Egyptian Journal of Veterinary Sciences

https://ejvs.journals.ekb.eg/

Poll Study for Cross-sectional Analysis of Population Data on Rodent Zoonoses, Specifically Leptospirosis, in The North-Central Region of Algeria

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Abstract

THE main objective of our study was to highlight the Blida region population knowledge status about rodent zoonosis, mainly leptospirosis. Data were collected through printed questionnaires applied to a sample of 252 interviewees. The data were entered and coded into tables in Microsoft Excel 2013 and then transferred into the R program for advanced analysis, frequencies were also calculated. The result showed that 91.3% of the respondents confirmed the transmission of the diseases from rodents to humans, however the knowledge about the main risk factors of transmission was insufficient; 38.5% of them stated that contamination occurs through rodent's bite, while, only 6.35% of the respondents cited contamination through contaminated food and 0.4 % of them cited contamination through sewage water. Plague was the most mentioned (23.01%) zoonosis. Some of the interviewees cited respectively, Malaria and Cholera (0.4%, 1.98%); however, these diseases are not associated with rodents. Regarding prophylaxis; 32.9% declared that cleaning and hygiene are necessary to avoid rodent's zoonosis transmission. Concerning leptospirosis, only 14.7% Heard or knew about the disease with urine as a principal factor of transmission cited by just 4.37% and jaundice as symptom by only 2% of the participants. Our study indicates the potential knowledge of the population of Blida about rodent zoonosis and its spread, which needs to be increased.

Keywords:Algeria, humans, Leptospirosis, Rodents, Zoonosis

Introduction

Rodents are the dominant extant mammalian order, accounting for approximately 42% of global mammalian biodiversity [1-2]. They are divided into 33 families grouped into approximately 2277 known species, and with worldwide distribution, except in Antarctica and a few isolated islands [2-3]. They are considered small to medium-sized mammals with a short reproductive cycle and large litter [4], and are known to adapt well to various habitats [4-5]. Rodents had commonly accompanied men in their worldwide dispersal, becoming invasive in the areas where were sited, wreaking havoc on biodiversity and deep impacts on human activities [5-3].

Zoonotic diseases represent over 60% of human infectious diseases [6], they are usually originated from wildlife [7] with rodents related to over 80 of them [8]. The most important rodent-borne diseases are hantavirus pulmonary syndrome, haemorrhagic fever with renal syndrome, bubonic plague, and leptospirosis [9]. Rodent-borne diseases can be transmitted to human directly; through bites or inhalation of germs from rodent's feces, or indirectly; through consumption contaminated food and water with rodent feces and or urine [9].

Leptospirosis is an re-emerging rodent-borne disease [10] caused by spirochetes of the genus Leptospira [11] Human contamination can occur

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(Received 15 October 2024, accepted 15 December 2024)
DOI: 10.21608/EJVS.2024.328398.2426

directly after exposure to contaminated animal's urine via broken skin, abrasion, or mucous membranes or indirectly through contact with polluted water or soil after being contaminated with infected animal urine [12] The majority of Leptospira infections are subclinical, nevertheless, a variety of symptoms can appear in humans such as high fever, headache, muscle aches, abdominal pain, meningitis, jaundice, renal failure, and haemorrhagic fever [13]. Small mammals, principally rodents, are chronic carriers of Leptospira and are the major reservoir host in the transmission of leptospirosis. [14] The precise number of human cases is unknown. Available reports show that the incidence rate varies from 0.1 to 1 Pcm (Pcm=100000) persons per year in temperate areas and from 10 to 100 Pcm inhabitants per year in the wet tropic regions [15], in effect, more than 1 million (14.8 cases per 100,000) clinical cases of leptospirosis occur annually, and almost 60,000 leptospirosis-related deaths (0.84 per 100,000) took place worldwide [16].

In Africa, the prevalence of leptospirosis in hospitalised patients presenting fibril illness ranged from 2.3% to 19.8% [17]. In North Africa, according to Barakat et al. [18] the prevalence of leptospira infection was about 25.3 % in human and 66.8 in animals in Egypt, however in Maroco, the prevalence of leptospirosis among high-risk populations was estimated to be 24.1% and 10.4% on general public [19].

Despite the increasing incidence, leptospirosis is unfortunately a neglected disease and lack of awareness and basic comprehension about the infection persist, especially, among high-risk groups [20]. However, a systematic understanding of people attitudes and practices toward contact-transmitted zoonosis is required to develop and implement effective preventive control measures [21-22]. Rodents are synanthropic and reservoir hosts of several Zoonoses, posing by consequences a significant risk to humans. For this reason, to avoid infection risk, people must have at least a basic knowledge of rodent zoonosis and their transmission risk.

The population's knowledge about rodent-borne zoonosis, particularly leptospirosis, has been studied in numerous parts of the world, including tropical countries such as Malaysia [23-24] and Brazil [25-26]. However, no research has been conducted in Algeria; an African Mediterranean country. Our study aimed to assess people's knowledge about rodent zoonosis, particularly leptospirosis, in Blida, Algeria and to identify factors that influencing rodent zoonosis preventative behaviours.

Material and Methods

Study sites

The present study was conducted in Blida city, a central northern state of Algeria. City population was estimated to be 1.081.376 in 2022 [27]. Blida is 229 meters above sea level; it is limited from the south by the Chrea Mountain, this characteristic gives her protection from the dry southern Saharan winds (Fig.1) and allows her to benefit from a sub-humid Mediterranean climate with hot dry summer, and cold wet winter. The average temperature is 4°C in January and 33°C in August, rainfall ranges from 600 to 1200 mm, relative humidity is about 59 to 70 percent. These favourable meteorological data supports vegetation; its arable soil is ideal for citrus and vegetable cultivation. The research location was precisely the downtown city (36028'12.0" N2049'43.4" E), where people from all across the city comes to shop (Fig.1).

Study design

A cross-sectional study was conducted in the above-mentioned region to assess people's knowledge related to rodent zoonosis, particularly leptospirosis. A sample of 282 was calculated based on a sampling error of 5% (confidence level of 95%), 35% of relative precision [28] and 10% of positive rate response to the principal question "whether they had ever heard of leptospirosis or rats yellow fever". Inclusion criteria were > 15 years old, residents of Blida, and agreeing to participate in the study. The questionnaire was developed in Arabic by the investigators. Before being used, it has been evaluated and revised. Oral face-to-face interviews were conducted and data were collected by means of printed questionnaires. The study was realised from June to September 2021.The questionnaire consisted of 28 questions categorized into three sections:

1) Sociodemographic characteristics (age, gender, educational level and occupation), 2) General knowledge about rodents, zoonosis, transmission and prevention, 3) Knowledge about leptospirosis, common symptoms, transmission and prevention practices. Respondents were given three answers options including "yes," "no," and "do not know." If the answer was "yes" an open end question was asked without options to explain.

Statistical analysis

Data were entered and coded into tables in Microsoft Excel 2013 (Microsoft corps, Redmond, Wa) and then transferred into the R program for advanced analysis. Descriptive statistics including means and frequencies were calculated. Sociodemographic parameters and knowledge scores underwent numerous logistic regression analyses. All P values were considered statistically significant at $P<0.05$.

Results

Sociodemographics

Two hundred fifty-two questionnaires (252) could be distributed corresponding so to 252 respondents, among them 108 were men and 144 were women (42.86%, and 57.14% respectively). People aged 15 to 82 were interviewed; the most

frequent age group was between 30 and 50 years (123/252; 48.80%). Concerning educational levels; the predominant level of schooling was the high school (34.52%), and university level (37.7%). The dominant occupation was student (23.41%) while 20.2% of the respondents were housewives and 3.97% of them were working in the medical sector (Table l).

Generals' knowledge about rodents and zoonosis

Most respondents considered rodents as dangerous (74.2%), while (12.3%) considered them both annoying and dangerous animals. (91.3%) confirmed their knowledge of disease transmission from rodents to humans. For transmission mode question, 141 of the 252 (56%) respondents answered by "yes" and (38.5%) of them suggested that diseases can be transmitted to human by bite, while (0.4%) of them stated that the transmission can occur by inhalation of the germs, through other animals, and through water sewer (Tab2). More than half of the respondents (137/252; 54.4%) answered negatively to the question concerning the knowledge of the rodent-borne zoonosis, whereas among the positive answers plague was the most cited (58/115; 23.01%). Septicemia (22/115; 8.73%), rabies (19/115; 7.54%) and leptospirosis (13/115; 5.16%) were also cited. Regarding the question asked about the disease transmission possibility from rodents to other animals (159; 63.1%) of the respondents responded positively and (168; 66.7%) of them thought that these diseases can be transmit by those animals to humans. Of the 252 people interviewed, (228; 90.5%) had rodents around or in their house, and (222, 88.1%) of the total interviewees control the population of rodents, by using rodenticides (142; 56.35%) and by using both rodenticides and bates (38; 15.1%), however, (17; 6.75%) of them chose to control rodents by rising cats or just killing them with rocks.

Concerning prevention methods, less than half of the respondents (121/252; 48%) stated to know how to prevent contamination, among them 83 (32.9%) thought that diseases could be prevented by cleaning and hygiene, (44/252; 17.5%) by controlling rodent's population, and (8/252; 3.2%) by vaccination (Table2).

Knowledge about leptospirosis

Only (37/252; 14.7%) from the 252 people interviewed knew or had previously heard about leptospirosis. One among the respondents (1/252; 0.4%) had once leptospirosis in his life, whereas (13/252; 5.2%) knew people who had leptospirosis. When asked about symptoms, 7.9% of them claimed to know the symptoms, fever was the most cited (17/252; 6.75%), jaundice (5/252; 2%) was also mentioned as a symptom (Table 3).

Regarding leptospirosis transmission (26/252; 10.3%) positively answered, and (21/252; 8.3%) of the respondents thought that leptospirosis can be transmitted by bites, while, (11/252; 4.37%) cited urines (Table3). A question was asked about the possibility of leptospirosis transmission to human through other animals; 8 eight of the total of the respondents (3.17%) answered by "yes", with 5 (five) cited dogs, and 4 (four) cited cats (Table 3).

Regarding prophylaxis methods against leptospirosis, 35 interviewed answered this question, with (31/252; 12.3%) suggesting cleaning and hygiene, (29/252; 11.5%) mentioned collecting garbage and (28/252; 11.5%) recommended controlling rodent populations (Table 3).

Finally, to verify the association level between the respondent's sociodemographic characteristics and the knowledge of leptospirosis, multivariable analysis was applied and showed that knowledge was significantly associated with the age (OR=1.03, P=0.01227) and the educational level of the respondents (OR=1.70, p=0.00862), however, no significant difference was observed concerning their gender and their occupation (P>0.05) (Table 4).

Discussion

The main objective of the present study was to assess public level knowledge and awareness about rodent zoonosis, particularly leptospirosis. To achieve our goals, a cross-sectional study was conducted in the city of Blida, Algeria using a printed questionnaire. Most of the respondents were women (57.14%), adults (48.80%) studying (23.41%), and having university educational level (37.7%).

The majority of the respondents considered rodents as dangerous animals (86.5%) and can transmit diseases to human (91.3%) effectively; according to the World Health Organization, rats pose a considerable risk to human health, mostly to young children and older people [29]. However, when asked about the main risk factors of rodent-zoonosis transmission, only around the half (56%) of the interviewees claimed to know these factors with bites as risk factor, the most cited (97/252; 38.5%). Inhalation, sewage water and transmission through other animals were however cited by only (1/252; 0.4%) for each one, well, according to Meerburg et al [9], rodent-borne diseases can generally be transmitted to humans directly or indirectly through bite, inhalation, or food or water contaminated with rodent's urine or feces [9]. Approximately half (54.4%) of the participants did not know rodent zoonosis. However, among others, plague was the most cited (23.01%), rabies (7.54%), and leptospirosis (5.16%) were also mentioned. Cholera (1.98%) and malaria (0.4%) were cited as rodent zoonoses by some of the respondents; however, cholera and malaria are water borne diseases [30] and vector borne diseases [31] respectively. Knowledge about plague as

rodent's zoonosis disease is probably associated to the history of this disease in Algeria; archives reported epidemics of plague in the 14th century, the epidemics had affected principally the port of Oran in 1556 and 1678 (with 3,000 deaths), another epidemic had hit the port of Skikda in 1899. Latterly, three other epidemics were reported in 1921, 1931, and 1944 with respectively 185, 76, and 95 cases [32, 33]. Regarding rabies, dogs are literally considered as the main source of human rabies deaths, and contribute with up to 99% of all rabies transmission to humans [34].

Almost, all the respondents (90.5%) had rodents around or in their house, and (88.1%) of them controlled the population of rodents by using rodenticides (56.35%), well, rodenticides are suitable, inexpensive and effective means to control moderate to severe rats infestations [35], however, an antidote has to be available in case where a non-target species has ingested the rodenticide [36], in addition, rodenticide can reduce rat populations only for a short period [29]. Furthermore, an incomplete extermination of a rat population can unfortunately provoke a temporary increase in colony's size consequently to a massive compensatory reproduction [37]. An effective rodent control is however composed of five steps: inspection, identification, corrective and preventive measures, rat control, and finally evaluation and monitoring [38]. For a few people the choice was to raise predators like cats to control rodents, using animals as predators to control rodents is considered a biological tool but it has its limits; according to Mason and Littin (2003) [39] the use of predators can just limit the growth of an already established rodent population but cannot destroy it. Constantly, approximately the half (48%) of the participants were aware of the main mode of prevention and prophylaxis, with cleaning and hygiene were the most cited (32.9%), while, only 3.2% of the respondents thought that collecting garbage and vaccination are preventive measures, effectively, the application of hygienic measures such as appropriate elimination of garbage can aid the control of urban rodent's population [35, 40] and as a result, reduce the zoonotic disease reservoirs.

Concerning leptospirosis, only (14.7%; 37/252) of the respondents had heard or knew about the disease, our result is widely lower than those found in two studies conducted in Brazil; (90.3%) [25], (93.33%) [26] and also lower to the result of the study conducted in Malaysia "all the respondents had heard about leptospirosis" [24]; effectively, leptospirosis costs more in tropical and subtropical regions as well as in Central and South America regions [41], this fact can explain for good the high level of the population knowledge of these regions about the diseases. In the contrary, in Nigeria 95.8% of abattoir workers had a poor knowledge level about leptospirosis [42]. Among the respondents, only one (1/252; 0.4%) had leptospirosis once in his life, and (5.2%; 13/252) knew people who had the disease in their life, a study conducted in Brazil [26] showed that 1.11% of the interviewers had leptospirosis in their life, and 18.89% knew persons who had leptospirosis. When asked about leptospirosis' symptoms (7.9%; 20/252) stated that they have knew it, fever was cited by 17 respondents (6.75%) and jaundice was cited only by five participants (2%). In the study conducted in Sri lanka [43] fever was the most mentioned symptom (86.0%) while jaundice was less cited (14.6%). In general, all the cited symptoms can be related to leptospirosis. In reality, the poor level of knowledge about leptospirosis and its symptoms can be explained by the fact that leptospirosis was reported to be a silent killer disease since the infected person can stay asymptomatic or can experience mild symptoms and be misinterpreted so as a flu-like illness until the disease becomes fatal [44]. Furthermore, the knowledge level concerning leptospirosis transmission means was in general very low (26/252; 10.3%), particularly via rodent's urine (11/252; 4.37%), Our results are largely lower compared to the studies conducted in Brazil [25], and Malaysia [24] (56.4%, and 73.7%) of the respondents respectively stated that people contract the disease through contact with the urine of rats, effectively, rats are known to be the most important source of Leptospira infection [45], the bacteria persists in their kidneys and are than excreted through their urine [46]. moreover, a study conducted in the city of Blida highlighted the importance of rats as potential reservoir of leptospira with a prevalence of 40.6% [47], however in the present study; knowledge about leptospirosis wasn't satisfactory;

In addition, none of the indirect contamination ways was cited. At the same time, a large proportion of respondents had poor knowledge about disease transmission to humans through other animals, dogs and cats were mentioned respectively by only 1.59% and 1.98% of the respondents. In the study conducted in Brazil [26], only (0.37%) of the respondent thought that cats are transmitter animals of leptospirosis. However, human Leptospira infection can also result from exposure to infected urine of non-rodents such as bats, ruminants, carnivores, primates, wild boars, deer, and dogs [48]. Unfortunately, concerning leptospirosis prevention, awareness level was considered low (35/252; 13.9%), the respondents cited collecting garbage (11.5%), cleaning and hygiene (12.3%), and control of the population of rodents (11.1%), effectively, Leptospirosis can be prevented by avoiding direct contact with infected animals or indirect contact with contaminated water and soil, the disease can be prevented also by wearing protective clothes and shoes and by keeping personal hygiene, in case of injuries, wounds and scars had to be protected, people had also to drink clean water [49]. According

to regression analysis, age was identified to be a significant predictor influencing respondents' leptospirosis knowledge, a study conducted in urban community in Malaysia [50] showed that respondents younger than 32 years old had three times more good knowledge on leptospirosis. However, a study conducted in Thailand on rural community [51] showed that there was no significant correlation between the participant's age and their knowledge level about leptospirosis. Educational level was found to be also associated with knowledge about leptospirosis, our result is in accordance with the study conducted in Thailand [51] and in contrast with the one conducted in Malaysia [50]. In our survey, age class between (20-30) years, and people with university level seemed to have more knowledge about leptospirosis; our results look logical; the class of age between (20-30) years old correspond to the class of young adult peoples who are generally still studying at the university or had barely finished their studies, this category of people has often curiosity of knowledge and are more likely attracted in the media; internet, radio, television and others mains of information to the crucial subjects including diseases.

Finally, the present study has several limitations which need to be highlighted. The findings of our study could not be generalized to all the general population. In addition, the questions used were mostly an open-ended format exposing the participants to forget to mention all the possible answers. The respondents were chosen according to their acceptance in participate to the study exposing by consequence the study to a bias of selection. Moreover, more questions had to be asked, such as if they did or did not practice preventive measures against rodent's zoonosis. Nevertheless, our findings can provide preliminary information regarding knowledge level of the general population about rodent zoonosis, particularly, leptospirosis in the study area. However further and deeper studies should be conducted to evaluate better people's knowledge, attitude and practice toward rodent zoonosis to implement better and more effective prophylaxis strategies.

Conclusion

The study highlights for the first time the public knowledge level about rodent's zoonosis in Blida, Algeria. Our results indicate that it is primordial to increase people's knowledge about rodent-borne zoonosis, particularly, leptospirosis and especially knowledge about indirect transmission routes and prophylaxis methods.

Acknowledgments

The authors would like to thank all the participants in this study.

Funding statement

This study didn't receive any funding support

Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical of approval

This study follows the ethics guidelines of the Institutional Animal Care Committee of the Algerian Higher Education and Scientifc Research (Agreement Number 45/DGLPAG/DVA.SDA.14).

TABLE 1. Sociodemographic characteristics of the respondents (N = 252)

Category	Profile of respondents	Number	Percentage
Gender	Male	108	42.86
	Female	144	57.14
Age-group (years)	< 20	38	15.08
	20–30	50	19.84
	30–50	123	48.81
	> 50	41	16.27
Education	No formal education	11	4.365
	Primary school	11	4.365
	Secondary school	48	19.05
	Tertiary education	87	34.52
	University	95	37.7
Occupation	Student	59	23.41
	Medical sector	10	3.97
	Teacher	13	5.16
	Private business	23	9.13
	Administration	42	16.7
	Housewife	51	20.2
	Employee	32	12.7
	Unemployed	11	4.365
	Retired	11	4.365

TABLE2. Proportion of respondents with affirmative answers for knowledge on rodents zoonosis (N =252)

Knowledge regarding rodents zoonosis	Number	Percentage (%)
Rodents are		
Dangerous	187	74.2
Annoying	34	13.5
Dangerous and annoying	31	12.3
Rodents transmit diseases to human		
Yes	230	91.3
No	1	0.4
Don't know	21	8.3
Knowledge of the way of transmission		
Yes	141	56
No	111	44
***Transmission**		
Bite	97	38.5
Feces	34	13.5
Urine	33	13.1
Contaminated food	16	6.35
Direct contact with rodents	14	5.60
Scratches	13	5.16
Rodent's hair	10	3.97
Rodent's saliva	6	2.38
Ectoparasites	2	0.80
Inhalation	1	0.40
Throw other animals	1	0.40
Sewage water	1	0.40
Knowledge about rodent's zoonosis		
Yes	115	45.6
No	137	54.4
***Rodent's zoonosis cited**		
Plague	58	23.01
Respiratory allergies	12	4.76
Leptospirosis	13	5.16
Septicemia	22	8.73
Rabies	19	7.54
Tubercolosis	9	3.57
Scrabies	1	0.40
Brucellosis	2	0.79
Cholera	5	1.98
Malarya	1	0.40
Typhus	2	0.79
Transmission from rodents to other animals		
Yes	159	63.10
No	13	5.20
Don't Know	80	31.70
These animals can transmit to human		
Yes	168	66.7
No	11	4.30
Don't Know	73	29.00
Presence of rodents around		
Yes	228	90.50
No	24	9.50
Controlling rodent's population		
Yes	222	88.10
No	30	11.90
How to control them		
Traps	25	9.90
Rodenticides	142	56.35
Traps and rodenticides	38	15.10
Others methods	17	6.75

Knowledge about rodent's zoonosis prophylaxis		
Yes	121	48
No	131	52
***Prophylaxis**		
Hygiene and Cleaning	83	32.90
Rodent's control	44	17.50
Collect garbage	8	3.20
Avoid contact with sewage and standing water	7	2.80
Vaccination	8	3.20
Avoid direct contact with rodents	2	0.80
Public awareness	1	0.40

TABLE 3.Proportion of respondents with affirmative answers for knowledge on leptospirosis (N = 252)

Knowledge regarding leptospirosis	Number	Percentage
Know or heard about leptospirosis		
Yes	37	14.7%
Non	215	85.3%
Having leptospirosis in your life		
Yes	01	0.4%
Non	251	99.6%
Know anyone who had leptospirosis		
Yes	13	5.2%
Non	239	94.8%
Knowledge of leptospirosis symptoms		
Yes	20	7.9%
Non	232	92.1%
***Symptoms**		
Fever	17	6.75%
Exhaustion	2	0.8%
Appetite loss	2	0.8%
Muscle pain	5	2%
Jaundice	5	2%
Anemia	1	0.4%
Vomiting	2	0.8%
Hepatitis	1	0.4%
Dyspnea	1	0.4%
Cough	1	0.4%
Kidney damage	1	0.4%
Headache	1	0.4%
Death	1	0.4%
Knowledge transmission		
Yes	26	10.3%
No	226	89.7%
***Mode of transmission**		
Bite	21	8.3%
Urine	11	4.37%
Feces	10	3.97%
Inhalation	1	0.4%
Scratches	2	0.8%
Transmission to human by others animals		
Yes	8	3.17%
No	244	96.83%
***Cited animals**		
Dog	5	1.98%
Cat	4	1.59%
Livestock	3	1.2%
Boar	1	0.4%
Bat	1	0.4%
Chicken	1	0.4%

Knowledge prophylaxis		
Yes	35	13.9%
No	217	86.1%
***Cited prophylaxis**		
Collect garbage	29	11.5%
Rodent's control	28	11.1%
Cleaning and hygiene	31	12.3%
Controlling stray animal's population	17	6.74%
Insect control	12	4.76%
Don't let standing water	12	4.76%
Wear gloves and boots when gardening or sanitation maintenance	23	9.12%

***Open-ended questions and multiple responses recorded for each respondent**

TABLE 4. Multivariate logistic analysis of socio-demographic characteristics associated with leptospirosis' knowledge

Category	Variable		OR	P-value
Age	<20 years	1.03	0.01227 *	
	20-30 years			
	30-50 years			
	>50 years			
Sex	Female	1.35	0.40857	
	Male			
Educational level	No formal education	1.70	0.00862 **	
	Primary school			
	Secondary school			
	Tertiary education			
	University			
Profession	Unemployment	1.37	0.52129	
	Employee			

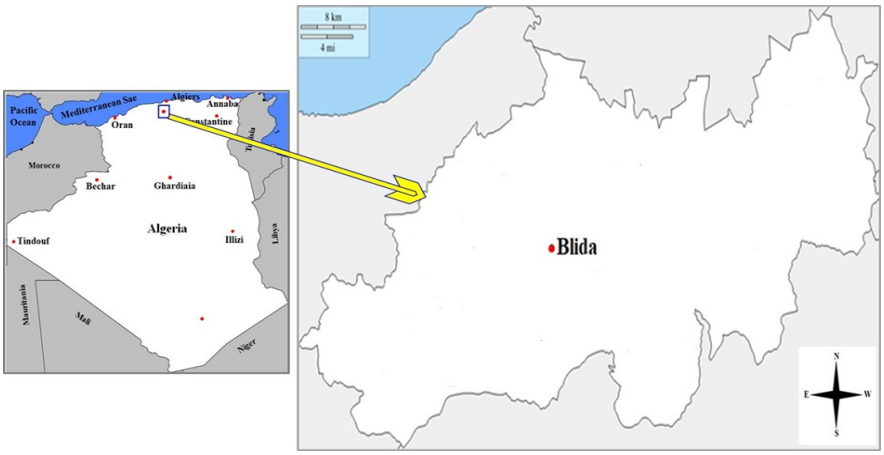

Fig.1. Study area

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دراسة مستعرضة للبيانات السكانية حول الأمراض الحيوانية المنشأ للقوارض: داء اللولبية النحيفة، في المنطقة الشمالية الوسطى من الجزائر

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الملخص

تمثلت الأهداف الرئيسية لدراستنا في تسليط الضوء على حالة المعرفة بالأمراض الحيوانية المنشأ للقوارض، وخاصة داء اللولبيات النحيفة في منطقة البليدة في الجزائر. وقد تم جمع البيانات من خلال استبيانات مطبوعة تم تطبيقها على عينة من 252 شخصًا تمت مقابلتهم. ثم تم إدخال البيانات وترميزها في جداول في برنامج مايكروسوفت إكسل 2013 ثم تم استيرادها إلى برنامج R لمزيد من التحليل، كما تم حساب الترددات. أظهرت النتيجة أن 91.3% من المبحوثين أكدوا انتقال الأمراض من القوارض إلى البشر، لكن معرفتهم بعوامل الخطر الرئيسية لانتقال العدوى والأمراض الحيوانية المنشأ لم تكن كافية؛ حيث ذكر 38.5% منهم أن التلوث يحدث من خلال لدغة القوارض. ومع ذلك، كان الوعي حول التلوث غير المباشر ضعيفًا؛ حيث ذكر 6.35% فقط من المستجيبين أن التلوث يحدث عن طريق الطعام الملوث و0.4% ذكروا مياه الصرف الصحي. كان الطاعون هو الأكثر ذكرًا (23.01%). وأشار بعض المجيبين (0.4% و1.98%) على التوالي إلى الملاريا والكوليرا، إلا أن هذه الأمراض لا ترتبط بالقوارض. فيما يتعلق بالوقاية؛ أعلن 32.9% من المجيبين أن التنظيف والنظافة ضروريان لدرء التلوث بالقوارض. أما فيما يتعلق بداء داء اللولبيات النحيفة ، فإن 14.7% فقط سمعوا أو عرفوا عن المرض، وذكر 4.37% فقط من المبحوثين البول كعامل خطر رئيسي لانتقال العدوى، وذكر 2% منهم اليرقان كأحد الأعراض. تشير دراستنا إلى المعرفة المحتملة لسكان البليدة حول الأمراض الحيوانية المنشأ للقوارض وانتشارها، والتي من الضروري تطبيق تدابير المكافحة.

الكلمات الدالة:الجزائر، البشر، داء اللولبيات النحيفة ، القوارض، داء حيواني المنشأ.