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# Age and Gender Association with Changes in Blood Cells Count After Radioiodine Therapy

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**ABSTRACT**

Aim: The effect of radioiodine on blood cell Materials and Methods: 23 patients who have expressed the written satisfaction to participate in the project 3 months, the first blood sample was taken from Their Before Radioiodine therapy. The next samples, were taken from patients 2 weeks after treatment and 3 months after treatment. To analyze the data is used from: descriptive statistics, middle, the confidence interval and appropriate chart. For compare reduction cells in two groups age and sex and Mann-Whitney test was used and finally, the final analysis was performed with software Spss- cp.
Result: Mean and standard deviation three stages 1 to 4 is drawn on a graph. The average results of WBC was 30/6991 in the first stage that showed no significant difference with average results of WBC in the second stage sampling  which was 43/6920 while the average results of WBC was slightly decreased in the third phase (13/6339). About hemoglobin, the average of data was 96/13 in sample of pre-treatment and in second and third stages was 13.04 and 13.4, respectively.  Standard deviation (SD) was 1.4 and 1.19 and 1.12 respectively in all three phases.
Conclusion: Female are more sensitive than men especial in PLT.

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## Introduction

It is about a century that human knows ionizing radiation is harmful for biological tissues and in acute doses it can lead to irreversible insult, cancer and even death.[1,2] The natural impact of ionizing radiation on human body relies on upon the aggregate measurements of radiation gotten and measurements rate of presentation. High-measurements ionizing radiation, gave to a great degree at high-measurements rate, is ordinarily thought to be destructive, coming about in apoptosis, DNA harm and development of tumor cells. Radiation triggers DNA repair pathways and cell cycle checkpoints in typical cells and results in recuperation or cell passing With advances in science of technology [3], the human exploitation is increasing of the new energy sources and endless such as nuclear energy. Medicine is one of the important fields that mankind has used

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this power for the treatment and diagnosis of many diseases. In fact, nuclear medicine is one of the valuable diagnostic and therapeutic methods in medicine that its resplendence from the beginning to now was a compilation of important historical discoveries. In a way, that mentioned in the history of nuclear medicine which American scientists after World War II when I$_{131}$ was available to the medical community, observed that the absorption of Radioiodine can indicate thyroid function after use that [4]. Among the various medical fields, the study of the Endocrine system was one of the most important applications in nuclear medicine. So that Radioiodine has been used for the treatment of thyroid cancer and hyperthyroidism almost more than five decades [4,5].

Thyroid cancer is the most common Endocrine system cancer and oral radioactive Radioiodine therapy is very useful in the treatment of differentiated Thyroid cancer. This treatment method with a history of more than 50 years have interesting and strong therapeutic effects for cancer of the thyroid gland will lead to side effect on patients in the short-term and long-term. Of course complications of this type of treatment is usually mild and reversible. Serious complications occur in patients that have used high doses of Radioiodine due to metastasis or recurrence of the disease. The examples of these side effects are Inhibit the proliferation of the bone marrow or pulmonary fibrosis [6,8].

Thyroid carcinoma is the most common malignancy of the endocrine system and most patients refer with a palpable mass in the neck. Malignant tumors derived from follicular epithelium are classified according to their histologic features. Differentiated tumors such as Thyroid Papillary (PTC) or Thyroid follicular cancer (FTC) are often treatable and curable and theirs Prognosis is good if the patient is diagnosed at an early stage. The contrary, Thyroid anaplastic cancer (ATC) is aggressive and gives poor response to treatment. Theirs prognosis is poor [7-10]. The risk of leukemia increased a little and permanent inhibition of bone marrow is rare in at dose of less than one Curie. However, serious complications are very high after the first day of treatment with 200 mCi or less. Leukemia is one of the important, rare and long-term complications encountered with Radioiodine that was reported in use of higher doses of 800 mCi. However, there are also reports of lower doses. But anyway, may be seen only 2% of cases of leukemia or aplastic anemia in the long term. Due to the possibility of such cases, full blood cells and platelets and hemoglobin tests usually done before treatment and after 6 weeks of treatment. Because it is possible sharp drop in white blood cells or platelets in 6 weeks after the treatment and if this drop is in the fourth week, the patient to be follow until returned to normal levels these values [11]. The use of high-dose (100 mCi) that are used for the treatment of metastases and prevent cancer recurrence. Has been seen that platelet production more than others, is sensitive to exposure to radiation therapy with Radioiodine. In a study conducted in the same field, red and white blood cells relative reduction, observed in 2 of the patients of 21 patients and pancytopenia (hemoglobin below 12-13.5), red blood cells is less than or equal 3.9-4.9 million and white blood cells less than or equal $3.5 \times 10^{3}$ and platelets less than or equal $1.4 \times 10^{5}$ was observed in 4 of the patients [8]. Has been seen that the effect of Radioiodine on lymphocytes depend on the amount of Radioiodine activity and natural killer cells (NK Cell) are more sensitive of all lymphocyte cells and may be reduced even with a low dose. B lymphocytes and then T lymphocytes are the cells which may be reduced. Of course, in a study that these results were obtained, none of these patients have not shown signs of declining the level of Immune system [11-13]. In the same study, in patients who not have metastatic or did not exist recurrent disease, in most cases, no change was seen in blood cells [13].

In another study of high-dose Radioiodine complications on blood cells, has been observed that the number of patients may be a drop of blood cells in the first year and in 91% of patients was happened temporary inhibition of bone marrow, but none of the patients did not require blood transfusion and did not show side effects of decreased blood cells [14-16]. According to these data and data from other studies, Blood cells count (CBC) appears necessary monthly. We also decided Check blood cells of the Namazie educational hospital' patients with differentiated Thyroid Cancer who receive Radioiodine until realized blood cell changes after the use of Radioiodine.

## Method

This study is a prospective cohort study. All patients using Radioiodine to treat thyroid cancer for the first time included in the project. The total number of patients was more than 23 people, but due to lack of follow-up of patients, People who have not been once blood samples removed from the project. Patients included all women and men that because of Differentiated Thyroid Cancer had received Radioiodine orally (liquid) at a dose of 100 mCi that the age range of their, was 14 to 72 years old. Finally the project, we only were able to follow 23 patients. In nuclear Department of Namazie educational - treatment centers, on specified days, patients who have expressed the written satisfaction to participate in the project 3 months, the first blood sample was taken from Their before Radioiodine therapy. The next samples, were taken from patients 2 weeks after treatment and 3 months after treatment. To analyze the data is used from: descriptive statistics, middle, the confidence interval and appropriate chart. For compare reduction cells in two groups age and sex and Mann-Whitney test was used and finally, the final analysis was performed with software Spss- cp.

## Results

In follow-up of patients who were referred to the Namazie Hospital for Radioiodine therapy in the thyroid differentiated cancer treatment, we were able to select more than 30 patients and follow their Treatment course to 3 months. Of course, from those, only 23 patients remained until the end of 3 months and others were eliminated due to lack of blood samples and discontinue experiments. This number of patients were men and women that suffering from cancer and were in an age range

17-14 years old that patients' age average was 65/43. CBC samples were taken in the third stage of the disease (Before treatment, two weeks after treatment and three months after treatment with Radioiodine). Mean and standard deviation three stages 1 to 4 is drawn on a graph. The average results of WBC was 30/6991 in the first stage that showed no significant difference with average results of WBC in the second stage sampling which was 43/6920 while the average results of WBC was slightly decreased in the third phase (13/6339). About hemoglobin, the average of data was 96/13 in sample of pre-treatment and in second and third stages was 13.04 and 13.4, respectively. Standard deviation (SD) was 1.4 and 1.19 and 1.12 respectively in all three phases. Our results about the average of red blood cells was 4.8 million and 4.6 million and 4.5 million in all three phases. The Standard deviation all three was 0.7 and 0.8 and 0.58. Platelets were measured with average 222000 and 185000 and 230000 and the standard deviation of platelets in the first stage was 14.55 and 45.12 in the two weeks after treatment and at three months after treatment was 17.114. In the comparison between the results obtained in all three phases should be mentioned that the comparison between first stage of WBC and two weeks after treatment (p.value = 0.6) and first stage with three months of treatment (p.value = 0.2) and 2 weeks after treatment with the third stage (p.value = 0.19), there was no significant reduction in white blood cells. About hemoglobin, in the comparison between the hemoglobin of first and second stage and first stage with sampling third stage, due to 0.04 and 0.01 p.value, was observed the significant decrease in hemoglobin in the two-step and also about red blood cells also just the comparison of red blood cells first and third stages (p.value = 0.02) occurred a significant reduction in red blood cells. Platelet patients as compared with the three-step. The platelets of patients in the two weeks after treatment with (p.value = 0.04) almost had a significant decrease but in the second and third stages compared platelets, greater reduction have shown due to (p.value = 0.02). All these assessments and comparisons also were evaluated in two age groups and gender. in females had a significant reduction in white blood cells, but in the case of hemoglobin in three stages due to 1.03 and 0.01 and 0.05 respectively p.value the significant changes seen. In the case of platelets, the initial platelets p.value in comparison with platelet second stage (p.value = 0.01) and platelets, second and third phase is (p.value = 0.03). In the two comparison, has been accessed reduce and important changes in platelets and has not been in males at no curtain and no step (p.value <0.05). Leukopenia and anemia were 7.8% of patients before treatment. In the second stage of sampling, 8% of patients were leukopenia, but 13% were anemic and 13% also had a platelet count less than 140,000. In the final stage and three months after treatment, 4% of patients with white blood cells less than 3500, 8% were anemic patients, 4% were in the range of thrombocytopenia, Mann-Whitney test results according to age (over 40 and less than or equal to 40 years) and gender (male and female) has been depicted graphs 5 to 12. In comparison white blood cells at the mentioned time in the study population according to gender, the least amount of p.value is belonging to the white blood cells before treatment, but generally not significant p.value. Compare the level of hemoglobin in the mentioned time based on gender, had Just two weeks after treatment (p.value = 0.03). It is considered significant that occurs more the significant decrease in women. About comparison of the mean of platelet based on gender was not found also significant p.value. About compared to the average of all parameters in terms of age less than 40 or greater than or equal to 40, obtained p.value were all above o.o5.
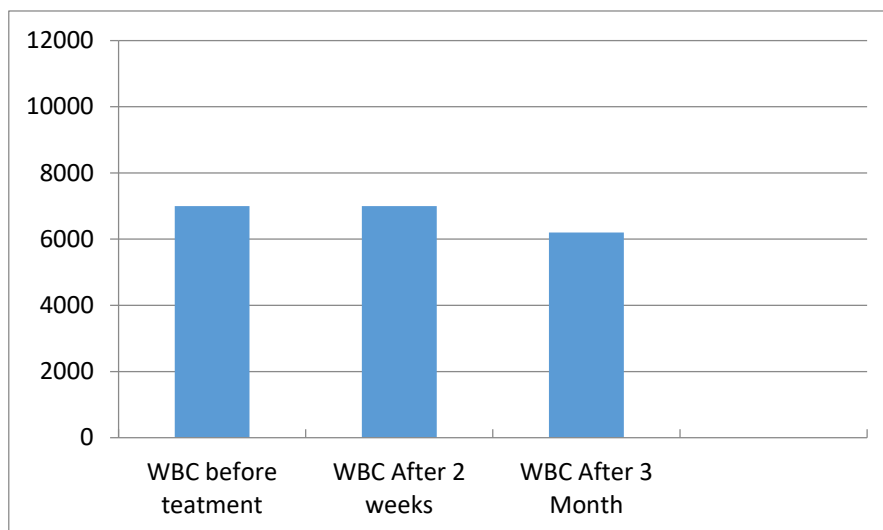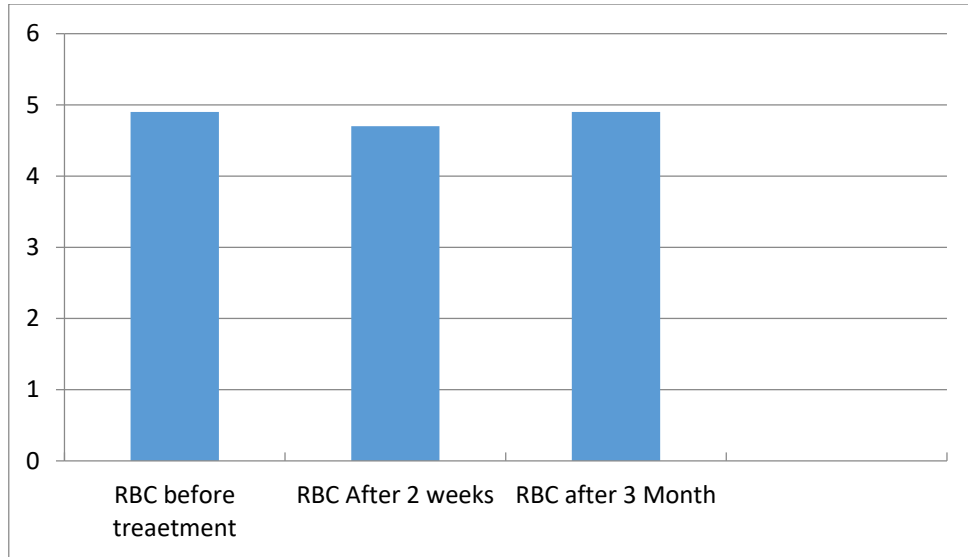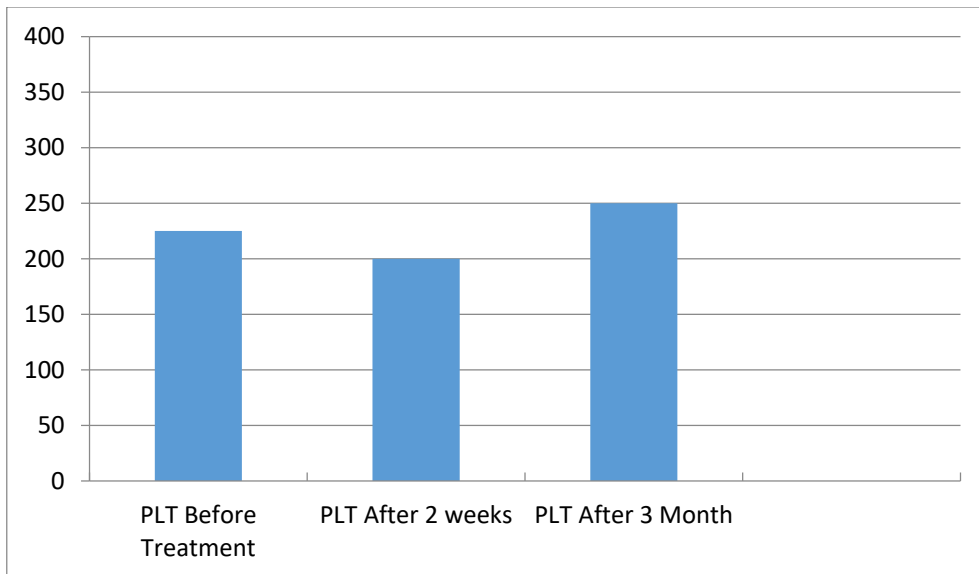


**Figure 1**: WBC changes

**Figure2:** RBC Changes
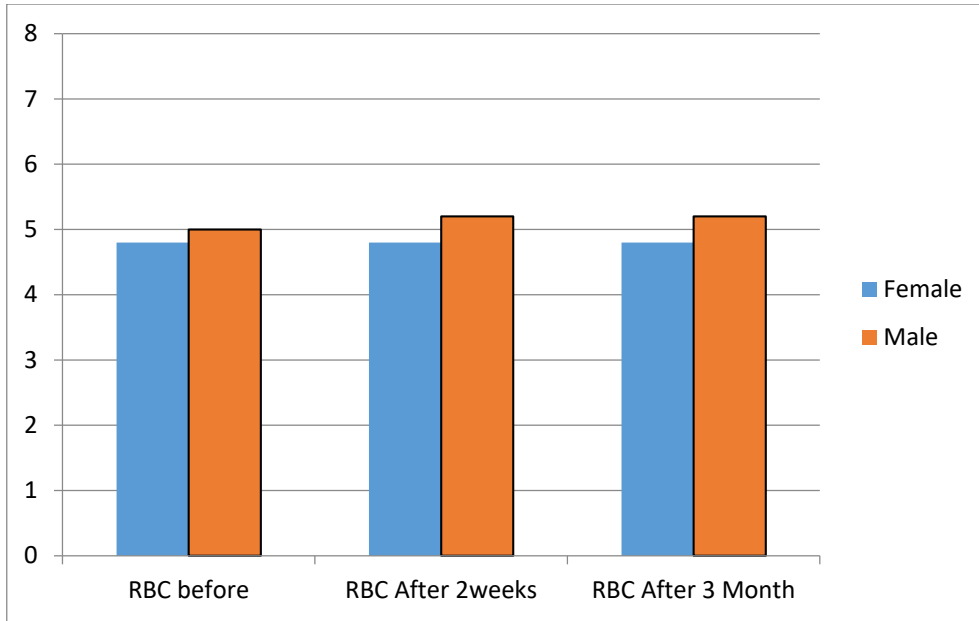


**Figure3:** PLT Changes
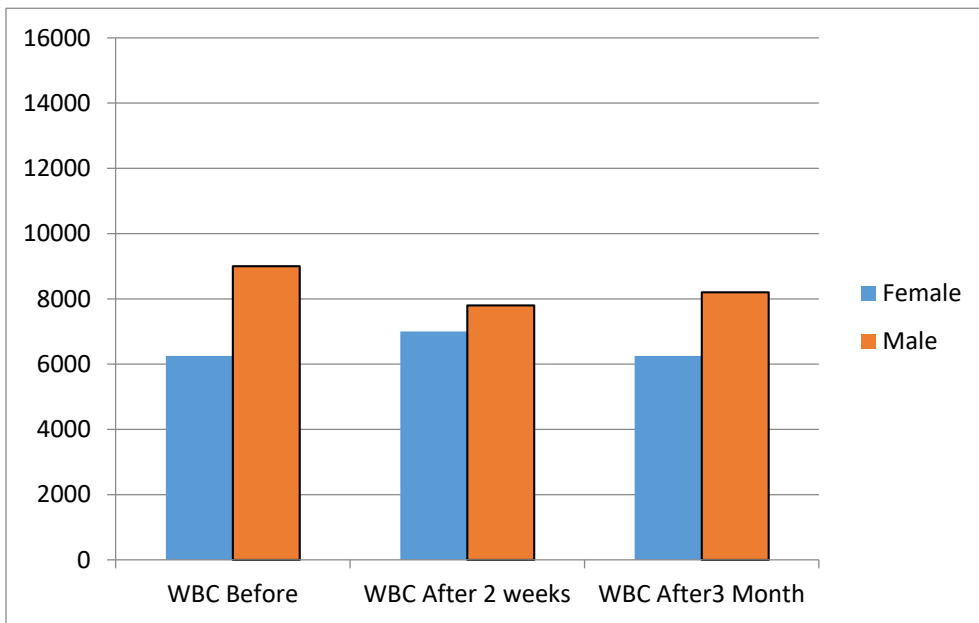
**Figure4:** RBC Changes
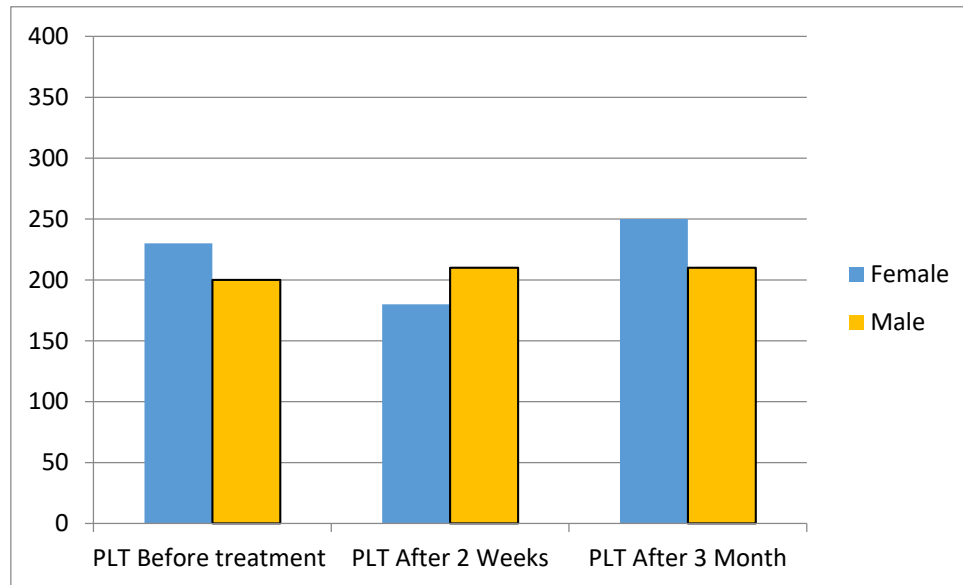


**Figure5:** WBC Changes

**Figure6:** PLT Changes

### Discussion and conclusion

Since the lymphatic tissue is very sensitive to the use of Radioiodine, one complication Radioiodine therapy is myelosuppression. Although this complication is mainly created by transient. According to sources of nuclear medicine, this side effect usually occurs in the weeks after treatment. Of course is very rare in fewer days of a query. In the findings of our study compared the white blood cells at any stage of sampling did not show any significant reduction, although there are studies that in the course of treatment is very decline white blood cells, particularly lymphocytes, and among them, natural killer cells and In the rank after, lymphocytes B and then the T-cells and significant decrease was seen in the category. In this study did not have possible for us to check white blood cell subsets. In a study on changes in blood cells following therapeutic Radioiodine, the relative decline of red and white blood cells were observed in the two of twenty-one patients, and pancytopenia was visible in the four of these patients, in this study, patients who did not have metastatic or recurrent disease. In most cases, no change was observed in their blood cells, that in our patients were 90% without metastasis and relapse patients. About patients who become Anemic only at the end of three months blood cells patients showed decline and hemoglobin were significantly lowered in the three stages. Of course should were considered the initial rate of anemia among patients who entered the study. This means that this decline is due to relatively low hemoglobin at all studied patients. Platelet of patients Did not show a significant change, However, the study of Danish was conducted on 24 patients with Differentiated Thyroid Cancer, After treatment neutropenia and thrombocytopenia occurred in all patients and pancytopenia have been reported In the four patients and one patient was pre-leukemia. When all the comparisons conducted according to gender, thrombocytopenia and reduce of hemoglobin occurred in women with significant p.value. So reduction of these two cell lines was strongly related to gender. Evaluation of all the cell lines showed that age above 40 years and below 40 years, there is no significant correlation between age and changes.

### Conflict of Interest

The authors report no declaration of interest.

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