Research Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2025.62.009731

Examining the Relationship between the Use of Herbicide and Types of Cancer Living on the Outskirts of the City Compared to Other Areas of Mashhad, Khorasan Province, Iran

Giti Sabet Teymour[1], Hassan Vatandoost[1,2]*, Mozhgan Sabet Teimouri[3]*, Abbas Rahimi Foroushani[4] and AhmadAli Hanafi Bojd[1]

[1]*Department of Vector Biology and Control, School of Public Health, Tehran University of Medical Sciences, Iran*

[2]*Department of Chemical Pollutnats and Pesticides, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, Iran*

[3]*Academic Center for Education, Culture and Research, ITOR, Iran*

[4]*Department of Epidemiology and Statistics, School of Public Health, Tehran University of Medical Sciences, Iran*

***Corresponding author:** Hassan Vatandoost, Department of Vector Biology and Control, School of Public Health, Department of Chemical Pollutnats and Pesticides, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, Iran

ARTICLE INFO

Received: May 31, 2025

Published: June 17, 2025

Citation: Giti Sabet Teymour, Hassan Vatandoost, Mozhgan Sabet Teimouri, Abbas Rahimi Foroushani and AhmadAli Hanafi Bojd. Examining the Relationship between the Use of Herbicide and Types of Cancer Living on the Outskirts of the City Compared to Other Areas of Mashhad, Khorasan Province, Iran . Biomed J Sci & Tech Res 62(3)-2025. BJSTR. MS.ID.009731.

ABSTRACT

Objectives: The use of herbicides and insecticides in industry and agriculture requires great care so that they do not cause poisoning. Although small amounts of these substances enter agricultural products systemically, this small amount can also cause poisoning and even cause cancer.

Materials and Methods: This is a descriptive research study. For this purpose, the statistics of cancer patients in the suburbs of Mashhad were recorded by referring to the provincial health center 2017 to 2018, separately by region. Data recording, classification and statistical analysis were done by SPSS software. Data analysis and summary of results based on information and statistical data were presented using k2 method.

Results: A very significant and positive relationship was observed between types of cancer and use of herbicides ($p<0.001$), which showed the effect of herbicide applicatant on types of cancer.

Discussion and Conclusion: This study showed that agricultural toxins have a significant effect on the occurrence of various types of cancer. Therefore, it is necessary for managers and officials to develop programs to increase farmers' awareness.

Keywords: Agricultural Toxins; Cancer; Mashhad

Introduction

Agricultural pesticides are one of the natural environmental pollutant sources [1]. Todays agriculture is mixed with the use of pest control materials, and although many companies are trying to produce organic or low-complication pesticides, but due to the high price, these pesticides have not yet opened their main place in the consumer market of agricultural pesticides and fertilizers [2]. Unfortunately, most of the pesticides after being used in different parts of the soil, air, water, consumable food such as plants and animals and our various products are accumulated and absorbed by the body in different ways [3]. Poisoning caused by exposure to pesticides is a global problem, because these compounds cause a significant burden of disease, especially in low- and middle-income countries [4].

According to the documents of the World Health Organization, one third of this disease burden is caused by environmental factors, and pesticides can be cited as a very important factor. Undoubtedly, it is very important to reduce the reliance on pesticides and their optimal use in the face of plant damage factors and to adjust this burden [5]. The negative effects of the consumption of these substances on health and the environment should also be considered in the policies and regulations of the countries, so that their controlled and optimal use can be justified [6]. Achieving this importance is in the shadow of researches that show the increasing role of the effect of pesticides in a wide range of diseases such as cancer [7]. Uninformed, indiscriminate and excessive use of chemical poisons may cause dangerous diseases such as blood cancer, cancers of the digestive system, prostate, breast and other physiological disorders in the human body such as neurological, respiratory and skin diseases, abortion and infertility [8].

The use of herbicides and insecticides in industry and agriculture requires great care so as not to cause poisoning. Small amounts of these substances enter agricultural products systemically. This small amount, but can be toxic and cause cancer [9]. Finally, to reduce the risks associated with agrotoxins and prevent cancer, it is important that farmers and workers in the agricultural sector use protective equipment such as protective clothing and masks and follow hygiene guidelines during all stages of cultivation and harvesting. Also, the development of organic farming methods and the use of appropriate planting and spraying methods can help reduce the use of agricultural pesticides and reduce the risk of cancer [10,11]. Considering that the Mashhad plain is one of the target areas for agricultural development and the agricultural lands are on the outskirts of Mashhad city, conducting this research in order to access information about the possibility of the occurrence of cancers and the use of agricultural poisons in order to eliminate pests and diseases in this area. The area seems essential. From the point of view of innovation, it should be mentioned that until now, proper monitoring has not been done on the possibility of the relationship between the occurrence of cancers in the suburbs of Mashhad, which is next to the belt of lands with agricultural use.

Method

This is a descriptive research study. By referring to the agricultural data center of Khorasan Razavi province, the statistical information of farmers on the outskirts of the city was received and the area of agricultural land under cultivation on the outskirts of Mashhad city was also estimated. The statistics of cancer patients in the suburbs of Mashhad city were obtained by referring to the provincial health center in the years 1397 to 1400, separately by region and in the form of an information file in which only the information of some cancers was recorded. Also, patients' information files were received by keeping the patient's personal information. Data recording, classification and statistical analysis were done by SPSS software. Data analysis and summary of results based on information and statistical data were presented using k2 method (Figure 1).

Figure 1: Location of Mashhad in Iran.

Results

According to Table 1, it is clear that there is a significant relationship between the types of cancer and the residential area (0.001) and it shows the effect of the place of residence on the types of cancer. The most common type of cancer was kidney cancer, which had the highest number in peripheral areas. The rest of the cancers were more in urban areas than in peripheral areas. According to Table 2, most cancers were seen in the age group over 45 years old. Based on these data, it is clear that with the age of the groups, the rate of cancer increased and the peak of this rate was seen in the group over 45 years old. Based on Table 3, it was found that there is a significant relationship between age and the number and type of cancer (P≤0.001). Based on Table 4, it can be seen that most cancers occurred in men and the share of kidney cancer was higher in them. Also, in women, the number of kidney cancer was more than other cancers. According to Table 5, it is clear

that there is no significant relationship between types of cancer and gender (0.4). Table 6 shows that these four types of Herbicides have been used the most in different regions. Kidney cancer has the highest rates in any area where one of these herbicides is used. Diclofop Methyl had the highest rate of cancer. According to Table 7, it is clear that there is a significant relationship between types of cancer and herbicides (0.001). Based on Table 8, it is stated that based on the amount of gram of herbicide per hectare, the highest number of cancers seen was kidney cancer. The highest amount of herbicide used was 301-600 grams per hectare and the lowest amount of herbicide used was 100-300 grams per hectare. According to Table 9, it is clear that there is a significant relationship between the types of cancer and the amount of herbicide use (0.001) and it shows the effect of the amount of herbicide use on the types of cancer (Table 10).

Table 1: The number of each type of cancer.

Type of cancer	Peripheral		urban		Total	
	%	n	%	n	%	n
Kidney	79.39	2847	15.98	685	44.87	3532
Blood	4.43	159	16.9	724	11.21	883
Skin	4.26	153	17.39	745	11.41	898
the brain	3.68	132	16.01	686	10.39	818
Stomach	4/32	155	16.29	698	10.83	853
intestine	3/90	140	17.41	746	11.25	886
Total	100	3586	100	4284	100	7870

Table 2: Number of each type of cancer in each age group.

Age		Intestine	Stomach	Brain	Skin	Blood	Kidney	Total
0-15	n	54	65	59	73	47	76	374
	%	14.43	17.37	15/77	19.51	12.56	20.32	100
16-30	n	65	65	62	75	68	69	404
	%	16.08	16.08	15.34	18.56	16.83	17.07	100
31-45	n	74	72	55	77	75	86	439
	%	16.85	16.4	12.52	17.53	17.08	19.58	100
>45	n	693	651	642	673	693	3301	6653
	%	10.41	9/78	9.64	10.11	10.41	49/61	100
Total	n	886	853	818	898	883	3532	7870
	%	11.25	10.83	10./39	11.41	11.21	44.87	100

Table 3: Chi2 test for the relationship between cancer types and age.

	Value	Degree of freedom	P Value
Pearson Chi-Square	406.74	5	0/000
Likelihood Ratio	434.885	5	0/000
Linear-by-Linear Association	211.967	1	0/000
n	7870		

Table 4: Number of each type of cancer in each gender group.

Sex		Kidney	Blood	Skin	Brain	Stomach	Intestine	Total
male	n	1909	454	497	447	446	487	4240
	%	45.02	10/.7	11.72	10.54	10.51	11.48	100
female	n	1623	429	401	371	407	399	3630
	%	44.71	11.81	11.04	10. 22	11.21	10.99	100
total	n	3532	883	898	818	853	886	7870
	%	44.87	11.21	11.41	10.39	1083	11.25	100

Table 5: Chi2 test for the relationship between cancer types and age.

	Value	Degree of freedom	P Value
Pearson Chi-Square	4.46	5	0.485
Likelihood Ratio	4.456	5	0.486
Linear-by-Linear Association	0.048	1	0.827
N	7870		

Table 6: The number of each type of cancer with common herbicides.

Herbicides		Kidney	Blood	Skin	Brain	Stomach	Intestine	Total
Ethofumesate	n	715	37	28	30	45	29	884
	%	80.88	4/.18	3.16	3.39	5.09	3.28	100
Pendimethalin	n	699	48	33	37	36	43	896
	%	78.01	5.35	3.68	4.12	4.01	4.79	100
Diclofop Methyl	n	760	44	47	31	33	33	948
	%	80.16	4.641	4.95	3.27	3.48	3.48	100
Haloxyfop-R-Methyl	n	673	30	45	34	41	35	858
	%	78.43	3.49	5.24	3. 96	4. 77	4.07	100

Table 7: Chi2 test for the relationship between types of cancer and herbicides.

	Value	Degree of freedom	P Value
Pearson Chi-Square	3181.4	5	<0.000
Likelihood Ratio	3434.57	5	<0.000
Linear-by-Linear Association	1552.26	1	<0.000
n	3586		

Table 8: The number of each type of cancer with the amount of herbicide use in g/ha.

Amount of Herbicides		Kidney	Blood	Skin	Brain	Stomach	Intestine	Total
100-300	n	714	31	34	38	34	31	882
	%	80.95	3.51	3.85	4.3	3.85	3.51	100
301-600	n	685	34	49	28	39	30	865
	%	79.19	3..3	5.66	3.23	4.5	3.46	100
601-900	n	727	51	38	31	52	36	935
	%	77.75	5.45	4.06	3.31	5.56	3.85	100
>900	n	721	43	32	35	30	43	904
	%	79.75	4.75	3.53	3.87	3.31	4.75	100

Table 9: Chi-2 test for the relationship between types of cancer and the amount of herbicide.

	Value	Degree of freedom	P Value
Pearson Chi-Square	3182.42	5	>0.000
Likelihood Ratio	3436.57	5	>0.000
Linear-by-Linear Association	1549.54	1	>0.000
n	3586		

Table 10: Chi-Square test for the relationship between types of cancer and the region of residence.

	Value	D.F.	P Value
Pearson Chi-Square	3173.6	5	<0.000
Likelihood Ratio	3416/101	5	<0.000
Linear-by-Linear Association	2138/401	1	<0.000
n	7870		

Discussion

Herbicides are chemical agents specially formulated to suppress or eliminate unwanted vegetation, typically weeds, and are extensively utilized in agricultural, industrial, and residential settings to maintain crop yields and reduce laborious manual weeding. Their operational variety is vast, with contact herbicides causing damage on contact and systemic ones getting absorbed to eradicate the plant from within, offering choices between swift superficial action and thorough, long-lasting effects [12]. While selective herbicides confer the ability to target specific plant species, preserving desired flora and ensuring agricultural selectivity, non-selective varieties indiscriminately obliterate all plant life in an area, useful for clearing overgrown or unmanaged lands [13]. Correspondingly, the timing of application is pivotal, with pre-emergent herbicides inhibiting weed growth before it begins, in contrast to post-emergent herbicides applied once weeds have surfaced. This agricultural technology streamlines crop management yet demands thoughtful application to prevent off-target effects, environmental contamination, and resistance development among weed populations, necessitating that users meticulously adhere to application instructions, don protective gear, and consider the implications for local ecosystems and biodiversity. The use and impact of herbicides are subjects of ongoing agricultural science research and environmental policy debates, reflecting the complexity of their role in modern agriculture and ecosystem management [13,14].

Disabling the natural mechanism of fighting cancer in the body. In order to cause poisoning, the amount of poison in the body must reach a certain minimum concentration so that the symptoms of poisoning appear in the body. Based on current knowledge, scientists have come to the conclusion that even a very small dose of a genetically toxic chemical agent can cause a healthy cell to turn into a malignant cell. Since the endocrine hormone estrogen itself is a cancer developer, therefore, any additional external agent of toxins in low doses is effective for the occurrence of cancer and endangers human health. Environmental hazards are sudden or gradual occurrences of natural or human origin that endanger the health and safety of human habitations. Agriculture has a direct relationship with the environment and their behavior can have many positive and negative effects on the environment. Indiscriminate use of chemical poisons, in addition to economic problems, causes irreparable damage to the environment and ecosystems and disrupts the ecological balance in various sources such as water and air and other living organisms. Some experts believe that the first step in planning to reduce the risks caused by chemical poisons is to conduct research to investigate the diseases of that area and their relationship with the poisons used [15,16].

According to the research results, the use of chemical pesticides in agriculture causes environmental pollution. These pollutions affect the environment and cause its destruction. Farmers who use pesticides in more years cause more damage to the environment. The use of highly productive chemical poisons in an unbalanced and excessive form and not complying with them in disposing and burying containers of chemical poisons are considered as environmental complications and dangers. The reason for the low level of biological performance of farmers compared to their biological awareness is that the studied farmers had to use poisons despite being aware of the problems caused by chemical poisons in order to fight against pests. In addition, despite knowing some aspects related to modern irrigation methods, they were not able to use them due to financial constraints. Therefore, revision of spraying techniques and methods and the correct and scientific use of spraying tools, training of farmers in disposing, burning or burying containers of poisons, integrated management and the use of drip irrigation along with fertilizers and agricultural poisons have valuable results. The overall rate of cancer in inner city areas was more than the periphery of Mashhad city, but in kidney cancer this relationship is opposite and this type of cancer is more in the peripheral region than inner city regions. The results showed that there is a significant relationship ($P \leq 0.00$) between the types of cancer and the residential area, which shows the effect of the place of residence on the types of cancer.

Also, the results of this study determined the occurrence of most cancers in the age group of more than 45 years and estimated the lowest number in the age group of 0 to 15 years, which shows a significant relationship ($P \leq 0.00$) between types of cancer and age and also shows Age had an effect on the types of cancer. These results indicated more cancers in men, although the lowest number of cases were in the age group of 0 to 15 years. Further, no significant relationship ($P \geq 0.4$) was observed between the types of cancer and gender, which indicated that gender does not affect the types of cancer. Most of the cancers were recorded in the ostrich and the lowest number of cancers were recorded in the tracheal ligament. There was a significant relationship ($P \leq 0.00$) between the types of cancer and the type of

marginal region, and it shows the effect of the type of marginal region on the types of cancer. It should be noted that kidney cancer was observed more in the areas where more types of herbicides were used. The number of cancer occurrences in the areas that have used Diclofop Methyl more than others and there is a significant relationship between the types of cancer and herbicides (0.001) and it shows the effect of the type of herbicide on the types of cancer. The results obtained from Iskander Zand, insecticides in the northern regions had the highest carcinogenicity, in addition to the non-carcinogenic effects, including reproductive risks, mutagenicity follows. The results showed that the use of fungicides increases the probability of cancer in people by 3 times. These toxins cause brain tumors and leukemia in children, and the probability of leukemia and lymphocyte cancer is higher in children whose parents deal with toxins [17].

Conclusion

According to the mentioned materials, the agricultural sector as the front line deals with these chemicals and their behavior can have many positive or negative effects on their own health, food security, society, environment, therefore, the need for proper management of producers. The agricultural sector, including the agricultural sector, is essential when using chemical pesticides. Safety and health in the factory are applied in a good and strict manner, but during spraying and after spraying, no control and testing is done regarding the harm of poisons for ecological and environmental communities. The reason for this can be the non-emergence of diseases caused by the consumption of poisons immediately, or the belief that the consumption of poisons is low-risk, because of this, the manifestations of the disease are invisible in the short term.

References

1. Tudi M, Daniel Ruan H, Wang L, Lyu J, Sadler R, et al. (2021) Agriculture development, pesticide application and its impact on the environment. International journal of environmental research and public health 18(3): 1112.
2. Merotto Jr A, Gazziero DL, Oliveira MC, Scursoni J, Garcia MA, et al. (2022) Herbicide use history and perspective in South America. Advances in Weed Science 40.
3. Su LJ, Young SG, Collins J, Matich E, Hsu P C, et al. (2022) Geospatial Assessment of Pesticide Concentration in Ambient Air and Colorectal Cancer Incidence in Arkansas, 2013–2017. International journal of environmental research and public health 19(6): 3258.
4. Pluth TB, Zanini LAG, Battisti IDE (2019) Pesticide exposure and cancer: an integrative literature review. Saúde em debate 43: 906-924.
5. Tyohemba RL, Humphries MS, Schleyer MH, Porter SN (2022) Accumulation of commonly used agricultural herbicides in coral reef organisms from iSimangaliso Wetland Park, South Africa. Environmental Pollution 294: 118665.
6. Alshemmari H, Al Shareedah AE, Rajagopalan S, Talebi LA, Hajeyah M (2021) Pesticides driven pollution in Kuwait: The first evidence of environmental exposure to pesticides in soils and human health risk assessment. Chemosphere 273: 129688.
7. Varghese JV, Sebastian EM, Iqbal T, Tom AA (2021) Pesticide applicators and cancer: a systematic review. Reviews on Environmental Health 36(4): 467-476.
8. Garibaldi LA, Goldenberg MG, Burian A, Santibañez F, Satorre EH, et al. (2023) Smaller agricultural fields, more edges, and natural habitats reduce herbicide-resistant weeds. Agriculture Ecosystems & Environment 342: 108260.
9. Krstev S, Knutsson A(2019) Occupational risk factors for prostate cancer: a meta-analysis. Journal of Cancer Prevention 24(2): 91-111.
10. Burns CJ, Juberg DR (2021) Cancer and occupational exposure to pesticides: an umbrella review. International Archives of Occupational and Environmental Health 94: 945-957.
11. Lerro CC, Koutros S, Andreotti G, Sandler DP, Lynch CF, et al. (2019) Cancer incidence in the Agricultural Health Study after 20 years of follow-up. Cancer Causes Control 30: 311-322.
12. Cullen MG, Thompson LJ, Carolan JC, Stout JC, Stanley DA (2019) Fungicides, herbicides and bees: A systematic review of existing research and methods. PLoS One 14(12): e0225743.
13. Gaines TA, Duke SO, Morran S, Rigon CA, Tranel PJ, et al. (2020) Mechanisms of evolved herbicide resistance. Journal of Biological Chemistry 295(30): 10307-10330.
14. Gupta PK (2022) Herbicides and fungicides. Reproductive and developmental toxicology, pp. 665-689.
15. Hossain M (2015) Recent perspective of herbicide: Review of demand and adoption in world agriculture. Journal of the Bangladesh Agricultural University 13(1): 13-24.
16. Hulme PE (2023) Weed resistance to different herbicide modes of action is driven by agricultural intensification. Field Crops Research 292: 108819.
17. Eskandar R, Blair A, Lynch CF, Schroeder P, Hoppin JA, et al. (2015) Fonofos exposure and cancer incidence in the agricultural health study. Environmental health perspectives 114(12): 1838-1842.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2025.62.009731

Hassan Vatandoost. Biomed J Sci & Tech Res

Submission Link: https://biomedres.us/submit-manuscript.php