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A DESCRIPTIVE STUDY TO ASSESS THE KNOWLEDGE AND AWARENESS ABOUT RADIATION PROTECTION AMONG ORTHOPEDIC SURGEONS DURING FLUOROSCOPY USE.

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ABSTRACT: Fluoroscopic imaging has become more common in contemporary orthopedic operating rooms, which provides many advantages for orthopedic treatments. Intra-operative fluoroscopy enables indirect visualization of anatomy, which facilitates quicker, less stressful, and easier patient operations and lowers morbidity. However, due to the well-known biological consequences of ionizing radiation, the use of fluoroscopy in the orthopedic theatre poses hazards to orthopedic surgeons. These side effects range from dose-dependent deterministic ones like cataracts and infertility to dose-independent stochastic ones like the development of cancer in radiosensitive organs. Real-time imaging of moving structures and improved visualisation of anatomical functioning are made possible by the use of radio contrast chemicals in fluoroscopy and angiography, which utilize X-ray imaging. Despite the benefits of fluoroscopy, orthopedic surgeons frequently do not receive the required radiation safety training, which leads to a lack of understanding of the dangers of ionizingradiation. In an academic hospital in Kashmir, this study sought to evaluate the orthopedic surgeons' general radiation safety knowledge, awareness, and practices. A convenience sample of orthopedic surgeons from predetermined hospitals was used in a survey research approach. A questionnaire was randomly distributed, and percentage tables were used to analyses the results. 66 responses were obtained in response to the 100 questionnaires that were delivered. The results of this study provide important light on the current state of radiation safety knowledge and awareness among orthopedic surgeons, emphasizing

the need for better education and procedures to reduce the dangers of ionising radiation in the orthopedic theatre.

Keywords - **Fluoroscopic imaging, Orthopedic surgeons, Intra-operative fluoroscopy, ,Deterministic effects, Stochastic effects,**

I. INTRODUCTION

Radiation safety is a concern for patients, physicians, and staff in many departments, including radiology, interventional cardiology, and surgery. Radiation emitted during fluoroscopic procedures is responsible for the greatest radiation dose for medical staff. Radiation from diagnostic imaging modalities, such as computed tomography, mammography, and nuclear imaging, are minor contributors to the cumulative dose exposures of healthcare personnel. However, any radiation exposure poses a potential risk to both patients and healthcare workers alike.[1]Radiation protection aims to reduce unnecessary radiation exposure with a goal to minimize the harmful effects of ionizing radiation.[2] In the medical field, ionizing radiation has become an inescapable tool used for the diagnosis and treatment of a variety of medical conditions. As its use has evolved, so have the cumulative doses of lifetime radiation that both patients and medical providers receive. Most radiation exposure in medical settings arises from fluoroscopic imaging, which uses x-rays to obtain dynamic and cinematic functional imaging. Formal radiation protection training helps reduce radiation exposure to medical staff and patients.[3] However, enforcing radiation safety guidelines can be an arduous process, and many interventionalists donot receive formal training in either residency or fellowship on radiation dose reduction. Inparticular, clinicians or medical staff that use fluoroscopic imaging outside of dedicated radiology or interventional departments have low adherence to radiation safety guidelines. Fluoroscopy is used in many specialties, including orthopedics, urology, interventional radiology, interventional cardiology, vascular surgery, and gastroenterology. As radiation exposure becomes more prevalent, a thorough understanding of radiation exposure risks and dose reduction techniques will be of utmost importance. There are three basic principles of radiation protection: justification, optimization, and dose limitation. Justification involves an appreciation for the benefits and risks of using radiation for procedures or treatments. Physicians, surgeons, andradiologic personnel all play a key role in educating patients on the potential adverse effects of radiation exposure. The benefits of exposure should be well known and accepted by the medical community. Often, procedures that expose patients to relatively higher doses of radiation—for example, interventional vascular procedures—are medically necessary, and thus the benefits outweigh the risks. The As Low as Reasonably Achievable (ALARA) principle, defined by the code of federal regulations, was created to ensure that all measures to reduce radiation exposure have been taken while acknowledging that radiation is an integral part of diagnosing and treating patients. Any amount of radiation exposure will increase the risk of stochastic effects, namely the chances of developing malignancy following radiation exposure. These effects are thought to occur as a linear model in which there is no specific threshold to predict whether or not malignancy will develop reliably. For these reasons, the radiologic community teaches protection practices under the ALARA principle. A basic understanding of the science behind the damaging effects of radiation is crucial in evaluating the different strategies to protect medical professionals and patients. X-rays are composed of high-energy photons within the electromagnetic spectrum. X-rays are notable in comparison to lower energy photons since they are powerful enough to break molecular bonds and ionize atoms.[4] This ionization produces free radicals, chemically active compounds that can indirectly damage DNA.[5]

Medical staff and patients can be exposed to x-ray radiation either as scattered x-rays or by direct exposure to the x-ray beam. Scattered x-rays give up part of their energy during the scattering process, and thus energy deposited in tissues from scattered x-rays is lower than directly from the x-ray source. Radiation doses can be expressed in three different ways. The absorbed dose is the radiation deposited in an object and is measured in milligrays (mGy). The equivalent dose is calculated, taking into account the organ-specific radiation exposure, as well as the organ's sensitivity to radiation, andis expressed in millisieverts (mSv). The effective dose is the sum over the entire body of the individual organ equivalent doses and is expressed in millisieverts (mSv). An understanding of these definitions is critical to interpreting dose recommendations. The ICRP's dose recommendations are shown in fig 1.[3] For reference, 20 mSv/year roughly equates to 2 to 3 abdominal and pelvic computed tomography (CT) scans or 7 TO 9 years of background radiation. Exposure surpassing this threshold averaged over five years has been associated with a 1 in 1000 lifetime risk of fatal cancer.

Radiation exposure can produce biological effects as either a dose-dependent effect or a dose- dependent probability.[8] Dose-dependent effects are referred to as deterministic effects and occur when a specific exposure threshold has been exceeded. A dose-dependent probability is referred toas a stochastic effect and represents an outcome that occurs with a certain probability but without adefined threshold at which these effects are triggered.[9] Examples of deterministic effects that have been documented in the fields of interventional radiology, cardiology, and radiation treatment include radiation-induced thyroiditis, dermatitis, and hair loss. Stochastic effects are discovered many years after radiation exposure and include the development of cancer.[3] It is important to note that deterministic effects are determined by the cumulative amount of radiation exposure an organ or tissue experiences over time (the lifetime equivalent dose). In comparison, there is a chance that a specific x-ray causes DNA damage that later develops into cancer, a stochastic effect. As the number of x-rays a patient is exposed to increases, the chance of a stochastic effect increases; however, the lifetime equivalent radiation dose does not play a role in stochastic effects. Researching the effects of long-term low-dose exposure to ionizing radiation is difficult because literature is based on epidemiologic data from large radiation exposures at doses that are much higher than is used in the medical setting. Current literature suggests that medical radiation may result in a modest increase in the risk of cataracts, cancer, and possibly hereditarydiseases.[6] The duration of radiation exposure, distance from the radiation source, and physical shielding are the key facets in reducing exposure. The exposure duration can be minimized in several ways. When exposing a patient to radiation, the technician or physician should preplan the required images to avoid unnecessary and redundant exposure. Magnification significantly increases the exposure to the patient; therefore, magnification should be used judiciously.[11] Continuous orlive fluoroscopy may be helpful to understand anatomy during procedures better, but standard fluoroscopy machines capture roughly 35 images per second. Decreased exposure can be achieved instead by using pulsed fluoroscopy, which obtains about five images per second without sacrificing imaging quality. Lastly, exposure duration should be limited whenever possible.

Increasing the distance between the x-ray beam and the part that is being imaged is another way to minimize exposure. The image intensifier or x-ray plate should be as close to the patient as possible, with the x-ray tube positioned as far away as possible while maintaining adequate image resolution. A similar approach can be used to minimize exposure to medical professionals. Scattered radiation—the type of radiation that surgeons, interventionalists, and operating roomstaff commonly encounter during procedures requiring fluoroscopy—follows an inverse square law. Scattering exposure levels decrease proportionally with the inverse of the distance squared from the x-ray source. Staff can lower their exposure levels by a factor of four by doubling their distance from the source. Through this simple concept, occupational radiation exposure can be dramatically reduced.

Physical radiation shielding can be accomplished with different forms of personal protective equipment (PPE). Some fluoroscopy suites contain ceiling-suspended lead acrylic shields, which can reduce doses to the head and neck by a factor of 10. Portable rolling shields, which do not require installation, can protect staff in operating rooms and interventional settings. These mobile shields have been shown to decrease the effective radiation dose to staff by more than 90% when used correctly. In cases where it is not feasible to shield oneself behind a physical barrier, all personnel should wear leaded aprons for protection. Leaded aprons, which are required in most states, commonly come in thicknesses of 0.25 mm, 0.35 mm, and 0.5 mm. Aprons that wrap circumferentially around the body are preferred to front aprons, given their increased surface area coverage. In general, transmission through leaded aprons is typically between 0.5% and 5%. Leaded aprons should always be companied by a thyroid shield. Personal protective equipment also protects our patients. Patients should wear protective gowns in areas not being imaged, whether in plain radiographs, fluoroscopy, or CT scans. Leaded eyeglasses and should be at least are commonly cited as the least worn piece of PPE in multiple studies, with compliance rates ranging from 2.5% to 5%.[11] Studies have shown a relationship between occupational radiation doses and cataract development before 50 in a large cohort of radiation technologists, specifically the posterior lens. Interestingly, the opacification of the posterior lens, in comparison to the other locations, is relatively specific to radiation exposure. Regular use of leaded eyeglasses can reduce radiation exposure to the lens by 90%. The low compliance rate for wearing leaded eyeglasses demonstrates an area for improvement. Beyond the appropriate use of leaded aprons, proper storage and testing of the equipment are critical to ensuring its effectiveness. Lead garments should be checked every six months to assure their integrity, and leaded aprons should be hung rather than folded to prevent cracking.

Dosimeters are devices that measure cumulative radiation exposure. These devices should be wornby all hospital staff who encounter planned ionizing radiation. Unfortunately, in a significant number of healthcare settings, there is a paucity of monitoring and, thus, a lack of reliable data. Sanchez et al. reported that as much as 50% of physicians do not wear or incorrectly wear dosimeters.[11] Dosimeters should be worn both outside and inside the leaded apron for comparison of doses, and the readings should be analyzed by the facility's radiation safety department. Raising awareness of the importance of dosimetry should be a priority for the occupational safety or radiation safety departments in health systems. Staff who comply with dosimeter regulations can receive feedback about where and when they are receiving radiation doses, which can help audit behaviors and promote increased safety awareness. As medical imaging evolves, so does the medical community's understanding of how to protect people from ionizing radiation. The first step to optimizing safe radiation practice is educating hospital staff on radiation best practices. Each institution's radiation safety department is responsible for educating and enforcing protective strategies. Protocol development and education strategies have been effective in multiple specialties. Simple interventions can play a major role in radiation dose optimization. For example, after a 20-minute video was used to educate physicians on radiation best practices, it was found to reduce median fluoroscopy time by 30% to 50%.[11] Justification, optimization, and adherence to dose limits can significantly decrease exposure when followed. Following the ALARA principle, health care workers should confirmthat the benefits of the exposure outweigh the risks and strive to decrease radiation. ALARP is an acronym for an important principle in exposure to radiation and other occupational health risks and in the UK stands for "As Low As Reasonably Practicable".[11] The aim is to minimize the risk of radioactive exposure or other hazard while keeping in mind that some exposure may be acceptable in order to further the task at hand. The equivalent term ALARA, "As Low As Reasonably Achievable", is more commonly used outside the UK. This compromise is well illustrated in radiology. The application of radiation can aid the patientby providing doctors and other health care professionals with a medical diagnosis, but the exposure of the patient should be reasonably low enough to keep the statistical probability of cancers or sarcomas (stochastic effects) below an acceptable level, and to eliminate deterministic effects (e.g. skin reddening or cataracts). An acceptable level of incidence of stochastic effects is considered to be equal for a worker to the risk in other radiation work generally considered to be safe. This policy is based on the principle that any amount of radiation exposure, no matter how small, can increase the chance of negative biological effects such as cancer. It is also based on the principle that the probability of the occurrence of negative effects of radiation exposure increases with cumulative lifetime dose. These ideas are combined to form the linear no-threshold model which says that there is not a threshold at which there is an increase in the rate of occurrence of stochastic effects with increasing dose. At the same time, radiology and other practices that involve use of ionizing radiation bring benefits, so reducing radiation exposure can reduce the efficacy of a medical practice. The economic cost, for example of adding a barrier against radiation, must also be considered when applying the ALARP principle. Computed Tomography, better known as C.T. Scans or CAT Scans have made an enormous contribution to medicine, however not without some risk. They use ionizing radiation which can cause cancer, especially in children.[12] When caregivers follow proper indications for their use and child safe techniques rather than adult techniques, downstream cancer can be prevented.

II. REVIEW OF LITERATURE

Louis W.A. van Papendorp, Farhana E. Suleman et al conducted a study to assess orthopedic surgeons' knowledge, awareness, and practices related to radiation safety in an academic hospital. The study used a questionnaire with multiple-choice questions to gather data. The participants were orthopedic surgeons from the University of Pretoria's orthopedic circuit. Findings revealed that most surgeons frequently use fluoroscopic imaging in their procedures, but have insufficient knowledge of radiation safety. Many participants did not wear personal dosimeters and had not received adequate training in radiation safety. These results highlight the need for implementing a radiation safety training program for orthopedic surgeons.

Ashish S Ranade , Gauri A Oka et al conducted a study among the Indian Orthopedic Community to assess their knowledge and practices regarding radiation safety. A questionnaire with 16 multiple- choice questions was distributed, resulting in a 62.7% response rate with 439 participants. Only 16.2% of respondents were aware of the ALARA principle. While 86.3% always used lead aprons,68.8% never used thyroid shields. Knowledge of the ALARA principle was associated with better radiation safety practices. Almost 99% of participants expressed interest in radiation safety training. The study emphasizes the need for improved awareness and training in radiation safety among Indian orthopedic professionals.

Adriana J Saroki , Coen Wijdicks et al conducted a study explore the use of radiograph imaging in perioperative care for femoroacetabular impingement (FAI) and to assess surgeon knowledge and perspectives on radiation safety. An online questionnaire was distributed to hip arthroscopists, including practicing attending orthopedic surgeons. The survey received responses from 91 surgeons. The results showed that the majority of surgeons utilized pre-operative radiographs and intra-operative spot fluoroscopic images during FAI treatment. Some surgeons also used pre- operative computed tomography (CT) and real-time moving fluoroscopy. However, the study revealed a lack of knowledge among surgeons regarding optimal C-arm positions and settings to minimize radiation doses. Furthermore, the majority of surgeons believed that orthopedic surgeonsin general need to be better informed about radiation safety. The findings highlight the need for enhanced education on radiation safety among orthopedic surgeons treating FAI patients.

M Nugent , O Carmody et al conducted a study to assess the knowledge and practices of Irish orthopedic trainees regarding the use of ionizing radiation. A confidential internet-based survey was distributed via email to 40 higher specialist trainees, addressing questions on radiation safety training and work practices. Out of 26 respondents (65% response rate), all reported regular exposure to ionizing radiation. Compliance with body shields was high, but other protective measures, such as thyroid shields, were less frequently used. Only 14 respondents regularly practiced the "as low as reasonably achievable" principle. Radiation safety training varied, with around half feeling adequately trained, and 65% having attended a radiation protection course. Usage of dosimeters was poor, with only 15% using them regularly, primarily due to availability issues. Although most trainees had some knowledge of radiation safety, many did not consistently employ all available measures to reduce radiation exposure. Barriers to using protective mechanisms included availability and perceived impracticality.

Roxanne Chow, Lauren A Beaupre et al conducted a study to assess the perceived personal risk, awareness of cataract formation risk, awareness of occupational dose limits, and current radioprotective practices among orthopedic surgeons in Canada. A total of 264 responses (23% response rate) were received from Canadian Orthopedic Association members. The study found that 41% of respondents believed they were at least moderately at risk for cataract formation dueto occupational radiation exposure. Additionally, 22% felt they lacked sufficient knowledge to estimate the risk, and 45% had minimal awareness that ionizing radiation could contribute to cataract genesis. Furthermore, almost 75% of respondents had minimal awareness of the existence of dose limits. The study highlights an information deficit among orthopedic surgeons regarding the awareness of cataract formation risk and occupational dose limits associated with radiation exposure.

Fırat Fidan , Mehmet Umit Cetin et al conducted a study to assess the knowledge and behavior of Turkish orthopedic surgeons regarding fluoroscopy usage and radiation safety. A questionnaire consisting of nineteen questions was distributed to 323 orthopedic surgeons online, and 277 individuals completed it. Among the 180 surgeons who participated in at least one fluoroscopy requiring operation per week, only 12% reported receiving training on fluoroscopy usage. Around 33.3% of participants did not use any protective equipment regularly. The most commonly used protection methods were lead aprons (68.3%) and thyroid protectors (52.1%). There was nosignificant difference in the use of protective equipment based on academic title. Only 10.6% of surgeons used dosimeters regularly, and 83.3% of them checked their dosimeters. The study concluded that orthopedic surgeons in Turkey lack adequate training and equipment for preventingradiation damage during fluoroscopy procedures.

Fr Khan , Z Ul-Abadin et al conducted a study to assess the awareness and attitudes of basic surgical trainees in England and Wales regarding radiation in orthopedic trauma surgery. Fifty trainees participated and answered questions from a pre-set questionnaire covering areas such as radiation hazards, use of protective wear, pregnancy testing for female trauma victims, and principles of safe radiation. The study revealed a lack of essential knowledge among the trainees regarding ionizing radiation. It was observed that most trainees were not adhering to radiation safety principles and were not practicing safely. The authors strongly recommend the implementation of robust training and information programs for surgical trainees at local, regional,and national levels to address these deficiencies.

M Torres-Torres , J Mingo-Robinet et al conducted a study to analyze the ionizing radiation exposure of two Orthopedic Surgeons during their daily work and review national and international recommendations on the subject. The study retrospectively evaluated surgical treatments using fluoroscopy performed by the surgeons over one year. The radiation received by the surgeons during this period did not exceed current legislation or new European and international recommendations. The exposure was highest in the hands, and the new recommendations emphasize the need to reduce radiation exposure to the eyes. The study highlights the importance of radiation protection measures, particularly for the hands and eyes,and emphasizes the necessity of having good knowledge of operating fluoroscopes and implementing radiation safety measures.

Robinson Esteves Pires , Igor Guedes Nogueira Reis et al conducted a study in Brazil to assess the knowledge of orthopedic surgeons regarding ionizing radiation and its health effects on surgical teams and patients. A survey consisting of 15 questions on radiation safety and exposure was administered during a medical conference. Out of 1,000 surveys distributed, 258 were completed (25.8% response rate). The results showed that only a small percentage of participants used basic radiation protection equipment and knew about safe radiation practices. Many participants lacked knowledge about the risks of radiation exposure during pregnancy, the most exposed areas of the body, safe distances from radiation-emitting tubes, and the effects of radiation on obese patients. These findings highlight the inadequate knowledge among orthopedic surgeons in Brazil regarding radiation safety. It emphasizes the need for education and implementation of safety measures to minimize the harmful effects of ionizing radiation.

III. Aim and Objectives

3.1 To assess the level of Knowledge and Awareness of Radiation protection amongorthopedics during fluoroscopy

3.2 To assess the associated risks of radiation among orthopedics.

IV. Research Methodology

4.1	Research approach	:	Observational approach
4.2	Research design	:	Cross sectional study
4.3	Research setting	:	Kashmir
4.4	Population	:	Orthopedic surgeons working in different hospital inKashmir
4.5	Sample size	:	100
4.6	Sampling technique	:	Convenience Sampling Technique
4.7	Statistical method	:	Descriptive statistical method

Sampling Criteria

4.8 Inclusion criteria : Orthopedic surgeons working in different hospital in Kashmir

4.9 Exclusion criteria : Orthopedic surgeons, who were not willing toparticipate

V. Method

Among orthopaedic surgeons working in several hospitals in Kashmir, a questionnaire-based studynamed "DESCRIPTIVE STUDY TO ASSESS THE KNOWLEDGE AND AWARENESS OF RADIATION PROTECTION AMONG ORTHOPAEDIC SURGEONS" was done. In Kashmir, the study was conducted at various hospitals. The ETHICAL committee, led by JAMIA HAMDARD, reviewed, approved, and self-structured the questionnaire. Multiple-choice questions were included in the questionnaire to assess orthopaedic surgeons' knowledge and awareness of radiation protection. questionnaire was given to each participant. The questions of the questionnaire are divided into three sections.

5.1 The first section consists of questions related to respondent age, sex, qualification and No personal identifying data was collected.

5.2 The second section consisted of 18 multiple choice questions about radiation hazards and its safety.

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

VI. RESULT & DATA ANALYSIS

6.1 Results of Descriptive Statics of Study

Figure 1

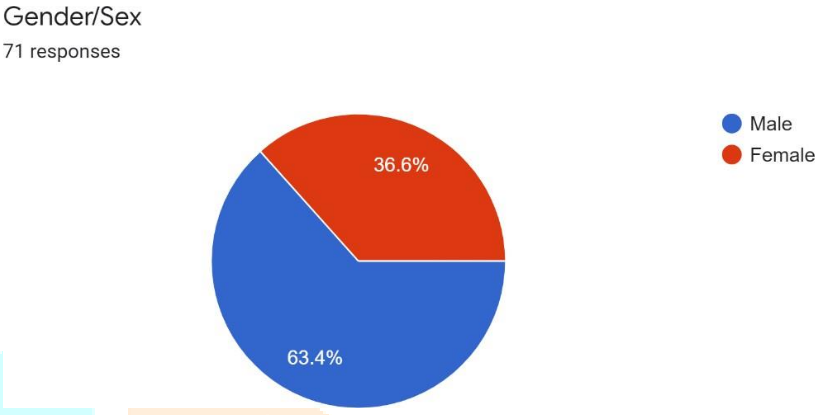
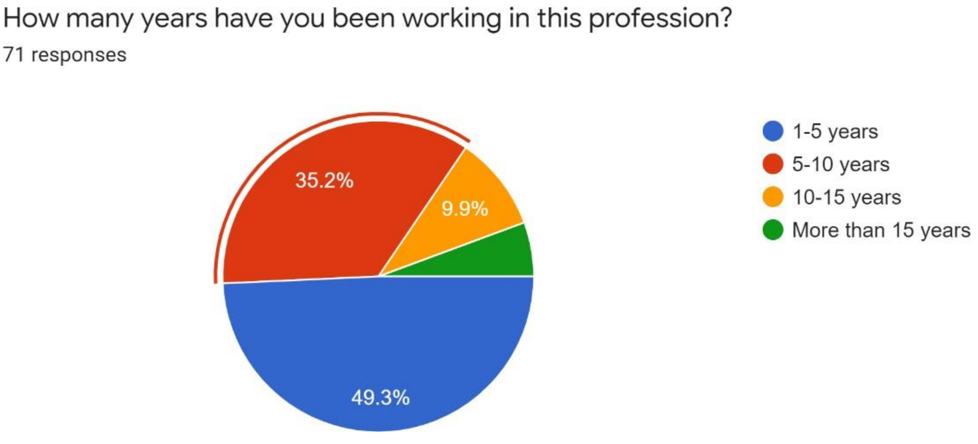


Table no 1

Gender	Counts	Percentage
Male	45	63.4%
Female	27	36.6%

out of 71 respondents 63.4% were males and 36.6% were females.

Figure 2



results show that 49.3% doctors have 1-5 years of experience in said department while 35.2% have 5-10 years of experience in orthopaedic surgeries using fluoroscopy and rest ofthe participants have more than 10 years of experience in the said field.

Figure no 3

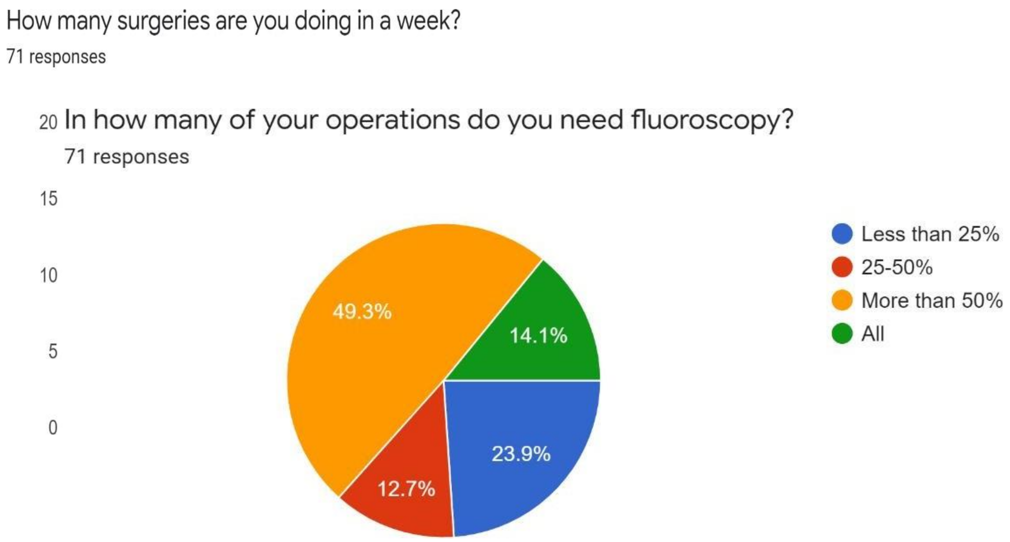
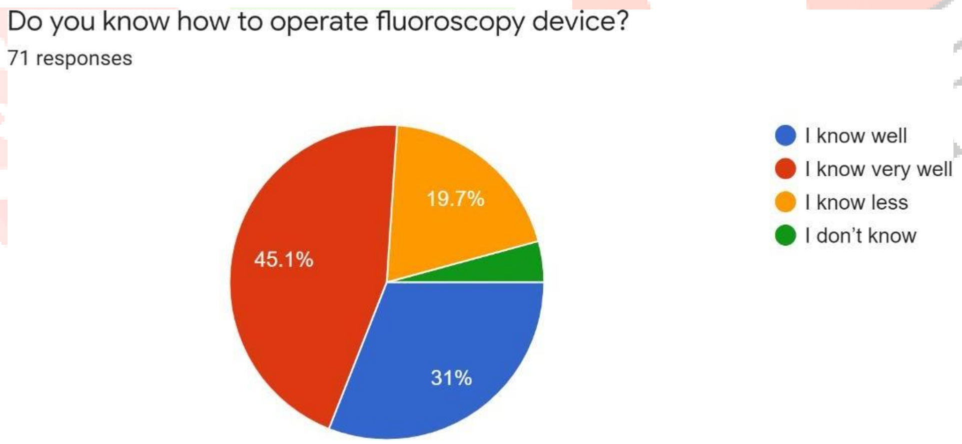


Figure no 4

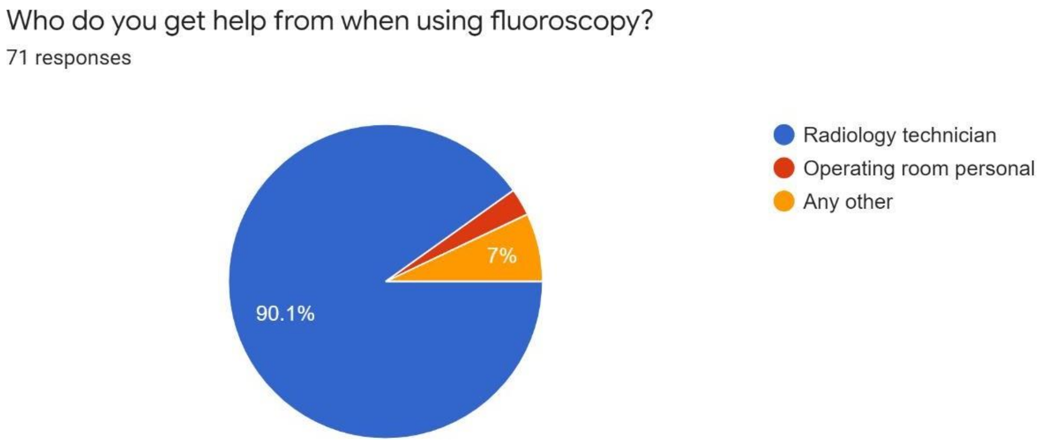
results show that most of the orthopedic surgeons (49.3%) were using fluoroscopy insurgeries in more than 50% of surgeries they perform.

Figure no 5



out of total 71 respondents 45.1% of respondents knew very less about how to operate fluoroscopy device,19.7% knew less and 31% were well aware about it.

Figure no 6



results show that most of the respondents 90% got help from radiology technicians tooperate fluoroscopy devices in operation rooms

Figure 7

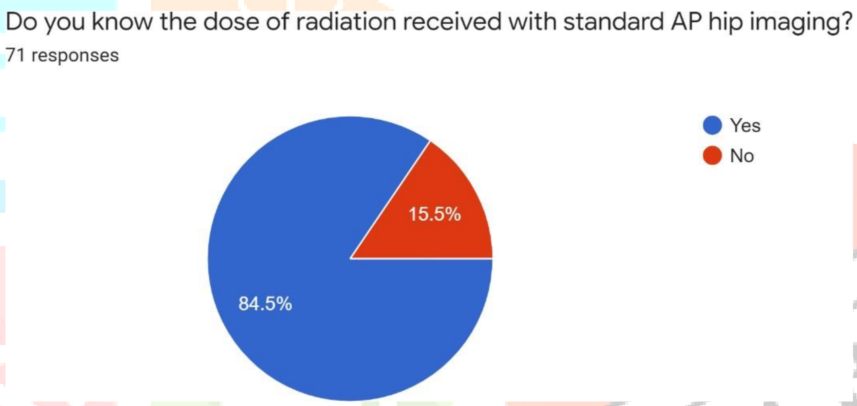
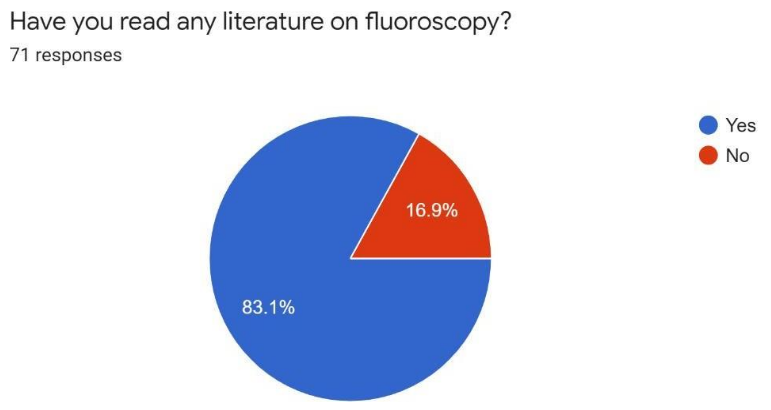


Table No 7.1

Response	**Counts**	**Percentage**
Yes	60	84.5%
No	11	15.5%

out of 71 respondents 84.5% knew the dose of radiation received during hip ap imaging and15.5% had no idea about it.

Figure 8



result show that 83.1% of respondents had read literature on fluoroscopy and 16.9% ofrespondents had not read any literature about fluoroscopy

Figure 9

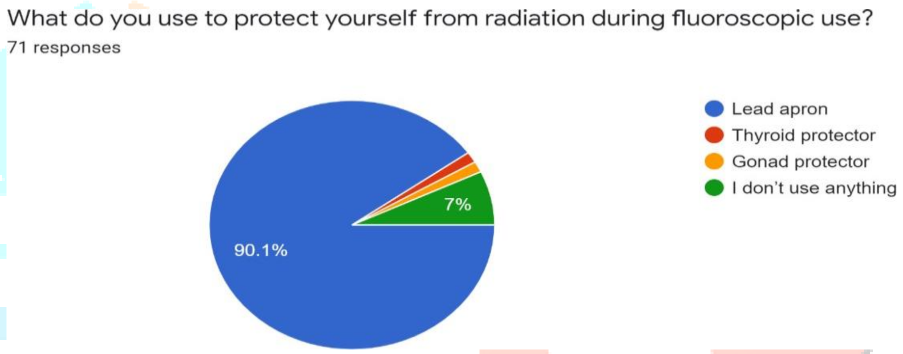


Table 9.1

Response	**Counts**	**Percentage**
Lead Apron	64	90%
Thyroid protector	1	1.5%
Gonad protector	1	1.5%
I don't use anything	5	7%

results show that 90% of respondents use lead apron as a protective measure while 1.5%used thyroid protector and gonad protector and 7% of respondents do not use any of theseprotective measures.

FIGURE 10

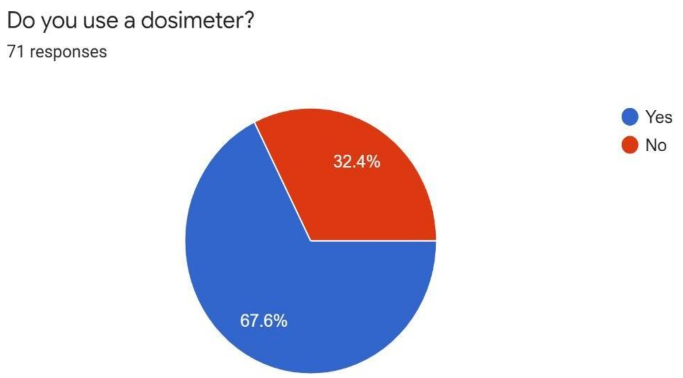


Table 10.1

Response	Counts	Percentage
Yes	48	67.6%
No	23	32.4%

out of 71 respondents 67.6% of respondents were using dosimeter and 32.4% were not usingdosimeter.

Figure 11

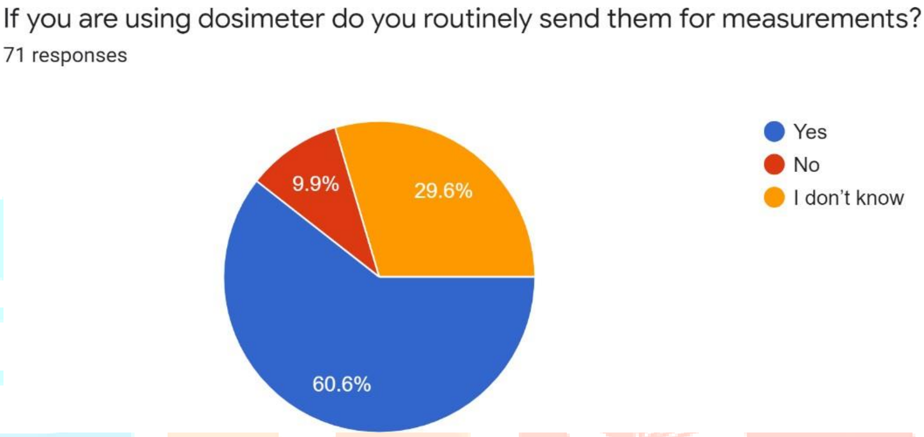


Table 11.1

Response	**Counts**	**Percentage**
Yes	43	60.6%
No	21	29.6%
I don't know	7	9.9%

results show that out of 71 respondents 60.6% were sending their dosimeters for routine measurements and 29.6% were not, also 9.9% had no idea

Figure 12

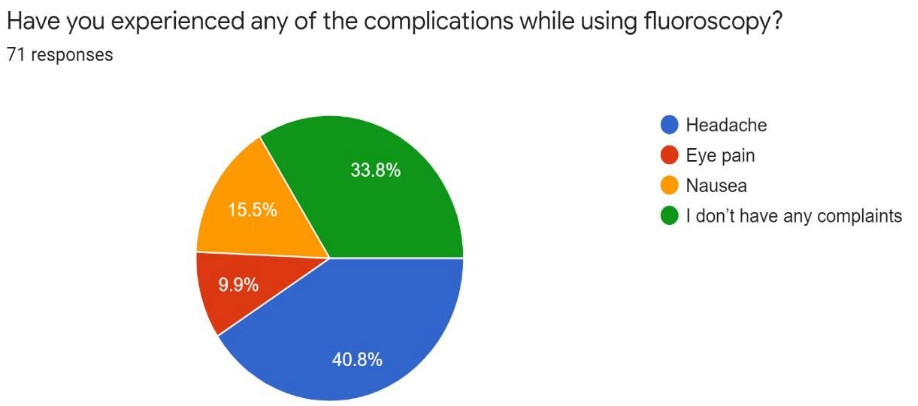


Table 12.1

Response	Counts	Percentage
Headache	29	40.8%
Eye pain	7	9.9%
I don't have any complaints	24	33.8%
Nausea	11	15.5%

results show that 33.8% have no complaints while 15.5% had experienced nausea 9.9% had experienced eye pain and 40.8% had experienced headache

Figure 13

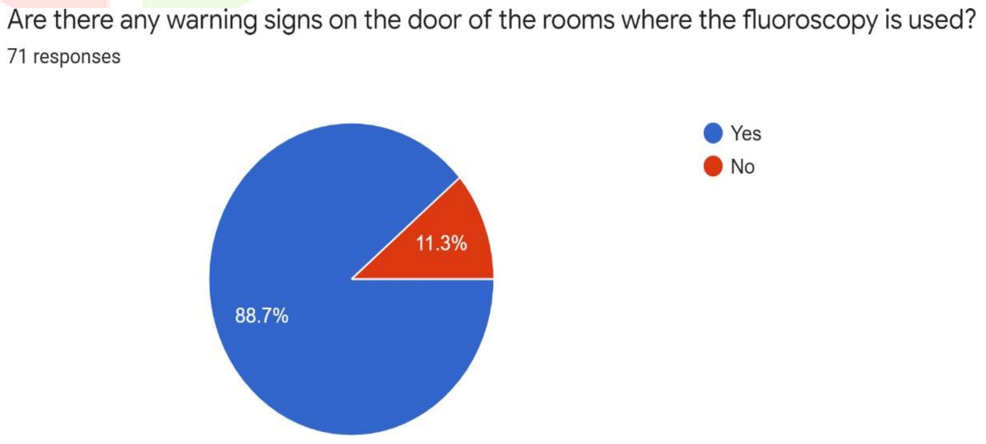


Figure 14

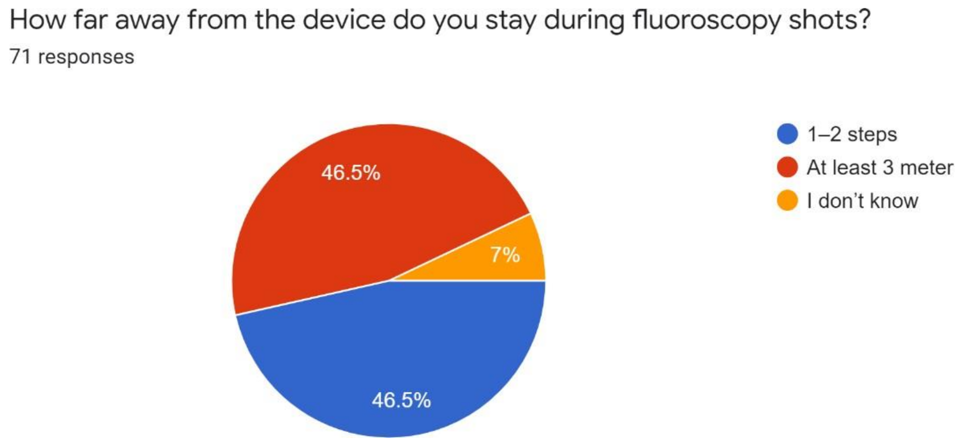
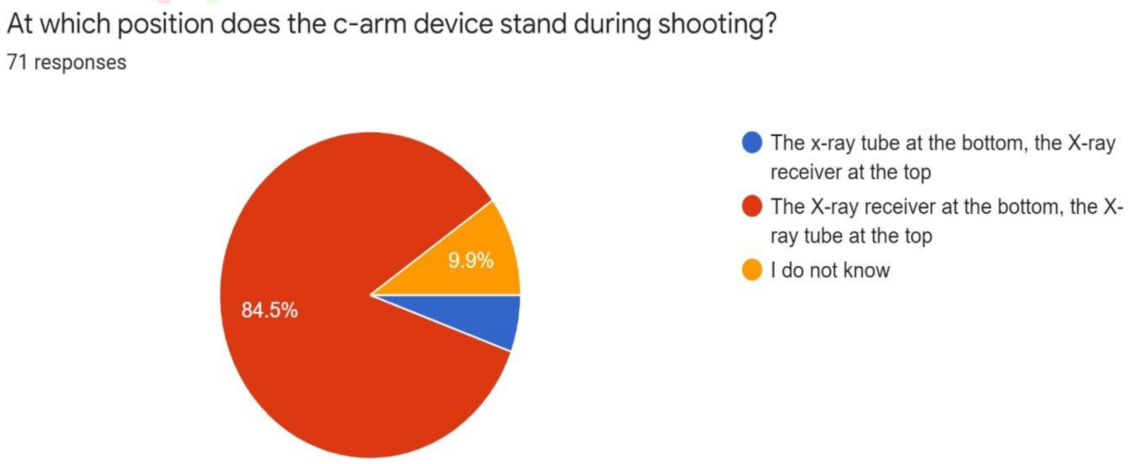


Table 14.1

Response	**Counts**	**Percentage**
1 to 2 steps	33	46.5%
At least 3 meters	33	46.5%
I don't know	5	7%

results show that out of 71 respondents 46.5% were staying 1 to 2 steps away duringfluoroscopy shot and 46.5% were staying at least 3 meter, rest 7% don't know

Figure 15



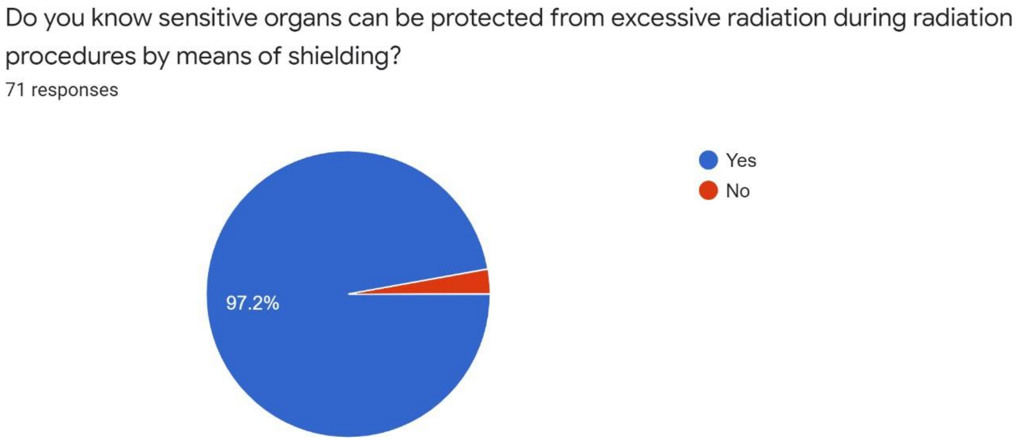


Figure 16

Table 16.1

Response	Counts	Percentage
Yes	98	97.2%
No	2	2.8%

out of 71 respondents 98% know this protection measure while 2% had no idea

Figure 17

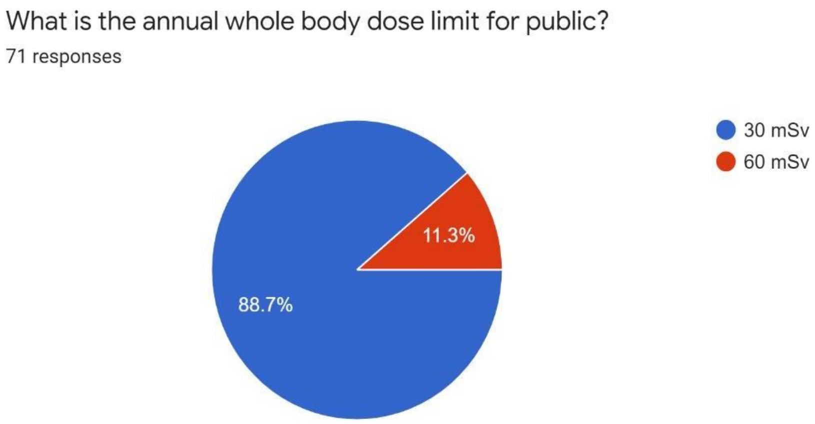


Table 17.1

Response	Counts	Percentage
30 msv	43	11.3
60 msv	21	88.7
I don't know		

the results show that 88.7 % choose 30msv and 60% choose 30msv

Figure 18

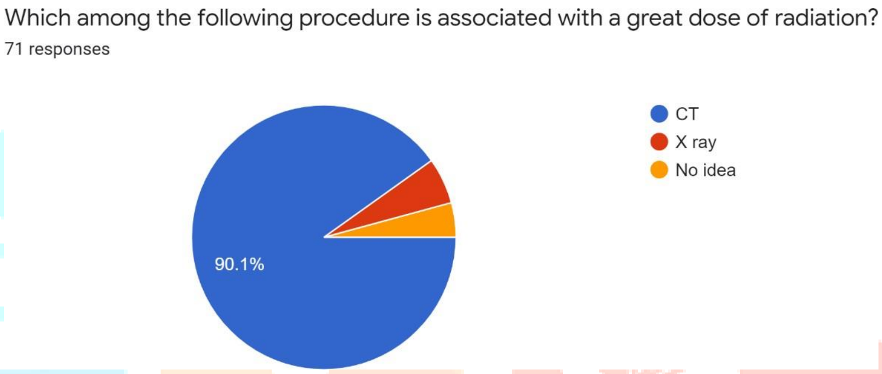


Table 18.1

Response	Counts	Percentage
CT	43	90.1%
X ray	21	4.9%
No idea	7	5%

results show that out of 71 respondents 90.1% knew ct is provides greater dose as comparedto x ray while 4.9% answered x ray and rest didn't know

Figure 19

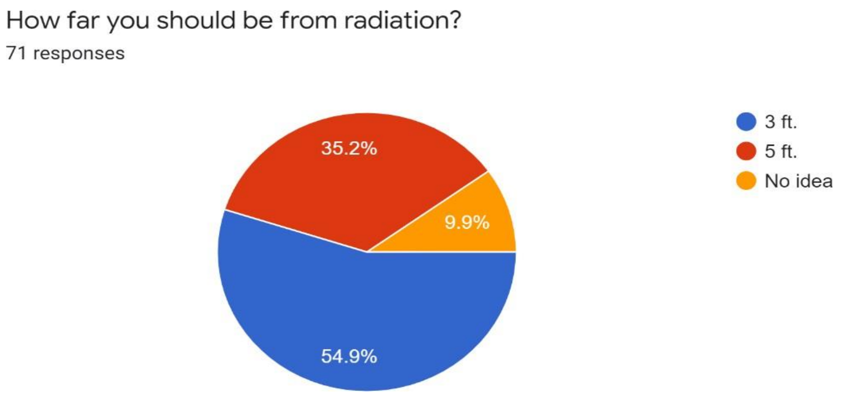


Table 19.1

Response	**Counts**	**Percentage**
3ft	39	54.9%
5ft	25	35.2%
No idea	7	9.9%

result shows that 54.9% respondents think we should remain 3 feet away from radiationwhile 35.2% think 6 feet and 9.9% had no idea.

Figure 20

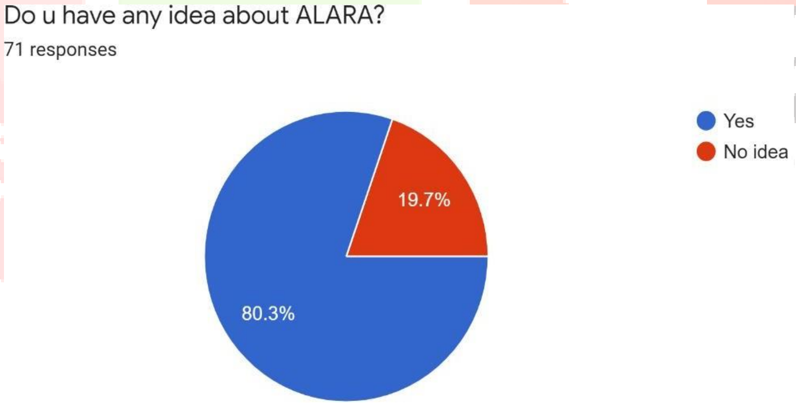


Table 20.1

Response	**Counts**	**Percentage**
Yes	57	80.3%
No idea	14	19.7%

out of 71 respondents 80.3% knew about alara and 19.7% had no idea

VII. DISCUSSION

The orthopaedic theatre must use fluoroscopic imaging, but doing so carries a risk of ionising radiation exposure. A sufficient level of expertise and awareness about radiation safety is necessary to reduce the risk to the fluoroscopic operator and the theatre crew. According to the results of this investigation, orthopaedic surgical staff members' awareness of radiation safety is manifestly lacking. Orthopaedic registrars were able to decrease radiation duration and exposure while operating, resulting in decreased radiation exposure to registrars and patients, according to research by Gendelberg et al.11 after completing a structured radiation safety programme. In a similar vein, the study's participants might gain from the introduction of such a radiation safety training programme. The findings of this study show a lack of understanding of radiation safety among the participants, as seen by the underuse of radiation-shielding gear, the majority of participants not keeping track of their screening time,and a very small number actually donning personal dosimeters. According to several prior studies, participants' complacent attitude may have developed out of a sense of safety. Orthopaedic dosages were still within international safety standards, according to a related study by Troisi et al.1 that was conducted in the Pietermaritzburg training circuit. It examined the exposure on orthopaedic doctors' personal dosimeters. However, these findings do not excuse a lack of knowledge regarding radiation safety. This raises the following point for further discussion: "Would the orthopaedic surgeons have used these devices if they were easily accessible?" Given that many radiation protection technologies are believed to be inaccessible. Further evidence of the participants' lack of radiation knowledge and awareness comes from their admission that they were unaware that some gadgets may be used to protect themselves from radiation. Possible explanations for operators not using specific radiation protection gear were highlighted by a study done by Mei Singer et al. in 2012. The findingsof impracticality and discomfort presented in this study are furthered by the awkward positioning of shields, the weighty clothing, the snug thyroid collars, and the hard leadgloves. Similar studies carried out in the United States, Ireland, and Turkey supported similar findings, concluding that the need for fluoroscopy in the orthopaedic theatre was very highbut that orthopaedic surgeons did not possess sufficient knowledge of the risks of fluoroscopyand the techniques for preventing biological harm. According to our study, 90.1% of the 71 respondents recognised that CT delivers a higher dose than X-rays, whereas 4.9% said that X-ray, and the remaining respondents were unsure. According to the results, out of 71 respondents, 46.5% remained between one and two steps away and 46.5% remained at least three metres away from the fluoroscopy needle. The remaining 7% of respondents were unsure. According to the results, 90% of respondents usea lead apron as a protective measure, while 1.5% also use thyroid and gonad protectors, and 7% don't use any protective measures at all.

VIII. CONCLUSION

According to survey, the majority of orthopaedic surgeons employ fluoroscopy in operating rooms, but most of them are uninformed and unconcerned about the patient. As a result, patients receive higher radiation doses and personal protective equipment is either not available or is used insufficiently when it is. Patients and healthcare workers may be at increased danger as a result of this. Thus, it is advised that a radiation safety and protection training programme be put in place for the orthopaedic population in several chosen hospitals in Kashmir. The vast majority of responders expressed an interest in receiving radiation safety training. In order to improve the orthopaedic community in Kashmir's awareness and practise of radiation safety, we think that professional organisations and hospitals may start training programmes for them. Local and national efforts should be taken to solve these gap

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[11]This is the wording used by the national regulatory authority that coined the term, in turn derived from its enabling legislation: Health and Safety at Work etc. Act 1974:"Risk management: ALARP at a glance". London: Health and Safety Executive. Retrieved 13 February 2011. 'ALARP' is short for 'as low as reasonably practicable