Clinical and Experimental Health Sciences

Knowledge Level About Insects and Mites of Health School Students

Nil Bagriacik[1], Cigdem Samanci Tekin[2]

[1] Niğde Ömer Halisdemir University Faculty of Arts and Sciences, Biology Department, Niğde, Turkey
[2] Niğde Ömer Halisdemir University, Faculty of Medicine, Internal Medical Sciences, Department of Public Health, Niğde, Turkey

Correspondence Author: Cigdem Samanci Tekin
E-mail: cigdemstekin@hotmail.com

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ABSTRACT

Objective: Today, diseases transmitted by insects and mites still remain an important public health problem. Therefore, the training received by health personnel and their experiences on this topic is important. This study was conducted to determine the knowledge and experiences of students, who were health personnel candidates, on insects and mites likely to be encountered in hospitals or on patients

Methods: This study is cross-sectional. No sample selection was made and 1st – and 4th-grade students in midwifery and nursing departments constituted the universe. Independent-samples t-tests compared knowledge to identify differences by students ' experiences and education about insects and mites, $\chi 2$ tests compared frequency of correct knowledge answers according to experiences and education about insects and mites.

Results: The participants stated that, in their daily lives, they mostly encountered cockroaches (77.9%) in their environment and lice (52.5%) on their bodies. In this study, the prominent finding was that both experiences and education were important in getting information on insects and mites. Students' ratio of thinking that they had sufficient knowledge on insects and mites, the ratio of recognizing insects and mites given in images, the mean scores of correct answers given to the propositions on insects and mites, and the knowledge of struggling methods were low.

Conclusion: Today's changing environmental conditions have increased the risk of confronting epidemics related to insects and mites at any time. Therefore, it is highly important for health personnel, who are actively involved in epidemics and who consult the community, to receive effective training on insects and mites during the university period.

Keywords: Insect, Mite, Knowledge Level, Nursing Education, Public Health

1. INTRODUCTION

Many diseases are carried and transmitted by arthropods (Arthropoda), especially insects (Insecta), mites and ticks (Acari) in tropical and subtropical regions of the world. These organisms operate as biological or mechanical vectors for the spread of human-to-human and animal-to-human transmitted diseases, parasites, and their eggs on earth (1). At the same time, the developmental stages of insect populations (age composition of insect populations) constitute an epidemiological risk (2). Diptera (mosquitoes, black flies, sand flies, blowflies, flesh flies, horse flies, deer flies, stable flies, and house flies), Hemiptera (bed bugs and assassin bugs), Siphonaptera (fleas), Phthiraptera (sucking lice) and Dictyoptera (cockroaches) are most important insect groups for human health (3).

Especially, hospitals are suitable premises for harboring and spreading of many pathogens. Cockroaches (Insecta: Dictyoptera) have a very important role in the spread of nosocomial infections and drug-resistant bacteria in hospitals (4). 82 pathogenic bacteria were isolated from the flies (Insecta: Diptera) collected from hospitals in the UK and 68 strains of them were found to be resistant to antibiotics (5). Cockroaches are present in many areas that humans use in their daily lives such as houses, restaurants, hotels, malls, residences (6). The production of allergens triggering asthma and rhinitis negatively affects human health by causing the transport of enteric pathogens and psychological stress. Urban populations with low-income are the most powerful risk groups for susceptibility to cockroach allergens and the development of asthma (7,8).

Pediculosis is a parasitic disease caused by human lice (Insecta: Phthiraptera). It may originate from the head, clothes, and pubic lice depending on the etiological factor. Head pediculosis is epidemic worldwide (9). The prevalence of pediculosis is variable depending on socioeconomic status, population density, and hygiene rules (10, 11).

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Fleas (Insecta: Siphonaptera) are able to transmit agents of infectious diseases in humans and animals. Flea-borne infections are common worldwide and may have a high incidence (12). These zoonotic agents are transmitted to humans mainly through bites or exposure of feces to itchy bite lesions (13).

Bedbug (Insecta: Hemiptera) is a nocturnal, flightless ectoparasite that preferably feeds on human blood (14). The bite of a bedbug causes physical and psychological problems such as itching, rashes, allergies, insomnia, anxiety; moreover, bedbugs create serious economic concerns and quality of life problems for households (15, 16).

Scabies is a skin disease caused by Sarcoptes scabiei var. hominis (Arachnida: Acari) in humans. It is commonly seen in the world and affects humans of all races and social statuses. It is transmitted by close contact and can lead to rapid epidemics in families, dormitories, kindergartens, and nursing homes (17). Ticks are considered to be the second among the vectors of disease-causing factors in humans. It is reported that there are more than 100,000 diseases caused by tick-borne pathogens (18). Therefore, they are medically important ectoparasites. In the world and in Turkey, mite – and insect-borne diseases remains to be a major public health problem. In Turkey, currently, there are 3,649,750 Syrian refugees by 2019 (19) and the increase in infectious diseases is remarkable (20). Refugees may carry new health problems to migration areas where these problems have not been there before. Therefore, it is highly important to give primary preventive health services to immigrants (21).

After the realization of family practice system in Turkey, mostly nurses and midwives have been started to be assigned in family health centers (22). The lack of environmental health personnel in family health centers necessitates midwives and nurses to have knowledge of all aspects of health, including environmental health services. It is important for midwives and nurses to have knowledge and experience about insects and mites as health consultants. Health workers should recognize insects and mites in order to protect themselves and their environment have information on the diseases and preventive methods. Experiences and education ensure the acquisition of this knowledge.

The most common insects and mites that are scabies, louse, flea, tick, bedbug, and cockroach were involved in this study. The aim was to determine the knowledge levels of students studying in midwifery and nursing departments.

2.METHODS

2.1. Participants

The cross-sectional descriptive study design was employed. 281 1st – and 4th-grade students in midwifery and nursing departments participated in this research. No sample selection was made, and it was aimed to reach the whole universe. The rate of participation was 93.3%.

2.2. Measures

A questionnaire was prepared by the researchers by reviewing the literature and it was applied to the participants. The questionnaire consists of questions about the sociodemographic characteristics, the status of encountering insects and mites, and the sources of information on insects and mites. In addition, the questionnaire included images of insects and mites, 52 propositions to determine the knowledge levels, and questions of known struggling methods.

2.3.Data Collection

The study data were collected between October and November 2018. After the approval of the Ethics Committee, the permission of the school administration was obtained. Prior to the application of the questionnaire, the students were informed and the questionnaire was applied to the volunteers. The questionnaires were applied to the students face to face in the classroom environment. The application took approximately 20-25 minutes.

2.4. Data Analysis

Data were analyzed using SPSS Version 21.0 (IBM, Armonk, NY, USA). Data were summarized as mean ± standard deviation and percentage. Chi-square test was employed for the comparison of categorical data. To compare between the two groups, independent t test was used. The level of significance was taken as 0.05.

2.5. Ethical Considerations

For this study, permission was obtained from the Ethics Committee of Nigde Omer Halisdemir University (2018/11-06). After the students were informed about the purpose of the research and the questionnaire, the questionnaire was applied to those who gave written and oral consent.

3.RESULTS

3.1. Demographic Information

The number of female students who participated in the study was 242 (86.1%) and the number of male students was 39 (13.9%). The mean age was 20.09±1.76 years. Of the participants, 62.3% were studying in the nursing department and 37.7% were studying in the midwifery department. Of the participants, 55.5% were 1st-graders and 44.5% were 4th-graders. 77.6% of the students were living in dormitories and 15.3% were living with their families. Of the students, 55.2% stated that they lived in the province before they started university, 29.2% in the district, and 10.3% in the village (Table 1).

Table 1. *Sociodemographic characteristics of students*

Sociodemographic Characteristics	Number	%
Age		
20 years and below	160	56.9
21 years and over	121	43.1
Sex		
Female	242	86.1
Male	39	13.9
Department		
Nursing	175	62.3
Midwifery	106	37.7
Class		
1st-grade	156	55.5
4th-grade	125	45.5
Place of residence		
At home with family	43	15.3
Dormitory	218	77.6
At home with friends	15	5.3
Alone	3	1.1
Other	2	0.7
Former living place		
Province	155	55.2
District	82	29.2
Small town	14	5.0
Village	29	10.3
Other	1	0.4

3.2.Evaluation of Participants' Statuses Related to Insects and Mites According to Some of Their Characteristics

The ratio of the participants who had fed an animal once in their lifetime was 54.8%. 63% of the animal feeders had fed two or more species of animals. The participants stated that they had fed many animals such as cat, dog, bird, fish, chick, cow. The ratio of those engaged in livestock farming was 14.9%. 50% of those engaged in livestock farming stated that were engaged in bovine breeding. 52.3% of the participants answered "yes" and 47.7% answered "no/no idea" to the question "Have you received information about insects and mites during your education?".

The students stated that they mostly encountered cockroaches (77.9%), lice (56.2%) and fleas (41.3) in their daily lives. The students mostly encountered lice (52.5%) on their bodies. They stated that they would mostly recognize cockroaches (59.7%) when they saw one (Table 2).

There was a significant difference between those who lived in a province and those who lived in other settlements in terms of encountering lice and fleas. According to this, people who lived in settlements such as districts, villages, and small towns encountered lice ($\chi 2=9.132,\ p=0.03$) and fleas ($\chi 2=8.885,\ p=0.03$) more than those who lived in a province.

There was a significant difference between animal feeders and those who had never feed an animal in terms of encountering lice and ticks. According to this, animal feeders encountered lice ($\chi^2=4.128,\ p=0.04$) and ticks ($\chi 2=4.803,\ p=0.02$) more compared to those who had never feed an animal. In addition, those who were engaged in livestock farming encountered scabies ($\chi^2=5.929,\ p=0.01$) and cockroaches ($\chi^2=7.380,\ p=0.00$) more.

In terms of sex, there was a significant difference between female and male students in terms of encountering lice and bedbugs. According to this, female students encountered lice ($\chi^2=7.605,\ p=0.006$) more, while male students encountered bedbugs ($\chi^2=5.212,\ p=0.02$) more.

Of the participants, 55.2% stated that they had sufficient information about lice, 35.9% about fleas, 55.2% about ticks, 13.5% about scabies, 50.5% about cockroaches, and 11.0% about bedbugs. The source of information was close environment (54.1%), courses (34.8%) and personal experiences (40.0%) for lice; close environment (55.4%), related courses (36.6%) and personal experiences (24.7%) for fleas; close environment, related press such as TV, newspaper and courses (41.3%), internet (40.0%) and books (13.5%) for ticks; related courses (55.2%), internet, close environment (36.8%) and related press such as TV, newspaper (29.0%) for scabies; close environment (56.3%), personal experiences (46.4%) and internet (13.9%) for cockroaches; and personal experiences (46.4%), internet (25.8%) and related courses (19.3%) for bedbugs.

The ratio of recognizing insects/mites given in images was 34.8% for lice, 65.1% for cockroaches, 29.1% for fleas, 59.4% for ticks, and 16.4% for bedbugs.

3.3.Evaluation of Participants' Knowledge Levels on Insects and Mites According to Their Status of Encountering and Educational Status

The students were given propositions about the insects/mites such as their appearances, characteristics, diseases

Table 2. *The Ratio of encountering insects and mites in daily life*

Insects and Mites	Status of Encountering				I saw on my body/in my environment *		I saw on somebody else's body/in another environment*		I can recognize		I cannot recognize	
	Yes		No		N	%	N	%	N	%	N	%
	N	%	N	%								
Lice	158	56.2	123	43.8	83	52.5	93	58.9	108	38.4	173	61.6
Fleas	116	41.3	165	58.7	37	31.9	87	75.0	83	29.5	198	70.5
Ticks	92	32.7	191	67.3	16	17.3	87	94.5	97	34.5	184	65.5
Scabies	13	4.6	268	95.4	1	7.7	12	92.3	6	2.1	275	97.9
Cockroaches	219	77.9	62	22.1	93	42.5	149	64.8	168	59.7	113	40.3
Bedbugs	50	17.8	231	82.2	20	40.0	36	72.0	27	9.6	254	90.4

** Multiple options were selected.*

they carry, and struggling methods and they were asked to answer them as true/false/I do not know. The answer "true" was evaluated as "1 point" and the answers "false" and "I do not know" were evaluated as "0 points". The mean scores of "true" answers given by the students to the propositions on insects and mites were given in Table 3. Accordingly, the most correct answers given to the propositions were about lice. The second most correct answers were given about ticks. The lowest score was obtained about bedbugs.

Table 3. *Mean knowledge scores of students on insects and mites*

Insect/ Mite	Number of Students (N)	Max Score	Mean ±SD	%
Lice	281	13.0	8.03±2.54	61.8
Fleas	281	6.0	2.97±1.46	49.5
Scabies	281	8.0	3.66±2.55	45.7
Ticks	281	10.0	5.80±2.43	58.0
Bedbugs	281	7.0	2.59±2.18	37.0
Cockroaches	281	8.0	3.76±2.20	47.0

No significant difference was found between midwifery and nursing departments in terms of knowledge scores on insects and mites.

Animal feeders had a higher knowledge level on lice (χ^2=8.519, p=0.000), ticks (χ^2=6.071, p=0.04), and cockroaches (χ^2=4.006, p=0.04). Knowledge score about lice was higher in those who were engaged in livestock farming (χ^2=8.857, p=0.02).

Knowledge scores according to the status of encountering insects and mites were given in Table 4. Except for scabies, those who encountered insects and mites in their daily lives had higher scores than those who did not.

Table 4. *Mean knowledge scores of students according to their statuses of encountering insects and mites*

Insect/ Mite	Encounter	N	X	SD	t	P
Lice	Yes	158	8.49	2.35	**-3.514**	**0.001**
	No	123	7.43	2.67		
Fleas	Yes	116	3.25	1.39	**-2.731**	**0.007**
	No	165	2.77	1.48		
Scabies	Yes	13	4.69	2.32	-1.483	0.139
	No	268	3.61	2.55		
Ticks	Yes	92	6.36	2.26	**-2.727**	**0.007**
	No	189	5.53	2.47		
Bedbugs	Yes	50	4.04	1.85	**-5.928**	**<0.001**
	No	231	2.27	2.13		
Cockroaches	Yes	217	4.07	2.06	**-4.336**	**<0.001**
	No	64	2.65	2.31		

When the first-graders and fourth-graders were compared in terms of mean knowledge scores on insects and mites, fourth-graders were found to have higher knowledge scores on lice (χ^2=9.240, p=0.00), fleas (χ^2=3.216, p=0.01), scabies (χ^2=4.488, p=0.00), ticks (χ^2=6.208, p=0.01). The students who received training on insects and mites during their education had higher knowledge scores on insects and mites than those who did not receive (Table 5).

Tablo 5. *Mean knowledge scores of students according to their statuses of receiving training on insects and mites*

Insect/ Mite	Training	N	X	SD	t	P
Lice	Yes	147	8.87	2.56	**-6.257**	**<0.001**
	No	134	7.10	2.18		
Fleas	Yes	146	3.38	1.46	**-5.063**	**<0.001**
	No	135	2.93	1.33		
Scabies	Yes	146	4.33	2.61	**-4.787**	**<0.001**
	No	135	2.93	2.26		
Ticks	Yes	146	6.68	2.15	**-6.763**	**<0.001**
	No	135	4.84	2.36		
Bedbugs	Yes	146	3.30	2.16	**-5.995**	**<0.001**
	No	135	1.82	1.94		
Cockroaches	Yes	146	4.30	2.09	**-4.403**	**<0.001**
	No	135	3.17	2.16		

The ratio of known struggling methods for insects and mites was 72.2% for lice. 6.5% of the answers were common struggling methods such as gas oil, vinegar, garlic, and aspirin.

The ratio of known struggling methods for fleas was 37.4% and 2.9% of those were common methods such as diesel oil and vinegar. The ratio of known struggling methods for ticks was 40.9% and 19.3% of the respondents stated that when encountered a tick, the one should apply to a health care facility and 14.5% stated personal protective measures such as wearing long clothes in green areas. 4.8% of the respondents gave incorrect answers such as removing the tick with tweezers, burning, using bleach. The ratio of known struggling methods was 18.1% for scabies, 41.3% for cockroaches, and 23.8% for bedbugs.

4.DISCUSSION

This study aimed to determine the knowledge and experiences of students, who were health personnel candidates, on lice, fleas, scabies, ticks, bedbugs, and cockroaches that they may frequently encounter in the field. Because vector-borne diseases cause significant morbidity and mortality worldwide (13). In recent years, there has been a striking change in the geographical and host areas and diseases of many vector-borne pathogens, generally due to climate change and destruction of wild habitats (12). This means that the geographical spread of mites and insects is expanding, and their life cycle processes are changing. Thus, the incidence of vector-transmitted diseases may increase due to their large scale spread.

With the health reform that started in 2003 in Turkey, the family practice system has been realized and spread all over the country by 2010. With the family practice system, midwives and nurses take an important role in the functioning of the primary health care system together with family physicians (22). Nurses and midwives can consult all individuals, families, and community who are in need in terms of health whether they are sick or healthy at any level of age (23). Consultancy of health personnel becomes more important, especially in rural areas. In this study, those who lived in rural areas and those who were engaged in livestock

farming encountered insects and mites more. From this point, it becomes more important for health personnel to have knowledge about infections that can be encountered frequently in rural areas and that are caused by insects and mites and diagnosis, treatment and prevention methods. Otherwise, health professionals who are unaware of the presence of these infections generally postpone the diagnosis and treatment and therefore these infections are often ignored when determining the cause of a patient's disease (12). Similar to the other studies conducted in Turkey, female students in this study encountered lice more and the most encountered insect on students' bodies was lice (24). Lice are ectoparasites, can be transmitted by direct human-to-human contact, and can easily cause epidemics. Pediculosis is an important health problem for primary school-age children in Turkey and in many parts of the world, including developed countries (25). Although lice infestation is less common in Turkey, it is still confronted today (26). The studies conducted on lice in Turkey are generally the review articles and focus on prevalence (24). In order to prevent lice infestations, it is recommended to make screenings at regular intervals (27). However, there is no study found describing the knowledge level of health personnel on lice. Therefore, similar studies to be conducted with health personnel are required.

In this study, participants stated that the least encountered one was scabies. Only one female student reported that she had scabies. Similarly, there are a limited number of studies on scabies that determine its prevalence in Turkey (26). The prevalence of scabies worldwide is unknown (28).

Studies conducted on fleas in Turkey mostly include animals (29). Likewise, studies on fleas in the world have been generally conducted on animals (30; 31).

The lowest knowledge score of the participants was on bedbugs. In a similar study, it was found that 70% of people who live at homes where there was bedbug infestation were unaware of the presence of bedbug (32).There are few studies conducted in Turkey on bed bug (Cimex lectularius) (33).

The participants encountered cockroaches the most in their daily lives (77.9%) and stated that they would recognize cockroaches the most when they saw one. Likewise, in the studies conducted in the world, participants stated that they encountered cockroaches in their houses ranging from 50% to 81.5% (34,35). Studies in Turkey mostly focuses on the allergenic aspect of cockroaches (36).

The importance of ticks has increased in Turkey, especially with the detection of cases of Crimean-Congo Hemorrhagic Fever. In Turkey, especially since 2006, there been an obvious increase in the number of cases, almost 5% of the cases were fatal (37). This situation has caused the printed and visual media and the Ministry of Health to focus more on the issue. In our study, the students stated that they had the highest knowledge level on ticks as well as lice. Similarly, the sources that students learn about ticks the most are the press such as television and newspapers and the close environment.

Participants' sources of information about insects and mites were generally the experiences they gained by themselves or from their close environment and the training they received.

It is crucial for healthcare professional candidates to properly know medical methods in the struggle against insects and mites. In the struggle against pediculosis it is of particular importance to do checking regularly, obey the personal hygiene rules, change clothes and bedclothes regularly and use products such as shampoo, lotion and cream against pediculosis (38). In the struggle against pediculosis our study also gave traditional, and mis known answers like gas oil, vinegar, garlic, and aspirin use. Scabies is an easily transmitted illness, and it spreads quickly in bad hygiene conditions and crowded spaces. In the struggle against scabies, it is of prime importance to know the symptoms properly, make true diagnosis and treat the patient and his/her relatives. The patient's clothes and bedclothes should be washed properly (17). In the struggle against flea, it is of prime importance to vacuum the environment properly, have the pets checked, cleaned, and treated regularly and wash the patient's clothes (39). In the struggle against flea our study also gave traditional, and mis known answers like diesel and vinegar. In the struggle against bedbugs appropriate insecticides should be applied for beds and floorings (40). The use of chemical insecticides in the struggle against cockroaches has not been chosen in recent years because of their harm to the environment, humans and other creatures and the resistance of the insects (41). Instead, boric acid and insecticide-containing jelly feed have been used in recent years (42). Also, the use of entomopathogen isolate against cockroaches is becoming widespread (43). In the struggle against ticks the people who live in endemic areas or travel to these areas should pay a particular attention to personal protection. Ticks are usually active between October-April. People should take precautions such as keeping away from areas like grasslands, waterfronts, forests, animal shelters or wearing long-sleeve and light-colored clothes, socks, gumboots and putting the trotters into the socks (44). It is necessary to often check the body and clothes for ticks and immediately remove the tick using fine-tipped pliers or tweezers near the mouth area in an upward position without breaking off and crushing the head or apply to the nearest healthcare organization. Bug-repellents should be used against tick attacks. It is of particular importance to disinfect animal shelters with acaricides and calcimine them with lime (45). In the struggle against ticks our study gave traditional and misknown answers like burning, using bleacher and removing the tick via hands or tweezers without paying attention to its integrity. Fact that the medical personnel candidates also mentioned traditional and misknown methods regarding the methods of struggle against bugs and mites, demonstrates that experiences also play an important part in learning and unless supported with education they may lead to incorrect and/or inadequate learning. The fact that the ratio of those who thought that they had sufficient information about insects/mites and the ratio of recognizing insects/mites given in images were low supports this situation. Likewise, the mean scores of

participants for propositions about insects and mites were low. In this study, the prominent finding was that knowledge of insects and mites was obtained through experiences and training. It cannot be expected that students have experience for each insect/mite, but they can be taught through courses. In relevant courses, they should be provided real insects and mites, and students should be given the opportunity to examine insects and mites. For this purpose, laboratory practices should be provided with the courses and students should also be allowed to do an internship in rural areas. Because even if students encounter insects and mites in their daily lives, their knowledge will remain insufficient unless supported by theoretical knowledge.

Considering the rapid increase and aging of information, which is the characteristic feature of the information age, nowadays, professional midwifery/nursing education should have the characteristics in a way that it can provide continuous development and adaptation to innovations through effective learning. This necessitates the selection of effective learning methods that will enable learning through experiences in the teaching-learning environment (46).

Strengths and Limitations

The strength of this study is that it is the first comprehensive study that determines the knowledge levels of students, who will be health personnel in Turkey, on commonly encountered insects and mites. The research cannot be generalized since it included only the students of the school of health in a university.

5. CONCLUSIONS

Today's changing conditions have increased the risk of confronting epidemics related to insects and mites at any time. It is highly important for health personnel, who are actively involved in epidemics and who consult the community, to receive effective training on insects and mites. Therefore, the curriculum should be reviewed, appropriate laboratory conditions should be established, and students should be ensured to gain experience through internships. There are limited studies on this topic; therefore, further scientific studies are required.

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