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Hematological Changes in Nurses Handling Antineoplastic Drugs

M Ansari-Lari [1],[*]M Saadat [2]

[1]*Dept. of Social Medicine, Medical School , Shiraz University of Medical Sciences, Shiraz, Iran.*
[2]*Dept. of Biology, College of Sciences, Shiraz University, Shiraz 71454, Iran.*

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ABSTRACT

A cross-sectional study to determine whether occupational exposure to antineoplastic drugs can cause hematologic changes was performed. Blood samples were collected from a group of 24 hematology/oncology nurses who were exposed to antineoplastic drugs during a mean preiod of 5.5 years (standard error =1.1). The control group, matched by sex, and age, consisted of 18 nurses, worked on other sections. Within the normal range we found significant differences between the exposed and the control group in the absolute mean number of the total white blood cells (t=-2.50; df=40; P<0.05) and neutrophils (t=-1.72; df=40; P<0.05; one tailed test). The findings suggested, that the hematologic changes can serve as biological markers for medical surveillance and early detection of health problems due to handling antineoplastic drugs.

INTRODUCTION

Biological monitoring, with sister chromatid exchange, chromosomal aberration, and forward mutation assays has produced positive results in nurses handling antineoplastic drugs (4, 5). However, several studies do not confirm these observations (3). The hematological changes have already been used as marker for bone marrow supression after radiotherapy or chemotherapy and individuals occupationally exposed to low levels of some biological hazards such as ethylene oxide, an alkylating agent (1, 2). Thus, we can investigate the biological effect(s) of occupational exposure to antineoplastic drugs, by identifying changes in hemopoietic subpopulations through the use of traditional methods of quantitating peripheral blood elements.

MATERIALS AND METHODS

The study population consisted of 42 healthy female, including the exposed (24) and the unexposed (18) groups. Both groups were unrelated Iranian Muslims. There was no statistically significant age difference between the oncology/hematology nurses (age range = 22 to 43 years, average age=28.5 years) and the control group (age range= 21 to 41 years, average age =29.1 years). The nurses were from two hospitals of Shiraz, Iran (Nemazi hospital and Ali-Asghar hospital). None of the individuals had confounding factors e.g., current illness, asthma, on chemotherapy, exposure to radiation, cigarette smoking, etc. The exposed nurses had been handling antineoplastic drugs for a range of 1-10 years. The most frequently handled drugs included Etoposide, Cylophosphamide, Methotrexate, Vincristine, Adriamycin, 5-fluorouracil, Cisplatinum and Bleomycin. Venousblood (3ml) was withdrawn into ethylenediamine tetraacetic acid vacutainer tubes to measure hematological markers such as CBC test and WBC differential according to standard hematological methods. The differences were compared using unpaired Student's t-test. A probability of P<0.05 was considered statistically significant.

RESULTS AND DISCUSION

As shown in Table 1 the WBC (t= -2.80; df=40; P<0.05) and neutrophil counts (t=-1.72; df=40; P<0.05; one-tailed test) among oncology/hematology nurses were significantly lower as compared with those of control nurses. There was no statistically significant difference between the studied groups for lymphocytes, platelets, hematocrit and hemoglobin.

The present data is in agreement with the observations of most authors that the antineoplastic drugs supressed the bone marrow of cancer patients during the chemotherapy and individual occupationally exposed to low levels of ethylene oxide (1, 2). Biomonitoring using CBC test, appears to be a sensitive way to evaluate the biological effects of antineoplastic drugs in occupationally exposed people. This type of monitoring may be used as an indicator to detect early damage and to demand more controls.

Our results are also particularly interesting for a developing country such as ours, where biological security controls are not strict and extended work days are common. For health surveillance, the detection of early genotoxic effects may permit the adoption of preventive biological controls such as hygienic improvements in the workplace or the reduction of hours of occupational exposure. Further studies should examine the efficacy of CBC and WBC differentials in relation to exposure levels while considering all of the possible confounders.

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[*] Corresponding author, Tel: +98-711-2282747 ;Fax: +98-711-2280926; E-mail: saadat@susc.ac.ir

Table 1. **Comparison of CBC between oncology/hematology nurses and control nurses**

Groups	Mean ± SD	t-value [a]
WBC		
Oncology/hemotology [b]	6410 ± 1000	-2.50 [d]
Control [c]	7210 ± 1050	
Neutrophil		
Oncology/hematology	3580 ± 950	-1.72 [d]
Control	4070 ± 870	
Lymphocyte		
Oncology/hematology	2480 ± 580	-1.39 [e]
Control	2750 ± 680	
Platelets		
Oncology/hematology	250000 ± 88400	-1.06 [e]
Control	279000 ± 76500	
Hemoglobin		
Oncology/hematology	13.52 ± 1.02	1.22 [e]
Control	13.13 ± 0.97	
Hematocrit		
Oncology/hematology	41.79 ± 2.97	1.69 [e]
Control	40.22 ± 2.96	

a: with df=40;
b: Oncology/hematology means exposed group;
c: Control means unexposed group;
d: The observed difference is statistically significant;
e: The observed difference is not significant.

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