

ASSESSMENT OF EQUIVALENT DOSES FOR THE EYE LENS FOR THE WORKERS IN TWO ST. PETERSBURG NUCLEAR MEDICINE DEPARTMENTS

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INTRODUCTION

Workers of nuclear medicine departments can receive high doses in the eye lens. These workers include radiochemists and technologists involved in the production and quality control of radiopharmaceuticals, as well as nurses preparing radiopharmaceuticals using radionuclide generators, dispensing and injecting radiopharmaceuticals to patients for diagnostic and therapeutic procedures. The aim of the study was to assess the absorbed doses in the eye lens of the staff of medical facilities working with radiopharmaceuticals and to estimate the relationship between the dose in the eye lens and the activities of the radionuclides in order to determine categories of the staff for regular individual monitoring of the eye lens doses in nuclear medicine departments.

MATERIAL AND METHODS

Individual dose equivalent of the eye lens $H_p(3)$ of the staff was measured in two medical facilities in St. Petersburg during one month. The staff was divided by two groups depending on the used radionuclides.

Table 1. Categories of surveyed workers working with radiopharmaceuticals.

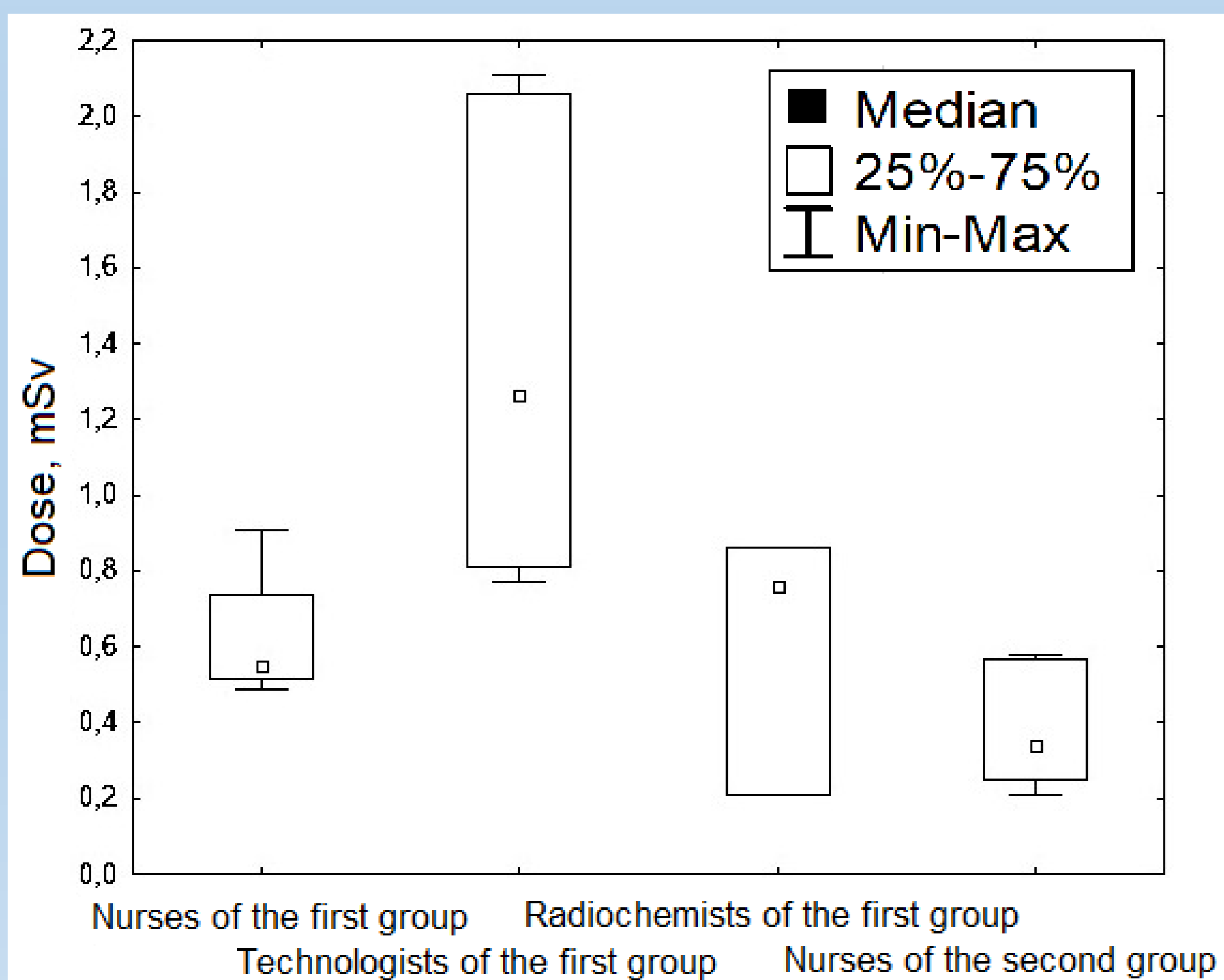
Medical facility	Staff	Number of monitored workers	Radionuclides	Type of work
Medical facility -1	Nurses	5	^{99m}Tc , ^{123}I	production of radiopharmaceuticals, dispensing of syringes, measurement of the activity for each syringe, injection to patients
	Nurses	1	^{18}F , ^{11}C , ^{68}Ga	dispensing of syringes, injection to patients
	Technologists	4	^{18}F , ^{11}C , ^{68}Ga	synthesis, measurement of the activity and packaging in a transport container, packing of syringes
	Radiochemists	2	^{18}F , ^{11}C , ^{68}Ga	synthesis, quality control
Medical facility -2	Nurses	2	^{99m}Tc , ^{89}Sr	production of radiopharmaceuticals, dispensing of syringes, measurement of the activity for each syringe, injection to patients
	Nurses	3	^{18}F , ^{11}C , ^{68}Ga	dispensing of syringes, measurement of the activity for each syringe, injection to patients
	Technologists	2	^{18}F , ^{11}C , ^{68}Ga	synthesis, measuring the activity and packaging in a transport container, sampling, transportation
	Radiochemists	1	^{18}F , ^{11}C , ^{68}Ga	quality control

The $H_p(3)$ in the eye lens were measured with individual thermoluminescent dosimeters (MKD-A with detectors made of $\text{LiF}:\text{Mg}, \text{Ti}$ (DTG-4). The uncertainty of the measurements $H_p(3)$ was $\pm 30\%$ ($P=0.95$). Conversion coefficient from $H_p(3)$ to equivalent dose of the eye lens was 1.



RESULTS AND DISCUSSION

Figure 1. The range of doses to eye lens of the monitored workers for investigated month



The highest equivalent doses in the eye lens (1.3 mSv) were determined for technologists from the first group involved into the synthesis of radiopharmaceuticals for PET (Figure 1). Relatively high equivalent doses were determined for radiochemists involved in the synthesis and quality control of radiopharmaceuticals for PET (0.76 mSv). The equivalent doses of nurses in PET engaged in dispensing of radiopharmaceuticals in syringes, measurement of the activities and injection to the patient (0.55 mSv) were higher compared to equivalent doses of nurses working with ^{99m}Tc , ^{123}I and ^{89}Sr (0.34 mSv). The analysis showed a high correlation between eye lens doses of nurses and radiochemists working in PET and activity of radionuclides; there was no correlation for other groups.

CONCLUSION

High doses were determined for the nurses, radiochemists and technologists working with positron-emitting radionuclides (^{18}F , ^{68}Ga and ^{11}C), which can exceed 20 mSv in a year. It is recommended for this category of workers to perform individual monitoring of the eye lenses after a preliminary assessment of the level of exposure of workers and an assessment of the risks of high doses of the eye lens.

