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Introduction

The use of cytostatics drugs in anticancer therapy is increasing. Health care workers can be occupationally exposed to these drugs classified as carcinogenic, mutagenic or teratogenic (IARC, 1987, 1997). Workers may be exposed to this drug, being in the hospital settings the main focus dwelled upon the pharmacy, and nursing personnel. Although the potential therapeutic benefits of hazardous drugs outweigh the risks of side effects for ill patients, exposed health care workers can have the same side effects with no therapeutic benefit. The exposure to these substances is epidemiologically linked to cancer and nuclear changes detected by the cytokinesis-block micronucleus test (CBMN). This method is extensively used in molecular epidemiology, since it determines several biomarkers of genotoxicity, such as micronuclei (MN), which are biomarkers of chromosomes breakage or loss, nucleoplasmic bridges (NPB), common biomarkers of chromosome rearrangement, poor repair and/or telomeres fusion, and nuclear buds (NBUD), biomarkers of elimination of amplified DNA.

Research Aim and Methods

The aim of this study is to compare the frequency of genotoxicity biomarkers, provided by CBMN assay in peripheral lymphocytes between pharmacists, pharmacy technicians, and nurses occupationally exposed to cytostatic drugs and a control group. The group of cases was constituted by 46 workers exposed occupationally to cytostatics and 46 unexposed individuals (controls), from whom both peripheral blood was collected in order to measure the genetic endpoints proposed in this study.

Results

Table 1 - Descriptive statistics of MN, NPB and NBUD in the studied population (mean \pm mean standard error, range), p-value of the Mann-Whitney test, and results of binary logistic regression concerning the association between exposure and genotoxicity biomarkers, as evaluated by the odds ratio (OR).

	MN in BN Mean \pm S.E. (range)	NPB Mean \pm S.E. (range)	NBUD Mean \pm S.E. (range)	MN in MONO Mean \pm S.E. (range)	MN in MULTI Mean \pm S.E. (range)
Exposed	9.83 \pm 1.28 (1-58)	0.65 \pm 0.14 (0-3)	2.43 \pm 0.37 (0-11)	1.35 \pm 0.32 (0-9)	4.09 \pm 0.78 (0-21)
Controls	5.09 \pm 0.89 (0-34)	0.11 \pm 0.05 (0-1)	1.37 \pm 0.32 (0-13)	0.41 \pm 0.11 (0-3)	1.46 \pm 0.22 (0-6)
p-value¹	<0.001	0.001	0.006	0.027	0.044
OR	6.667	5.770	2.893	1.894	1.111
CI 95%	2.369-18.76	1.924-17.307	1.135-7.373	0.813-4.412	0.452-2.726
p-value²	<0.001	0.002	0.026	0.139	0.819

¹ Mann-Whitney test

² Binary logistic regression

All the genotoxicity biomarkers studied presented statistical significant differences between exposed and non-exposed subjects to cytostatics (Mann-Whitney test). Using multiple linear regression all the variables under study; gender, tobacco and alcohol consumption did not show significant results for all the genotoxicity biomarkers, only age had a significant result in the frequency of MN ($p \leq 0.002$) in both groups.

Conclusions

Occupational exposure to cytostatics drugs is associated with genotoxic effects that can be evaluated by biomarkers. In this study, the results suggest that pharmacy and nursing personnel who prepare and/or administer cytostatics drugs in the studied Portuguese units showed increase frequency of genotoxicity biomarkers in comparison with non-exposed.