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An Evaluation on Beekeeper's Health Risk and Some Other Risk Factors in Beekeeping Farms: A Case of Izmir-Turkey

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Abstract

Beekeeping has an economic importance in crop production and animal production. The health of the beekeepers has been faced with many various risks due to beekeeping managed under the influence of environmental, climatic conditions, the effect of psychological, physical, and mechanical difficulties. In this study, it was investigated whether beekeepers take care of their own health and some other risk factors affecting their health were evaluated. The data was collected from 12 districts of the province of Izmir in Turkey and obtained face-to-face method with 175 beekeepers. The socio-economic characteristics and the health risk factors of beekeepers were investigated in this study. The average age of the beekeeper was 54.45 called as "middle age" group. 52% of beekeepers - predominantly migrant - had over 20 years of experience in beekeeping. Approximately 90% of beekeepers had social security. It was determined that 77.1% of the beekeepers were not affected by cold working conditions and falling danger, 83.4% of them had not allergic reactions on the skin, and 7% of beekeepers did not encounter physical difficulties. Besides, 22.3% of the beekeepers used alcohol, 56% had cigarette smoking and only 6.3% of them had health problems. In addition, 83% of the beekeepers knew their blood groups. As a result, it was observed that all of the beekeepers in research took care of their health by taking all necessary cautious. The result of this study shows that the health of beekeeper is very important for beekeeping activity.
Key words: Beekeeper, health, risks, social security, bee production, safety standards.

Arıcılık İşletmelerinde Arıcı Sağlığı Riski İle Diğer Bazı Risk Faktörlerinin İncelenmesi "İzmir Örneği-Türkiye"

Özet

Arıcılık, bitkisel ve hayvansal üretimde ekonomik bir öneme sahiptir. Ancak arıcıların sağlığı, çevresel, iklimsel koşullar ile psikolojik, fiziksel ve mekanik zorlukların etkisi altında yönetilen arıcılık nedeniyle birçok riskle karşı karşıya kalmaktadır. Bu çalışmada, arıcıların bu faaliyet boyunca kendi sağlıklarına özen gösterip göstermedikleri araştırılmış ve sağlıklarını etkileyen bazı risk faktörleri değerlendirilmiştir. Veriler, İzmir ilinin 12 ilçesinden toplam 175 arıcı ile yüz yüze anket yöntemiyle elde edilmiştir. Bu çalışmada öncelikle arıcıların sosyo-ekonomik özellikleri ve sağlık riski faktörleri incelenmiştir. Arıcıların yaş ortalaması "orta yaş" grubu olarak adlandırılan 54.45'tir. Arıcıların %52'si ağırlıklı olarak göçer arıcı olup, 20 yıldan fazla deneyime sahiptir. Arıcıların yaklaşık % 90'ının sosyal güvencesi bulunmaktadır. Arıcıların% 77.1' inin soğuk çalışma koşulları ile düşme tehlikesinden etkilenmediği, % 83.4' ünün cilt üzerinde alerjik reaksiyonlara sahip olmadığı ve arıcıların % 7'sinin fiziksel zorluklarla karşılaşmadığı belirlenmiştir. Ayrıca, arıcıların % 22,3'ü alkol ve %56'sı sigara içerken, sadece %6.3'ü sağlık sorunları yaşamaktadır. Bununla beraber, arıcıların % 83'ünün kan gruplarını bildiği belirlenmiştir. Son olarak, araştırmadaki tüm arıcıların, gerekli tüm önlemleri alarak sağlıklarına özen gösterdikleri gözlenmiştir. Bu çalışmanın sonucu, arıcı sağlığının arıcılık faaliyetleri için çok önemli olduğunu göstermektedir.
Anahtar kelimeler: Arıcı, sağlık, riskler, sosyal güvenlik, arı ürünleri, güvenlik standartları.

1.INTRODUCTION

The sustainability of beekeeping sector have recently been discussed in all of the world. Beekeeping is a rapidly growing livestock activity and income source for rural population in Turkey. Beekeeping does not require high investment costs and depend on land. Beekeeping can be done as a hobby activity as well as a source of additional and/or main income (Adams, 2018; Nazik et al., 2018; Popescu and Popescu, 2019). Beekeeping constitutes health risks for beekeepers and living people near hives. Although there are various negative health consequences, no systematic review has been carried out (Stanhope et al., 2017). The colonies are transferred to flora regions in order to get benefit from floral sources in the world. In Turkey, the migratory beekeeping is managed to a higher degree in comparison to other countries.

The unhealthy living conditions created for short periods due to the follow-up of the flora in migratory beekeeping has brought out the necessity to carry on the majority of works in open areas. Bee stings are the biggest risk factors for occupational health and safety (Light et al., 1975; Pastorello et al., 1987; Annila et al., 1996; Annila et al., 1997; Çelikel et al., 2006; Richter et al., 2011; Becerril-Angeles et al., 2012; Çeliksoy et al., 2014). While bee sting reactions can be a significant problem for those who have allergies, there are many other factors in beekeeping that are more dangerous in occupational health and safety than bee stings (Münstedt et al., 2008; Nettleingham and White, 2008).

There have been a lot of research on climate change due to beekeeping activity (McMichael et al., 2006), exposure to high temperatures (Kovats and Hajat, 2008), propolis allergy (Münstedt et al. 2007; Basista and Filipek, 2012; Basista-Sołtys, 2013), beekeepers live a long time away from home due to the apiculture (Günbey, 2007), hive working height and hive ergonomics (Aiyeloja et al., 2015), work-related musculo-skeletal problems in beekeeping (Maina et al. 2016), and tick bites (Stanhope et al., 2017).

There are disadvantage concerns as the lack of occupational health and safety standards and regulations in agriculture or the difficulties of their implementation; so that the majority of the beekeepers are family-owned and the employees are not covered within the occupational health and safety services. In addition, there are problems such as insufficient health control and informed workers about occupational health and safety issues (Donham and Thelin, 2006; Topal et al., 2016).

In this study, especially the socio-economic characteristics of the beekeepers in Izmir province of Turkey were determined and the beekeepers' health risks encountered during bee production, and some factors affecting the health of beekeepers were evaluated.

2. MATERIAL and METHOD

The data was collected with face-to-face interviews of a random sample of 175 beekeepers in Izmir province of Turkey in 2018 production year. In addition, previous research and review results, publications, and websites were also used. The survey was implemented in the 12 districts of Izmir province. Izmir province is among the top ten cities in the animal husbandry activities within Turkey with the existence of 215.217 total colonies and 2.032 total beekeeping farms. The distribution of the number of beekeepers and beehives by the districts of Izmir Province are given in Table 1.

Table 1. Number of Beekeepers and Beehives by Districts in Izmir Province

District		Number of beekeepers	Number of beehives
1	Bergama	320	52000
2	Ödemiş	256	31145
3	Kemalpaşa	300	25000
4	Tire	106	11426
5	Menemen	66	9311
6	Bayındır	129	11200
7	Menderes	180	9620
8	Torbalı	76	11485
9	Seferihisar	73	8915
10	Kiraz	53	5020
11	Dikili	38	3805
12	Bornova	44	3100
	Total of first 12 districts	**1641 (80.75%)**	182027 (84.57%)
13	Total by other districts	391 (19.24%)	33190 (15.42%)
General Total		2032	215217

Source: TURKSTAT, 2017

The first 12 districts in Izmir province are the districts where beekeeping is carried out intensively and these districts accounted for 80.75% of the total number of beekeepers (1641 beekeepers) and 84.57% of the hives (182.027) in Izmir. The sample size was determined by using proportional sampling method (Newbold, 1995). According to the proportional sampling method with a 95% confidence and 7% error margin, the required sample size was calculated as 175.

$$n = \frac{N p(1) - p}{(N-1)\sigma^2_{\hat{p}_x} + p(1-p)}$$

n= Sample size

N= Number of Beekeepers in Izmir

p=Percentage of the beekeepers who have enough knowledge about beekeeping ((taken as 0.50 to reach maximum sample size), and $\sigma^2_{\hat{p}_x}$ =Variance.

The number of beekeepers included in the study was calculated according to the distribution percentages of the districts. 175 beekeepers were interviewed face-to-face. .Beekeeping farms are divided into 3 different groups by the number of hives and all of the analysis given by this classification (Table 2).

Table 2. Beekeeping Farms by Number of Hives

Groups	Farm Size (Number of Hives)	Number of Beekeepers	Percentage
1st Group	Less than 100	73	41.71
2nd Group	100-250	62	35.43
3rd Group	251 and above	40	22.86
Total		175	100.00

According to this classification, the number of farms which have less than 100 hives in the first group is determined as 73, while the number of farms having 100-250 hives in the second group is 62 and number of farms having 251 and more hives in the third group is 40 (Table 2).

In the study, the average and percentage calculations were used to determine the encountered risk during beekeeping activities and strategies. Beekeepers as survey respondents were requested to rank about the importance of each risk or strategy response using a Likert-type scale with a range from one(never) to four(very). Chi-square analysis was used for comparisons among groups concerning data obtained by this study.

3. RESEARCH FINDINGS and DISCUSSION

3.1. Socio-Economic Characteristics of Beekeepers

Socio-economic characteristics in beekeeping farms are given on Table 3. The average age of the beekeepers is 54.45 and 60% of beekeepers are between 46-65 years old.

The average age of the beekeeper is 55 years in the first group, 56 in the second group, and 51 in the third group. According to the results of variance analysis, the difference between the groups was not found to be statistically significant (F=2,382 p = 0,095). Additionally, it was seen that beekeepers on early ages have smaller size beekeeping farms on comparison to beekeepers having middle and big size beekeeping farms between the ages of 46 and 65. In this study, it was determined that the experience of beekeepers increased with age. 62% of the beekeepers were graduated from primary school (5 years of education) while 15.4% were high school graduates (12 years of education). In the study conducted in Kütahya province, it was determined that beekeepers were 3% literate, 49.3% primary school, 15.9% secondary school, 20.9% high school, and 10.9% university degree (Özer, 2017). According to another study, 56% of the beekeepers in Konya province constitute the age group of 26-45 and 40% of them were primary school graduates. The experience period of 64.4% of beekeepers is 10 years or more (Çelik and Turhan, 2014).

Table 3. Distribution of Beekeepers by Age and Education Level (Percentage)

Age Groups (years)	Farm Size Groups			
	1st Group (73)	2nd Group (62)	3rd Group (40)	General (175)
			%	
20-35	6.8	4.8	2.5	5.1
36-45	23.3	11.3	17.5	17.7
46-55	16.4	30.6	47.5	28.6
56-65	28.8	33.9	32.5	31.4
65+	24.7	19.4	-	17.1
Education Period (%)				
Primary school	57.5	62.9	70.0	62.3
Middle School	6.8	14.5	10.0	10.3
High school	17.8	12.9	15.0	15.4
Vocational School	6.8	3.2	2.5	4.6
Undergraduate	11.0	6.5	2.5	7.4

It was determined that 30.9% of beekeepers were only beekeepers, 20.6% were farmer, 24% were self-employed, and the rest of them were retired and other occupational groups. Only 50% of the producers in the 3rd group were determined as having beekeeping as the main profession (Table 4). Most of the beekeepers that have small-scale beekeeping farms are engaged in other agricultural activities. However, since the management of large beekeeping farms requires significant knowledge and professional experience, it was seen that beekeepers who are the owners of large-scale beekeeping farms are only engaged in apiculture activities. This situation shows that beekeeping is an animal activity which requires importance in itself. Furthermore, it was determined that 65.7% of the beekeepers had Social Security Insurance, 23.4% were under retirement fund, 2.9% had a green card, and 8% had no social security.

Table 4. Distribution of Beekeepers by Main Professions (%)

Profession	Farm Size Groups			
	1st Group (73)	2nd Group (62)	3rd Group (40)	General (175)
	%			
Beekeeper	20.5	30.6	50.0	30.9
Farmer	19.2	19.4	25.0	20.6
Self-employment	27.4	27.4	12.5	24.0
Retired	24.7	11.3	10.0	16.6
Other	8.2	11.3	2.5	8.0

When the experience of the beekeeper is examined, it is seen that 52% of the beekeepers have more than 20 years of experience. When the focus was on the farm groups, it is found out that 59.7 % of the beekeepers in the second group and 65% of the beekeepers in the third group have more than 20 years of professional experience (Table 5). As beekeepers gain experience, they tend to significantly increase the number of colonies.

Table 5. Beekeeping Experience

Beekeeping Experience (Years)	Farm Size Groups			
	1st Group (73)	2nd Group (62)	3rd Group (40)	General (175)
	Percentage			
1-5	23.3	9.7	-	13.1
6-10	16.4	3.2	15.0	11.4
11-20	21.9	27.4	20.0	23.4
Over 20 years	38.4	59.7	65.0	52.0

57.1% of the beekeepers received help from their family members during the beekeeping activity and 42.9% of the beekeepers carried out apiculture alone (Table 6). According to Chi-square analysis, in terms of getting help during the beekeeping activities, the difference between groups was found as statistically significant ($\chi 2$= 3.571 p=0.059). Generally, in small-scale beekeeping farms, it is seen that most of the beekeepers continue this activity without receiving any help, while they tend to get more help as their operating capacity grows. In the study in Kütahya province, 30.3% of the beekeepers had the experience of beekeeping between 0-5 years and the ratio of those who have more than 20 years of experience had been determined at 30.3% (Özer, 2017).

Table 6. The Status of Receiving Assistance During The Beekeeping

	Farm Size Groups								p *
	1st Group (73)		2nd Group (62)		3rd Group (40)		General (175)		
	Number	%	Number	%	Number	%	Number	%	
Performing the beekeeping activity alone	45	61.6	24	38.7	6	15.0	75	42.9	.059
Getting help during the beekeeping activity	28	38.4	38	61.3	34	85.0	100	57.1	
Total	73	100.0	62	100.0	40	100.0	175	100.0	

** Shows the p-value of chi-square analysis. * significant at P<0.05;*

Table 7 shows whether or not beekeepers have hive transport insurance. The most important transferring tool in beekeeping is hive transport insurance. It was determined that 86.3% of the beekeeping farms did not have hive transport insurance and 13.7% of them had hive transport insurance. According to the results of chi-square analysis, the difference between the groups was found to be statistically significant (2=9,366 p=0,009). This situation may be due to different reasons such as the lack of sufficient information known by beekeepers related to beehive insurance and beekeepers not feeling the need to make insurance and having hesitations with insurance companies to make beekeeping insurance. Özer (2017) found that 3.5% of the beekeepers in the province of Kütahya insured their hives.

Table 7. Hive Transport Insurance in The Farms

	Farm Size Groups								
	1st Group (73)		2nd Group (62)		3rd Group (40)		General (175)		P *
	Number	%	Number	%	Number	%	Number	%	
Hive transport insurance	5	6.8	8.0	12.9	11	27.5	24	13.7	
No hive transport insurance	68	93.2	54.0	87.1	29	72.5	151	86.3	0,009
Total	73	100.0	62.0	100.0	40	100.0	175	100.0	

** Shows the p-value of chi-square analysis. * significant at P<0.05;*

It was determined that 83.4% of beekeepers were migratory beekeepers and 16.6% were not migratory beekeepers (Table 8). This condition shows that hives tend to be transported regardless of farm size. In Turkey, migratory beekeeping is widespread. Turkey being quite rich in terms of biodiversity makes it almost mandatory to move the hives to the regions with successive flowering in order to utilize the floral nectar and pollen resources in these regions. 21.9% of the beekeepers in Kütahya province (Özer, 2017), 96% of beekeepers in the province of Konya (Çelik and Turhan, 2014), and 92% of the province of Ağrı is migrant beekeeper (Kaya, 2008). As a result of the migrant beekeeping, beekeepers who have to live away from the social and family environment are also faced with environmental challenges. In the study carried out, it was determined that 33.75% of beekeepers engaged in migratory beekeeping activities stayed 6-7 months, 31.25% stayed 5-6 months, and 17.50% stayed 4-5 months (Günbey, 2007).

Table 8. Beekeeping Type Preferred in Beekeeping Farms

Beekeeping Types	Farm Size Groups							
	1st Group (73)		2nd Group (62)		3rd Group (40)		General (175)	
	Number	%	Number	%	Number	%	Number	%
Stationary	20	27.4	8	12.9	1	2.5	29	16.6
Migratory	53	72.6	54	87.1	39	97.5	146	83.4
Total	73	100.0	62	100.0	40	100.0	175	100.0

It has been determined that 93.7% traditional beekeeping, 4% best beekeeping practices and 2.3% organic beekeeping were performed in the investigated farms (Table 9). This situation reveals that traditional beekeeping is performed very commonly in Turkey. However, this situation is far from the production concept, which is advanced due to the development of apitherapeutical studies in recent years that require the production of healthy and reliable bee products without using synthetic chemical drugs. Therefore, for the production of apitherapeutical bee products, it is necessary to switch from this production model to the production model which performed best beekeeping practices. It was determined that 94.9% of the farms did not get benefit from the grant support. The most important reason for this situation can be shown as the beekeepers not being able to reach sufficient information and/or informed about the grant support.

Table 9. Beekeeping Methods in Investigated Farms

Production Method	Farm Size Groups							
	1st Group (73)		2nd Group (62)		3rd Group (40)		General (175)	
	Number	%	Number	%	Number	%	Number	%
Organic	2	2.7	2	3.2	-	-	4	2.3
Traditional	68	93.2	57	91.9	39	97.5	164	93.7
Best beekeeping practices	3	4.1	3	4.8	1	2.5	7	4.0
Total	73	100.0	62	100.0	40	100.0	175	100.0

3.2. Production of Bee Products

The production of honey and other bee products in beekeeping farms are given in table 10. It was determined that the percentage of farms producing honey, pollen, propolis, and royal jelly as 99.4%, 42.9%, 13.7%, and 2.9%, respectively. The percentage of farms producing beeswax was found to be 38.9% (Table 10).

Table 10. Production of Bee Products in Investigated Farms

Bee Products		Farm Size Groups							
		1st Group (73)		2nd Group (62)		3rd Group (40)		General (175)	
		Number	%	Number	%	Number	%	Number	%
Honey	Yes	72	98.6	62	100.0	40	100.0	174	99.4
	No	1	1.4	-	-	-	-	1	0.6
Pollen	Yes	18	24.7	35	56.5	22	55.0	75	42.9
	No	55	75.3	27	43.5	18	45.0	100	57.1
Propolis	Yes	4	5.5	11	17.7	9	22.5	24	13.7
	No	69	94.5	51	82.3	31	77.5	151	86.3
Royal Jelly	Yes	-	-	3	4.8	2	5.0	5	2.9
	No	73	100.0	59	95.2	38	95.0	170	97.1
Beeswax	Yes	17	23.3	29	46.8	22	55.0	68	38.9
	No	56	76.7	33	53.2	18	45.0	107	61.1

The amount of bee products is given in Table 11. The most produced product was the honey. Honey was followed by pollen, beeswax, propolis and royal jelly. It was determined that the royal jelly was produced more than the large-scale beekeeping farms; however, the production of royal jelly was not done in the small farms and the medium-sized farms.

Table 11. Production of Bee Products in 2017 (kg)

Production Amount of Bee Products	Farm Size Groups			
	1st Group (73)	2nd Group (62)	3rd Group (40)	General (175)
Honey	513.63	2137.42	6222.50	2393.80
Pollen	9.75	106.45	321.25	115.21
Propolis	0.06	1.29	13.18	3.49
Royal Jelly	-	1.63	0.05	0.59
Beeswax	12.42	33.65	101.63	40.33

3.3. Information Related to Beekeeper's Health

The results are given by the average in the farms in this chapter. It was determined that 82.9% (145 people) of the beekeepers knew their blood group in case of any injury or accident and 17.1% (30 people) did not. It was found that 77.7% of the beekeepers did not use alcohol, but the rate of smoking was at 56%. Furthermore, it was defined that only 6.3% (11 people) of the producers had a health problem (Table 12). It was stated that 97.1% of the beekeepers do not have an allergy to bee products and 92% of the beekeepers do not have a body reaction after the bee sting. Beekeepers stated that they were generally healthy (93.7%) and beekeepers said that they pay attention to health and hygiene conditions.

Table 12. Information Related to The Beekeepers' Health

	Responses	Number	%
Blood group	Group A	53	30
	Group B	27	15
	Group AB	17	10
	Group O	48	27
	Does not know	30	17
Alcohol Use	Yes	39	22.3
	No	136	77.7
Smoking	Yes	77	44.0
	No	98	56.0
Health problem	Exists	11	6.3
	Does not exist	164	93.7
Allergy to Bee Products	Yes	4	2.3
	No	170	97.1
	I do not know	1	0.6
Body reaction to bee sting	Yes	13	7.4
	No	161	92.0
	I do not know	1	0.6

According to the evaluation of whether or not beekeepers had a first aid kit against any injury, 70.7% (124) of the farms are determined to not have a first aid kit; however, 29.3% (33) carried the first aid kit with them. In the examined farms, it was identified that in the case of a health problem the first number of beekeepers would call is official numbers by 43.4%, their own family with 32% and their beekeeper friends with 22.3%. It was specified that 97% of the beekeepers did not have an allergy test while 2.9% of them had an allergy test.

In the study conducted by Özer (2017), it was found that literate beekeepers did not have a first aid kit; however, 15.2% of primary school graduates of beekeepers, 25.0% of secondary school graduates, and 38.1% of high school graduates of beekeepers had a first aid kit.

3.4. Encountered Risks and Vulnerability Levels in Beekeeping Activity

The most common difficulties faced by beekeepers and their vulnerability level are shown in Table 13. According to the obtained results, it was determined that beekeepers have not adversely affected by factors including working conditions with cold weather and danger of falling with 77.1%, working in hot weather conditions with 56.6%, allergic reactions with 83.4%, and physical difficulties with 57.7% by farm size groups (Table 13). On the other hand, there was no significant difference for risks between the two groups by the beekeeping types.

Table 13. Risk Factors Faced by Beekeepers and Their Vulnerability Level in Investigated Beekeeping Farms

Difficulty factors		Farm Size Groups by the number of hives				Beekeeping Types	
		1st Group (73)	2nd Group (62)	3rd Group (40)	General (175)	Stationary	Migratory
		%					
Cold weather conditions	Never	82.2	77.4	67.5	77.1	58.6	80.8
	Too little	15.1	12.9	27.5	17.1	24.1	15.8
	Some	2.7	6.5	2.5	4.0	10.3	2.7
	Too much	-	3.2	2.5	1.7	6.9	0.7
Hot weather conditions	Never	60.3	51.6	57.5	56.6	48.3	58.2
	Too little	13.7	17.7	15.0	15.4	10.3	16.4
	Some	13.7	17.7	15.0	15.4	31.0	12.3
	Very	12.3	12.9	12.5	12.6	10.3	13.0
Jobs with danger of falling	Never	80.8	82.3	62.5	77.1	75.9	80.7
	Too little	8.2	9.7	22.5	12.0	17.2	11.4
	Some	5.5	6.5	5.0	5.7	6.9	5.7
	Too much	-	-	7.5	1.7	0.0	2.1
Allergic reactions on beekeeper's skin	Never	84.9	85.5	77.5	83.4	79.3	86.0
	Too little	6.8	8.1	20.0	10.3	10.3	10.5
	Some	5.5	3.2	2.5	4.0	10.3	2.8
	Too much	1.4	-	-	0.6	0.0	0.7
Physical difficulties	Never	65.8	58.1	42.5	57.7	55.2	58.6
	Too little	9.6	14.5	12.5	12.0	27.6	17.9
	Some	15.1	17.7	30.0	19.4	10.3	12.4
	Too much	9.6	9.7	12.5	10.3	6.9	11.0

It is noteworthy that the beekeepers have been injured in transport and maintenance, the traffic and equipment accidents during the transportation, and the fire situation when using the bellows (Table 14). Experience of Izmir beekeeper's had an effect on these results.

Table 14. Accident Risks of Beekeepers in Investigated Farms

Accidents		Farm Size Groups			Beekeeping Types		
		1st Group (73)	2nd Group (62)	3rd Group (40)	General (175)	Stationary	Migratory
		%					
Injury During Transport	Yes	2.7	16.1	10.0	9.1	14.3	8.3
	No	93.2	83.9	90.0	89.1	85.7	91.7
	I do not remember	0.0	0.0	0.0	0.0	0.0	0.0
Injury During Maintenance	Yes	4.1	4.8	2.5	4.0	0.0	4.8
	No	91.8	95.2	97.5	94.3	96.4	95.2
	I do not remember	1.4	0.0	0.0	0.6	3.6	0.0
Traffic Accident During Transport	Yes	2.7	4.8	12.5	5.7	3.6	6.2
	No	95.9	93.5	87.5	93.1	96.4	93.8
	I do not remember	0.0	0.0	0.0	0.0	0.0	0.0
Tool-Equipment Accident	Yes	0.0	3.2	2.5	1.7	3.6	1.4
	No	97.3	91.9	97.5	95.4	89.3	98.6
	I do not remember	1.4	1.6	0.0	1.1	7.1	0.0
Accidental Fire When Using Bellows	Yes	0.0	0.0	0.0	0.0	0.0	0.0
	No	97.3	100.0	95.0	97.7	100.0	99.3
	I am not sure	1.4	0.0	0.0	0.6	0.0	0.7

The number of beekeepers stung by bees more than 500, between 101-500, between 21-100, and below 20 in a year was determined to be as 64.3%, 18.7%, 17%, and 1.8%, respectively. It was determined that 49.1% of beekeepers used only masks as a precaution to the bee attack while 42.3% of them used both masks and gloves and 8% did not use either.

Özer (2017) reported that 99.5% of beekeepers do not have the experience of traffic accidents during colony transport. It is determined that 88.3% of beekeepers with beekeeper outfits used their clothes actively and 11.7% of them used occasionally. It was found that 95.0% of them continue to work after bee sting. When the health problems caused by beekeeping activities are evaluated, it was observed that 3.0% of them have health problems, 84.1% of them do not have any health problems, and 12.9% of them have health problems. It was established that only 13.7% of beekeepers were exposed to tick bites during beekeeping activities.

It was determined that Lyme borreliosis (tick bites) on 31,1% of beekeepers requested had been diagnosed in the study having the frequency of incidence of Lyme borreliosis in Europe. However, it was reported that limited number of beekeepers (11.4%) have protected against tick bites (Münstedt and Thienel, 2012).

3.5 . General Risk Sources of Beekeepers

Beekeepers have stated the first risk of scorpion and snake bites with 21.08%. The risk of traffic accidents during the hive transportation is second with 15.91%, the risk of fire during the use of the bellows is in the 3rd place with 14.84%, and the risk of ground fighting between beekeepers is in the fourth place with 10.32%(Table 15).

Table 15. General Risks for Beekeepers

Risks	Number of beekeepers	%
Scorpion and snake bites	98	21.08
Traffic accident during hive transportation	74	15.91
Accidental fire during the use of bellows	69	14.84
Apiary fight between beekeepers	48	10.32
Food poisoning	35	7.53
Bee sting	32	6.88
Bear and pig damages	29	6.24
Tick bite	28	6.02
Allergy reaction to bee products	21	4.52
Incorrect use of the tools and machines	17	3.66
Other	14	3.01

4.CONCLUSION

It was determined that beekeepers of Izmir province mainly belonged to the middle age group, graduated from primary school and they were experienced beekeepers and were producing honey and other bee products. It was determined that 65.7% of the beekeepers had Social Security Insurance, 23.4% were under retired fund, and 2.9% had a green card and 8% had no social security.

It was determined that 77.1% of the beekeepers were not affected by cold working conditions and falling danger while 83.4% of them have not allergic reactions on skin. It was determined that 57.7% of beekeepers did not encounter physical difficulties.

The most important tool used in the transfer risk during beekeeping is hive insurance. It was determined that only 13.7% of the enterprises constructed with 50% state-funded hive transport insurance in research area.

During the beekeeping activity, health protection practices should be done as well as avoiding risks on production. Intensive researches are carried out for health-related use of bee products, as well as issues related to beekeeping, the feeding and breeding of honey bees, bee diseases, and pests. However, the studies on the health of the beekeepers have not reached the desired level. It is determined that there are some injuries because of the transportation and maintenance of colony, traffic accident during the transportation of hives, and equipment accident. Beekeeping is an intensive production model. Even though the beekeeper is faced with certain risks while producing the bee products, beekeeper can earn money from bee products and save on health expenses by protecting beekeeper health.

Beekeeper health should be taken into consideration firstly in decision-making situations, and risk factors should be evaluated in this respect. Beehives constitute a potential health and safety risk for beekeepers, agricultural workers, and local people.

Appropriate boards must be placed to warn the hives and the hazards they have created. Beekeepers should place their colonies on appropriate locations which are distant from the area where people and animals would be located; otherwise, they

could be under some health risk because of bees. Increasing R&D activities, which will minimize hand-power and reducing stress factors are very important in order to protect the health of the beekeeper.

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REFERENCES

Adams, E. C., 2018. How to become a beekeeper: learning and skill in managing honeybees. Cultural geographies, 25(1), p31-47.

Aiyeloja, A. A., Adedeji, G. A., & Emerhi, E. A., 2015. Impacts of bee hive stands' heights and hives' types on the ergonomics of honey harvesting in Port Harcourt, Nigeria. N Y Sci. J., 8(4), p23-27. (ISSN: 1554-0200).

Annila, I. T., Karjalainen, E. S., Annila, P. A., & Kuusisto, P. A., 1996. Bee and wasp sting reactions in current beekeepers. Annals of Allergy, Asthma&Immunology, 77(5), p423-427.

Annila, I. T., Annila, P. A., & Mörsky, P., 1997. Risk assessment in determining systemic reactivity to honeybee stings in beekeepers. Annals of Allergy, Asthma & Immunology, 78(5), p473-477.

Basista, K. M., & Filipek, B., 2012. Allergy to propolis in Polish beekeepers. Advances in Dermatology & Allergology/Postepy Dermatologii i Alergologii, 29(6), p440-445.

Basista-Sołtys, K., 2013. Allergy to Propolis in Beekeepers- A Literature Review. Occup Med Health Aff, 1(105), p2.

Becerril-Ángeles, M., Núñez-Velázquez, M., Grupo, D. P. D. C. D., & la Abeja, A., 2012. Risk Factors for Allergy to Honey-bee Venom in Mexican Beekeepers. Revista alergia Mexico (Tecamachalco, Puebla, Mexico: 1993), 60(3), p100-104.

Çelik, Y.,Turhan, İ., 2014. Konya İlinde Arıcılık İşletmelerinin Yapısal Özellikleri. U. Arı Drg. Mayıs, 14 (1), p15-25.

Çelikel, S., Karakaya, G., Yurtsever, N., Sorkun, K., & Kalyoncu, A. F., 2006. Bee and bee products allergy in Turkish beekeepers: determination of risk factors for systemic reactions. Allergologia et immunopathologia, 34(5), p180-184.

Çeliksoy, M. H., Sancak, R., Söğüt, A., Güner, Ş. N., Korkmaz, A., 2014. Characteristics of venom allergic reactions in Turkish beekeepers and alternative treatment modalities. In International forum of allergy & rhinology (Vol. 4, No. 7, pp. 555-558).

Donham, K. J., & Thelin, A., 2006. Agricultural medicine: occupational and environmental health for the health professions. Black well Pub.

Günbey, V. S. 2007. Van ili gezginci arıcılık hareketlerinin belirlenmesi. Yüzüncü Yıl University Institute of Natural and Applied Sciences. Master's Thesis. p:61.

Kaya, F. 2008. Ağrı İlinde Arıcılık Yapısı Ve Değerlendirme Durumu. Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 12(2).

Kovats, R. S., & Hajat, S., 2008. Heat stress and public health: a critical review. Annu. Rev. Public Health, 29, p41-55.

Light, W. C., Reisman, R. E., Wypych, J. I., & Arbesman, C. E., 1975. Clinical and immunological studies of beekeepers. Clinical & Experimental Allergy, 5(4), p389-395.

Maina, G., Rossi, F., & Baracco., A., 2016. How to Assess the Biomechanical Risk Levels in Beekeeping, Journal of Agromedicine, 21(2), p209-214, DOI:10.1080/1059924X.2016.1141132

McMichael, A. J., Woodruff, R. E., & Hales, S., 2006. Climate change and human health: present and future risks. The Lancet, 367(9513), p859-869.

Münstedt, K., Hellner, M., Hackethal, A., Winter, D., & Von Georgi, R., 2007. Contact allergy to propolis in beekeepers. Allergologia et immunopathologia, 35(3), p95-100.

Münstedt, K., Hellner, M., Winter, D., & Von Georgi, R. 2008. Allergy to bee venom in beekeepers in Germany. Journal of Investigational Allergology and Clinical Immunology, 18(2), p100.

Münstedt, K., & Thienel, J., 2012. Beekeepers in central Europe are at high risk for contracting Lyme borreliosis. Journal of Apicultural Research, 51(4), p291-297.

Nazik, H., Turhan, M., Koca, T. T., Mülayim, M. K., Öztürk, P., & Nazik, S., 2018. Arıcılarda Arı Ürünlerine Maruziyet ile Allerji, İnflamasyon ve Enfeksiyon İlişkili Durumların Araştırılması. Kahramanmaraş Sütçü İmam Üniversitesi Tıp Fakültesi Dergisi, 13(2), p34-37.

Nettleingham J, White B., 2008. Beekeeping Certificate III, Participants Learning Guide, RTE3713A Carry out workplace OHS procedures. Australian Honey Bee Industry Council: 4-18, Available at: https://www.honeybee.org.au/pdf/RTE3713A.pdf Accessed: 01.07.2019.

Newbold, P. 1995. Statistics for Business and Economics, Prentice Hall International Editions.

Özer, E. 2017. Kütahya İlinde Arıcılığın Yapısal Analizi, Arıcı Sağlığı, Güvenliği, Sorunları Ve Çözüm Önerileri. Uşak Üniversitesi Fen Bilimleri Enstitüsü Yüksek Lisans Tezi. 85 sayfa. Uşak.

Pastorello, E. A., Incorvaia, C., Sarassi, A., Qualizza, R., Bigi, A., & Farioli, L., 1987. Epidemiological and clinical study on bee venom allergy among beekeepers. Bollettinodell'Istitutosiero terapicomilanese, 67(5-6), p386-392.

Popescu, C. R. G., & Popescu, G. N., 2019. The Social, Economic, and Environmental Impact of Ecological Beekeeping in Romania. In Agrifood Economics and Sustainable Development in Contemporary Society (pp. 75-96). IGI Global.

Richter, A. G., Nightingale, P., Huissoon, A. P., & Krishna, M. T., 2011. Risk factors for systemic reactions to bee venom in British beekeepers. Annals of Allergy, Asthma & Immunology, 106(2), p159-163.

Stanhope, J., Carver, S., & Weinstein, P., 2017. Health outcomes of beekeeping: a systematic review. Journal of Apicultural Research, 56(2), p100-111.

Topal, E., Atayoğlu, T A., Kösoğlu, M., & Atayoğlu, G. A., 2016. Arıcılıkta İş Sağlığı ve Güvenliği Risk Faktörleri. 8th International Congress on Occupational Health and Safety. p:458, Istanbul, 8-11 May.

TURKSTAT, 2017. Beekeeping Statistics, Ankara.