



Determination of Knowledge, Attitude and Behaviors of Pesticide Dealers and Applicators in Different Cities of Turkey

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Abstract

Introduction: Biocidal products refer to the general name of substances used in order to prevent, control or reduce the harmful effects of hazardous organisms present in all areas of public health describing human settlements, working areas, physical places and environment related to daily living [1]. The use of biocidal product around the world is, on average, 3 million tons per year; this amount is 13.000 tons in Turkey.

Objective: Objective this study is to measure the knowledge, attitude and behaviors of Pesticide sellers and Pest Control Companies during February-May 2017 in the cities of Antalya (Aksu), Denizli (Center), Isparta (Center) and Ankara (Center).

Materials and method: This study was conducted in the cities of Antalya, Denizli, Isparta and Ankara during the months of February-May 2017 by means of surveys prepared to measure knowledge, attitude and behaviors of pesticide sellers and home pest control companies. In the survey study, 37 questions in total were addressed to pesticide sellers while 48 questions were directed to managers and workers in home pest control companies. Statistical significance value was accepted as $p < 0.05$. For statistical analyses and calculations, IBM SPSS Statistics 21.0.

Results: The average age of respondents was 36.77 ± 10.73 years for home pest dusters and 37.50 ± 9.74 for pesticide sellers. Pesticide sellers (86.7% was university graduate) were found to have higher education level in comparison to home pest dusters (53.3% was university graduate). When the questions of surveys were evaluated, average score of home pest dusters were defined as 64.69 ± 7.79 whereas pesticide sellers scored 64.18 ± 9.74 on average.

Keywords: Biocidal product; Pest control; Biocide poisoning; Agriculture

Introduction

Biocidal products refer to the general name of substances used in order to prevent, control or reduce the harmful effects of hazardous organisms present in all areas of public health describing human settlements, working areas, physical places and environment related to daily living unknown [1]. Although the concepts of biocidal product and pesticide are usually substituted for each other, pesticides are used as a general term involving all kinds of chemical substances used in implementations of agricultural pest

control [2]. Rapidly growing world population and unchanging world acreage point out that the yields from cultivated areas should be increased [3]. Illness and detrimental weeds lead to product losses up to 25-30% in cultivated plants. In order to minimize or prevent this loss, chemical control is the most preferred method as it is easy to implement and quickly yields solution [4]. Hazardous chemicals started to be widely used in pest control during mid 1940s [5]. 75 % of all biocidal and pesticide usage in the world

occur in developed countries. However, in developing countries, both biocide and pesticide usage have been increasing [6]. Besides, 95% of poisoning and mortality related to biocide and pesticide takes place in developing countries.

Whereas the use of biocidal product around the world is, on average, 3 million tons per year; this amount is 13.000 tons in Turkey. With the aim of maximizing productivity of agricultural lands, use of pesticide in pest control has been increasing more each year due to ease of implementation and quick solution [7]. In pesticide use against pests, illnesses and weeds leading to yield loss; only 0.015%-6.0% of pesticides reach the target organism and the remaining 94.0%-99.9% reach non-target organisms and soil or meddle with other ecosystems as contaminant [8]. Inappropriate use of biocidal products can lead to acute and chronic intoxication, food and environment pollution and development of resistance against these products in target organisms [9,10]. It is quite hard to evaluate the impacts of biocidal products on human since there are many unknown factors related to the exact nature of problem. Socio demographic attributes such as age, gender, race, economic situation change the extent and results of influence considerably [11,12].

In this study, "home pest dusters" refer to the people who actually do the pest control with biocidal products used in public health areas and natural or legal persons who sell these products are stated as "pesticide sellers". The study evaluates knowledge, attitude and behaviors of pesticide sellers and staff working in pest control companies in four selected cities as well as investigates the factors that might have an impact [13]. The amount of pesticide consumption per hectare is lower in Turkey than European Union Countries yet there is not any tracking and control system regarding the implementation of standards and procedures in preparation, application and sales of these pesticides. In addition; health education as well as education about the pre-and post-processes of pesticide application are necessary to perform balanced and conscious application and to avoid adverse effects of pesticides. The safety of workers applying pesticides is protected by some regulations with active participation of health, environment and business sector. Regulations for workers mainly include components such as the update of acts related to employee and employer, employee protection standard development, extending risk benefit analysis, guidance and training certification [14]. Although there are limited studies about attitude and behaviors of agricultural laborer in use of pesticide, there is no study done regarding pesticide dealers and home pest dusters.

Materials and Method

This study was conducted in the cities of Antalya, Denizli, Isparta and Ankara during the months of February-May 2017 by means of surveys prepared to measure knowledge, attitude and behaviors of pesticide sellers and home pest control companies. Four provinces have been selected in the agricultural sector,

which have export licenses and are important in the country of agriculture. While the ratio of the total agricultural area of Ankara to Turkey is about 5%, the ratio of the fruit area of Ankara to Turkey is 8.46%; the ratio of vegetable area of Ankara to Turkey is 5.93% and the ratio of cultivated area to Turkey is 5.01% [15] (Ankara Kalkınma Ajansı, 2017). The city of Antalya constitutes 28.41% of cucumber production; 27.28% of orange production and 78.15% of avocado production in Turkey Antalya İl Gıda Tarım ve Hayvancılık Müdürlüğü [16] and takes the first place in Turkey in Isparta apple production Bashimov [17] (20.2% of total Isparta apple production) Yaman et al. [18].

The share of agricultural production in Denizli South Aegean production basin in 2010 was 30%. According to 2011 data, about 99% of Denizli's agricultural production is wine grapes. When agricultural products exported in Denizli in 2013 are examined, 11.081 tons of fresh grapes are in the first place; and they are exported to countries such as Russia, Ukraine, Germany, Bulgaria and Azerbaijan. Denizli meets 90% of thyme production in Turkey, 15% of sunflower seeds and 80% of chickpea production in Turkey. Denizli is the world's top producer in thyme, Turkey's top producer in sunflower seed and opium, Turkey's second producer in grape production and in milk production, it is the largest fourth producer of Aegean region and the largest ninth producer of Turkey Öselmiş [19]. The main materials of study include the pesticide sellers in the cities mentioned, pest control company executive, employees and survey questions addressed to these people. Lists of Pesticide dealers were obtained from Directorates of Provincial Food Agriculture and Livestock in the cities of Ankara, Antalya, Denizli and Isparta. Based on the obtained data; 57.69 % of pesticide dealers within the study were reached and 37-question surveys were applied.

Furthermore, lists of home pest control companies were obtained from environmental health units of Ankara, Antalya, Denizli, Isparta Municipalities. 48 question surveys were applied to 10 out of 14 companies in Antalya, 3 out of 4 in Denizli, 3 out of 5 in Isparta and 14 out of 22 companies in Ankara. Selection of companies were made randomly in both survey studies. Distribution of continuous variables such as age, working years was reviewed with Shapiro-Wilk Test and graphs of normality. Kruskal-Wallis test was used in comparison of points of knowledge by cities whereas Mann-Whitney U test and t-test based on the distribution of knowledge point were used in comparison of points of knowledge by education level. In comparison of categorical variables such as education level etc. depending on poisoning, chi square test was applied. The relations between education point and age, working years were assessed by Spearman's correlation analysis. Statistical significance value was accepted as $p < 0.05$. For statistical analyses and calculations, IBM SPSS Statistics 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.)

For 35 knowledge measurement questions in the survey measuring the knowledge, attitude and behaviors of home pest dusters and 25 questions in the survey measuring the knowledge, attitude and behaviors of pesticide sellers, "knowledge score" was calculated out of 100 points. During the calculation of knowledge score, every question measuring knowledge level was evaluated in equal weight. Multiple answer questions were scored by adding the number of correct answers for related question. The main professions of home pest dusters and pesticide sellers were divided to two categories as area and non-area for statistical analyses. Professions such as Agricultural technician, agricultural engineer, environmental engineer, health personnel and chemist were regarded as in area while accountant, tradesman, business manager, teacher and other professions were accepted as non-area.

Results

In this study, survey questions were applied to 150 people in the group of pesticide sellers and to 30 people in the group of home pest dusters. In the survey study, 37 questions in total were addressed to pesticide sellers while 48 questions were directed to managers and workers in home pest control companies. Average ages of home pest dusters in study were 36.77 ± 10.73 . 53.3% of the 30 home pest dusters within the scope of research were university graduate and 46% were high school graduate. 70.8% of the home pest dusters were among area professions. Average time spent in professional life was 6.03 ± 4.85 years. As for pesticide sellers, average age was 37.50 ± 9.74 . 86.7% of them was university graduate, 12.7% high school graduate and 0.7% of them was primary school graduate. 92.1% of pesticide sellers were within the group of area professions. Average time spent in working for pesticide sellers were 9.27 ± 7.02 years. Average knowledge level of home pest dusters was 64.69 ± 7.79 while that of pesticide sellers was 64.18 ± 9.74 . Knowledge level of home pest dusters was seen to be higher than that of pesticide sellers. There was no statistically meaningful difference between the knowledge levels of pesticide sellers and home pest dusters ($z=0.207$, $p=0.836$).

When the knowledge levels and professions of home pest dusters are compared, it was seen that there was no statistically meaningful difference between the knowledge level of participants with in-area ($n=17$) and non-area ($n=9$) professions ($Z=1.647$, $p=0.107$). In comparison of professions and knowledge levels in pesticide sellers, there was also no meaningful difference between the knowledge level of participants with in-area ($n=137$) and non-area ($n=13$) professions ($Z=0.164$, $p=0.870$). In addition, there was no meaningful relation found between ages and knowledge levels of home pest dusters and pesticide sellers ($p>0.05$). Also, there was no meaningful relation between daily working period and knowledge levels ($p>0.05$). A moderate negative linear relation was detected in working years and knowledge levels of home pest dusters ($p=0.026$). As working period of home pest dusters decreased, their knowledge levels increased. According to this

result, it can be deduced that as working years of home pest dusters increased, they could not sufficiently keep up with current issues and they supposed that the knowledge they possess is enough for them. On the other hand, when working years and knowledge levels of pesticide sellers are compared, there was no meaningful linear relation found between working period and knowledge level ($p>0.05$).

According to results, there was no meaningful difference between education level and knowledge level of home pest dusters ($t=1.081$, $p=0.289$). Also, when pesticide sellers' education level and knowledge level are compared, there was no meaningful difference in score between high school and university graduates ($z=0.515$, $p=0.607$). When knowledge levels and the cities home pest dusters live are compared, there was again no meaningful difference ($x^2=0.343$, $p=0.952$). On the other hand, knowledge level and the cities of pesticide sellers are compared, knowledge levels were detected to show meaningful difference based on the cities ($x^2=18.706$, $p<0.001$). As a result of pair comparisons, it was determined that pesticide dealers from Denizli had higher scores than the participants from Antalya and Isparta ($p<0.05$) and pesticide sellers in Denizli was found to be more knowledgeable in terms of professional knowledge when compared to other cities.

It was detected in this study that average daily working hours of home pest dusters were 9.47 ± 1.28 , there was first aid kit and medicine chest in all workplaces, safety measures were being taken against fire in 90% of the workplaces, there was a separate changing room for the workers in 50% of the workplaces. 40% of companies participating the survey were detected to prepare biocidal products for application in workplace; 13.3% of companies in vehicle and the remaining percentage in application area. However, it was well known that preparation for application should be done in workplaces. Maintenance and calibration of the equipment used in pesticide application was being done regularly by all home pest dusters or through outsourcing. All home pest dusters were using back pumps for spraying and no treatment was done with living things that have died after pesticide use. Yet it is laid down by laws that these dead animals should be disposed properly.

Based on the answers of surveys, it was observed that all home pest dusters think that an ideal biocidal product should be harmless to humans and other organisms, 16.7 % of them think that biocidal product has influence over more than one species, 10% of them think it has influence over only one species, 10% that it should be easy to use and 10% believe that it should be cheap. As for pesticide sellers; it was determined that 53.3% supposed that an ideal biocidal product should be harmless to human and other organisms, 24.0% that it should be easy to use, 21.3% that it has influence over more than one species, 21.3% that it should be cheap and 20.7% that it should impact only one type of species. The main characteristic of an ideal biocidal product is that it should be affectless to human and other organisms. While all home pest

dusters have knowledge of this, only 53.3 of pesticide sellers have it.

According to research results, 36.7% of home pest dusters and 79.3% of pesticide sellers believe that even small doses of biocidal products are harmful to other organisms. Among home pest dusters, 93.3% of suppose that biocidal products leave residues in the environment after being used. 100% of participants answering this question believe that residues remain in air, 3.6% believe they remain in rain and there was no one thinking that residues stay in earth, water, food, household goods and clothing. As for pesticide sellers, 75.2% think that residues stay in earth, 37.6% in food, 24.0% in water, 20.0% in air and 4.8% in rain. While pesticide sellers think that after use of biocidal products, residues remain mostly in earth, food and water; home pest dusters believe that they stay in air and rain at most. According to the results obtained, all of home pest dusters were seen that they think biocidal products are not hazardous to human health while 78% of pesticide sellers think they are. As a result, pesticide sellers think they are harmful to human health at a higher rate than home pest dusters. 96.7% of home pest dusters consider that biocidal products enter the human body via inhalation, 16.7% think they enter orally while no one thinks that they enter via skin, touch, eye contact or other ways. 67.3% of pesticide sellers state that biocidal products penetrate the human body via inhalation, 27.3% orally, 52.7% via skin contact, 13.3% via another way, 12% via eye contact. While pesticide sellers consider that biocidal products enter the human body via inhalation and skin contact at most; home pest dusters believe that they do through inhalation and mouth.

All of home pest dusters stated that they know the symptoms of biocide poisoning. Having looked at the distribution of answers; we saw that 100% is nausea and vomiting, 13.3% dizziness, 13.3% weakness, 6.7% fainting and 6.7% excessive perspiration. However apart from these signs, no one considered encopresis, seizures, lachrymation, dyspnea, stomachache, being unable to urinate are among the symptoms of poisoning. As for pesticide sellers, 98.7% stated that they know the symptoms of biocide poisoning. 86.5% marked nausea and vomiting, 48% dizziness, 28.4% excessive perspiration, 23% weakness, 18.2% fainting, 14.2% lachrymation, 14.2% dyspnea, 6.8% stomachache, 11.5% seizures and 10.8% marked encopresis among the symptoms of biocide poisoning. These results showed that although pesticide sellers stated that they are less informed about the symptoms of biocide poisoning than the home pest dusters, they could count the signs more comprehensively.

96.7% of home pest dusters stated that it is necessary to use protective material to avoid biocide poisoning while 83.3% of pesticide sellers confirmed the necessity of protective material, 30% stated that long term exposure should be avoided, 28.7% that unconscious use should be restrained, 26% that they should be kept under safety conditions, 21.3% that their mix with water and food should be avoided and 1.3% that other ways should be done

to avoid biocide poisoning. When these answers were analyzed, it was detected that the pesticide sellers knew the ways of protection from biocide poisoning more comprehensively than home pest dusters. Based on the survey answers, it was seen that all of home pest dusters stated they use personal protective equipment; gloves, mask and boots. 20% of survey participants mentioned they use apron, 6.7% goggles and 3.3% safety helmet. On the other hand, only 85.3% of pesticide sellers were using personal protective equipment. 93% of those who use prefer gloves, 26% mask, 18.8% goggles and 3.1% another personal protective equipment. All in all, while pesticide sellers use gloves and mask more as personal protective equipment, home pest dusters mostly use gloves, mask and boots. Surveys showed that all of home pest dusters believe that biocidal products are not harmful to human health while 78% of pesticide sellers thinks they are. 78% of pesticide sellers mentioned that they believe biocidal products cause respiratory system disease, 47% dermatological disorders, 24.8% cancers, 12.8% gastrointestinal and 7.7% cardiovascular, 4.3% blood diseases and 0.9% other diseases. It was found out that the home pest dusters in study did not know the phone number of National Poisons Information Center (UZEM) while only 46.7% of pesticide sellers did know it.

While 76.7% of home pest dusters think that insecticides have antidote, 6.3% think they don't. As for pesticide sellers, 70% mentioned that they believe biocidal products have antidote and 75.3% definitive treatment of biocide poisoning can be carried out. The study revealed that none of the home pest dusters got examined in regular intervals whereas 100% had no health complaint during or after the application of biocides. 19.3% of pesticide sellers got poisoned while no one among home pest dusters had biocide poisoning. 89.7% of pesticide sellers who had been poisoned consulted a medical institution. This situation can result from the fact that usage ratio of personal protective equipment among home pest dusters is 100%. All the home pest dusters see themselves at no risk of biocide poisoning while only 26% of pesticide sellers see themselves under risk. It was observed that pesticide sellers see themselves under risk of biocide poisoning at a higher rate than home pest dusters. It is considered that awareness level of pesticide sellers was higher than that of another group. All home pest dusters mentioned that they stored biocidal products in accordance with safe storage conditions while only 3.3% of pesticide sellers informed that they did not keep them safely.

According to survey results, 70% of home pest dusters were eating at work. All the workers were washing their hands before meal and after contact with biocides. On the other hand, 96% of pesticide sellers were washing their hands before meal and 86.7% were washing hands after contact with biocides. It was observed that behavior of pesticide sellers about this issue is less conscious when compared to home pest dusters. The study revealed that 93.3% of home pest dusters were following the related legal developments. 73.3 of them took part in training programs about biocidal products

and 100% participated courses about preparation and application of biocides. 100% of home pest dusters were making arrangements at home before application and giving information to the hosts about the application. In Turkey, trainings for pest controllers are arranged in two categories: responsible manager trainings and operator trainings. Operator training programs are arranged by authorized relevant occupational organization, university or directorate for minimum 24 hours not to be less than 3 days and more than 10 days [20]. Pesticide sellers were found to follow up legal developments about biocidal products at a higher rate (99.3%) than home pest dusters. Again, the participation rate of pesticide sellers in education programs related to biocidal products (91.3%) was higher than that of home pest dusters.

According to the results of the research, 63.3% of home pest dusters read the contents of biocides. 70% of home pest dusters think that biocidal products are used consciously while 40% of pesticide sellers think so. 98.7% of pesticide sellers stated that they informed buyers about the biocidal products. It was determined that 76.4% of the survey participants gave information about dose, 65.5% about how to apply, 39.9% about the content, 5.4% about side effects of exposure, 4.7% about the symptoms of poisoning, 4.1% about immediate first aid in case of poisoning, 4.1% about actions to be avoided in case of poisoning, 2.7% about other issues apart from these.

93.3% of home pest dusters pointed out that they knew the necessary immediate actions in case of biocide poisoning. 92.9% of home pest dusters believe that things to do in urgent cases include helping to enable regular breathing, according to 7.1%, it is to get one out of the scene, according to 7.1%, it is to wash the person, according to 3.6% it is to help the person vomit. Among pesticide sellers, the ratio of those who know the necessary immediate actions in case of biocide poisoning is 96%. 37.5% of pesticide sellers stated that in case of biocide poisoning, the person poisoned should be made to vomit immediately, 36.1% stated that the poisoned person should be get out of the scene, 34.7% that the clothes of the poisoned person should be removed, 36.6% that he/she should be helped to breath regularly, 18.1% that the person should be washed, 7.6% that another action apart from these must be taken. According to 26.7% of home pest dusters, the poisoned person must not be made to drink water and according to 46.7%, movements of the person should not be hindered during seizures. As for pesticide sellers, 44.7% of them stated that to make one drink water was wrong and 33.3% that to hinder the movements during seizures and 22.7% that to make one eat yogurt is wrong.

The rate of biocide poisoning in pesticide sellers is 25.0% in Ankara (n=8), 28.6% in Antalya (n=20), 0.0% in Denizli (n=0) and 5.6% in Isparta (n=1). Distribution of poisoning varies across the cities (p=0.003). Poisoning rate in Denizli is lower than Ankara and Antalya. This meaningful low level in poisoning rate of Denizli is accordant with the high level of knowledge in the participants from Denizli. Pesticide sellers who did not have biocide poisoning

had a higher rate of not using personal protective equipment (p=0.008). Among pesticide sellers who had biocide poisoning, the ratio of those who thought biocides were used consciously was higher (p>0.001). It has been determined that the persons who had biocides poisoning were not using biocidal products consciously although they thought themselves conscious user. It was detected that the ratio of those who were aware that biocidal products might enter human body via skin contact was lower among those who had biocide poisoning than those who did not get poisoned (p=0.017). The poisoned people were not aware that the biocides might enter through skin. Similarly, the ratio of those who knew that biocidal products might enter human body via eye contact was lower among those who had biocide poisoning than those who did not get poisoned (p=0.024).

Discussion

It is demanded that the biocides used in biocidal applications are to have a minimum impact on human beings and other organisms and even low doses of these chemicals should have harmless contents for other organisms. However, it has been announced in the studies done that these products might cause problems in non-target organisms. Tolosana and his friends (2009) who researched the dermatological impacts of pesticide use at home among 740 families in rural, urban and informal residential areas of Cape Town (South Africa) determined that exposure to pesticide was highest among children in informal residential areas (89%); followed by children in rural areas (78%) and children in urban areas (63%) and 53.9 of children with atopic dermatitis (73%) were ill due to exposure to pesticide use at home [21]. All home pest dusters in our study considered that an ideal biocide should be harmless to human beings and other organisms; yet 36.7% of home pest dusters and 79.3% of pesticide sellers knew that even small doses of biocidal products are harmful to other living things.

Agricultural laborers stand out as the leading risk group in terms of biocide exposure. In South Africa, 913 female agricultural laborers' knowledge, attitude and behaviors were analyzed and it was detected that a large majority of the women had acute or chronic exposure while working on the field while the remaining part had it while washing the biocide-contaminated clothes of their spouses and/or consuming contaminated food [22]. Mistakes done during storage, preparation and spraying of biocidal products appear among the factors increasing exposure risk. A study which investigated the knowledge, application and exposure of farmers with respect to biocidal product exposure in rural area villagers who derived their livelihoods from agriculture in Tanzania pointed out that biocidal product exposure is a potentially serious public health problem [23]. Tuncdemir (2015) did research on attitude and applications regarding biocidal products and knowledge levels of 384 farmers in Adiyaman (Turkey) about impacts of biocides, ways of entry into the human body, toxic symptoms and protective equipments. It was determined that during biocide application, the farmers were not using gloves (45.6% were using sometimes)

and masks (46.6% were using sometimes) regularly; and that boots (73.4%) and protective clothing (80.7%) were mostly not being used [24]. 37.6% of pesticide sellers in this study expressed that biocidal products leave residues in food while 24% said they leave residues in water. 67.3% of pesticide sellers stated that biocides enter the human body through inhalation; 52.7% through skin contact and 27.3% said they enter orally. 85.3% of pesticide sellers stated that they use personal protective equipment. Among those who use personal protective equipment, 93.0% use gloves, 26% use masks, 19.5% goggles, 18.8% aprons and 3.1% use another protective equipment. The studies carried out reveals that especially biocide applicators and sellers are required to receive more vocational education.

One of the most important points during biocide applications and the following period is that biocide applicators are aware of the impacts of chemicals and they believe that these chemicals can be hazardous. It has been determined that a large majority of the 89 people in Cambodia who engage in agricultural production and biocide application themselves believe that the biocides penetrate the body and have harmful effects on their health and 46% have investigated the explanations on the labels of biocidal products. In this study, it was found that most farmers (88%) showed symptoms of acute biocidal product poisoning and that these symptoms were significantly related to the time spent by biocidal product spraying. However, it was determined that educated farmers reduced the risk of biocidal product poisoning by 55% with extra personal protection measures [25]. In another study, it was found that 97.9% of agricultural laborers knew the harmful effects of pesticides on human health and 64.7% of the survey participants reported that the most common symptom was burning on the face and eyes. The people who felt these signs showed high dose pesticide usage and mixtures of different drugs as the reason of these symptoms [26]. According to results obtained in our study, 98.7% of pesticide sellers stated that they knew the symptoms of biocide poisoning. The answers revealed that the most known symptoms of poisoning were nausea, vomiting, dizziness and excessive perspiration. 83.3% of pesticide sellers argue that use of personal protective equipment is necessary to avoid biocidal product poisoning.

Studies have shown that exposures to agrochemical-based exposures are a major problem globally and this has led exposure studies to focus on pesticides. As mentioned above, reduction in exposures is only possible with training activities. A study made in Lebanon states that a vast majority of pesticide applicators and sellers (85%) need pesticide safety education given by experts. The information obtained about pesticides has been shown to be obtained orally among farmers (52.3%) or from their previous experience (44.9%). In the same study; the knowledge, attitude and behavior scores obtained for agriculture workers who had previously been trained in pesticides had an average score of 7.4 out of 19, and the average score of more than 75% of the workers included in the survey remained below 10. The updating

of the provided trainings and information is also important both in exposure control and in the use of appropriate chemicals. 61 farmers and their spouses in the West Bank (Palestine) in 1998 and 250 male farmers in the same village in 2006 were examined for their knowledge, attitudes and behaviors regarding the use of biocidal products. In 1998, 17 banned biocidal products were used while in 2006 only 5 prohibited biocidal products were used. This successful outcome has been reported to be related to the introduction of different policies and regulations related to pesticides in the country after 1998 [27]. In Bolivia, differences in terms of biocidal product poisoning were examined among a group of farmers trained in pest control in the years of 2002, 2004 and 2009 and another group of neighboring farmers who have not received training and progress was observed over time in both groups [28]. 99.3% of the pesticide sellers in our research stated that they followed legal developments related to their professions and 91.3% stated that they participated in training programs related to biocidal products.

However, when the data obtained are evaluated, it is seen that there is a lack of conscious use of pesticides, preservation of pesticides and protection from pesticides, even though legal developments are followed and participation rates in education programs are high. It is thought that these deficiencies can be reduced by actualizing and following the programs including necessary trainings in order to awaken and gain awareness about these issues. As a result, it has been determined that home pest dusters and pesticide sellers in the cities where the study was conducted did not fully comply with the binding rules when doing this work, and that their level of knowledge and education were not sufficient. In addition to these, the physical conditions of the workplaces were also detected to have inadequacies. It is thought that all staff who would work in the application of biocidal products which are highly important products in terms of public health should be able to work in the field after receiving an education program with this aim and being provided with certificate. Many wrong applications which were found in this study can be prevented in this way. Again, according to this research, it has been revealed that authorized dealers who sell pesticides known to be of great importance in terms of public health do not have accurate and sufficient information about the sale and application of these chemicals. It is considered important that these and similar researches are carried out in wider range of areas in the following years, that trainings are given by public and private institutions in both occupation groups, their results are followed and developments in attitude, behavior and knowledge level of these people are monitored.

The fact that about one fifth of pesticide sellers participating in the study had poisoning case as well as poisoning frequency was seen higher in people with lower knowledge score and that while the high level of knowledge score is irrelevant to the school of graduation, it is inversely correlated to the years spent in profession emphasize the importance of certificate trainings renewed in

regular intervals for people dealing with pesticides. As a result, home pest dusters and pesticide sellers in this study have been found to have insufficient knowledge about requirements of this application, low level of knowledge and inadequate education. In addition, deficiencies were also detected in the physical conditions of workplaces. As this issue is of concern to not only pesticide sellers, home pest dusters but also to the society and environment-wide in terms of public health; international organizations, non-governmental organizations should be much more supported to carry out projects about these issues. Also, more actions should be taken to provide applications based on international standards and related competent authorities should develop stricter follow up mechanisms about this issue.

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