Statement of Study X-ray Generated in the Effect of Computerized Tomography Devices on Blood Samples

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Abstract. Studying the effect of X-ray emitted from the CT scanner devices on blood samples taken from a eleven persons between the ages of 10-20, 20-30, 30-40, and 40-60 years. The measurements were many of parameters of blood such as "WBC" White blood cell, "RBC" red blood cell, and "PLT" platelet count. It was noted that the parameters of blood properties that are exposed to X-rays are affected every time in a simple and within the normal range.

Keyword: X-rays, CT scanner, blood, age, time, WBC, RBC, PLT

1. Introduction
For some X-ray radiation medical, for example extremity, chest and dental radiographs, include efficient only a few doses micro Sieverts. Yet, device Dosages and Effective doses can be tens of milli-Sieverts for hold fluoroscopic or Computed tomography examinations [1]. The risks of radiation are reviews information available at low dose radiation efficacy at regular periods by national and international organizations. Modern reviews involve those conducted in 1995 via NRPB” National Radiological Protection Board” [2], in 2000 via UNSCEAR” United Nations Scientific Committee on the Effects of Atomic Radiation" [3] and in 2001 via NCRP " National Radiological Protection Board" [4]. The proofs considered via these include the bodies of epidemiological studies of humans, and biological studies of radiation including Laboratory experiments on animals and live cells. Computer tomography (CT) alone accounts for nearly half of this dose of medical radiation from continuous progress, indicating that computerized tomography will remain the most important contributor, via medical dosages in US " United States" [5–7]. Providing the utilized radiation of ionizing in the medical imaging, which includes computerized tomography (CT), diagnosis of valuable information that will certainly help many patients [8]. However, it is believed that exposure to radiation, and currently works to induce pregnancy is small, i.e., only nonzero, risk [8].

In this work, the effect of X-rays generated in CT imaging devices has been studied on some blood parameters in the human body and more than once and for different ages.

2. Theories and Methods
The amount of the basic dose in radiation safeguard is the dose of absorption, which is the absorbed energy per unit mass and its unit joul (J) per kilogram (kg), called a special name (Gray) The rate
during which a dose absorbing is received is very object of interest. Common rates of dose are rad/s, m rad/h, ...etc. In SI units, the rates of dose can be express such as Gy/s, mGy/h, etc., and because of the gray (Gy) is a big unit compared to many popular state of affairs, the unit lGy/h is predominately utilized [9]. The eventuality of stochastic influence is found not only but also depended on absorbed dose, however as well on a type of the radiation and energy. This taken into consideration weighing the absorbed dose via a factor concerning to the type of radiation. The factor of weighting is named the factor of weighting radiation (WR) and the dose weighted is named the equivalent dose (this factor of weighting was named the quality factor (Q), and the weighted dose was named the dose equivalent). The equivalent dose (HT) in tissues (T) is given through the following expression \[ H_T = \sum T \cdot w_T \cdot D_{T,R} \], whereas \( D_{T,R} \) is a dose absorbed averaged on the tissue or organ( T) result to radiation( R). The equivalent dose unit is joul (J) per kilogram (Kg) with the special name called sievert (Sv) [10]. the values Factor is of the radiation weighting given for this type and energy of radiation has been chosen via the International Committee of the Radiological guarantee to represent the values of the relative biological effectiveness of the radiation in the random influences included in doses low [10].

The dosimetric computation in Computerized tomography dose index (CTDIvol) and Dose–Length Product (DLP). First of these two quantities on exposure factors depend, and the field of vision to the survey, the choice of pitch factors and settlement, while the second is also a dependent of these quantities along the survey [11]. Definition (DLP) as the product of the volume (CTDI) and the length of the irradiated scan [12].

\[
\text{DLP} = \text{CTDIvol} \times \text{irradiated length}
\]

where (CTDIvol) is represented the volume (CTDI) [13, 14]. By comparing the values of effective dose predestined from (DLP) to a wide range of scanner values derived models of effective dose calculations (NRPB) and coefficients (tissue weight 60 ICRP), a linear relationship was found [13] while information set were registered to the same as anatomic region.

For calculated the dose of effective, CT scan was multiplied via the k-coefficient derived from the previously published Table via Deak et al. [15], as Illustrated below:

\[
E=k \times \text{DLP}
\]

This method of calculation in helical imaging (CT), is suitable to minimize an estimate (E) when calculating DLP using only (CTDIvol) and the scanning range described due to the radiated length usually exceeds the scanning length described due to use of this method is widespread, mostly of the manufacturers of scanners CT are now calculated and displayed (DLP), taking into account the entire radiated length instead of the lowest prescribed scan length. The (CTDIvol) provides an extremely useful method compared the doses delivered via different protocols of scan or to achieve a certain level of quality for image for a specific size for patient [12]. The conversion factors and the effective dose are relatively depended on peak kilovolt for examinations of human body [17].

3. Results and Discussion

Nine blood samples were taken for people of different ages ranging from 10-20, 20-30, 30-40, 40-60 for both sexes, and a CBC (Complete blood count) measurement of these samples was done for each of the following parameters white blood cell “WBC”, red blood cell “RBC”and platelet count “PLT”, and then the samples were saved in the EDTA tube and Put it in a place laboratory and it kept for three days. These samples were exposed to X-rays emitted from the computed tomography (CT scan) through examining the abdominal area in a period of 39 seconds in the first exposure where the radiation exposure was measured by inspector XP detector [17] the American-made as shown in Figure 1. The absorbed dose rate was before exposure inside examination room 0.04 μSv/h (0.004mR/h) and during the examination given absorbed dose rate was 27μSv/h (2.7 mR/h), after
which blood parameters were measured as shown in and Table 1 Figure 2. The limit for safety dose is 1 mSv / year or 0.0011mSv /hour (0.114 mR/hour) for a member of the public [18]. In the second exposure, the blood was exposed at the same time period and the same amount of radiation. The DLP and CTDIvol was automatically measured by the CT and its first exposure values were 887 (mGy.cm) and 19 (mGy) respectively, and the peak of the kilovolts was 120 Kv. The DLP and CTDIvol was automatically measured by the CT and its second exposure values were 1186 (mGy.cm) and 26 (mGy) respectively, and the peak of the kilovolts was 120 Kv.

To confirm the results obtained, we took two samples of blood and were exposed to radiation in the same of the day and measured their parameters. The same changes have been observed as shown in Table 2.

Table 1. A comparison between the values of normal parameters of blood ("WBC" white blood cell, "RBC" red blood cell and "PLT" platelet count) and the values of blood parameters after the first exposure (WBC1, RBC1 and PLT1) and the values of blood parameters after the second exposure (WBC2, RBC2 and PLT2) and for different ages and after save blood.

| No. | AGES (YR.) | WBC | WBC1 | WBC2 | RBC  | RBC1 | RBC2 | PLT  | PLT1 | PLT2 |
|-----|------------|-----|------|------|------|------|------|------|------|------|
| 1   | 10-20      | 9.4 | 8.3  | 8    | 4.43 | 4.64 | 4.36 | 273  | 341  | 320  |
| 2   | 20-30      | 10  | 8.5  | 4.2  | 5.03 | 5.16 | 5.21 | 156  | 190  | 194  |
| 3   | 30-40      | 11.2| 9.1  | 8.9  | 4.64 | 4.85 | 4.89 | 217  | 191  | 183  |
| 4   | 40-50      | 8   | 7.2  | 7.2  | 4.1  | 4.26 | 4.35 | 227  | 257  | 266  |
| 5   | 50-60      | 8.1 | 7.2  | 7.2  | 5.16 | 5.28 | 5.43 | 189  | 233  | 211  |

Table 2. A comparison between the values of normal parameters of blood (white blood cell "WBC", red blood cell "RBC" and platelet count "PLT") and the values of blood parameters after the first exposure (WBC1, RBC1 and PLT1) and the values of blood parameters after the second exposure (WBC2, RBC2 and PLT2) and for different ages in same day.

| AGES (YR.) | WBC  | WBC1 | WBC2 | RBC  | RBC1 | RBC2 | PLT  | PLT1 | PLT2 |
|------------|------|------|------|------|------|------|------|------|------|
| 20-30      | 7.3  | 8.5  | 8.3  | 5.16 | 5.31 | 5.27 | 177  | 176  | 181  |
| 40-50      | 9.2  | 10.5 | 10.2 | 4.37 | 4.45 | 4.31 | 323  | 363  | 369  |
Figure 1. The measurement of exposure rate by using inspector XP detector.

Figure 2. A comparison between the values of normal parameters of blood (a) white blood cell normal "WBC", the values of blood parameters after the first exposure (WBC1) and the values of blood
parameters after the second exposure (WBC2), (b) red blood cell normal "RBC", after the first exposure RBC1, after the second exposure RBC2 and (c) Platelet count "PLT", PLT1 and PLT2, for different ages and after save blood.

4. Conclusion
Nine blood samples were taken from people of different ages ranging from 10-20, 20-30, 30-40, 40-60 for both sexes, and a CBC measurement of these samples was done for each of the following parameters WBC, RBC and PLT, and then the samples were saved in the EDTA tube and put it in a place kept for three days. These samples were exposed to X-rays emitted from the spiral scanner to examine the abdominal area in a period of 39 seconds in the first exposure. The radiation exposure was measured by the American-made inspector XP detector. The X-ray dose was given 27 μsv / h, after which blood parameters were measured. In the second exposure, the blood was exposed at the same time period and the same amount of radiation. To confirm the results obtained, we took two samples of blood and were exposed to radiation in the denials of the day and measured their parameters. The same changes have been observed.

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