

## A Survey on the application and storage conditions of pesticides in Kashan, Iran, 2012

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### Abstract

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**Background:** Noticeable amounts of pesticides are used in developing countries each year. However excessive application of these chemicals in the past few decades has bred serious problems to both animals and humans. Although most studies have targeted acute poisoning, in the present study chronic poisoning as a new and important health problem has been studied due to application and storage of pesticides at homes.

**Materials and Methods:** This descriptive study was designed in Kashan, located in the dry central region of Iran in 2012. The data were collected by interviewing 500 home owners and filling questionnaires. The data were analyzed using abundance tables and SPSS software and statistic tests  $\chi^2$  and fisher exact.

**Results:** The results showed high availability and application of pesticides (97.2%). Citizens reported using pesticides once every six months. There was a positive relationship between the application of pesticides and the observed disorders ( $p < 0.0001$ ).

**Conclusion:** Pesticides are available for most people in an uncontrolled way, which may be the cause of many health problems.

**Keywords:** Application, Developing Countries, Pesticides, Storage

### Introduction

Today, pesticides have a widespread range of application in the world, particularly in developing countries. They are used in agriculture to control pests and weeds and over time, this application has been growing. The application of pesticides in developing countries has become a way to increase productivity especially in tropical rain areas (1, 2). According to reports by international organizations (e.g. FAO), 2.5 million tons of pesticides are used annually in the world; the trend is growing continuously (3).

Pesticides can be useful although they can also remain in environment and animal tissues and cause different effects on

humans and other organisms (4, 5). Pesticide poisoning may lead to brain tumors, leukemia, and cancers (6-8). Most of these poisonings occur in children especially those whose parents are farmers (9-11). Studies have shown that 3000000 people are poisoned by these materials each year, of whom 200000 die worldwide. 37000 cancers are associated with the pesticides particularly in developing countries (3). Acute poisoning is another important type of pesticides outcomes which may result in suicide (12); this problem is closely associated with the

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availability and sale regulations of pesticides mostly occurring in Asian and Latin America countries (13-16).

Although acute poisoning is important, chronic poisoning has been in the center of attention recently. Chronic poisoning may lead to different effects including neurological dysfunction, endocrine disorders, disorders of the immune system, and allergic reactions on the skin (17-19). This poisoning is often due to the proximity of homes to farms, keeping and using pesticides in home, and deposited pesticides on surfaces of the homes (9-11, 20). Pesticides used indoor are more persistent than those used outdoor because more physicochemical reactions occur to break down pesticides outdoor (21, 22). As a result, buying and storing pesticides at home should be according to strict and specific guidelines and protocols. For example, in a study done by Tariq et al (2007) in Pakistan, a high percentage of residents in rural areas were exposed to pesticides, many of poisonings due to this contact, and there was no proper and strict law about application of pesticides in that country (3). Also in a survey conducted in the United States by Bass et al (2001), it was found that there was more than one type of pesticide in every house, and pesticides in most homes were reachable by children (23). In Iran, as in many other developing countries, many types of pesticides are used frequently and this indiscriminate use has led to increase numbers of different species of resistant insects as in Tehran due to the excessive use of pesticides (24, 25).

Considering problems associated with chronic exposure to pesticides and lack of appropriate legislation for the sale and storage of these products in Iran, the present study evaluates the storage and application of pesticides in houses. Kashan was selected as

study area because this city has warm and dry weather and different species of insects such as scorpions are present throughout the entire year.

## Materials and Methods

This descriptive study was conducted in Kashan, a city located in the central desert of Iran with a warm and dry climate in 2011 to 2012. Data were collected using questionnaires filled in by the participated residents. Participants consents were obtained and the aim of the study was explained to them. Main data gathered from homes included formulation and usage frequency of pesticides, duration of the insect return, and symptoms observed after the use of pesticides. Symptoms that were considered included any coughing, sneezing, dyspnea, itching on hands and body and/or any complications that could be related to the contact with pesticides.

The houses in this study were selected by cluster sampling. The whole city was divided into four regions, each region into five streets, and each street into five alleys; finally, 500 houses were randomly selected from alleys. The criterion for number of the houses selected was based on similar studies. Data were analyzed using SPSS software and statistic test chi-squared and fisher exact.

## Results

The data gathered through questionnaires (n=496) showed that 97.2 % (482) of participants used pesticides.

The pesticide formulations used by the houses are depicted in Fig 1. According to reports of home owners, powder and pellet had the highest and lowest applications, 42.8% and 8.12%, respectively (Figure1).

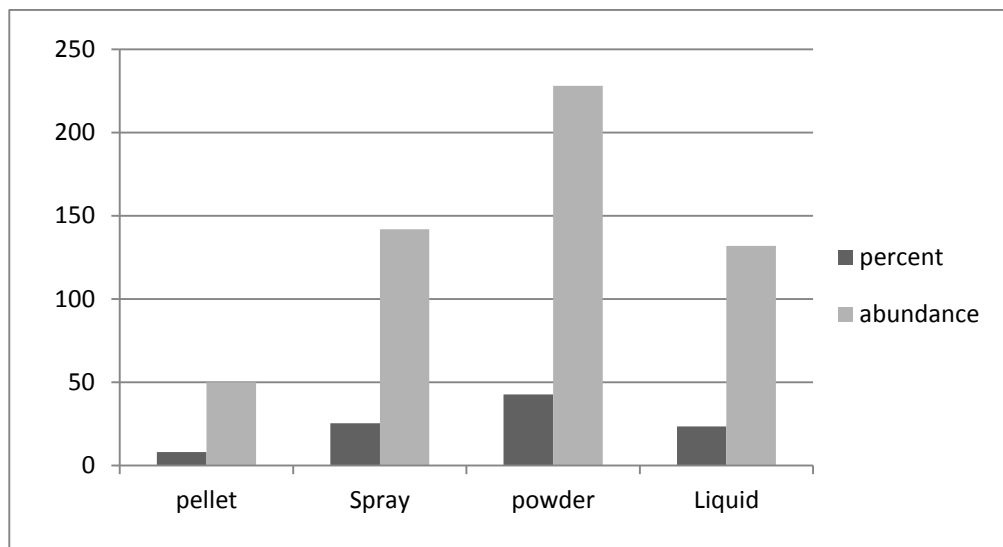


Figure 1: Types of formulations used in Kashan

Home owners (33%) reported that the most common application period of pesticide use has been once every 6 months. Observation of insects after each spraying lasted three months; 270 (58.6%) of the parents reported that insects were not found for three months

after spraying, 78(16.9%) of the parents indicated the time to be three to six months, 55(11.9%) of the parents for six month to one year, and 59(12.7%) of them for more than one year (table 1).

Table1: Periods of insects restarting and pesticides application in Kashan

Time	Periods of insects restarting		Periods of pesticides application in Kashan	
	Frequency	Percentage	Frequency	Percentage
Weekly	-	-	103	22.2
Monthly	-	-	128	27.5
Trimester	270	57.6	78	16.8
Biannual	78	16.9	156	33.5
Between six months to one year	55	11.9	-	-
Annually and more	59	12.7	-	-

Checking the data obtained from the questionnaire, the researchers found that there is a strong positive association ( $p < 0.0001$ ) between pesticides use and symptoms observed after spraying (table 2).

Table2: Symptom observation based on pesticides application

symptoms application	+	-	total
-	6	8	14
+	412	70	482

## Discussion

This study investigated the storage condition and application of pesticides. In Kashan, it seems that most people tend to use pesticides to ward off insects regardless of the risks associated with it. It also became clear that people do not face any legal barriers for buying and selling the pesticides.

The overuse of pesticides at home by residents and easy access to these chemicals by non-professionals in this research were similar to the results obtained from two studies in USA and UK (9, 26). In another study, Tariq et al (2007) reviewed the conditions of pesticides exposure in Pakistan and concluded that working with pesticides and keeping them at home do not observe any regulations there, which is similar to the results of our study (3). The easy access to pesticides may be a factor for suicide and intentional injuries as it was shown in a study by Van Der Hoek et al (1998) (27). It seems that governments play an important role in pesticide access and application. On the other hand, surveys have determined that people have little information about the use of pesticides (28, 29). Therefore, training and awareness of people, can help decrease the risks related to pesticides.

Application method and the type of pesticides that participants had used in their homes was very different in Kashan. It is probably due to reliance on vendors' recommendations and lack of public awareness about methods of insect control. Similar results about using various methods for repelling insects from homes were observed in the study of Ssempebwa (2011) (30).

According to the reports of Kashan residents, most homeowners applied pesticides against insects twice a year and often the insects returned every three months, which is probably due to the hot climate of Kashan. Study results of Freeman et al (2004)

indicate an increase use of pesticides with seasonal change from winter to summer which indirectly was similar to our results. In warmer climates this application increases the amount of the use of pesticides and reduces the return period of the insects (26). Also in a study conducted by Gray et al (2006), residents reported that they had used pesticides 2 to 4 times a year in their homes (9) and, in the present study, most of Kashan citizens have also used the pesticides twice a year. It can be stated that the climate can have a large impact on insect activity and use of pesticides, consequently. Most of studies were performed about the effect of climate on the amount and frequency of pesticide use in farms but in case of indoor application of pesticide and effects of climate on it few studies have been conducted.

Considering the overuse of pesticides in farms and homes, it appears that deployment minimizing and managing programs in Iran and consequently Kashan is required as in the case of other developing countries such as Cameroon which has used this controlling methods (31).

In this study, there was a significant relationship between the application of pesticides and increased complications on the residents. The study in UK also showed the existence of pesticides and their use at homes can be a crucial factor for exposing pesticides (9) and according to other studies this exposure can cause many disorders (17-19). It is probably due to spraying the wrong way and lack of attention to the safety requirements which stems from unawareness and lack of education.

Keeping different types of pesticides and their continuous use at homes can cause malignant diseases to the society, so it is essential to develop educational programs for people with different occupational groups to reduce the complications of these materials. Future researches may be done on the types of pesticides usage, storage, risk assessment

of these materials at home, association of pesticides with advanced and chronic diseases, and inadvertent contact with these substances.

The limitations of this study include lack of information such as pesticides names and labels, however, the main strength of this study was that the data were collected through face-to-face approach.

### Conclusion

This study showed that the levels of application and use of pesticides in Kashan are high. According to the results, people had excessive and unsupervised access to pesticides. It seems that this is due to the insufficient controlling laws in the sales and storage of pesticides. Most people use wrong spraying methods against pests and they are experiencing complications after spraying which needs training to avoid.

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