

Carcinogenic effect of external formula on skin: a clinical study

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Abstract

Introduction: *There are numerous risk factors for cancer occurrence, including: age, family history, microbial infections, lifestyle and contact with harmful exogenous or endogenous factors associated with touching, eating, drinking, or breathing. The aim of this study was to estimate the potential carcinogenic effect of using some cosmetics and household detergents by cancer patients and to describe their toxic and carcinogenic ability.*

Methods: *One hundred of cancer patients from Baghdad city were included in the questionnaire during the period from June to September 2019, in which the frequency of using ten different items(external formulas) was investigated. which in contact with the skin.*

Results: *The results indicated that the most vulnerable age for cancer among the individuals who used to deal with chemicals was the 50s (29%). While the highest rate of cancer was the breast cancer in women (22%), lung and tracheal cancer in men accounted for 18% and gut cancers ranked third (14%) in both sexes. Housewives reported the highest number of cancer cases (30%), followed by the group of painters, carpenters, barber and building workers (20%), and finally the group of drivers and oil workers (15%). There was a significant value for the daily use of the selected items, especially powder detergents, liquid cleaning products, , skin moisturizers, and sunblock. However, no significant value appeared when cancer patient used these items weekly or monthly.*

Conclusion: *The excessive use of chemicals can cause many health disorders, one of them is cancer. Therefore, it is recommended to use alternative and safe products instead of those containing chemicals as much as possible to avoid direct their effects, such as burns, allergies, or cancer at the long term.*

Key words: *cancer, risk factors, household chemicals, detergents, cosmetics*

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I. Introduction

The industrial revolution in the second half of the last century and its consequences in as the fields of energy, transport, agriculture, food and health led to production and introduction of millions of man-made chemical substances into the environment. As a result, according to the European commission, about 100,000 external formulas have been so far marketed since the last world war without sufficient toxicological control. Chemicals are a significant pollution problem that threaten biota and ecosystem. (1). Ecosystems can be broken down due to a constant pressure from chemicals. Chemical products can act as persistent toxic pollutants and contaminate air, soil, water and food. Many of them are carcinogenic, mutagenic and/or reprotoxic molecules (2)

The exposure to chemicals during periods of human development could increase the risk of bad health effects including allergic diseases, neurodevelopmental disorders, reproductive disorders, respiratory diseases and cancer. Cancer is a compilation of diseases distinguished by the uncontrolled increase and extend of abnormal cells. If the spread is not restricted, it can result in death. Ten or more years, often pass between exposure to causative factors and detectable cancer (3). Cancer can be caused by internal causes, such as inherited genetic mutations, hormones, and immune conditions, or external causes such as tobacco, infectious organisms and an unhealthy diet or lifestyle. These factors may act together or in sequence to cause cancer. Occupational health organizations contracts strongly on all aspects of health and safety in the workplace, especially the primary prevention of risks. According to World health Organisation (WHO) there are many risk factors in the workplace that can lead not only to accidents but also to many diseases like cancer, musculoskeletal disorders, hearing and many communicable diseases (4).

Little is known about the form of cancer in Iraq. The need for comprehensive knowledge about cancer style in Iraq is mandatory to plan and establish control programs for the most common cancer. This may be satisfying for its prevention, early detection and cure (5).

The aim of this study was to estimate the potential carcinogenic effect of using some chemicals and household detergents that come in contact with the skin of cancer patients, and to describe their toxic and carcinogenic ability.

II. Methods

Methodology

Design of the study: Descriptive analytical study.

Sample of the study: One hundred of cancer patients.

Setting of the study: The data were collected from June to September 2019. The mean age was 50.5 (13-76) \pm 10 SD years old. The patients have lived \geq 5 years in Baghdad city or its suburbs, and were

diagnosed with cancer no more than 6 months before the interview. Consent was obtained from all the participants before conducting the questionnaire, which was completed before their chemotherapy or radiotherapy sessions.

Place of interviewing: The questionnaire process was conducted at Imamein Kadhemin Medical City Hospital; the cases were interviewed in the Ward of Tumors and Blood Diseases in the hospital.

Performing a questionnaire included two parts:

Part 1: Demographic questionnaire: Information collected from each participant included: gender, age, marital status, educational level, occupational status, residence, pathological staging, time since diagnosis, and types of cancer (Table 1).

Part 2: Frequency of chemical use questionnaire: A list of 10 chemicals was included, along with the duration of their use: daily (always), monthly (rarely) or weekly (sometimes) (Table 2).

Statistics: The data were analyzed by using SPSS software version 22, and for comparisons between variables the chi-square test was used with a level of significance was lower than 0.05

Table 1- Demographic characteristic of the patients

Age	%	Marital Status	%
20<	6	Married	51
20-29	5	Un-married	22
30-39	9	Widowed	24
40-49	26	Divorced	3
50-59	29	Education level	%
60-69	20	Illiterate	11
≥ 70	5	Literate	20
Types of cancer	%	Primary	25
Breast	22	Secondary	28
		Universal	16
Lung & bronchus	18	Occupation	%
		Housewife	30
Urinary system	2	Painter r, Carpenter , barber and Building workers	20
		Chemist, Pesticide seller, agriculturist, veterinarian	11
leukaemia	12	Driver and oil workers	15
		Farmers	4
lymphoma	10	Children & teenagers	9
		Others	11
Larynx and pharynx	2	Location of residence	%
		Urban	30
Reproductive system in male	6	Urban	30

		Sub-urban	40
Reproductive system in female	5	Rural	30
		Sex	%
Digestive system	14	Male	54
Other	9	Female	46
Total	100	Total	100

Table 1, shows the socio-demographic and types of cancers of the patients. the mean age was 50.5 years with a range of 13 - 76, with a standard deviation of ± 10 years. The highest age of incidence was 50-59 years. The table shows also nine types of cancer according to their location in the body, and the most cancers reported were breast cancer in females 22%, followed by lung and bronchus cancer in males 18%, digestive tumors 14% like colon or stomach cancer, and 12% leukemia in both genders. Concerning occupations, 30% of the participants were housewives, followed by the group of painters, carpenters and building worker 20%, then the group of oil workers and drivers 15%.

III. Results:

Table 2: The frequency of use of the selected household chemicals, personal and cosmetic preparations

Local application formula	Rare %	Sometimes %s	Always%	Chi-Square Tests = P value (df) Asymp. Sig. (2-sided)
Hair dyes	25	37	38	26.626 ^a (14) 0.022
Tattoo	14	38	48	40.189 ^a (14) 0.001
Cosmetic	43	28	29	71280 ^a (14) 0.001
pesticides	35	20	45	32878 ^a (14) 0.003
Shampoo & hair conditioner	34	28	38	64215 ^a (14) 0.001
Liquid household cleaning products	10	18	72	31170 ^a (14) 0.005
Skin moisturizer	15	34	51	43591 ^a (14) 0.001
Detergent powder	5	9	86	59638 ^a (14) 0.004
Sunblock	54	22	24	30547 ^a (14) 0.006
Nail polish	34	29	37	33207 ^a (14) 0.003
Average	27.9	25.3	46.8	100

Rare = monthly, Sometime= weekly, Always=daily

Table 2 shows the repeated use of chemicals by patients. While the daily use of the cleaning powder was 86%, the liquid household cleaning products accounted for 72%. Skin moisturizers were used by 51% of all the patients. Every one of the chemicals, including hair dyes, tattoo compounds, cosmetics, shampoo, and sunblock, was statistically significant if used daily by patients.

Table 3: Type of cancer and its relationship with the patient's occupation.

Occupation groups	Type of cancers										Total	Chi -square test
	Lung & bronchus	Breast	Urinary system	leukemia	lymphoma	Larynx and pharynx	Reproductive system in male	Reproductive system in female	Digestive system	Other cancers		
Housewives	-	20	1	1	1	-	-	3	2	2	30	X ² =167.934a df =72 Asymp. Sig= <.01*
painter, carpenter, barber & building workers	5	-	1	2	2	2	1	-	6	1	20	
Driver & oil workers	5	0	-	-	2		2	1	4	1	15	
Chemist, pesticide seller, agriculturist & veterinarian	5	-	-	3	1		1	-	-	1	11	
Farmer	1	-	-	-	-	-	2	-	1	-	4	
Children & teenagers	-	-	-	5	4	-	-	-	-	-	9	
Other occupations	2	2	-	1				1	1	4	11	
Total	18	22	2	12	10	2	6	5	14	9	100	

Table 3 shows the types of cancer and its relationship with the patient's occupation, 30% of the patients were housewives followed by a group of painters, carpenters and building workers (20%), whereas the group of oil workers and drivers was comprised of 15% and the least percent (4%) was within the farmers. All these occupations showed significant values with the occurrence of various types of cancer.

Table 4: Active ingredients of the chemicals and their potential health effect

Local application formula	Some active ingredients	Potential health effects
Hair dyes	2,5-Diaminotoluene, aromatic amines	Skin irritation, allergic reactions, hair breakage, skin discoloration mutagenic and carcinogenic (6)
Tattoo material	Carbon antimony, arsenic, beryllium, calcium, lithium, selenium, sulphur, lead, titanium	Infection, skin irritation, allergic reactions (7)
Cosmetic	Castor oil, Cerebrosides and Erythrosine	Irritation , contact dermatitis, allergies, estrogenic activity in animal experiments (8)
Pesticides	Organic phosphorous compounds, organochlorine compounds, zinc phosphide, naphthalene	Burn allergic reaction, skin and mucous membrane irritants, congestion and swelling of the vocal cords, difficulty of breathing and cessation of the passage of air (9)
Shampoo	A surfactant: sodium lauryl sulfate, sodium laureth sulfate, co- surfactant : cocamidopropyl betaine, Lubricants: fatty alcohols, panthenol, dimethicone.	Skin irritation, allergy, hair breakage and fall, Skin discoloration and unintended results (10)
Liquid household cleaning products	Citric acid, linear alkylbenzene sulfonic acid (LABSA), sodium dodecyl diphenyl oxide disulfonate	Irritation the skin and congestion of mucous membrane, difficulty of breathing (11)
Skin moisturizer	Water, hyaluronic acid, glycerin, urea, antioxidants, alpha-hydroxy acids, aloe vera, zinc oxide, titanium dioxide, lanolin, mineral oil, petrolatum, and humectants extracted from film hydrolypidique	Increase the skin's susceptibility to irritants causing breakouts and acne (12)
Detergent powder	Caustic soda, sodium carbonate, Sodium bicarbonate , monosodium phosphate, triphosphate sodium , sodium silicate, sodium mita silicate, Sulphonic acid_taxabon _missol	Exposure to high levels has caused vertigo, drowsiness, headache, anorexia and irritation of the eyes, nose, throat, skin and lungs (13)
Sunblock	Padimate O, homosalate, methoxycinnamate, benzophenone, octyl salicylate, phenylbenzimidazole sulfonic acid, octocrylene and oxybenzone or avobenzone	Ocular diseases (cataracts, pterygium, ultraviolet keratitis , conjunctival neoplasm). erythema , oedema ,tissue inflammation , risk of skin cancers (melanoma, lip cancer, keratinocyte cancer) , (14)
Nail polish	Volatile organic solvent. Nitrocellulose dissolved in butyl acetate or ethyl acetate	Allergic reactions such as skin irritations, eye injuries, cognitive and neurological symptoms, nausea, respiratory problems, cancer and uncontrollable muscle contractions, impaired reproductive and development (15)

* had a statistical significant value

Table 4 shows the active ingredients of the ten items and their potential health effects. All of these chemicals included in the study may be irritating to the skin and mucous membrane of the respiratory system and sometimes had an effect on the digestive and nervous systems as previous studies have shown, usually this effect can be acute. Nevertheless, for the long-term exposure, mutagenic, carcinogenic, impaired reproductive development have been documented as indicated in the references in the Table 4

IV. Discussion

It is well known that there are different trends of cancer behaviours and incidence, specific to certain communities and regions in the world. In Iraq, a war-torn Arab country, it seems that the cancer and its trends have a unique behaviour and this became more obvious in the last decades (16). Cancer is the 3rd leading cause of deaths in Iraq after cardiovascular diseases and accidents, and is the seventh leading cause of morbidity. In addition to the weapons, a lot of materials may lead to great health problems, household or workplace chemical materials are the great contaminants. There is difficulty in studying the effects of these materials because of presence of many different groups including insecticides, herbicides, disinfectants, sterilizers, detergents and skin care or cosmetic, each one of these materials has a different structure, different mechanism of action, and different pathogenesis (17,18).

The results of this study showed that the age group of 50-59 years had cancer more than the other groups. Many studies have shown that exposure of human body to external influences for more than 10 years may cause cancer (19). In this study, the highest incidence rate of cancer was breast cancer, followed by respiratory, and then digestive cancer, this proves the exposure for long periods to the causative agent such as hormonal imbalance when mothers do not breastfeed the infants leading to breast cancer or someone smoke excessively for a long time caused lung cancer or an unhealthy food that can lead to digestive tract tumors. The external influences may lead to DNA damages and to error prone DNA repair or can cause replication errors. Such errors in repair or replication can result in mutations in tumor suppressor genes or oncogenes leading to cancer (20,21,22,23).

In this study, the daily use of chemicals, like pesticides, liquid household cleaning products, skin moisturizer, cosmetics, sunblock, detergent liquid or powder showed statistical significances. Pesticides are widely used in workplaces, households and agriculture. Pesticides used have been linked to cancer through laboratory and epidemiological research. Many studies have shown that pesticides can be a risk factor for cancer as organochlorine, which has been associated with the risk of non-Hodgkin's lymphoma, with the use of lindane as dog shampoos and livestock sprays (24,25). Another cohort and previous case control studies have reported occupational and residential chemical exposures to specific types of insecticides, herbicides and fungicides overall including duration of use at least 8 hr per week confirmed the well-established risk of myelodysplastic syndrome, and acute myeloid leukemia. A recent meta-analysis study reported a modest but statistically significant association between strong pesticide exposure and Myelodysplastic Syndrome (26,27,28).

Many common commercial household cleaning products contain toxic and carcinogenic materials. Also, the consumer exposes himself to these carcinogenic chemicals every time he rinses, or wears clothes washed with these detergents. Many laundry detergents also contain chemicals used to stabilize products, which have been linked to a low to moderate risk for cancer, depending on the types and quantities used. Toxic 1-4 Dioxane, 4 methylimidazole, imidazole, 2-methylimidazole and FURAN (heterocyclic organic

compound) are widely used in many detergents, and many studies link this substance to cancer. Most laundry detergents and cleaning agents contain nonylphenol ethoxylate, which accumulates in the environment and has wide-ranging effects on marine life. Alcohol ethoxylates and ethoxysulfates are surfactants, used widely in cosmetics and other commercial products. The process is of great industrial significance with more than 2,000,000 metric tons of various ethoxylates produced worldwide since 1994. The "Environmental Action Organization" warning lists determine the danger of the chemical Alcohol Ethoxylates depending on the degree of its concentration in the product, as it causes "some concern" about cancer. It is also considered one of the causes of endocrine disorder, which mimics the estrogen hormone making it harmful to any person, especially women who are susceptible to breast cancer, or other cancers related to the hormone estrogen. It is also forbidden to use it in Europe. Many commercial laundry detergents contain artificial colors, which are identified by the Environmental Working Group (EWG) as cancer-causing substances (29,30).

In this study, there was no evidence of skin cancer indicating its scarcity in Iraq. Previous studies linked occupational skin cancers to ultraviolet (UV) exposure due to outdoor working, exposure to chemical carcinogens such as polycyclic hydrocarbons, tar and arsenic as well as UV irradiation from welding, X-ray and industrial burns. The types of skin cancers mainly considered work-related are non-melanoma skin cancers (basal cell carcinoma (BCC) and squamous cell carcinoma (SCC)). Malignant melanoma is believed to be correlated with intermittent UV exposure rather than cumulative sun exposure, particularly early in life as BCC (31).

In the present study, painters, carpenters and building workers accounted for 20%, followed by the group of drivers & oil workers (15%); all of them were males. In comparison, housewives represented 30% of cancer patients involved in the current research. The excessive use of many chemicals in house and workplace without protection and safety application such as disinfectants or any organic and inorganic chemicals may have a role in cancer occurrence, as in a case-control study found that women working as dentists and dental nurses had 13 times more risk of thyroid cancer than those with other occupations (32, 33).

V. Conclusion

Substantial use of chemicals in homes or workplaces without awareness of the harmful effects and safety methods may play a role in cancer incidence after a period of time. The recommendation of this study involves reducing the use of chemicals as much as possible to avoid their direct effects such as burns, allergies, or cancer at the long term exposure. This study links the occupational exposure to chemicals with the risk of cancer, such as non-Hodgkin's lymphoma, Hodgkin's disease, multiple myeloma, and leukemia.

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Conflict of interest

The author declare that she has no conflict of interest.

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