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Original Research Article

Knowledge and Practice Regarding Radiation Control & Safety: A Cross Sectional Study on Radiological Technologists Working with Radio-diagnostic Centers in Dhaka City

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Abstract: Radiology and imaging is an integrated part of global medical science. Most of the diseases are now diagnosed by using radiology and imaging technology. Ionizing radiation is used by Radiology and Imaging Technologists during radio-diagnostic a procedure which may causes of biological affects in human body. There is a higher possibility to affect radiology & imaging technologists by radiation directly or indirectly. So that radiation safety is very important issues in diagnostic radiology. The aim of the study was to reveal the facilities, knowledge and practices of radiation safety among the radiological technologists working in radio-diagnostic centers of Dhaka city. It was a cross sectional descriptive study. Data were collected by the observation of 24 radio-diagnostic centers directly by using checklist and interview of 105 respondents were carried out by using pre-tested interviewer administered questionnaire. Collected data were analyzed by using Excel and SPSS. The study found that ±76% respondents have knowledge regarding radiation protection, control and safety assuring program. Among them ±8% respondents have excellent knowledge, ±59% respondents have good knowledge, ±10% respondents have average knowledge and ±23% respondents have poor knowledge on radiation protection, control and safety assuring program. The availability of radiation control, safety assurance and monitoring facilities were ±57% but only ±28% respondents were practicing radiation control and safely assuring program among 24 radio-diagnostic centers in Dhaka city which is very poor. Poor practicing of radiation control and safety assurance program by Radiological Technologists is alarming for radiation hazard among the radio-diagnostic centers of Bangladesh.
Keywords: Radiation, control, safety, absorbed dose, led apron, shielding, Thermo luminescent dosimeter.

INTRODUCTION

Radiology plays a vital role in modern medicine. Radiological technologists are working in the radiology department which is constrained as a hazardous area in the hospital. They perform radiological examination by using X-ray which having high frequency and ionizing capacity. Ionizing radiation is very harmful to human cell which is able to break down the atomic structure of hydrogen atom, destroy the chemical bond, produce free radical and finally affect on electro-chemical process in human body. A few research already done and reported that high frequency ionizing radiation having so many biological effects to human body. The primary X-ray exposure applied to the patient while little amount of X-ray is scattered from the patient's body or wall or image plate. Every day a lot of exposure is taken by a technologist while scattered X-rays are produced randomly. If technologists are absorbed a little amount of occupational exposure for a long time, they may be affected by radiation. Radiological technologists are rarely exposed by primary exposure when they perform conventional radiography and CT scanning but directly exposed during interventional radiology and fluoroscopy. So that technologists are susceptible to radiation exposure and its effect. But the biological effect of ionizing radiation can minimize by assuring adequate knowledge of professionals, enough radiation protection facilities, adequate radiation monitoring devices and practices radiation safety guidelines. Bangladesh is a developing country where radio-diagnostic departments are not fully controlled by the BAERA. The regulatory guidelines of Bangladesh Atomic Energy Regulatory Authority (BAERA) regarding infrastructure, accessories, devices, knowledge of human resources are not fully maintained by the authority of radio-diagnostic department. So that facilities of radiation control and safety assurance among the radio- diagnostic centers, knowledge of radiological technologists regarding radiation control & safety and practices the radiation protection guidelines became a considering issue for the study. The

objectives of the study were to find out the current status of facilities to assure radiation safety, knowledge of radiological technologists regarding radiation control & safety and practices of radiation protection guidelines among the radio-diagnostic centers in Dhaka city.

MATERIALS & METHODS:

This study was a cross sectional descriptive study. Data were collected by the observation of radiology and imaging department of 24 radio-diagnostic centers, 61 radiology & imaging installations and 92 radiological equipments directly by using checklist. Interview with the respondents were carried out by using pre-tested interviewer administered questionnaire. 105 respondents were selected by using simple random technique including male and female technologists from the 24 Radio-diagnostic centers of Dhaka City. Medical records & documents, infrastructure report, installation reports, periodical maintenance reports, preventive maintenance report, periodical personal monitoring report from individual thermo luminescent dosimeter of respondents were collected by using different individual check lists. Geiger Mueller (GM) counter was used to measure radiation exposure doses during the study. Duration of the study was 4 months which started from 01st September 2016 and ended at 31st December 2016. Collected data were analyzed by using EXCEL, M S Word and SPSS-16.

RESULTS

The study was carried out to identify the status of knowledge, practice and facilities regarding radiation control and safety among the radiological technologists working in the radio-diagnostic centers of Dhaka city. Data were collected from the 92 radiological equipments, 61 installations and 105 radiological technologists of 24 radio-diagnostic centers in Dhaka city. After completing data analysis the following results were found:

Table−1: Frequency distribution of knowledge of respondents regarding sources, characteristics & hazards of radiation (n=105).

Characteristics of Radiation	Have Knowledge		Have not Knowledge	
	Frequency	Percentage	Frequency	Percentage
Energy level of radiation	101	96.2%	4	3.8%
Types of Radiation	95	90.5%	10	9.4%
Sources of Radiation	63	60.0%	42	40.0%
Frequency of Radiation	104	99.0%	01	1.0%
Ionizing capacity of Rad.	41	39.0%	64	61.0%
MPD of patient & Tech.	44	41.9%	61	59.1%
Biological effects of Rad.	101	96.2%	04	3.8%
Tissue sensitivity of Rad.	104	99.0%	01	1.0%
Life time of each expo.	63	60.0%	42	40.0%
Radiation protection	87	82.85%	18	17.14%
Radiation control	84	80.19%	21	19.80%
Radiation safety assura.	79	75.23%	26	24.75%
Average Knowledge	**80**	**76.19%**	**25**	**23.81%**

NB: MPD- Maximum Permissible Dose

Table 1 show that average ±76% respondents found enough knowledge regarding characteristics of radiation. Among them 99% found enough knowledge regarding frequency and tissue sensitivity of radiation. 96.2% found enough knowledge on biological effects on ionizing radiation, 87% found enough knowledge on radiation protection, 80.19% found enough knowledge on radiation control and 75.23% found enough knowledge on radiation safety assurance program. The study found that 61% respondents had not enough knowledge on ionizing capacity of radiation, 59.1% respondents had not enough knowledge on maximum permissible dose for general public, patients and technologist and 40% respondents had not also enough knowledge on sources of radiation. Average ±24% respondents were unknown about characteristics, control and safety mechanism of radiation.

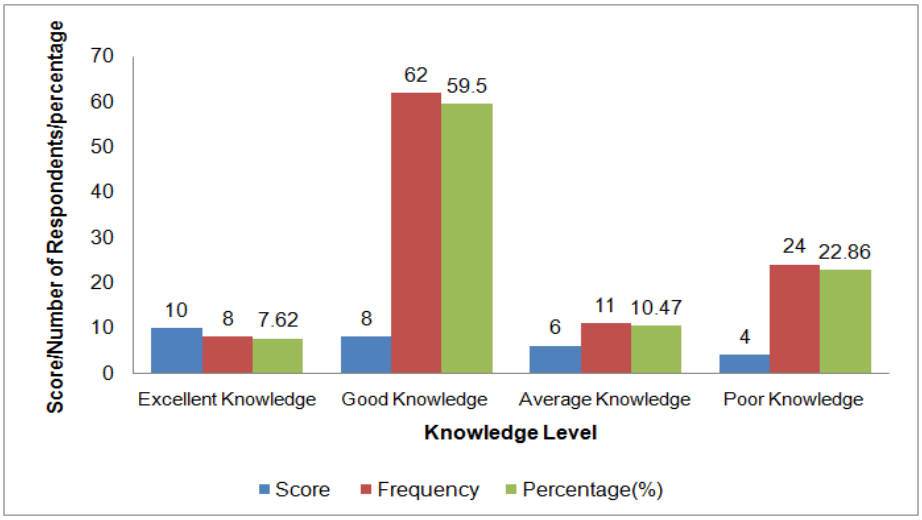


Fig-1: Knowledge level on respondents regarding radiation and its characteristics.

Figure 1 revealed the knowledge level of respondents where 7.62% respondents had excellent knowledge, 59.05% respondents had good knowledge, 10.47% respondents had average knowledge and 22.86% respondents had poor knowledge on radiation control and safety.

Table−2: Frequency distribution of X-ray machineries and their room size among the radio-diagnostic centers.

Types of Machine	**Frequency**	**Percentage (%)**
General Radiography	40	43.48
Digital Radiography	08	08.70
Mobile X-ray	12	13.04
Dental X-ray	07	07.61
OPG	08	08.70
Mammography	04	04.35
Computed tomography	13	14.13
Total	**92**	**100%**
Room size (sm)	**Frequency**	**Percentage (%)**
10-13square meter	36	59.02
14-17square meter	13	21.31
18-21square meter	06	09.84
22-25square meter	06	09.84
Total	**61**	**100%**
Func. Status of Colli.	**Frequency**	**Percentage (%)**
Yes	78	84.78%
No	14	15.22%
Total	**92**	**100%**

Table 2 show that 92 radiological equipments among the 24 radio-diagnostic centers were observed during the study in Dhaka city, where 43.48% General radiography, 08.70% Digital Radiography &OPG each, 13.04% Mobile X-ray, 7.61% Dental radiography, 4.35% Mammography and computed tomography equipments were14.13%. There were 61 machine rooms for 92 radiological equipments among 24 radio-diagnostic centers. The study also found that 40.98% machine room spaces were <14sm, and 59.02% machine room spaces were >14sm. The study found that number of machine rooms and maximum room spaces were not enough according to NSRC rules of BAERA. The significant number (86.43%) of collimator was found functional.

Table−3: Frequency distribution of the age of X-ray equipment, applied kVp, mA and exposure time.

Age	**GR**	**DR**	**Mobile**	**Mam.**	**Dental**	**OPG**	**CT**	**Total**
1-5	15	05	03	03	03	03	5	37 (40.22%)
6-10	12	02	04	01	03	05	7	34 (36.96%)
11-15	10	01	04	0	01	0	1	17 (18.48%)
16-20	01	0	01	0	0	0	0	02 (02.17%)
21-25	02	0	0	0	0	0	0	02 (02.17%)
Total	40	08	12	04	07	08	13	92 (100%)
kVp	**GR**	**DR**	**Mobile**	**Mam.**	**Dental**	**OPG**	**CT**	**Total**
> 60	0	0	0	04	0	0	0	04 (04.35%)
61-80	0	0	0	0	03	0	0	03 (03.26%)
81-100	03	0	07	0	03	03	0	16 (17.39%)
101-120	28	0	05	0	01	05	04	43 (46.74%)
< 120	09	8	0	0	0	0	09	26 (28.26%)
Total	40	08	12	04	07	08	13	92 (100%)
mA	**GR**	**DR**	**Mobile**	**Mam.**	**Dental**	**OPG**	**CT**	**Total**
>100	0	0	08	0	03	0	0	11 (11.96%)
101-199	03	0	04	04	04	02	0	17 (18.48%)
200-299	04	0	0	0	0	06	0	10 (10.87%)
300-499	28	0	0	0	0	0	02	30 (32.61%)
< 500	05	08	0	0	0	0	11	24 (26.09%)
Total	40	08	12	04	07	08	13	92 (100%)
Expo. Time	**GR**	**DR**	**Mobile**	**Mam.**	**Dental**	**OPG**	**CT**	**Total**
0.01-0.19	05	08	04	0	0	0	0	17 (18.48%)
0.20-0.39	28	0	08	04	0	0	0	40 (43.48%)
0.40-0.59	04	0	0	0	02	0	0	06 (06.52%)
0.60-0.79	03	0	0	0	05	05	0	13 (14.13%)
0.80-0.99	0	0	0	0	0	03	11	14 (15.22%)
1.00-6.00	0	0	0	0	0	0	02	02 (02.17%)
Total	40	08	12	04	07	08	13	92 (100%)

NB: GR- General Radiography, DR-Digital Radiography, Mam.- Mammography, OPG- Oral Phenography, CT-computed Tomography

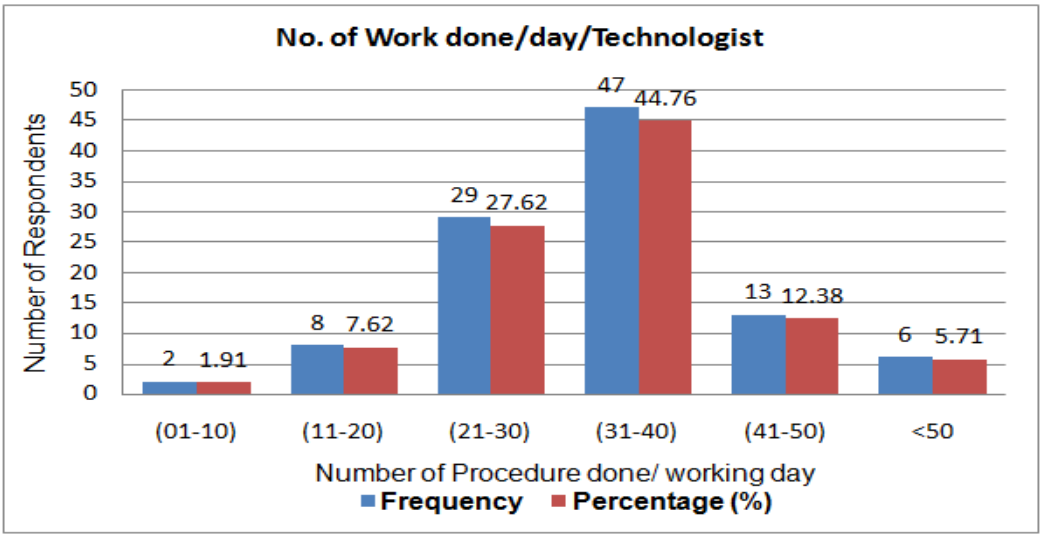
Table 3 indicates that the age of 77.18% radiology and equipments were >10 years and age of 22.82% radiology and imaging equipments were <10 years. The study found that the effective voltage ranges of 75% radiology equipments were <100kVp and 25% radiology equipments were found >100kVp. The study shows that mA range of 69.57% radiological equipments were <200, mA range of 30.43% radiological equipments were >200. The minimum approved mA range of general radiography 200mA and mobile radiography 50mA in Bangladesh. The study also found that 68.48% equipments were used >.6ms exposure time and 31.52% equipments used <.6ms exposure time. Less than .6ms exposure time mostly used in general radiography and more than .6ms used in dental and computed tomography.

Table−4: Frequency distribution of availability of radiation control, safety assuring facilities & monitoring devices. (n- 61, n= 105, n=24)

Shielding/Devices/ accessories	**Frequency**		**Percentage (%)**	
	Avail.	**Unavail.**	**Avail.**	**Unavail.**
Shielding of machine room wall	39	22	62.90%	37.10%
Shielding of control room wall	49	12	79.03%	10.97%
Shielding in door of mach. room	61	00	100%	00%
Enough ventilation	38	23	62.30%	37.70%
Lead apron	105	00	100%	00%
Hand gloves	20	85	19.05%	80.95%
Thyroid shield	20	85	19.05%	80.95%
Led goggles	20	85	19.05%	80.95%
TLD/film badge	86	19	81.91%	18.09%
GM counter	02	22	8.23%	91.65%
Radiation warning sign	18	06	75.00%	25%
Average Availability			**±57%**	**±43%**

NB: TLD- Thermo Luminescent Dosimeter, GM- Gigger Mullar counter

Table 4 show the facilities of radiation control and safety assurance and monitoring devices for 105 respondents and 61 installation rooms of 24 radio-diagnostic centers in Dhaka city. The study found that shielding of machine room wall was available 62.90/%, shielding of control room wall was available 79.03%, shielding of the door of machine room & lead apron were available 100%, TLD/Film badge was available 81.91% and radiation warning sign was available 75%, on the other hand thyroid shield, hand gloves, led goggles were available 19.05% and GM counter for classified and non-classified area monitoring was available only 8.33% among the 24 radio-diagnostic centers of Dhaka city. The study found that average ±57% radiation control, safety assuring facilities and monitoring devices were available among the 24 radio-diagnostic centers of Dhaka city.



Fig−2: Frequency distribution of daily work load of respondents (n=105).

Figure 2 shows daily work load of 105 respondents among 24 radio-diagnostic centers in Dhaka city. The study revealed that 44.76% respondents performed 31-40 radiological procedures within 8 working hours/day/technologist where 12.38% respondents performed 40-50 radiological procedures within 8 working hours/day/technologist and only 5.71% respondents performed more than 50 radiological procedures within 8 working hours /day/technologist.

Table−5: Frequency distribution of the radiation control and safety practice among the radio-diagnostic centers.

Lighting Red sign during Exposure	Frequency	Percentage
Yes	04	16.7%
No	20	83.3%
Total	24	100%
Wearing lead Apron during work	**Frequency**	**Percentage**
Yes	03	12.5%
No	21	87.5%
Total	24	100%
Using Hand Gloves during fluoroscopy	**Frequency**	**Percentage**
Yes	00	00%
No	24	100%
Total	24	100%
Using Thyroid shield during fluoroscopy	**Frequency**	**Percentage**
Yes	00	00%
No	24	100%
Total	24	100%
Using Goggles during fluoroscopy	**Frequency**	**Percentage**
Yes	00	00%
No	24	100%
Total	24	100%

Wearing TLD during work	**Frequency**	**Percentage**
Yes	16	15.24%
No	89	84.76%
Total	105	100%
Minimizing Field of view (FOV)	**Frequency**	**Percentage**
Yes	04	16.7%
No	20	83.3%
Total	24	100%
Practice ALARA concept	**Frequency**	**Percentage**
Yes	09	37.5%
No	15	62.5%
Total	24	100%
Using gonad shielding for patient	**Frequency**	**Percentage**
Yes	03	12.5%
No	21	87.55%
Total	24	100%
Optimizing the exposure factor	**Frequency**	**Percentage**
Yes	11	45.83%
No	13	54.17%
Total	24	100%
Minimize the repetition of exposure	**Frequency**	**Percentage**
Yes	19	62.5%
No	05	37.5%
Total	24	100%
Patients waits outside of the room	**Frequency**	**Percentage**
Yes	21	87.5%
No	04	12.5%
Total	24	100%
Regular personal monitoring	**Frequency**	**Percentage**
Yes	89	84.76%
No	16	13.24%
Total	105	100%
Periodical Health checkup of Techno.	**Frequency**	**Percentage**
Yes	13	12.4%
No	92	87.6%
Total	105	100%
Periodical equipment monitoring	**Frequency**	**Percentage**
Yes	02	8.33%
No	22	91.67%
Total	24	100%
Action taking against non-practicing	**Frequency**	**Percentage**
Yes	00	00%
No	24	100%
Total	24	100%
Regular updating knowledge on NSRC	**Frequency**	**Percentage**
Yes	24	100%
No	00	00%
Total	24	100%
Average Status of Practice		**Percentage**
Yes		**28.36%**
No		**71.64%**
Total		**100%**

NB: TLD- Thermo Luminescent Dosimeter, NSRC- Nuclear Safety & Radiation Control, ALARA- As Low As Reasonably Achievable.

Table 5 shows the radiation control, safety assurance and monitoring practice among 105 respondents in 24 radio-diagnostic centers in Dhaka city. The study found that 100% respondents updated their knowledge on radiation control and safety assurance regularly, 84.76% respondents monitor their TLD in regular basis but only 15.24% respondents wear TLD during work. The study found 62.5% respondents control repetition of exposure to the patient. On the other hand he study found 100% respondents do not use hand gloves, thyroid shield and eye protecting goggles during work, 87.5% respondents do not wear lead apron and do not provide gonad shield to the patient, 83.3% respondents do not practice minimizing the field of view (FOV), 83.3% installations found no radiation alarming sign (Red light), 62.5% respondents do not practice ALARA concept, 54.17% respondents do not practice optimization of exposure factors, only 12.4% respondents evaluate their health status and 8.33% radiological equipments are monitored periodically. The study found that no action was taken against the respondents who are not practicing radiation safety assurance program. However, the study revealed that ±28% respondents practice radiation control and safety assuring program among the 24 radio-diagnostic centers of Dhaka city.

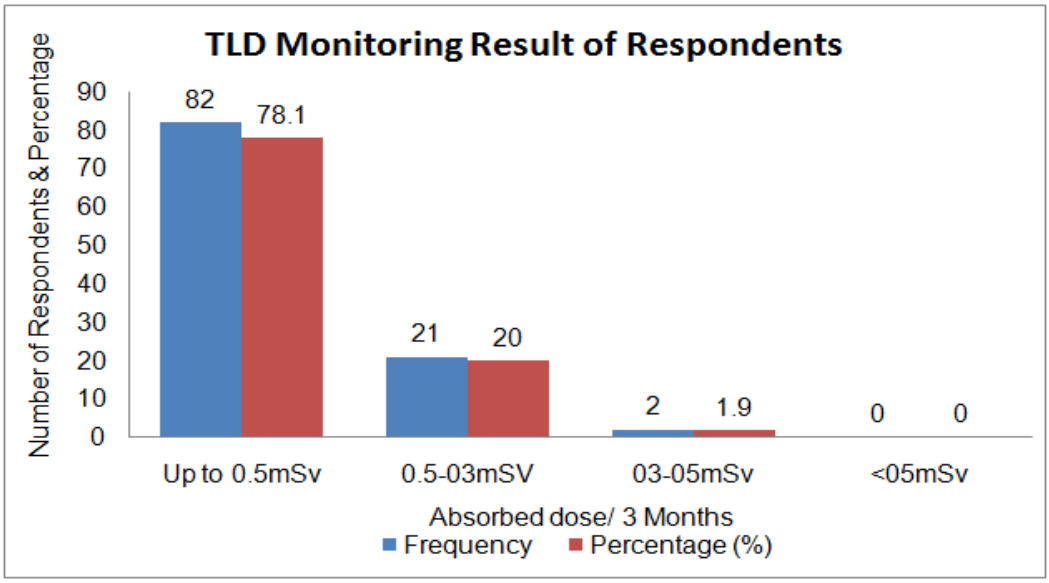


Figure-3: Frequency distribution of Personal Monitoring (TLD) results of respondents.

Figure 3 shows the personal monitoring report of 105 respondents of 24 radio-diagnostic centers in Dhaka city. The study found that 78.1% personal monitoring results of absorbed dose were >0.5mSv, 20% personal monitoring results of absorbed dose were 0.5-03mSv and 1.9% personal monitoring results of absorbed dose were 03-05mSv. There was no personal monitoring result of absorbed dose <5mSv for 3month.

Table-6: Frequency distribution of Socio-demographic background of respondents (n=105).

Age Group in years	**Frequency**	**Percentage (%)**
Up to 20	8	7.6
21-30	52	49.5
31-40	32	28.6
41-50	9	8.6
51-60	6	5.7
Total	105	100
Sex	**Frequency**	**Percentage (%)**
Male	87	82.9
Female	18	17.1
Total	105	100
Religious	**Frequency**	**Percentage (%)**
Muslim	74	70.5
Hindus	25	23.8
Christian	6	5.7
Total	105	100

Marital status	**Frequency**	**Percentage (%)**
Married	80	76.2
Unmarried	25	23.8
Divorced	00	00
Separated	00	00
Widowed	00	00
Total	105	100
Education	**Frequency**	**Percentage (%)**
Undergraduate	15	14.29
Diploma Degree	80	76.19
Secondary/Higher secondary	10	9.52
Total	105	100
Designation	**Frequency**	**Percentage (%)**
Medical Technologist	95	90.48
X-ray Technician	10	09.52
Total	105	100
Experience in Years	**Frequency**	**Percentage (%)**
01-05	32	30.5
06-10	33	31.4
11-15	13	12.4
16-20	13	12.4
21-25	4	3.8
26-30	6	5.7
<30	4	3.8
Total	105	100
Income in Month (BDT)	**Frequency**	**Percentage (%)**
>10,000	11	10.5
10,001-20,000	34	32.4
20,001-30,000	36	34.3
30,001-40,000	12	11.4
40,001-50,000	8	7.4
50,001-60,000	2	1.9
< 60,000	2	1.9
Total	105	100

Table 6 show that 78.1% (49.5%+ 28.6%) respondents were 21-40 years old and 90.48% respondents (14.29%+76.19%) were qualified who are designated as Medical Technologist and authorized to work in radiology department. On the other 9.52% respondents were nonqualified as well as unauthorized to work in radiology department. Among the respondents 82.9% were male and 17.1% were female. The study found that 76.2% respondents were married and 23.8% respondents were unmarried and most of respondents (69.5%) have experience <5 years and 30.5% respondents have the experience >5 years. The minimum income of respondent was 10000/= and maximum income was 68000/=. The study also found that income of 11.4% respondents were 30000/= to 40000/= which is considered as standard for a middle class employee in Bangladesh.

DISCUSSION:

The objectives of radiation control and safety assurance in a diagnostic center is to define how a radiology & imaging professional protect individuals, their descendants and the human race against the potential risks of ionizing radiation. Fundamental principles of radiation protection are justification of medical exposure, optimization of exposure factor and dose limitation. According to NSRC rules of BAERA-justification of medical exposure is the responsibility of physician while optimization of exposure factor and dose limitation depends on radiation control facilities of radio-diagnostic center, knowledge of radiological technologists regarding characteristics of radiation, radiation control and safety as well as practices the radiation control and safety programs. A skill Radiological technologist is capable to control and assure radiation safety for him by maintaining ALARA concept [2, 8].

Bangladesh Atomic Energy Regulatory Authority (BAERA) is the supervisory and controlling authority of Radiation control and safety program in Bangladesh. According to NSRC rules of BAERA and

IAEA guideline enough qualified professional is the first pre-requisite to introduce a radio-diagnostic center [6,7,8]. Radiological Technologists are directly involved with radiological procedure and equipments. So that they would have adequate knowledge on characteristics of radiation, its control and safety assuring program. The study revealed that average ±76% respondents had enough knowledge regarding characteristics, sources, protection, safety and biological effects of radiation. The study also found that 61% respondents had not enough knowledge on ionizing capacity of radiation, 59.1% respondents had not enough knowledge on maximum permissible dose of general public, patients and technologist and 40% respondents had not also enough knowledge on sources of radiation. The knowledge level of 7.62% respondents were excellent 59.05% respondents were good, 10.47% respondents were average and 22.86% respondents were poor knowledge on characteristics, control and safety of radiation So that Radiological Technologists should have needed to acquire enough knowledge regarding these issues. Average ±24% respondents were unknown about characteristics of radiation which is not significant overall number of respondents but may be considered as alarming due to the probability of biological effects as a professional.

According to IAEA guideline on radiation protection, the levels of radiation control and safety depend upon the facilities of radiology department, these are - types of imaging modalities, infrastructure of installation, operating procedure, equipments age, voltage, ampere, exposure time range, functional status of machine collimator, shielding system, availability of radiation accessories, monitoring devices and repetition of exposure [2,12,13,17]. The study found that most of the equipments of 24 radio-diagnostic centers as per approved kV and mA range of the BAERA where 77.18% radiology equipments were >10 years age, 75% radiology equipments were <100kVp, 69.57% radiological equipments were <200mA range which is significant to control and assure radiation safety. The study found that CT machine, dental machine and OPG machine (total- 31.52%) used only .6ms- 6ms/exposure and rest of the equipments (total-68.48%) used .6ms/exposure. According to BAERA and IAEA guideline this amount of exposure time is not significant to develop any biological effect instantly [2, 5, 7].

This study found that 61 machine rooms for 92 radiological equipments among 24 radio-diagnostic centers in Dhaka city. According to BAERA and IAEA one well structured radiation protective room will have needed for a single modality and multiple modalities should not be installed in one room. Regarding the rules (92-12 mobile) at least 80 machine rooms are required for existing equipments among 24 radio-diagnostic centers, but the study found 61rooms which were inadequate. The functional status of collimator of X-ray machine was 84.78% which is very effective to control radiation. According to NSRC rules of BAERA; at least 14sm spaces will have required for each machine room. The study revealed that 40.98% machine room spaces were <14sm, but 59.02% machine room spaces were >14sm. For which probability of exposing the technologist by scattered radiation is increased. So that number of machine room and room spaces were not enough according to NSRC rules of BAERA, which are the barrier of radiation control and safety assurance [2, 7, 8].

Important criteria of radiation control and safety is availability of radiation control and safety assurance accessories and monitoring devices in the radio-diagnostic center. The study found that shielding of door of machine room & lead apron 100%, shielding of control room 79.03%, TLD/Film badge 81.91%, shielding of machine room wall 62.90/%, ventilation-62.30% and radiation warning sign outside of installation were available 75%, but hand gloves, thyroid shield, led goggles were available only 19.05% and GM counter for classified and unclassified area monitoring was available only 8.33%. The study found that average radiation control, protection, safety assuring accessories and monitoring devices were available ±57% among the 24 radio-diagnostic centers of Dhaka city which is alarming for radiation control and safety[14, 16].

Daily work load is another considerable factor to assure radiation control safety in the radio-diagnostic centers. The study revealed that only (12.38+5.71) =18.09% respondents carried out more than 40 radiological procedures/ 8 hours in a day/technologist. According to book of hospital administration by Sakharkar BM, one radiological technologist is able to perform maximum 43 radiological procedures/8 working hours in a day [17]. So that work load of radiological technologist among 24 radio-diagnostic centers was within the expectable limit. Although radiation hazards of excessive exposure for large range of work may be controlled by using proper shielding system and accessories but technologist should be provided extra facilities and supplementary food to develop stamina not for radiation safety.

This study shows the status of radiation control, safety and monitoring practice among 105 respondents in 24 radio-diagnostic centers of Dhaka city. The study found that 100% respondents are regularly updated their knowledge on radiation control, safety assurance and monitoring but only 15.24% respondents wear TLD during working in radio-diagnostic centers where 84.76% respondents monitor their radiation absorbed dose in regular basis. It was surprised that (84.76%-15.24%) 69.52% TLD is

monitored without using. Follow through 78.1% TLD monitoring results were found >.5mSv as a back ground radiation. Regarding that the actual scenario becomes hidden in front of us. According to NSRC rules of BAERA >.5mSv absorbed dose is considered as background radiation and <.5mSv absorbed dose is countable and maximum permissible absorbed dose for radiological technologist is 5mSv for 3 months and 20mSv for 1 year. More than 20mSv for 1 year is considered as alarming for Radiological Technologist [9, 10, 15].

The study found that 100% respondents do not use hand gloves, thyroid shield and eye protecting goggles during fluoroscopy and general exposure, 87.5% respondents do not wear lead apron during exposure, 87.5% respondents do not use gonad shield for the patient during exposure, 83.3% respondents do not practice minimizing the field of view (FOV) to control scattered radiation and defined the object, 83.3% installations do not show radiation alarming sign (Red light) during exposure, 62.5% respondents do not practice ALARA concept, 54.17% respondents do not optimize exposure factors, 87.96% respondents do not evaluate their health status periodically and 91.77% radiological equipments are not monitored periodically. The study observed no disciplinary action was taken against the respondents who do not practice radiation control and safety assurance program. However, the study was revealed that ±28% respondents are practicing radiation control and safely assuring program among the 24 radio-diagnostic centers of Dhaka city which is very poor in comparison with India, Nepal, Nigeria, and other developing countries [5,6,10].

Socio demographic background of respondents sometime appeared as a barrier of radiation control and safety assurance program. The study found 78.1% respondents were 21-40 years and 90.48% respondents were enough qualified to work in radiology and imaging department. The study found that 69.5% respondents have experience <5 years which is significant to assure radiation safety. The minimum income of respondent was 10000/= and maximum income was 68000/=. The study found that income of 11.4% respondents were 30000/= to 40000/= which is considered as standard for a middle class employee in Bangladesh, but the income level of 88.96% respondents lying under the standard level of income. So respondents become interested to extend their working time even 16 hours/day in one more radio-diagnostic center, which may be risky for the respondents.

CONCLUSION

The study was carried out to identify current status of knowledge and practice of radiological technologist regarding radiation control and safety assurance guidelines and to observe radiation control and safety assuring facilities among 24 radio-diagnostic centers of Dhaka city. Radiation control and safety assuring is an integrated program where the role of NSRC authority, radiological technologist, radiologist and centre authority is equally significant. According to the study result ±76% respondents had enough knowledge regarding characteristics of radiation, its control and safety. The study revealed that ±57% radiation control & safety assuring facilities, accessories, and monitoring devices were available among the radio-diagnostic centers of Dhaka city. Though availability of facilities is <50% , but number of machine room and its spaces, shielding accessories, periodical monitoring devices were not enough which are the obstacle to assure radiation safety. The study also found a very unusual scenario that only 13.24% respondents wear TLD during work in radio-diagnostic centers but 84.76% respondents monitor their radiation absorbed dose in regular basis where 78.1% TLD monitoring results were found >.5mSv as a back ground radiation. Regarding that actual absorbed dose of respondents became hidden, which is alarming and considerable issue for the radiation safety of radiological technologist. The study revealed that unavailability of (±43%) radiation control, safety assuring facilities and very poor practices (±28%) of radiation control and safety assuring program is significant to breakdown the radiation control and safety assurance program among the radio-diagnostic centers in Dhaka city. Bangladesh Atomic Energy Regulatory Authority (BAERA) need to play more dynamic role on radiation control & safety assurance, authority of radio-diagnostic center need to assure adequate radiation control and safety assuring facility and radiological technologist have to self influenced to practice radiation control and safety assurance program to assure radiation safety among the radio-diagnostic centers. Moreover further study is recommended to identify the causes of less interest of radiological technologists to practice the guidelines of radiation control and safety assurance program.

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