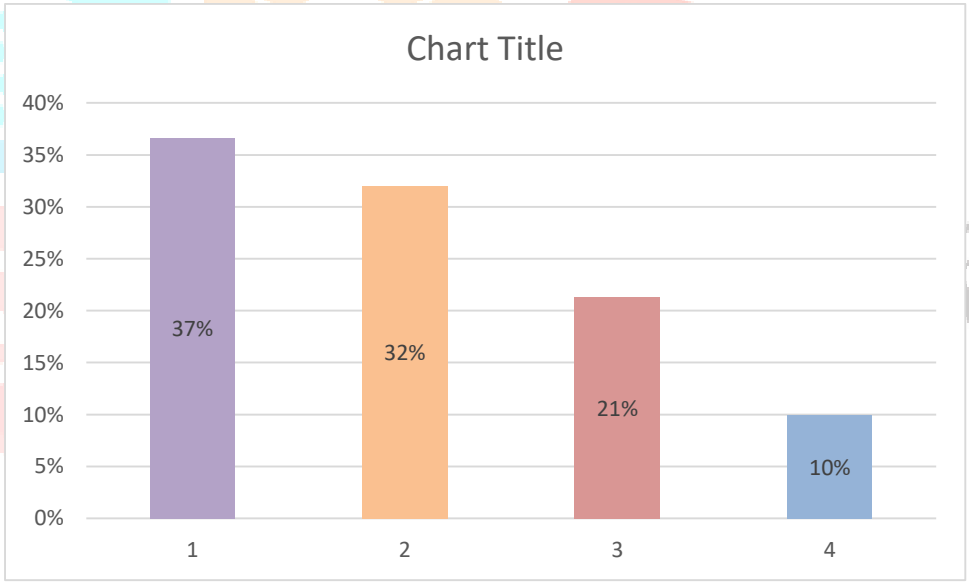
All respondents were been asked about their education status,42 % of respondents are MBBS-MD, while as 1% are MBBS-DNB,53 % are B.sc Radiology and 4 % are M.sc Radiology.

Table No. 8

Which radiological subspecialties do you predict will be more impacted by AI in the following 5–10 years?

S. No	Response Q1	Count (Out of 150)	Percentage
1	A	55	37%
2	B	48	32%
3	C	32	21%
4	D	15	10%
Total		150	100%

Figure No. 8



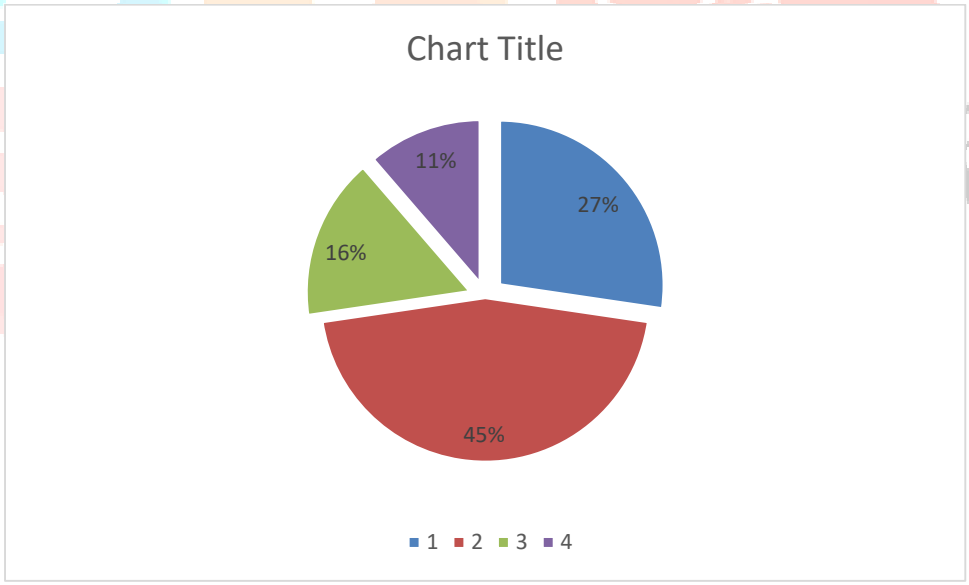
Out of 150 responses,11% of the respondents think that breast will be more impacted, while as 39 % of the respondents think that cardiovascular will be more impacted, 31 % of the respondents think that Abdominal imaging will be more impacted and 19% of the respondents think that other than these imaging methods will be impacted in next 5-10 years.

Table No. 9

Which procedures do you anticipate will be the most significant fields of AI applications in the following 5–10 years?

S. No	Response Q2	Count (Out of 150)	Percentage
1	A	41	27%
2	B	68	45%
3	C	24	16%
4	D	17	11%
Total		150	100%

Figure No. 9



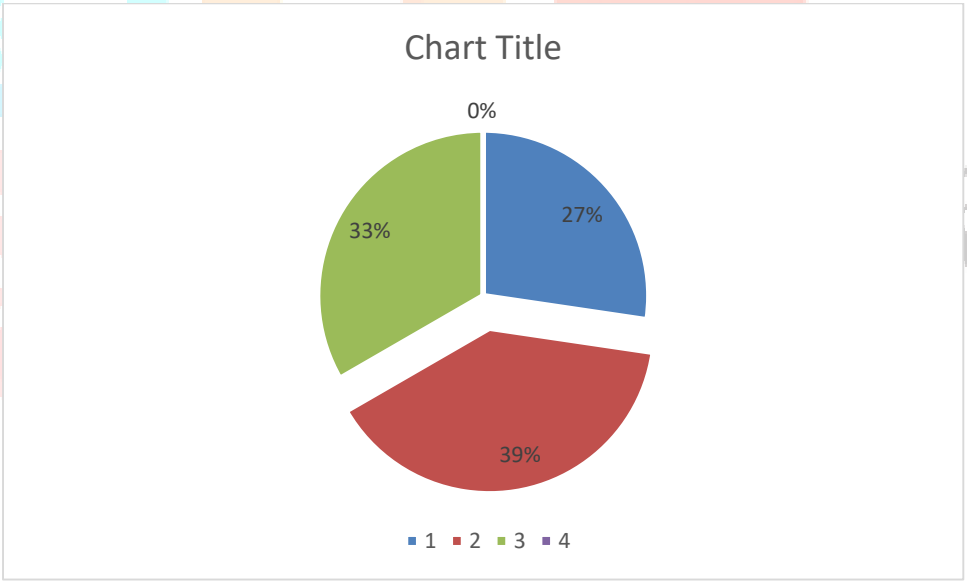
Above mentioned graph shows that out of 150 respondents 27 % of respondents think that Radiography, Mammography Ultrasound, Angiography/Fluoroscopy will be most significant fields of AI applications in the following 5–10 years, while as 45 % of respondents say that CT, MRI, PET/Nuclear, 16 % respondents think that Hybrid imaging, DXA and 11 % think that Other than these modalities.

Table No. 10

Which of the accompanying AI applications you believe are more significant as helps to radiological calling?

S. No	Response Q3	Count (Out of 150)	Percentage
1	A	41	27%
2	B	59	39%
3	C	50	33%
4	D	0	0%
Total		150	100%

Figure No. 10



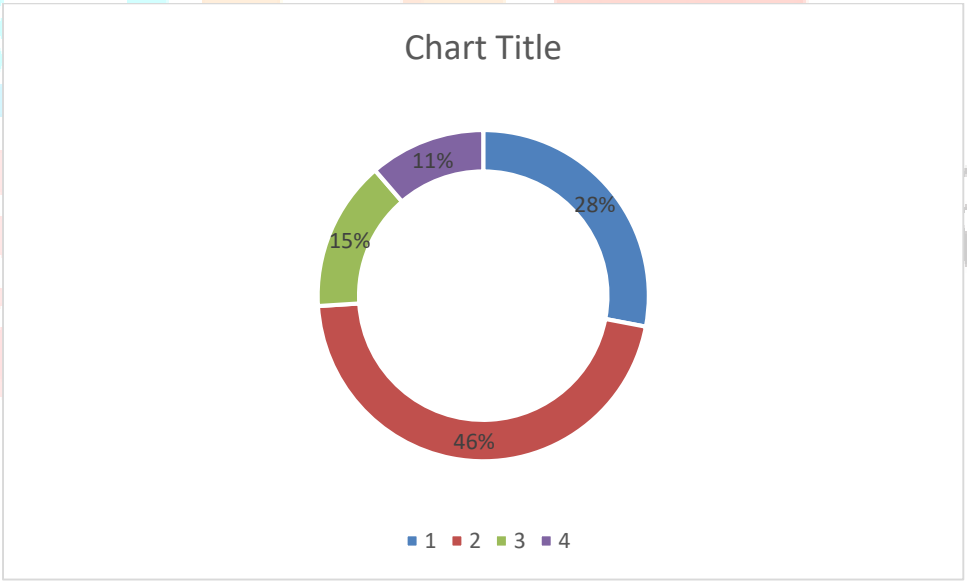
Total 150 respondents responded to this question out of which 27% believe that Imaging protocol optimization are more significant while as 39 % believe that Image post-processing are more significant and 33 % believe that Detection in asymptomatic subjects (screening), are more significant as helps to radiological calling,0 % thinks other than this.

Table No. 11

Do you anticipate an AI sway on expert radiologist's life regarding measure of occupation positions in the following 5–10 years?

S. No	Response Q4	Count (Out of 150)	Percentage
1	A	42	28%
2	B	69	46%
3	C	22	15%
4	D	17	11%
Total		150	100%

Figure No. 11



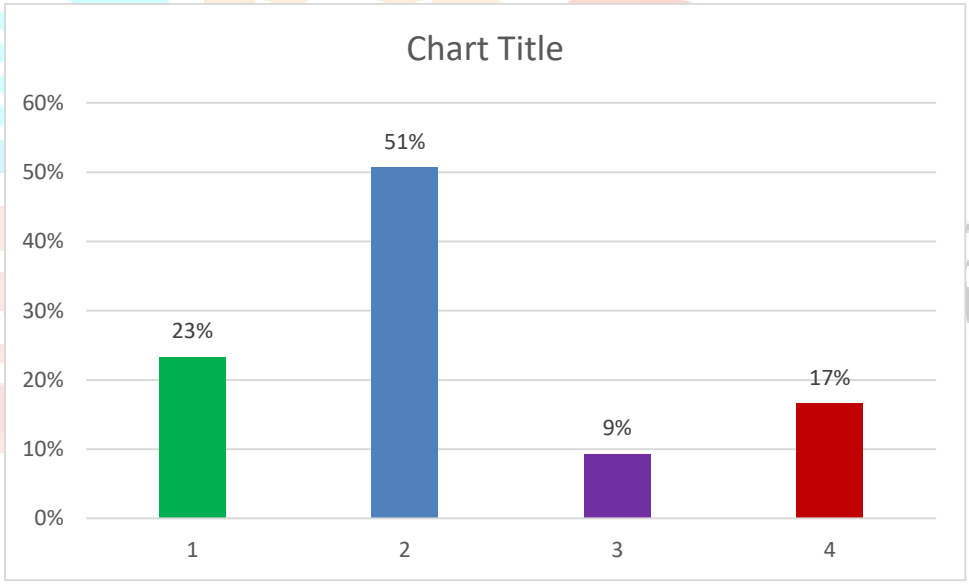
Out of 150 responses 28 % of respondents chooses No, 46 % chooses Yes, job positions will be reduceds, while as 15% of respondents says Yes, job positions will Increase and 11 % of respondents thinks None of these statements.

Table No. 12

In the following 5–10 years, the utilization of AI-based applications will make radiologists' obligations?

S. No	Response Q5	Count (Out of 150)	Percentage
1	A	35	23%
2	B	76	51%
3	C	14	9%
4	D	25	17%
Total		150	100%

Figure No. 12



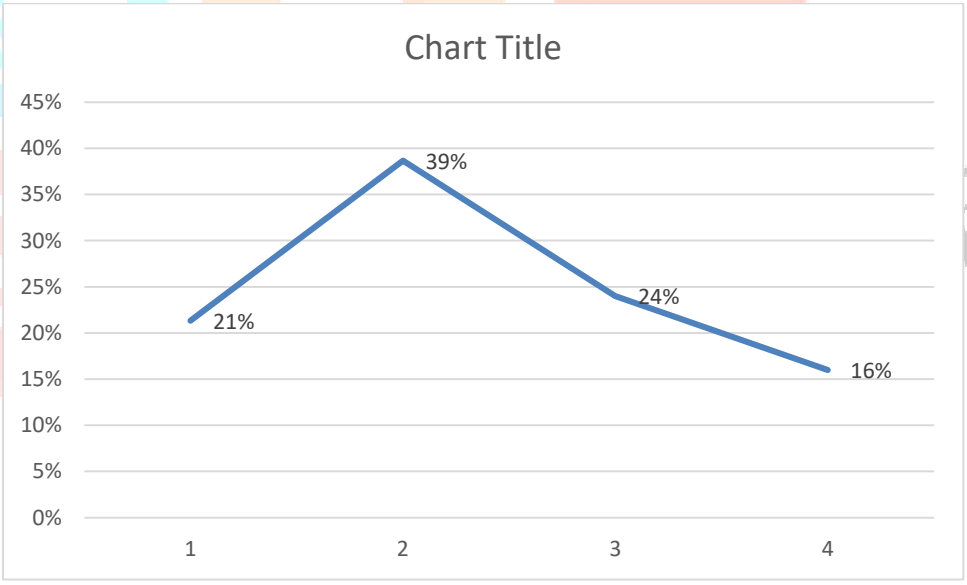
Out of 150 respondents, 23% of respondents believe that AI-based applications will make radiologists' obligations More technical, 51% of respondents believe that it will be More clinical,9 % believe that it will remain Unchanged and 17 % of respondents thinks that Other than these statements.

Table No. 13

Do you believe that, in the following 5–10 years, the utilization of AI-based applications will assist with announcing additionally assessments outside the field of sub-specialization?

S. No	Response Q6	Count (Out of 150)	Percentage
1	A	32	21%
2	B	58	39%
3	C	36	24%
4	D	24	16%
Total		150	100%

Figure No. 13



Total respondents responded in this statement are 150, out of which 21 % stated that No, radiologists will be more focused on radiology subspecialties,39 % of respondents choose Yes, radiologists will be less focused on radiology subspecialties. While as 24% believes that the rate of dedication to subspecialties will remain unchanged and 16 % other as their choice.

Table No. 14

Do you predict an AI sway on expert radiologist's life regarding absolute revealing remaining burden in the following 5–10 years?

S. No	Response Q7	Count (Out of 150)	Percentage
1	A	17	11%
2	B	58	39%
3	C	47	31%
4	D	28	19%
Total		150	100%

Figure No. 14

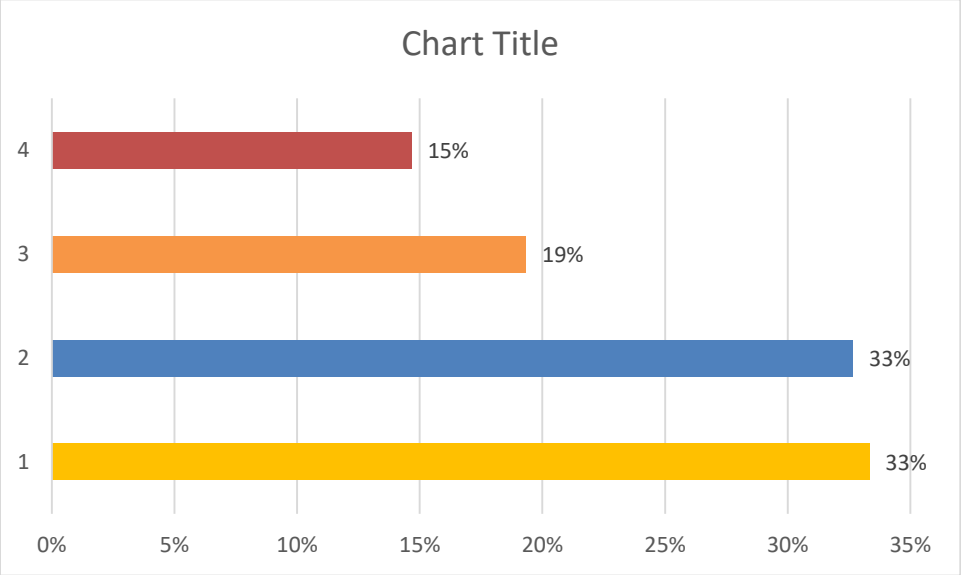
Out of 150 responses 11 % of responses No AI sway on expert radiologist's life regarding absolute revealing remaining burden in the following 5–10 years,39 % stated that Yes, it will increase,31 % responses reveals Yes, it will be reduced and 19 % None as their option.

Table No. 15

In the following 5–10 years, who will assume the lawful liability of AI-framework yield?

S. No	Response Q8	Count (Out of 150)	Percentage
1	A	50	33%
2	B	49	33%
3	C	29	19%
4	D	22	15%
Total		150	100%

Figure No. 15



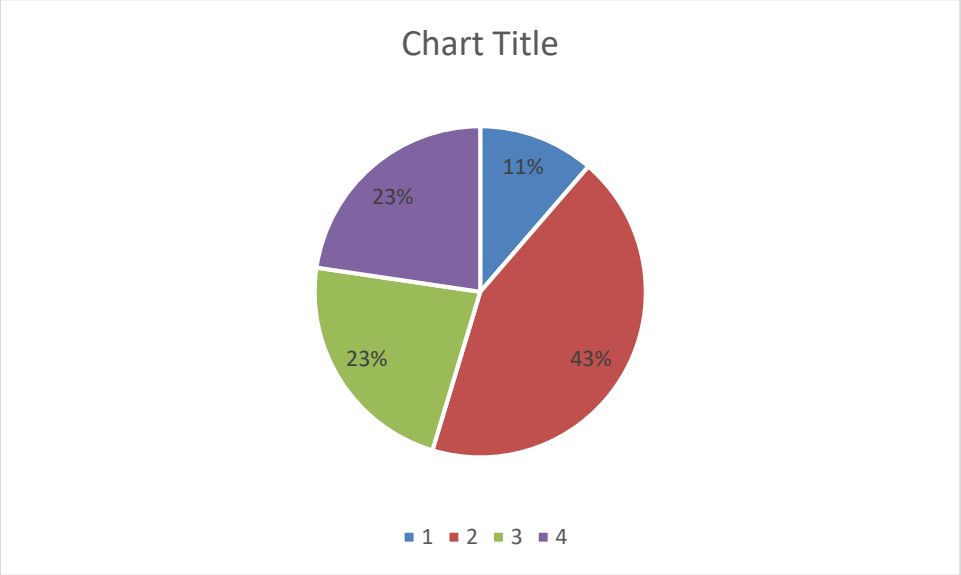
Out of 150 responses 15% thinks Radiologists will assume the lawful liability of AI-framework Yield, 19 % chooses other physicians (e.g., clinicians asking for the imaging study),while as 33 % chooses Developers of AI applications and 33 % thinks other than above mentioned options.

Table No. 16

In the following 5–10 years, will patients generally acknowledge a report from AI applications without management and endorsement by a doctor?

S. No	Response Q9	Count (Out of 150)	Percentage
1	A	17	11%
2	B	65	43%
3	C	34	23%
4	D	34	23%
Total		150	100%

Figure No. 16



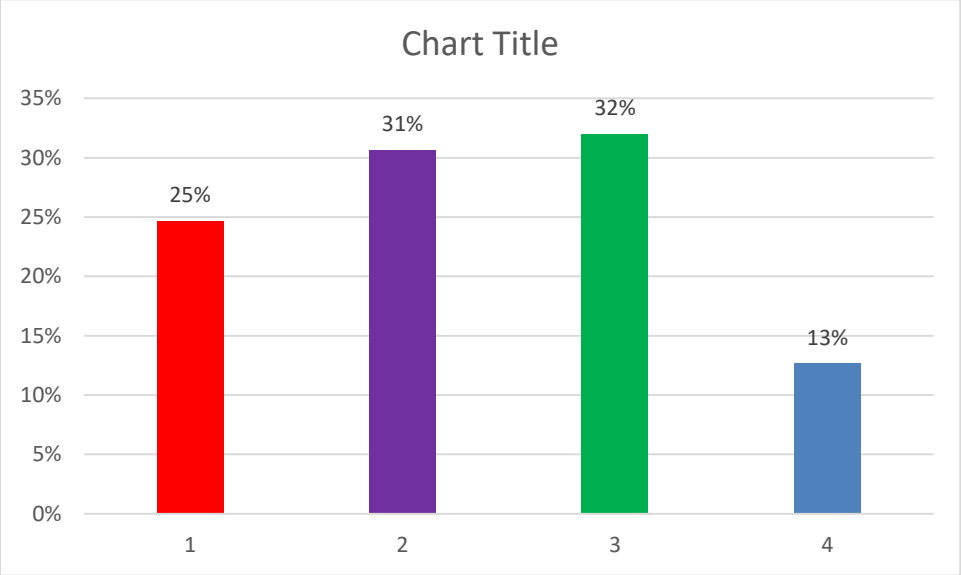
Out of 150 responses 11 % of the participants think Yes, the patients will generally acknowledge a report from AI applications without management and endorsement by a doctor, 43 % stated No, while as 23 % says that it is Difficult to estimate at present and 23 % says other than this mentioned option.

Table No. 17

How might be the connection between the radiologist and the quiet in light of AI presentation?

S. No	Response Q10	Count (Out of 150)	Percentage
1	A	37	25%
2	B	46	31%
3	C	48	32%
4	D	19	13%
Total		150	100%

Figure No. 17



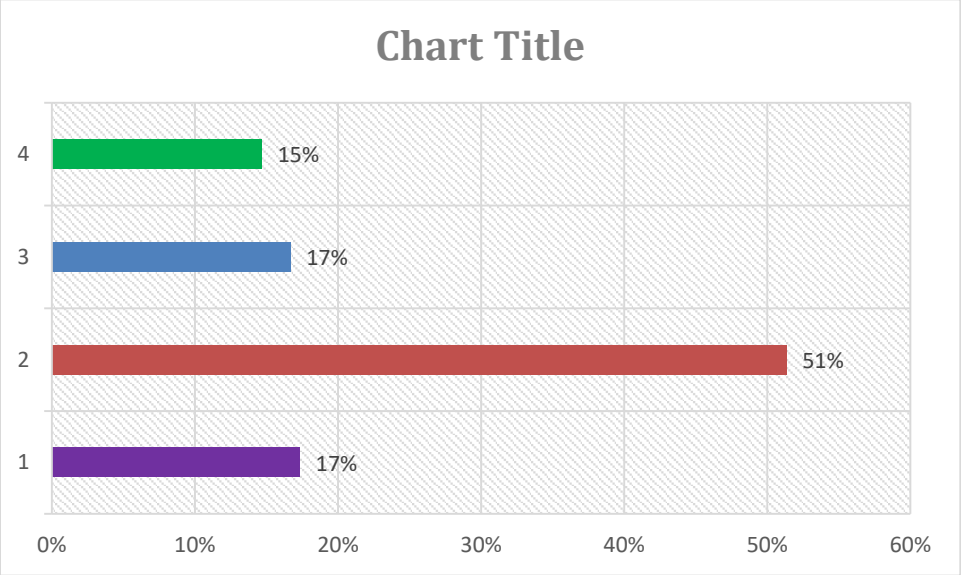
Out of 150 responses 25% of participants says that it will be More impersonal, 31 % says that it will be More interactive, while as 32 % says that it will remain unchanged and 13 % says none.

Table No. 18

Do you think an artificial intelligence may impact on radiology technologists also?

S. No	Response Q11	Count (Out of 150)	Percentage
1	A	26	17%
2	B	77	51%
3	C	25	17%
4	D	22	15%
Total		150	100%

Figure No. 18



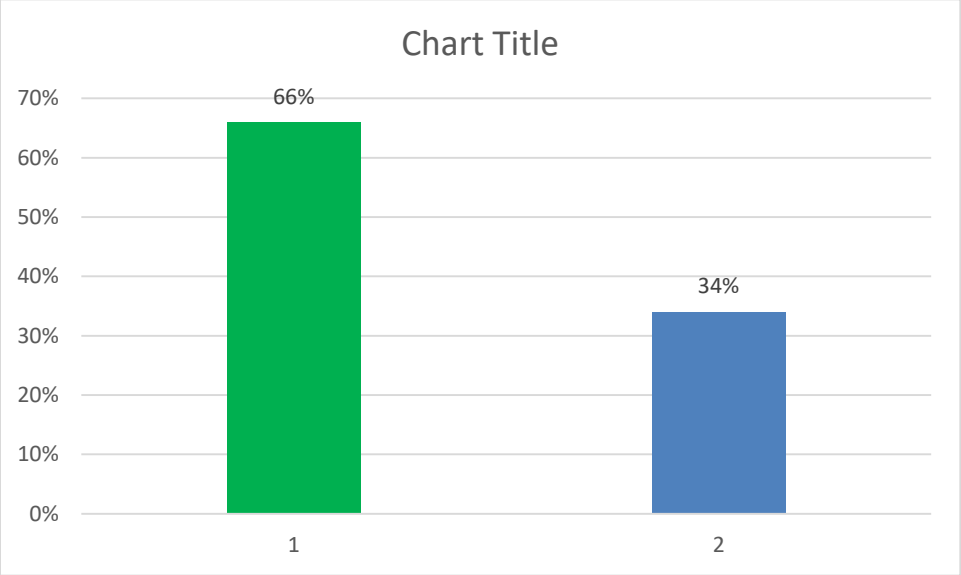
Out of 150 participants 15% chooses No as artificial intelligence may not impact on radiology technologists, 17% says yes artificial intelligence may impact on radiology technologists also, while as 51 % of participants says No, never, rest 17 % of the participants says its difficult to answer now.

Table No. 19

Should radiology technologists be educated on Artificial Intelligence?

S. No	Response Q12	Count (Out of 150)	Percentage
1	A	99	66%
2	B	51	34%
Total		150	100%

Figure No. 19



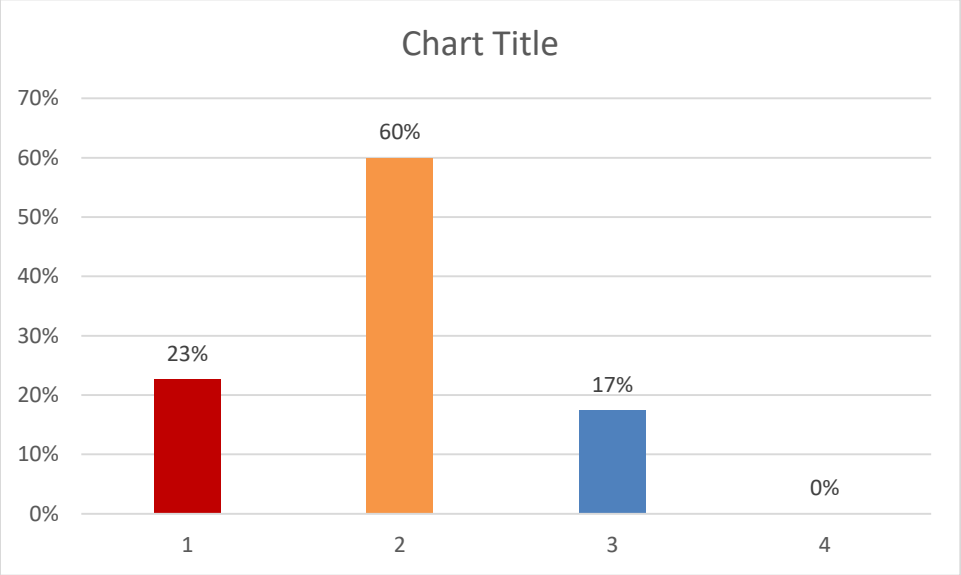
Above mentioned graph shows that out of 150 participants 66 % of participants say Yes radiology technologists be educated on Artificial Intelligence while as 34 % of participants think that radiology technologists should not be educated on Artificial Intelligence.

Table No. 20

Are you Utilizing Artificial Intelligence Services in Your Clinical Practice?

S. No	Response Q13	Count (Out of 150)	Percentage
1	A	34	23%
2	B	90	60%
3	C	26	17%
4	D	0	0%
Total		150	100%

Figure No. 20



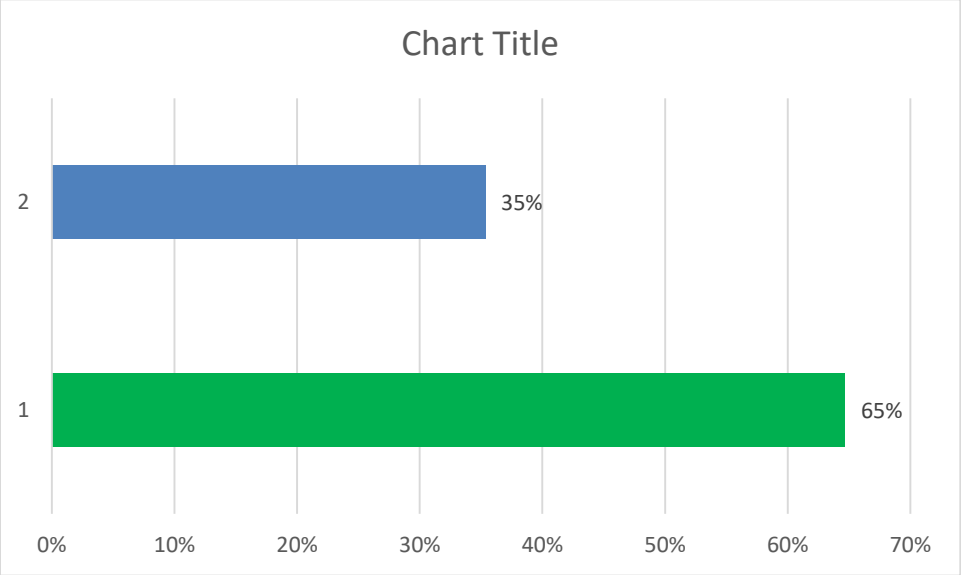
150 participants responded this question out of which 23 % of participants say yes we are utilizing AI service in our clinical practice, 60 % of participants chooses No we are not utilizing AI service and 17 % of participants are planning to utilize.

Table No. 21

Do you believe artificial intelligence poses a threat to the radiologist's assistance Function?

S. No	Response Q14	Count (Out of 150)	Percentage
1	A	97	65%
2	B	53	35%
Total		150	100%

Figure No. 21



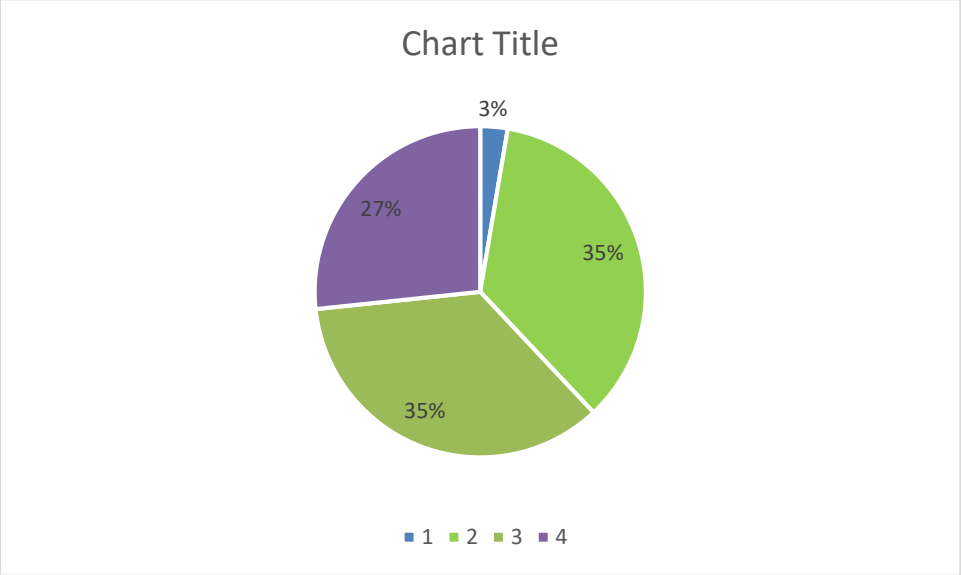
Total no of participants answered this question are 150 out of which 65 % of participants believe that Yes artificial intelligence poses a threat to the radiologist's assistance Function, while as 35 % of participants believe that NO, artificial intelligence poses a threat to the radiologist's assistance Function.

Table No. 22

Are you involved in research projects on AI-based application development?

S. No	Response Q15	Count (Out of 150)	Percentage
1	A	4	3%
2	B	53	35%
3	C	53	35%
4	D	40	27%
Total		150	100%

Figure No. 22



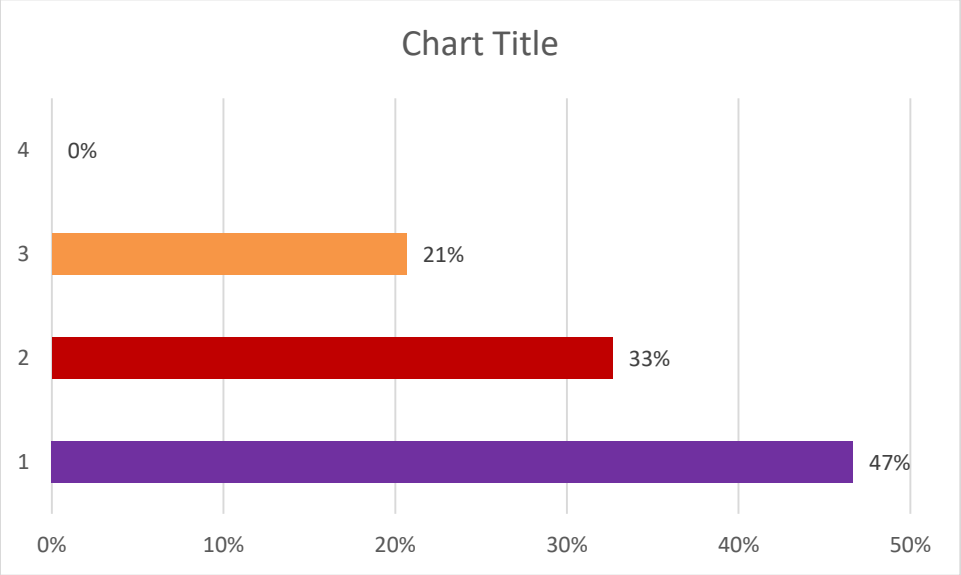
Out of 150 responses 3 % of participants says yes, testing, 35 % participants choose yes developing, while as 35 % of participants chooses No, but planning to be involved and 27 % chooses No.

Table No. 23

If there is Artificial Intelligence course in your institute, do you want to join?

S. No	Response Q1	Count (Out of 150)	Percentage
1	A	70	47%
2	B	49	33%
3	C	31	21%
4	D	0	0%
Total		150	100%

Figure No. 23



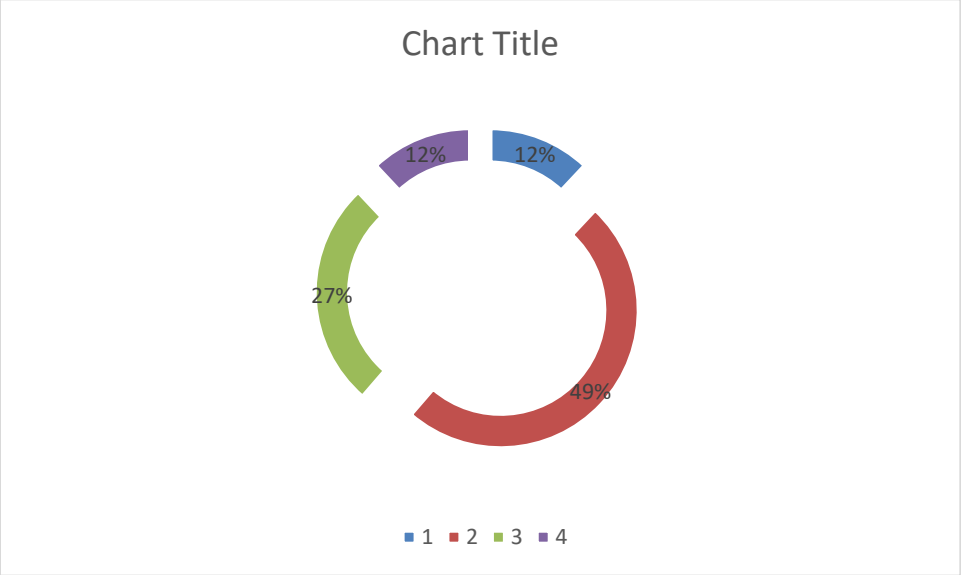
Out of 150 responses results reveal that 47 % of the participants are willing to join AI course if available, 33 % of participants chooses No, while as 21 % of participants are not interested to join this course.

Table No. 24

In your opinion, how much human radiologists' carrier will be impacted by Use of Artificial Intelligence?

S. No	Response Q2	Count (Out of 150)	Percentage
1	A	18	12%
2	B	74	49%
3	C	40	27%
4	D	18	12%
Total		150	100%

Figure No. 24



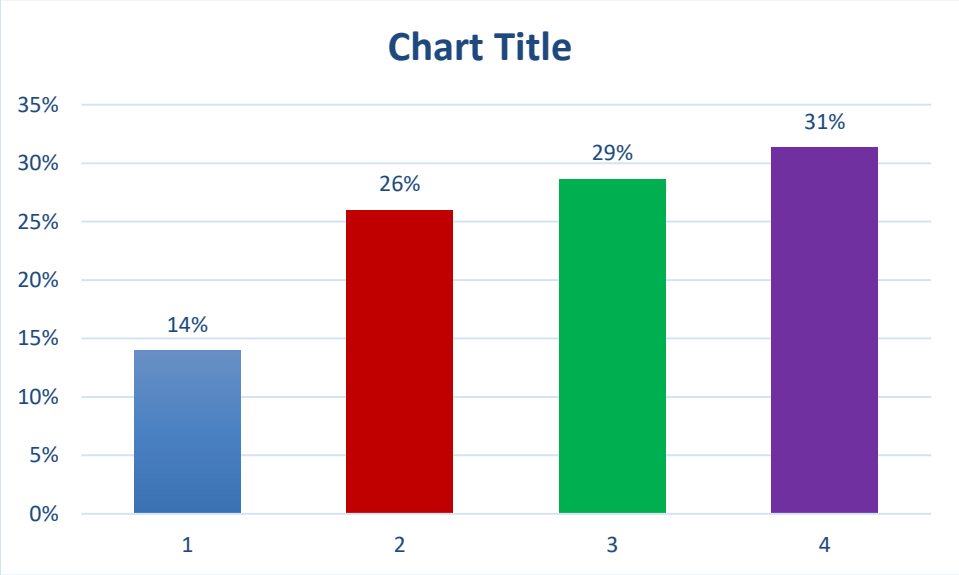
Results reveal that 12% of the participants thinks that 0 %1 human radiologists' carrier will be impacted by Use of Artificial Intelligence,49 % of participants think that 10 % of carrier will be impacted by the use of AI, while as 27 % of the participants thinks that 50 % of carrier will be impacted and 12 % of the participants thinks that 100 % of carrier will be impacted.

Table No. 25

Have you ever worked where Artificial Intelligence was prasticised?

S. No	Response Q3	Count (Out of 150)	Percentage
1	A	21	14%
2	B	39	26%
3	C	43	29%
4	D	47	31%
Total		150	100%

Figure No. 25



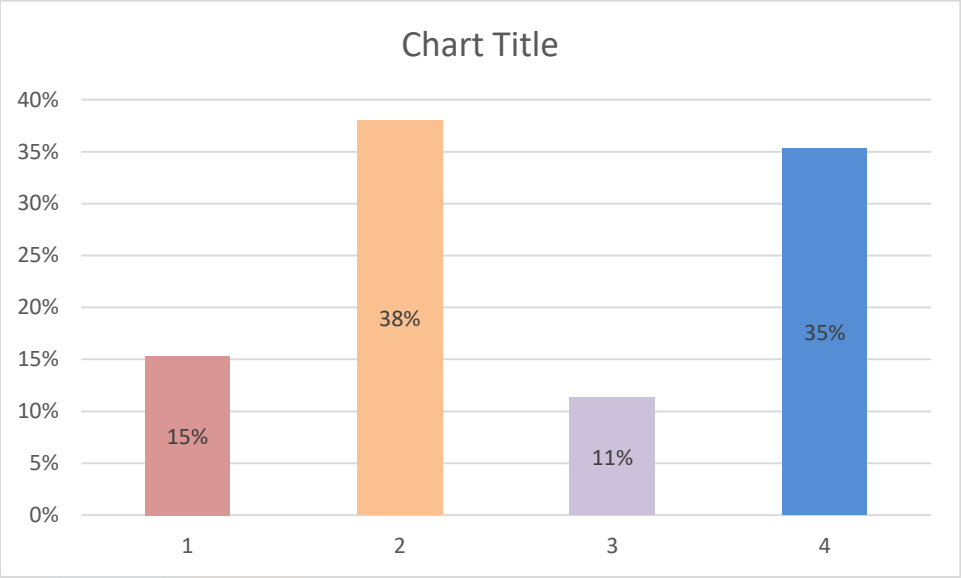
Out of 150 responses 14 % of participants worked every time where Artificial Intelligence was prasticised, 26 % of participants said yes, mostly ,29 % participants said yes sometimes we worked their where AI was prasticised and 31 % had never worked.

Table No. 26

Do you Think Artificial Intelligence Will Better Diagnose Then Human Radiologist?

S. No	Response Q4	Count (Out of 150)	Percentage
1	A	23	15%
2	B	57	38%
3	C	17	11%
4	D	53	35%
Total		150	100%

Figure No. 26



15 % of participants think that yes mostly Artificial Intelligence Will Better Diagnose Then Human Radiologist,38 % of participants say No, 11 % of participants says No every time and 35 % of participants believe that May be Artificial Intelligence Will Better Diagnose Then Human Radiologist.

Table No. 27

Do you Think People will accept the Diagnosis of Artificial Intelligence?

S. No	Response Q5	Count (Out of 150)	Percentage
1	A	34	23%
2	B	42	28%
3	C	44	29%
4	D	30	20%
Total		150	100%

Figure No. 27

Results reveal that 23 % of participants believe that yes every time People will accept the Diagnosis of Artificial Intelligence,28 % of participants believe that yes mostly People will accept the Diagnosis of Artificial Intelligence,29 % believe that yes sometimes People will accept the Diagnosis of Artificial

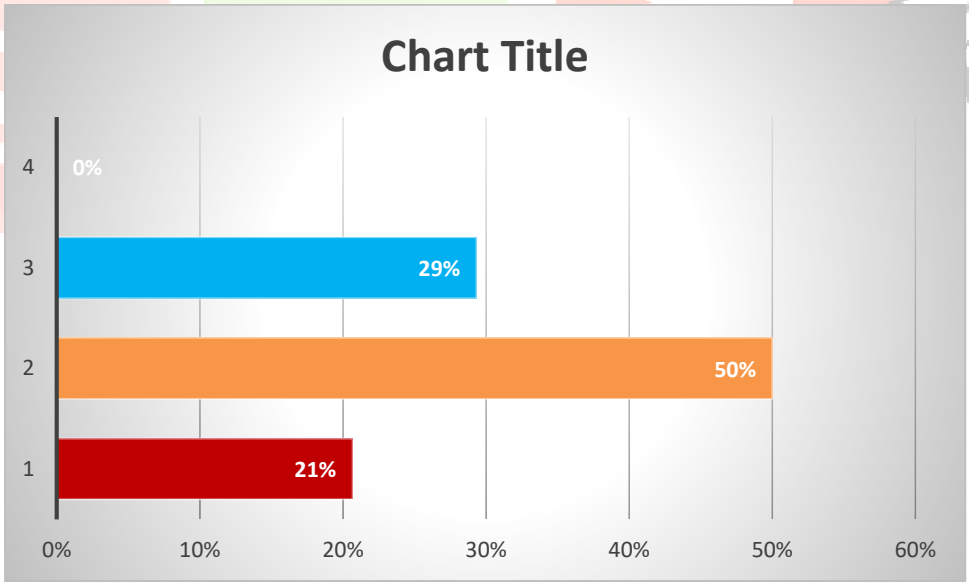
Intelligence and 20 % of participants believe that no never People will accept the Diagnosis of Artificial Intelligence.

Table No. 28

How happy would you be for AI to assess your scan without the help of a human doctor?

S. No	Response Q6	Count (Out of 150)	Percentage
1	A	31	21%
2	B	75	50%
3	C	44	29%
4	D	0	0%
Total		150	100%

Figure No. 28



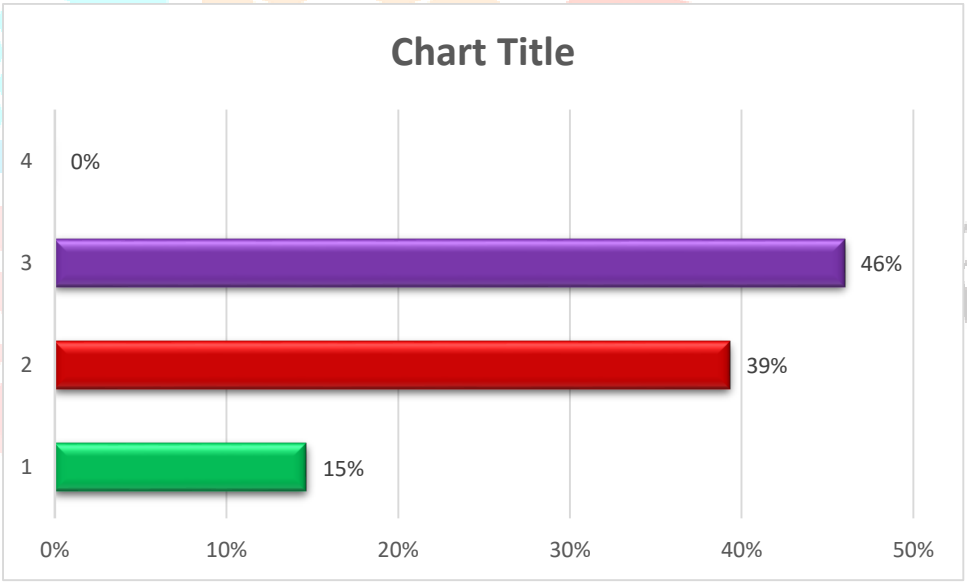
Out of 150 response 21 % of participants are unhappy for AI to assess your scan without the help of a human doctor, 50 % of participants are happy that AI to assess your scan without the help of a human doctor, 29 % of participants are not sure .

Table No. 29

If the AI was at least as accurate as a doctor, who would you prefer made the final diagnosis?

S. No	Response Q7	Count (Out of 150)	Percentage
1	A	22	15%
2	B	59	39%
3	C	69	46%
4	D	0	0%
Total		150	100%

Figure No. 29



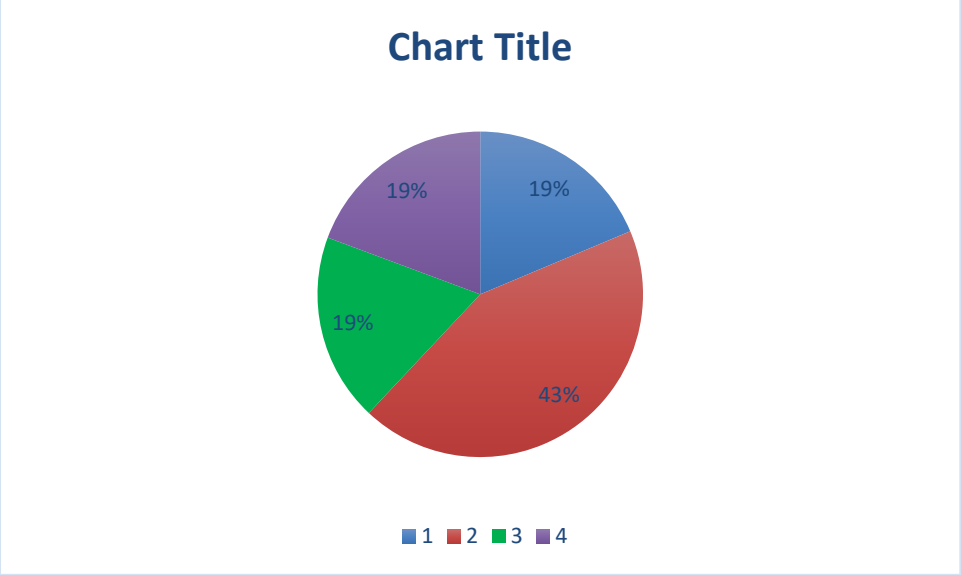
Out of 150 responses 15 % of participants thinks that Doctor alone, while as 46 % of participants believe that Doctor with AI and 46 % of participants reveal that AI alone.

Table No. 30

Do you think that Artificial Intelligence Should be introduced in every Hospital for better Diagnosis?

S. No	Response Q8	Count (Out of 150)	Percentage
1	A	28	19%
2	B	65	43%
3	C	28	19%
4	D	29	19%
Total		150	100%

Figure No. 30



Results reveal that out of 150 responses 19 % of participants thinks that yes, every time Artificial Intelligence Should be introduced in every Hospital for better Diagnosis, 43 % of participants believe that yes mostly that Artificial Intelligence Should be introduced in every Hospital for better Diagnosis, 19 % says yes sometimes and 19 % thinks no never Artificial Intelligence Should not be introduced in every Hospital for better Diagnosis.

Discussion

Artificial intelligence (AI) algorithms, notably deep learning, have unarguable outstanding progress in image-recognition tasks. ways starting from convolutional neural networks to variational autoencoders have found myriad applications within the medical image analysis field, propulsive it forward at a quick pace. historically, in radiology observe, trained physicians visually assessed medical footage for the detection, characterization and observance of diseases. AI ways shine at automatically recognizing difficult patterns in imaging data and providing quantitative, instead of qualitative, assessments of pictorial representation characteristics. throughout this research, we tend to determine a general understanding of AI ways, notably those concerning image-based tasks. we tend to explore but these ways might impact multiple sides of radiology, with a general focus on applications in medical science, and demonstrate ways that throughout which these ways are advancing the rostrum. Finally, we tend to debate the challenges facing clinical implementation and supply our perspective on but the domain can be advanced. computing (AI) has recently created substantial strides in perception (the interpretation of sensory information), allowing machines to raised represent and interpret complex data.

Within health care, AI is popping into a heavy constituent of the various applications, additionally as drug discovery, remote patient observation, medical science and imaging, risk management, wearables, virtual assistants and hospital management. Many domains with immense info components just like the analysis of deoxyribonucleic acid and compound sequencing data are expected to find out from the use of AI. Medical fields that hold imaging info, additionally as radiology, pathology, dermatology and ophthalmology, have already begun to find out from the implementation of AI ways in which. At intervals radiology, trained physicians visually assess medical footage and report findings to sight, characterize and monitor diseases. Such assessment is typically supported education and ability and will be, at times, subjective. In distinction to such qualitative reasoning, AI excels at recognizing advanced patterns in imaging info and will provides a quantitative assessment automatically. Further correct and duplicatable radiology assessments can then be created once AI is integrated into the clinical work flow as a tool to assist physicians.

AI on Radiology.

The primary driver behind the emergence of AI in medical imaging has been the need for bigger effectiveness and potency in clinical care. Tomography imaging knowledge continues to grow at a disproportionate rate in comparison with the quantity of accessible trained readers, and also the decline in imaging reimbursements has forced health-care suppliers to compensate by increasing productivity. These factors have contributed to a dramatic increase in radiologists' workloads. Studies report that, in some cases, a median specialist should interpret one image each 3–4 seconds in AN 8-hour workday to satisfy work demands. As radiology involves beholding similarly as deciding beneath uncertainty, errors square measure inevitable — particularly beneath such affected conditions.

A seamlessly integrated AI element inside the imaging advancement would increase potency, scale back errors and accomplish objectives with the smallest manual input by providing trained radiologists with pre-screened pictures and known options. Therefore, substantial efforts and policies square measure being recommend to facilitate technological advances associated with AI in medical imaging. Most image-based radiology tasks square measure contingent upon the quantification and assessment of picture taking characteristics from pictures. These characteristics may be necessary for the clinical task at hand, that is, for the detection, characterization or observance of diseases. The applying of logic and applied mathematics pattern recognition to issues in drugs has been projected since the first Nineteen Sixties, as computers became a lot of current within the Nineteen Eighties, the AI-powered automation of the many clinical tasks has shifted radiology from a sensory activity subjective craft to a quantitatively calculable domain. The speed at that AI is evolving radiology is parallel thereto in different application areas and is proportional to the rapid climb of information and process power. There square measure 2 categories of AI ways that square measure in wide use these days. The primary uses handcrafted designed options that square measure outlined in terms of mathematical equations (such as tumor texture) and might therefore be quantified victimization pc programs. These options square measure used as inputs to state-of the-art machine learning models that square measure trained to classify patients in ways in which will support clinical deciding. Though such options square measure gave the impression to be discriminative, they have faith in skilled definition and thence don't essentially represent the foremost best feature quantification approach for the discrimination task at hand. Moreover, predefined options square measure typically unable to adapt to variations in imaging modalities, like CT (CT), (PET) and resonance imaging (MRI), and their associated ratio characteristics. The second technique, deep learning, has gained hefty attention in recent years. Deep learning algorithms will mechanically learn feature representations from knowledge while not the necessity for previous definition by human specialists. This data-driven approach permits for a lot of abstract feature definitions, creating it a lot of informative and generalizable. Deep learning will therefore mechanically quantify composition characteristics of human tissues, promising substantial enhancements in designation and clinical care. Deep learning has the additional advantage of reducing the necessity for manual pre-processing steps. For instance, to extract predefined options, correct segmentation of morbid tissues by specialists is usually required. As a result of deep learning is knowledge driven, with enough example knowledge, it will mechanically establish morbid tissues and thence avoid the necessity for expert-defined segmentations. Given its ability to find out complicated knowledge representations, deep learning is additionally typically sturdy against unsought variation, like the inter-reader variability, and might thence be applied to an oversized kind of clinical conditions and parameters. In some ways, deep learning will mirror what trained radiologists do, that is, establish image parameters however additionally weigh up the importance of those parameters on the premise of different factors to reach a clinical call.

Given the growing range of applications of deep learning in medical imaging, many efforts have compared deep learning ways with their predefined feature-based counterparts and have reported substantial performance enhancements with deep learning. Studies have additionally shown that deep learning technologies square measure on par with radiologists' performance for each detection36 and segmentation tasks in ultrasound and magnetic resonance imaging, severally. For the classification tasks of lymphatic tissue

metastasis in PET-CT, deep learning had higher sensitivities however lower specificities than radiologists. As these ways square measure iteratively refined and tailored for specific applications, a much better command of the sensitivity: specificity trade-off is predicted. Deep learning may also modify quicker development times, because it depends exclusively on curated knowledge and also the corresponding data instead of domain experience. On the opposite hand, ancient predefined feature systems have shown plateauing performance over recent years and thence don't usually meet the tight necessities for clinical utility. As a result, solely many are translated into the clinic. It's expected that superior deep learning ways can surpass the edge for clinical utility within the close to future and might thus be with efficiency translated into the clinic.

The present descriptive study was conducted about impact of artificial intelligence on radiology among radiology residents, radiology technologists and trainees working in radiology department. this study was carried out at Different Hospitals of Kashmir (Departments of radio diagnosis and imaging SKIMS Soura Srinagar. Department of radio diagnosis and imaging S.M.H.S Srinagar and its associated hospitals. A self-structured questionnaire (30 questions) was handed over to the participants. total 150 participants were registered for this study, in this present study 36 % were trainee,34 % were radiology residents, and 30 % were radiology technologists

In this descriptive study, 150 participants were there, 36 % were trainee,34 % were radiology residents and 30 % were radiology technologists, working in academic or non-academic hospitals, completed the proposed survey.

Respondents who answered the survey practiced different subspecialties. Among possible options, none prevailed. Breasts and cardiovascular imaging were the most practiced subspecialties by responders, each of the two accounting for 69% of responders. In spite of the subdivision into different radiological areas, we observed a quite large agreement among them regarding which subspecialties will be more influenced by AI applications. Indeed, responders stated that abdominal (21.6%) and other imaging (10%) will be most impacted by the AI revolution. This is reasonable, because consolidated screening programs provide, since the beginning of AI era in the healthcare, a large amount of digital data. This condition makes breast imaging the first candidate for the application of machine learning algorithms. It does not surprise that the highest rated imaging subspecialties are those that frequently involve tumor detection and characterization. Indeed, this task represents a classification problem, which is prone to be solved using machine learning algorithms. Notably, radiomics represents the most promising approach for characterization of solid cancers, which are spatially and temporally heterogeneous Machine learning algorithms take advantage of the heterogeneity of imaging data used for cancer patient diagnosis and treatment. Imaging protocols traditionally used for cancer patient management include both morphological and functional imaging, which can be successfully processed using machine learning algorithms. These algorithms take advantage from the volume and heterogeneity of information contained therein to detect specific patterns starting from raw data.

Most of responders practice CT and MRI, accounting respectively for (45 %). Other frequently practiced modalities are Radiography, Mammography Ultrasound, Angiography/Fluoroscopy (27%) and Hybrid imaging, DXA (16%). As expected, when asked to foresee which imaging modalities will be the target field of application of AI systems, responders suggested CT (45%) followed by Radiography, Mammography

Ultrasound, Angiography/Fluoroscopy (27%). We should note that CT and MRI are only relatively standardized modalities while mammography (at least in the screening setting) is highly standardized. Conversely, Hybrid imaging, DXA remains poorly standardized in every field, adding a confounding variability to the data that machine learning should model field of AI application in the next 5–10 years.

The percentage of responders believing that AI will make radiological obligations more clinical (51%) is higher than those who foresee a more technical profile (23%). In addition, the percentage of responders believing that AI will make radiologists obligations unchanged are (9%) and other than these options are (17%). Thus, AI is mostly perceived as an innovation favoring a higher clinical profile and subspecialty dedication of radiologists, which are key factor for being visible to colleagues and patients, for instance playing a pivotal role in multidisciplinary tumor boards. In fact, the opposite AI-driven scenario would be radiological reporting as a low-value commodity.

An important result of this study reveals that 51% of responders believe that artificial intelligence may impact radiology technologists also, while as (17% both) of the responders believe that no, no never it will not impact radiology technologists and (15 %) of responders that it's difficult to answer now. This is the need of hour as artificial intelligence may not impact on radiology fields it will help radiology technologists as well as radiology residents to acquire best quality of imaging and better diagnose.

As a further demonstration we asked responders that Should radiology technologists be educated on Artificial Intelligence results reveal the important data that (66%) of responders agreed yes, they should be educated about artificial intelligence role on radiology while as (34%) of responders does not agree. We handed over the booklet to all the responders about role of artificial intelligence on radiology and asked the responders to read the booklet and make awareness about AI.

Furthermore (47%) responders are willing to join the artificial intelligence course if available, while as (53) are not interested to join. Results reveal that responders are still not aware about the use and benefits of artificial intelligence need of the hour is that Artificial intelligence-based workshops should be organized in every medical university/college/hospital so that everyone will get knowledge about artificial intelligence use.

This descriptive study has two main limitations. First, the limited number of responders are there in this study (150) and the number of responders who participated are radiology residents, radiology technologists and trainees. 77 % of responders work at hospital while as 23 % work at university or teaching hospitals, so the answers reflect the opinions and feelings of advanced realities, not of the general world of radiologists. However, the analysed answers give an idea of that part of the radiological world that has a guiding role and also teach radiology to residents, radiology technologists and trainees who are the future of radiology.

The finding was supported by a descriptive study conducted by

Marina Codari, Luca Melazzini, Sergey P. Morozov, Cornelis C. van Kuik, Luca M. Sconfienza & Francesco Sardanelli on Impact of artificial intelligence on radiology: a EuroAIM survey among members of the European Society of Radiology

the results of a survey conducted among ESR members in November and December 2018, asking for expectations about artificial intelligence (AI) in 5–10 years. Of 24,000 ESR members contacted, 675 (2.8%) completed the survey, 454 males (67%), 555 (82%) working at academic/public hospitals. AI impact was mostly expected (≥ 30% of responders) on breast, oncologic, thoracic, and neuro imaging, mainly involving mammography, computed tomography, and magnetic resonance. Responders foresee AI impact on: job opportunities (375/675, 56%), 218/375 (58%) expecting increase, 157/375 (42%) reduction; reporting workload (504/675, 75%), 256/504 (51%) expecting reduction, 248/504 (49%) increase; radiologist's profile, becoming more clinical (364/675, 54%) and more subspecialized (283/675, 42%). For 374/675 responders (55%) AI-only reports would be not accepted by patients, for 79/675 (12%) accepted, for 222/675 (33%) it is too early to answer. For 275/675 responders (41%) AI will make the radiologist-patient relation more interactive, for 140/675 (21%) more impersonal, for 259/675 (38%) unchanged. If AI allows time saving, radiologists should interact more with clinicians (437/675, 65%) and/or patients (322/675, 48%). For all responders, involvement in AI-projects is welcome, with different roles: supervision (434/675, 64%), task definition (359/675, 53%), image labelling (197/675, 29%). Of 675 responders, 321 (48%) do not currently use AI, 138 (20%) use AI, 205 (30%) are planning to do it. According to 277/675 responders (41%), radiologists will take responsibility for AI outcome, while 277/675 (41%) suggest shared responsibility with other professionals. To summaries, responders showed a general favorable attitude towards AI.

Conclusion

In conclusion, respondents to this study showed on average a positive attitude towards the adoption of AI programs. Good clinical radiation profile and extremely patient AI environment in advance. However, radiology residents, radiology technologists and trainees working in radiology department do not yet know how fast and disruptive the use of mechanical learning programs in radiology can be. This explains some of the cautious responses to the role of radiology residents, radiology technologists and trainees in addressing the impact of AI and in the design of AI systems, considering that many ethical and legal issues related to the use of these systems have not been resolved. The future will depend on what we do now and what we will do in the near future, that is, in our ability to take advantage of the many opportunities that AI will offer to radiology and radiology residents, radiology technologists and trainees working in the radiology department.AI will surely impact radiology, and more quickly than other medical fields. It will change radiology practice more than anything since Roentgen. Radiology Residents, Radiology Technologists can play a leading role in this oncoming change. An uneasiness among radiologists to embrace AI may be compared with the reluctance among pilots to embrace autopilot technology in the early days of auto-mated aircraft aviation. However, radiologists are used to facing technological challenges because, since the beginnings of its history, radiology has been the playfield of technological development. An updated radiology Resident, Radiology Technologist, Trainee should be aware of the basic principles of ML/DL systems, of the characteristic of datasets to train them, and their limitations. Radiology Residents, Radiology Technologists do not need to know the deepest details of these systems, but they must learn the technical

vocabulary used by data scientists to efficiently communicate with them. The time to work for and with AI in radiology is now.

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