Data Article

Data on the estimating the risk of cancer due to some common radiographs in Tehran city

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ABSTRACT

The purpose of the data is to estimate the excessive risk of cancer due to some common radiographs in Tehran. The data were collected in 8 radiology centers in Tehran city and on 283 patients with eight radiographic views. To obtain the data, PCXMC 2.0 based on Monte Carlo calculations, has been used to calculate the effective dose of each organ, and annual effective dose. The effective dose, cumulative effective dose, number of radiographs per year and excessive cancer risk due to the type of radiographs calculated. The additional risk of lethal cancer resulting from these radiographs in the target population is about 14.81 cases of the total population of Tehran city in one year. © 2018 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Specifications table

| Subject area | Radiation protection and radiation biology. |
|-------------|---------------------------------------------|
| More specific subject area | Calculating the risk of cancer due to some common radiographs in Tehran city. |
| Type of data | Tables |
| How data was acquired | The data on the cumulative effective dose of the population was calculated by PCXMC 2.0 software, and then the excessive risk of cancer was determined by standard equations. |

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Data format | Raw, Analyzed.
---|---
Experimental factors | The cumulative effective dose of the population was analyzed according to the equations for the excessive risk of radiation-induced cancer.
Experimental features | The excessive risk of radiation-induced cancer was determined.
Data source location | Radiology wards in educational hospitals affiliated to AJA university, Tehran province, Iran.
Data accessibility | The data are available with this article.

**Value of the data**

- The data show that the number of excessive cancers due to the common radiographs for the entire population of Tehran city is 14.81 cases per year. Therefore, data can be used to reduce the number of unnecessary radiographs and ultimately reduce the amount of cancer in Tehran city.
- The data is useful in demonstrating that the optimization of exposure factors including FOV, KVP, MAS and FSD could diminish the effective dose of patients in common radiographs. Therefore, more researches is needed to adjust the mentioned parameters to decrease the excessive risk of radiation-induced cancer in the current population.
- The data can be used to show that a specialist in radiation protection and radiation biology should supervise the radiology ward in order to monitor patient safety, quality control and quality assurance of radiology machines; consequently, the effective dose and the number of excessive cancers due to the common radiographs would be decreased.

1. **Data**

   In Table 1, the ESD, the mean of the exposure parameters used for each type of radiography is presented.

   Table 2 shows the effective dose, cumulative effective dose, the number of radiographs per year, and excessive risk of cancer.

2. **Experimental design, materials and methods**

   2.1. **Data collection**

   Data were collected on the 283 patients (65% male, 35% female) in eight common radiographs including, chest (Anterior-Posterior view), pelvic (Anterior-Posterior view), abdomen (Anterior-Posterior view), skull (Anterior-Posterior view), thoracic spine (Anterior-Posterior view), Thoracic spine (Lateral view), lumbar spine (Anterior-Posterior view), lumbar spine (Lateral view). At first, the accuracy tests of

| Radiology procedure | Mean KVP | Mean MAS | FSD (cm) | ESD (mGy) |
|---|---|---|---|---|
| chest (Anterior-Posterior view) | 65 | 20 | 180 | 0.15 |
| pelvic (Anterior-Posterior view) | 85 | 48 | 100 | 5.4 |
| abdomen (Anterior-Posterior view) | 64 | 44 | 100 | 2.7 |
| skull (Anterior-Posterior view) | 73 | 17 | 100 | 2.2 |
| Thoracic spine (Anterior-Posterior view) | 76 | 40 | 100 | 4.6 |
| lumbar (Anterior-Posterior view) | 76 | 55 | 100 | 5.8 |
| lumbar spine (Lateral view) | 85 | 69 | 100 | 6.2 |
| Thoracic spine (Lateral view) | 80 | 54 | 100 | 5.1 |
| Radiology Procedure | the annual number of X-ray examinations per 1000 population | Number of radiographs in the total population | The average effective dose | Accumulative effective dose (Man-Sievert) | The number of excessive cancers for the entire population of Tehran in one year |
|---------------------|----------------------------------------------------------|---------------------------------------------|---------------------------|------------------------------------------|--------------------------------------------------------------------------------|
| Chest               | 90.12                                                    | 784,172                                     | 0.028                     | 21.95                                    | 1.09                                                                           |
| abdomen (Anterior-Posterior view) | 11.28                                                  | 98,065                                      | 0.87                      | 85.3                                     | 4.26                                                                           |
| pelvic (Anterior-Posterior view)  | 14.91                                                 | 129,623                                     | 0.61                      | 79.07                                    | 3.95                                                                           |
| lumbar spine        | 24.9                                                    | 216,473                                     | 0.385                     | 83.34                                    | 4.167                                                                          |
| skull               | 25.77                                                   | 224,036                                     | 0.05                      | 11.20                                    | 0.56                                                                           |
| Thoracic spine      | 7.61                                                    | 66,159                                      | 0.24                      | 15.87                                    | 0.79                                                                           |
measuring half layer absorption, the accuracy of voltage of X-ray tube, time, Milliampere-seconds (mAs) were performed using Barracuda dosimeter (Multi-Purpose Detector). Then, the output of the X-ray machine was recorded at a distance of 100 cm and a voltage of 80 kV for 3 times in order to decrease the potential error. Also, all radiation parameters (voltage of tube, milliampere-seconds, focus to skin distance (FSD), filter thickness, field-of-view size (FOV) were recorded for all patients. To estimate Entrance Surface Dose (ESD) of the patients, the following equation used [1,2].

\[
ESD = A \times \left(\frac{KV}{80}\right)^2 \times mAs \times B/FSD^2
\]

A = The output of tube at a KV of 80 at 1 m distance from X-ray tube.
B = Correction factor based on IAEA report no. 457.
MAs = Milliampere-seconds applied.
FSD = Focus to skin distance (cm).

2.2. Calculating the effective dose

In order to estimate the annual effective dose and effective doses of organs the radiation parameters i.e. KV, MA-S, FSD, filter thickness, FOV entered in the PCXMC 2.0 software, manufactured by STUK – Radiation and Nuclear Authority, Helsinki, Finland.

2.3. Risk assessment

In order to estimate the excessive risk of radiation-induced cancer, the cumulative dose of the study population is required. The number of radiographs per year in the current society was extracted from previous studies [3–5]. Data on the cumulative effective dose for eight radiographs using of scientific relationships based on the acceptance of linear no-threshold model were obtained. Then, the risk of excessive cancer for each radiography was determined by standard equations [6,7].

The population of Tehran city is around 8,693,706 by the 2016 census [8]. Assuming that the frequency of radiographs in Tehran city is equal to the radiographic frequency in the country [9], the annual cumulative effective dose can be calculated for a specific radiography. Consequently, according to the following formula, the excessive risk of lethal cancer is obtained per 100,000 people [10,11].

\[
\text{Excessive risk of lethal cancer} = \%5 \times (\text{Man – Sievert})
\]

Conflict of interest

None to declare.

Transparency document. Supporting information

Transparency data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.08.208.

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