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Full Length Research Paper

The knowledge, attitude and practice about ionizing radiation among nurses working in Orthopaedic theatres in a tertiary care centre in Sri Lanka

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This study is to assess the knowledge, attitude and practice about ionizing radiation among nurses who are working in Orthopaedic theatres in Teaching Hospital-Batticaloa, Sri Lanka. A descriptive cross-sectional study included all nursing officers working in Orthopaedic theatres. A self-administered, pretested, content-validated questionnaire has been used to collect the data. After the initial data collection, a health education program was organized for the participants and again the same questionnaire was distributed and the responses were recorded. Data analysis was performed using SPSS (v23). Female comprises 76.2% of participants. The majority of them (61.9%) had been assisted with more than fifteen cases per month. 85.7% of participants did not obtain any training program in radiation safety. Though the usage of certain radiation protection gears was poor initially, there is a significant increase in usage noted after the intervention (p-0.0534). The knowledge of the ALARA principle significantly improved after the health education programme (p-0.0474). In addition to that, awareness of the adverse effects of radiation also has been significantly enhanced after the intervention (p-0.0253).Radiation safety awareness is poor among nursing officers. Frequent studies in various institutions will help to identify the deficit properly. Simple interventions like health education programmes will assist to help to enhance the knowledge and the quality of service.

Key words: Radiation protection gears, ionizing radiation, occupational hazard, safe dose, teratogenicity.

INTRODUCTION

The usage of fluoroscopy during orthopaedic procedures has increased in several folds recently due to the increased trauma load, increased reconstructive procedures and increased awareness about minimally invasive procedures (Badawy et al., 2017; Bhatt et al., 2008; Hossain et al., 2016; Maharjan et al., 2020). The ionizing radiation is like a “double-edged sword”. Like its benefits, it has its effects. The maximum safe dose is 0.5mSV for a year (Hossain et al., 2016). The risk of radiation-induced hazard is a collective effect that

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increases with time(Alzubaidi et al., 2017; Maharjan et al., 2020). Potential health risks due to ionizing radiation depend on the type of radiation, duration of exposure, age of the recipient and the tissue which got exposed (Alghamdi et al., 2020; Hossain et al., 2016). Effects of radiation are degenerative disorders, developmental anomalies, mutations and cancer formation (Hasanzadeh et al., 2018; Khani et al., 2017; Kumar and De Jesus, 2021; Seifi et al., 2019). Though hazardous effects are known to all healthcare professionals, awareness about radiation protection and adherence to it is proven to be poor in several studies (Alghamdi et al., 2020; Mynalli et al., n.d.). Reduced level of knowledge in this subject not only risks their health but also increases the risk to patients as well (Bwanga and Kayembe, 2020). International Commission on Radiological Protection (ICRP) stated that understanding radiation protection is of utmost importance to healthcare professionals (Alghamdi et al., 2020). To reduce the risks of occupational radiation protection, knowing and adhering to the ALARA (As Low As Reasonably Achieved) principle is mandatory. In our country, there are no accredited courses or health education programmes included in the curriculum of health care professionals and there is no such study to assess the knowledge about radiation protection among them during their professional life. This study is to assess the knowledge, attitude and practice about ionizing radiation among nurses who are working in Orthopaedic theatres in Teaching Hospital Batticaloa (Tertiary care centre), Sri Lanka.

MATERIALS AND METHODS

This study was a descriptive cross-sectional design that included all nursing officers working in Orthopaedic theatres at Teaching hospital Batticaloa, Sri Lanka. An online self-administered pre-tested content-validated questionnaire that contained 20 questions was used to collect the data to maintain anonymity. The questions were divided into demographic data, experience profile and knowledge towards radiation protection. After the initial data collection, the online portal was closed for further response. A health education program was arranged for all the nurses who are working in the theatre including the effects of radiation, the importance of knowledge in radiation protection, ALARA principles and safety practices. The same questionnaire was circulated again among the same group and the responses were recorded and compared with the pre-intervention results. All data were stored and analysed in the password-protected personal computer using SPSS (v23). The student T-test was used to compare the pre-intervention and post-intervention results. A *p*-value less than 0.05 was considered to be significant.

RESULTS

Forty-two participated in this study, among them majority are female (76.2%, n=32). The majority of them (61.9%, n=26) assisted more than 15 orthopaedic surgeries per month which needed fluoroscopy assistance. Figure 1 shows handling of fluoroscopic assisted orthopaedic cases by theatre nurses.

85.7% (n-36) of them disclosed that they had no prior training in radiation protection. All of them said that they are wearing protective gear during the surgery using fluoroscopy. Though all of them wear chest cover, waist cover and thyroid guards but other radiation protection gear were used at lower rates. Such as goggles (23.8%, n-10), caps (54.8%,n-23), gloves (7.1%, n-3) and lead shields (19%, n-8). 88.9 % (n-24) revealed certain protective gears which were underutilized, and not available in the setup. Interestingly 33.3% (n-9) think the radiation protective gears impede during surgery. The majority of them (76.2%, n-32) would like to participate in a training program in radiation protection.

92.7% (n-38) of them did not know about the dosimeter and the majority of them revealed that dosimeters are not available in the theatre to use. The image intensifier part and the radiation tube of the C-Arm device were correctly identified by 25 nurses. 90.5% of them were not aware of the ALARA principle. No one in this study did not answer correctly about the components of ALARA principles. Risk reduction measures were not known to many participants. Health issues caused by ionizing radiation were not known to the majority of the participants. Especially about degenerative conditions caused by ionizing radiation. Table 1 shows the score differences before and after the intervention.

Following the health education program the usage of radiation protection caps (Δ= 28.5%), goggles (Δ= 59.5%), gloves (Δ= 7.2%) and lead shields (Δ= 40.5%) increased. The number of participants who had thought that the radiation protection gears may impede the procedure changed their minds in the second survey (21.4% vs 100%). Following the initial awareness program participants (76.2% vs 100%) would like to participate in educational/training programs. Though the usage of the dosimeter has not increased due to unavailability, awareness about the dosimeter has increased (19% vs 95.2%). Awareness about the ALARA principle has increased (95.2% vs 9.5%) and knowledge of the ALARA principle has increased (73.8% vs 0%). The knowledge of ALARA principles significantly increased after the intervention (*p*-0.0474). The knowledge of adverse effects caused by ionizing radiation, especially on degenerative conditions has significantly increased among participants of this study (*p*-0.0253).

DISCUSSION

The healthcare field consists of several occupational health risks. Among these radiation exposure is an important occupational hazard. For this reason, healthcare workers should have sound knowledge of radiation protection. According to the analysis of this

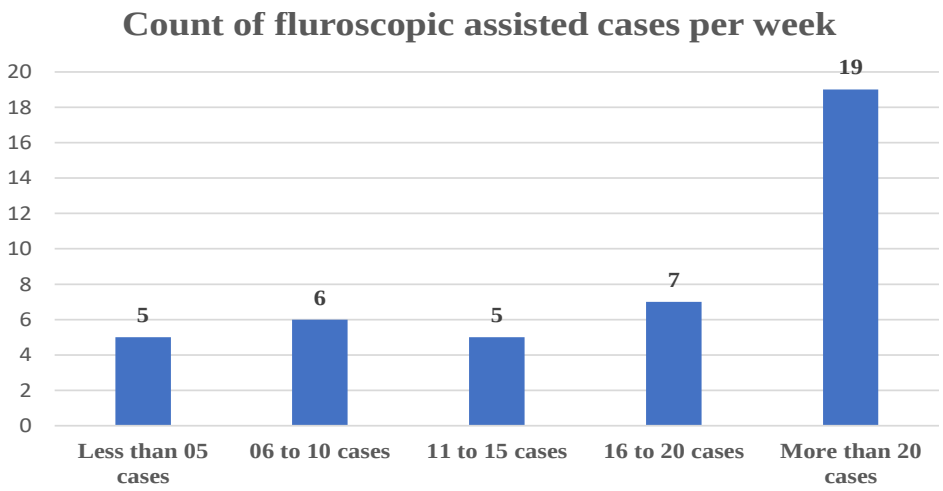

Figure 1. Handling of fluoroscopic assisted orthopaedic cases by theatre nurses.
Source: Author

Table 1. Scores of differences before and after the intervention.

Components	% of correct answers before intervention	% of correct answers after intervention
Usage of protection gears for fluoroscopy	100	100
Protection gears which are used		
Chest cover	100	100
Waist cover	100	100
Thyroid cover	100	100
Cap	54.8	83.3
Goggles	23.8	83.3
Gloves	7.1	14.3
Lead shield	19	59.5
Reason for not using the protection gear		
Unavailability of protection gears	88.9	85.3
Think the protection gears impede surgery	21.4	2.4
Willingness to be trained in radiation protection	76.2	100
Identification of parts of the C-Arm device		
Image intensifier	65.2	95.2
Radiation tube / Xray tube	62.5	90.5
Dosimeter		
Knowledge about the dosimeter	19	95.2
Usage of dosimeter	7.3	7
Awareness of ALARA principles	9.5	95.2
Knowledge of components of ALARA principles	0	73.8
Awareness of the effects of radiation		
Organs that are sensitive to radiation	16.7	71.4
Adverse effects caused by ionizing radiation		
Degenerative disorders		
Hair loss	16.7	59.5
Cataract	11.9	100
Carcinogenesis	92.9	100
Teratogenicity	45.2	100
Subfertility/Infertility	97.6	100

Source: Author

study, participants were shown a good attitude in using certain radioprotective gear such as chest, waist and thyroid covers even before the health education program. But the usage of other radiation protection gear such as lead caps, and goggles was poor among nurses before the intervention. The usage has increased following the health education program. The results are similar to previous studies (Mohd Ridzwan et al., 2019), in which thyroid shields and goggles (Kurtul, 2018) were underutilized. These radiation protection gears were underutilized as they were not available in the theatre like in our study. The reason for poor usage of gloves, goggles and lead shields even after the intervention due to unavailability. It is also shown in international surveys in other countries(Kurtul, 2018). Most importantly the main misconception was clarified in this study that 21.4% of participants thought that the protective gears impede the surgery and it has been reduced to 2.4% after the intervention and following the health education program increased number of participants (76.2% vs 100%) would like to participate similar educational programmes in this regard. A similar misconception was also noted in a study conducted in Turkey(Kurtul, 2018), which revealed poor usage of lead gloves thought to impede the surgery. Participants of our study show increased knowledge about the usage of dosimetry. But the usage of dosimetry has not increased after the intervention due to its unavailability. Only 9.5% of participants were aware of ALARA principles. Their awareness improved to 95.2% after the intervention. The knowledge of components of the ALARA principle was very poor (0%) and it has increased to 73.8%. The knowledge of the adverse effects of radiation increased to 88.5% from 46.8% after the intervention.

Conclusion

The results of the study strongly suggest that studies like this will help to assess the deficits in knowledge about occupational hazards and simple interventions like health education programmes will increase the knowledge, practice and attitude of participants.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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