

Chemotherapy and radiotherapy, a cause of hypertension and weight loss in cancer patients

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Abstract

Cancer is an abnormal condition in which uncontrolled growth and proliferation of normal cells occurs. Chemotherapy and radiotherapy treatments are used frequently to prevent cancer growth. These treatments can also reduce the ability of the bone marrow to produce red blood cells in response to their loss. The present study was conducted to compare the effect of chemotherapy and radiotherapy on the hypertension and weight loss in different types of cancer patients. A total of 80 samples for blood pressure and weight loss were compared as control and cancer patients. The Sphygmomanometer was used for the measurement of blood pressure and weight was measured by a Trimmer bathroom scale or weight machine. A significant difference between systolic and diastolic blood pressure with 136.6 ± 3.9 and 95 ± 4.3 mmHg was noted in cancer patients as in normal samples the values were 125.7 ± 2.9 and 79.5 ± 3.2 mmHg, respectively. In case of weight loss, the difference was also extensive as in cancer patients the value was 54.33 ± 7.8 kg, while in normal samples with same height, the values were 62.93 ± 5.3 kg. It was concluded that cancer treatments such as chemotherapy and radiotherapy can result in the increase systolic, diastolic blood pressure and pulse rate and reduced weight loss. Current findings showed that chemotherapy and radiotherapy effect quality of cancer patient's life. Healthy diet and proper care can be suggested to the patients during cancer treatment, especially in the case of chemotherapy and radiotherapy to maintain the blood pressure and body weight.

Keywords: Cancer, chemotherapy, radiotherapy, hypertension, weight loss.

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Introduction

Chemotherapy is being used to treat different types of cancer. Chemotherapeutics destroy cancer cells, stop their growth and spreading, cause shrinkage of tumor and relieve cancer symptoms [1]. In some cases, patients are treated with single chemotherapy or combined with radiotherapy effectively such as in anal cancer or esophageal carcinoma [2]. Radiations, exposure to x-rays or gamma rays can kill cancerous cells or stop their growth. It can be effective in the treatment of cancerous growths, because malignant cells are more sensitive to radiations than normal body cells. Radiations can be applied to a particular area, whilst the rest of the body is shielded from it [1]. Cancer appears to occur when the growth of immortal cells starts in body and there division becomes too fast [3, 4]. The majority of patients with incurable tumors suffer from the anorexia/weight loss syndrome and anemia, either as a result of the disease itself or the effects of cancer treatments particularly cytotoxic chemotherapy and radiation therapy [5, 6].

Recently, there are many different drug classes such as acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), antidepressants, birth

control, decongestants, steroids and different cancer chemotherapy agents which can cause increase in blood pressure. Chemotherapeutic agents and steroids are encountered most often in the oncological treatments. Drugs such as bevacizumab and sorafenibare resulted in increase of blood pressure [7]. Aromatase inhibitors such as tamoxifen have been associated with an increase in thromboembolic events, including an increase in blood pressure [8].

There are many chemotherapeutic agents that use the cytochrome P450 pathways for metabolism. Tamoxifen, a selective estrogen receptor modulator, is a potent CYP450 inhibitor that should be monitored with certain hypertensive medications [9]. Tyrosine kinases catalyze the phosphorylation of adenosine triphosphate (ATP) to proteins and play a key role in proliferation, angiogenesis, carcinogenesis and differentiation of cells. Tyrosine kinase inhibitors including imatinib, dasatinib, and lapatinib have changed the way in which many cancers have been treated. These agents are also potent CYP450 inhibitors and can interact with non-dihydropyridines as well as corticosteroids, which are potent CYP3A4 inducers [10]. Paclitaxel causes thrombosis in cancer patients [11]. Advances in cancer therapy have led to the use of monoclonal antibodies to manage certain

hematologic malignancies and solid tumors [12-15]. The infusion of these agents commonly resulted in hypertension caused by the massive release of cytokines, as well as fever, dyspnea, hypoxia or even death [16]. The incidence of radiation-induced heart disease is higher in patients given high doses of radiation therapy with doxorubicin [17].

In general, weight loss develops because of a negative balance between intake and expenditure of calories. Such a negative balance may occur with decreased calorie intake and normal energy expenditure. At the clinical level, an imbalance can result from inadequate food ingestion or habits, impaired digestion and absorption, external nutrient loss, tumor-host competition for nutrients or increased energy expenditure of the host [18]. The present study was conducted to find out the correlation between cancer treatments (chemotherapy and radiotherapy), hypertension and weight loss in different types of cancer patients.

Materials and methods

Total eighty samples (40 cancer patients and 40 normal subjects) were observed for the measurement of blood pressure and weight loss. Cancer patients were selected from Nuclear Institute of Medicine and Radiotherapy (NIMRA), Jamshoro, Pakistan. The selected cancer patients were being treated by radiation therapy and different drugs such as Paclitaxel (Taxol[®]), Docetaxel (Taxotere[®]) and Doxorubicin (Adriamycin[®]) from 3 months to 1 year. The age group of samples as well as control was between 25-50 years.

Measurement of blood pressure and pulse rate of control and cancer patients was carried out by using aneroid sphygmomanometer (HS-50A). In the measurement procedure, the cuff of aneroid sphygmomanometer was wrapped around a person's arm with an inflatable rubber bag inside the cuff centered over the brachial artery. Enough air pressure was pumped into the cuff to close the artery. Air pressure was then released by opening the thumb valve. When the pressure in the cuff was equal to the pressure on the artery, the artery was opened and the blood started to return to the part of the artery which was closed and clear pulse sounds observed. The cuff was connected by tubing to a manometer, which showed the amount of pressure on the artery. The first pulse sound sheared was the systolic blood pressure reading on the manometer. The last sound heard was of diastolic blood pressure. Same was the procedure to measure the blood pressure of control samples.

Two types of anthropometric measurement i.e. height and weight were also carried out. Height was measured by tap measurement and weight was measured by Trimmer (TRI1016) bathroom scale or weight machine. The results were statistically analyzed by using *t*-test and *p*-value (ANOVA).

Results and discussion

Mean value of systolic blood pressure for control samples and patient samples were 125.7 ± 2.9 and 136.6 ± 3.9 , respectively (Fig. 1). The *t*-value and *p*-value of systolic blood pressure was 0.24 and 0.8, respectively. The mean value of diastolic blood pressure for control sample and patient sample was 79.5 ± 3.2 and 95 ± 4.3 , respectively. Our results showed that systolic and diastolic blood pressure was higher in cancer patients as compared to control. Chemotherapeutic agents such as bevacizumab and sorafenib and steroids can result in increase of blood pressure [7]. Our findings are also in accordance with Fraley et al [10]. Interferons are proteins made and released by host macrophages and lymphocytes in response to the presences of any foreign antigen i.e. virus, bacteria, parasites or tumor cells and has been approved for the treatment of many types of cancer. Interferons usually cause acute symptoms during the first 2 to 8 hours after treatment, including flu-like symptoms, hypertension, tachycardia, and nausea and vomiting [19]. The studies conducted by Younis et al [20] also concluded that the anticancer treatment results in decrease of RBCs count and Hemoglobin level in cancer patients. It might be the reason of increase in blood pressure and weight loss. Mean values, *t*-test values and *p*-values of systolic, diastolic blood pressure and pulse rate are shown in Table 1.

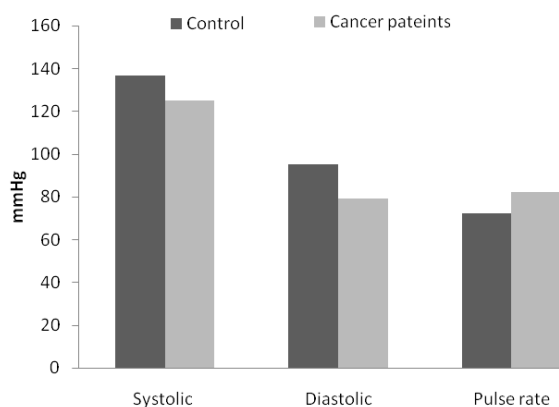


Fig. 1 Difference b/w blood pressure and pulse rate in control and cancer patients

Table 1 Statistical analysis of blood pressure and pulse rate.

Parameters	Control (n=40)	Cancer patient (n=40)	t- test	p- value
	Mean±SD	Mean±SD		
Systolic blood pressure (mmHg)	125.75±2.97	136.66±3.92	0.24	0.8
Diastolic blood pressure (mmHg)	79.5±3.2	95±4.3	1.69	0.1
Pulse rate (/min)	82.0±3.5	72.3±1.8	0.74	0.5

Table 2 Difference between height and weight in control and cancer patients.

Parameters	Control samples (cm)	Cancer patient samples (cm)
Height (cm)	176.06±4.5	161.7±4.01
Weight (kg)	72.9±2.3	54.3±5.8

The values indicate mean ±SD in total 40 samples.

Table 2 shows the mean values of height and weight for control and cancer patients. The mean value of height for control and cancer patients was 176.1 and 161.7, respectively, which indicated that the cancer patients were short in height as compared to normal. While the mean value of weight for control and cancer patients was 72.93 and 54.33, respectively, which indicated that the weight due to cancer treatment was decreased in cancer patients than controls with same height.

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