**ORIGINAL ARTICLE**

The Potential Genotoxic Effects of Antineoplastic Drugs in Occupationally Exposed Nurses

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### Abstract

*Background:* Antineoplastic drugs are commonly used globally. They directly interact with the tumor cell deoxyribonucleic acid and inhibit their growth. These actions are non-selective affecting both tumor cells and healthy cells producing toxic effects. The present study was designed to evaluate oxidative stress and genotoxic effects of antineoplastic drugs in occupationally exposed nurses under routine working conditions.

*Methods:* The studied groups included 28 nurses working in Hematology and Oncology unit, Benha University Hospitals and 20 non exposed subjects that work in academic jobs in Benha Faculty of Medicine, matched in age, gender & socioeconomic status. Malondoaldehyde (MDA) & reduced glutathione (GSH) were assessed for all individuals as oxidative stress markers. Leucocyte DNA damage was also assessed by the comet assay as a biomarker of genotoxicity.

*Results:* There were a significant increase in MDA & reduction in GSH in occupationally exposed subjects than control. Also, extent of DNA damage in the lymphocytes of occupationally exposed participants has a high significance than the controlsAge and work duration both had a big impact on how much DNA damage there was.

*Conclusion:* occupationally nurses who have been exposed to antineoplastic agents are more likely to experience oxidative stress, which can lead to DNA damage and other potential genotoxic effects.

**Keywords:** Antineoplastic, Oxidative stress, Comet assay, DNA damage.

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# INTRODUCTION

Antineoplastic medicines used in chemotherapy are extremely cytotoxic substances but while their usefulness is undeniable, they have been identified as potentially dangerous to occupational health care professionals (1).

The International Agency for Research on Cancer (IARC) has examined a number of anti-cancer medications that stop the formation of tumors by preventing cell division and killing developing cells, some of which were included as human carcinogens in Group1 (2). There are more than 10 million cancer cases

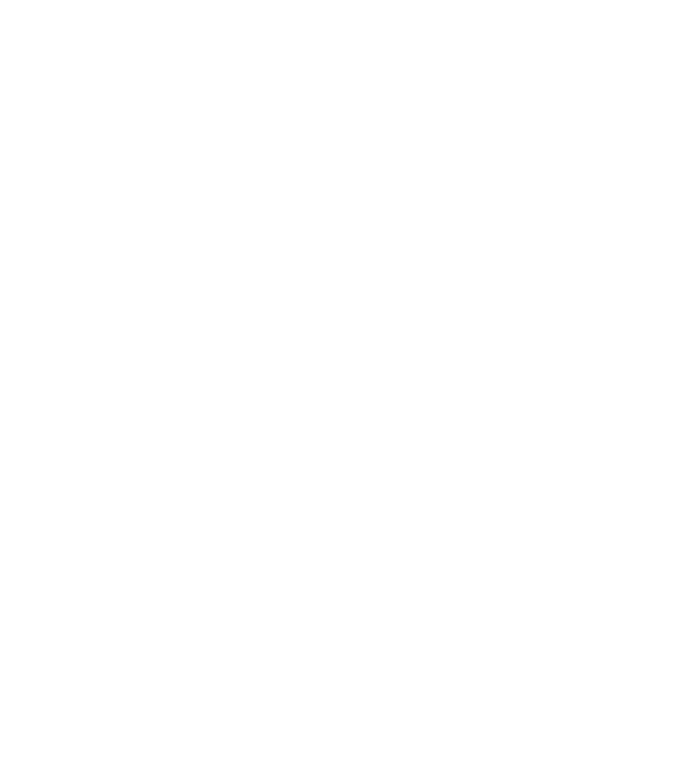
around the globe. WHO estimates that the disease will reach

more than 13 million by 2030. One of the cancer treatment routes is the use of cytotoxic compounds (3).

Exposure to antineoplastic drugs may occur during production, transportation and delivery and, of course, when used in health care facilities, either in hospitals or in the home, or even when disposed as waste materials. Different routes of exposure to pharmacists, pharmacy technicians and nurses who prepare or administer antineoplastic drugs such as through cutaneous absorption, inhalation, or less likely, ingestion (hand-mouth exposure route) (4 , 5).

Occupational exposures to chemicals are well recognized and regulated. However, families of workers may suffer second-hand exposure from contaminated clothes, placing them at greater risk than the general population. Pregnant women and children are especially sensitive subgroups in this scenario (6).

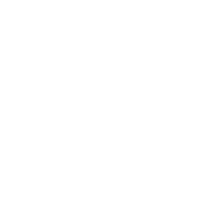
Reactive oxygen species (ROS), which cause DNA damage and mutations, can be produced by anticancer medications. Overproduction of ROS can damage a cell's lipids, proteins, and DNA and cause it to lose its structure and function (7).



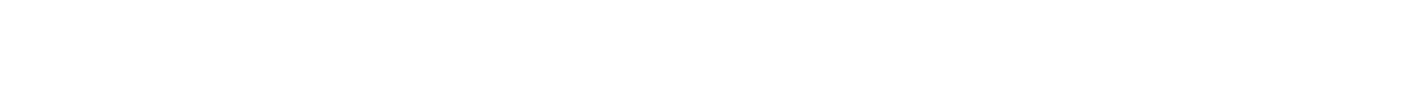
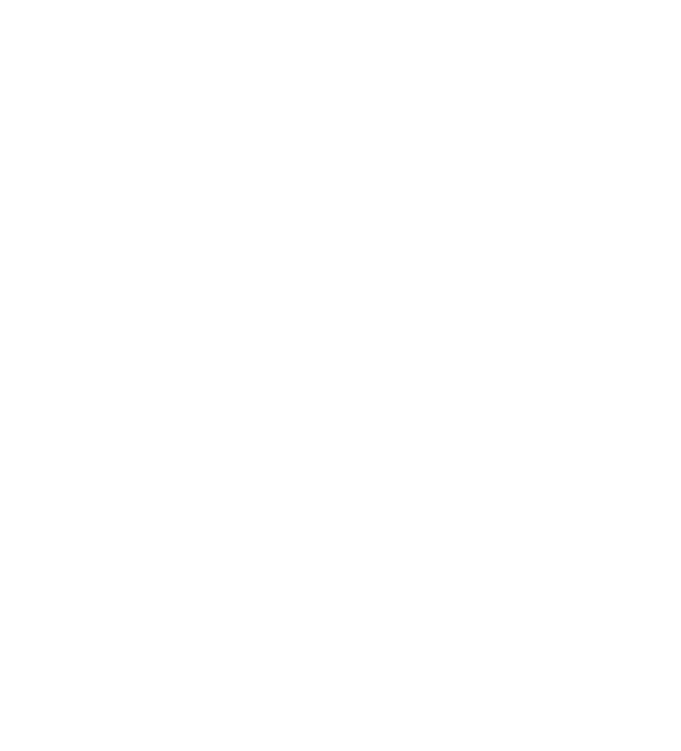
Several cytogenetic methods such as the examination of sister chromatid exchanges, micronuclei, and chromosomal abnormalities in peripheral blood cells had been employed frequently to assess the potential genotoxic effect of anticancer agents in occupationally exposed workers (8).

The alkaline single cell gel electrophoresis technique or COMET assay is a relatively new molecular assay which measures strand breaks incomplete excision repair sites, alkali labile sites and cross-linking, in individual cells (9).

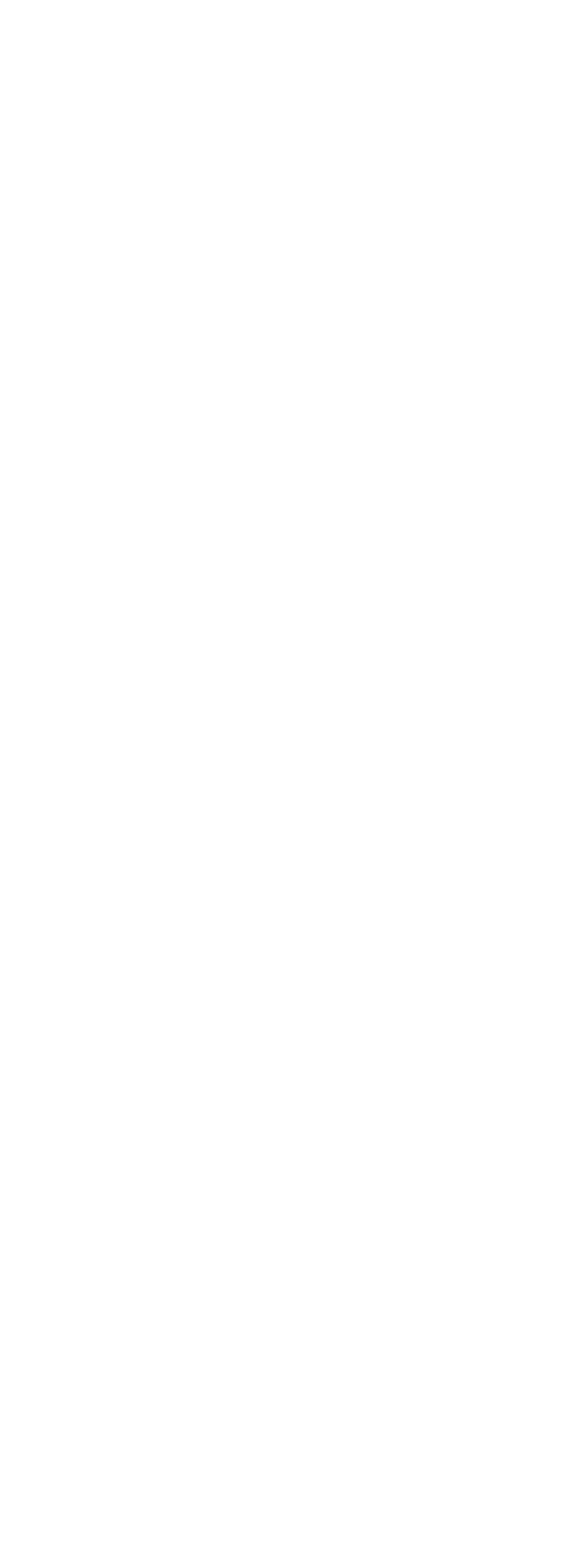
The rationale of the present study was to was to evaluate any potential genotoxicity of occupational exposure to anti-cancer medications and the relationship



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between that exposure and oxidative stress in occupationally exposed nurses.



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