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Breeders' knowledge of diseases transmitted from animals to humans and ways to prevent them in Al-Alam district/Salah al-Din Governorate-Iraq

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Abstract

The research aimed to determine the level of knowledge of breeders about diseases transmitted from animals to humans and ways to prevent them in Al-Alam District / Salah Al-Din Governorate - Iraq in each of the following study areas: (rabies, toxoplasmosis, Malta fever, hemorrhagic fever, anthrax, salmonella, hydatid cysts) and to identify the correlation between the level of knowledge of breeders about diseases transmitted from animals to humans and ways to prevent them and the independent variables studied, which are: (size of holding, animal husbandry profession, percentage of income contribution, participation in extension activities, contact with information sources). The study community included all animal breeders in Al-Alam District, numbering (543) breeders. A simple random sample of 50% was selected so that the number of breeders who underwent the procedures became (136). The results showed that Malta fever ranked first due to its association with the field of livestock breeding, followed by hydatid cysts due to its spread in rural areas. Rabies ranked third due to its seriousness and rapid transmission, while salmonella dropped to fourth place due to the lack of distinctive symptoms, then toxoplasmosis in fifth place due to its association with a specific source, followed by hemorrhagic fever in sixth place due to its low prevalence, and finally anthrax in seventh place due to its rarity and weak awareness. The researchers recommended the need for serious implementation and enactment of laws and legislation that prevent butcher shop owners from slaughtering animals without examination or health control, and for the border crossings department not to be lenient in the quarantine system for all imported animals.

Keywords: Knowledge, breeders, diseases transmitted from animals to humans

Introduction

Agriculture is considered one of the most important sectors, alongside the services and industry sectors, in achieving individuals' social and economic goals [1]. The agricultural sector is one of the most important economic activities in all Arab countries. Animal husbandry is the second most important aspect of the agricultural sector after the plant sector [2]. Iraq is considered one of the most important countries in raising various types of animals, due to its abundance of human and natural resources. The Arab world possesses approximately (350) million heads of various types of livestock, representing approximately (9%) of the global livestock population. This huge wealth produces only (4.3) million tons of red meat [4]. The above figures are very modest, and the evidence for this is that all Arab countries import large sums of red meat, milk, and dairy products from advanced animal production countries [5]. This is due to the failure to improve local livestock breeding and reproduction, the failure to secure appropriate nutritional needs for livestock according to age and production stage, and the limited care of livestock to old traditional methods. Furthermore, there is a lack of control over diseases that ravage livestock and the climate changes witnessed in the Arab world, which affect their growth. And the development of this livestock [6].

Iraq is considered one of the most important countries that excel in animal husbandry, due to its abundance of human and natural resources. Animal husbandry also includes all types of domestic animals, such as sheep, goats, and others, which are used as a source of food and other resources [7]. Farmers must provide an environment to protect them from diseases, such as providing suitable housing, protection from diseases, providing appropriate food, and protecting them from pests [8]. This is done by providing the necessary vaccines to protect them from diseases and protect humans from infection, as animal diseases are contagious and can be transmitted from them to humans. An infected person can be a source of infection in some diseases [9]. The study of diseases common to humans and animals is of great importance, as they represent a direct threat to the public health of humans [10]. Common human diseases are sometimes referred to as communicable diseases. Human-common diseases are spread by animals or insects to people. Human health issues are caused by some of these illnesses, even if they do not affect the animal. These illnesses vary from minor, transient conditions to severe, perhaps fatal conditions [11]. Breeders must thus be knowledgeable about animal illnesses and how to avoid them. Animals are available, and many people engage with them on a regular basis, whether inside or out. Worldwide, people rely on animals for companionship, transport, sports, food, fiber, and livelihoods. Nevertheless, animals may harbor pathogenic microorganisms that people may get, leading to illnesses known as zoonoses [12]. Zoonoses result from pathogenic microorganisms, including bacteria, fungi,

viruses, and parasites. These pathogens can lead to a variety of diseases in humans and animals, varying from mild conditions to severe outcomes, including mortality. Animals may exhibit outward signs of health while harboring pathogens capable of causing illness in humans. Considering the close relationship between humans and animals, it is essential to understand the common pathways through which individuals may become infected with pathogens responsible for zoonoses [13]. Transmission routes are diverse, including foodborne pathways: consumption of contaminated items such as unpasteurized milk, undercooked meat or eggs, and raw fruits and vegetables tainted with the feces of infected animals. Vector-borne refers to the transmission of pathogens through the bite of an insect, including ticks, mosquitoes, or fleas. Direct contact refers to the interaction with the saliva, blood, urine, mucus, feces, or other bodily fluids of an infected animal. This can occur through touching, biting, or scratching. Waterborne transmission occurs through the consumption or contact with water contaminated by the feces of an infected animal. Indirect contact occurs through touching areas inhabited by animals or objects and surfaces contaminated with pathogens from these animals. Examples include fish tank water, pet habitats, chicken coops, barns, plants, soil, and pet food dishes and water [14]. The Al-Alam district was chosen as the research area because it is considered one of the agricultural districts famous for growing grain crops, vegetables and horticultural crops, in addition to raising various animals such as sheep, cows, goats, poultry, dogs and cats. Due to the danger of diseases transmitted between humans and animals and the lack of knowledge of farmers about this matter or their lack of knowledge of the level of damage that this can cause in their communities, this topic was chosen for research. Here the role of agricultural extension appears in studying and searching for obstacles and finding solutions to them. Therefore, the current research will reach results derived from reality, through which it is possible to identify the level of knowledge of breeders about diseases transmitted from humans to animals and ways to prevent them. Therefore, the research came to answer the following question:

What is the level of knowledge of breeders about diseases transmitted from animals to humans and ways to prevent them in Al-Alam District/Salah al-Din Governorate - Iraq in general?

Research objectives

- The first objective is to assess the degree of understanding of animal breeders. regarding diseases transmitted from animals to humans and methods of preventing them for each of the following study areas, in the Al-Alam District of the Salah al-Din Governorate of Iraq: (rabies, toxoplasmosis, Malta fever, hemorrhagic fever, anthrax, salmonella, and hydatid cysts).
- The second objective is to ascertain the relationship between the knowledge level of animal breeders regarding diseases transmitted from animals to humans and methods of preventing them in Al-Alam District, Salah al-Din Governorate, Iraq, and the independent variables studied: (holding size, animal husbandry profession, percentage of income contribution, participation in extension activities, and contact with information sources).

Importance of the research

Diseases transmitted from animals to humans are among the challenges facing humanity. Therefore, humans strive to reduce these diseases, identify the symptoms they cause, and find the best available treatments. It is well known that one of the primary goals of agricultural extension is to identify all the causes that may affect humans, animals, and natural resources. Therefore, the importance of this research is highlighted.

Defining the research community and sample

The research community included all animal breeders in the Al-Alam district of Salah al-Din Governorate, who were officially registered in the records of the Agriculture Division, numbering (543) distributed across the district's regions. A simple random sample of 50% was selected, resulting in a total of (136) breeders.

Preparing the questionnaire

A questionnaire was designed as the primary tool for collecting research information, as it is most appropriate for the methodology used. It is an effective means of accurately obtaining factual information and data, helping to achieve the research objectives in an organized manner. The questionnaire allows for the collection of data in an organized and analyzable manner, which increases the accuracy of the results and ensures their reliability in interpreting the phenomenon under study. The questionnaire consists of two parts:

- Part One: Consists of questions on the study's independent variables.
- Part Two: Contains paragraphs related to diseases transmitted between animals and humans. A three-point scale (I know well, I know sometimes, I don't know) is used to measure the level of knowledge of breeders about certain diseases transmitted between humans and animals in the field of science.

Measurement of Study Variables

First: Measurement of Independent Variables

1. **Holding Size:** This variable was measured by the number of dunams owned or managed by the breeder at the time of data collection.
2. **Animal Husbandry Profession:** This variable was measured according to the following levels (primary, secondary) and was assigned the following weights (2, 1), respectively.
3. **Percentage of Income Contribution:** According to this variable, respondents were classified into three levels (high, medium, low) and assigned numerical values (1, 2, 3), respectively.
4. **Previous Infection:** This variable was measured according to the following levels (yes, no), and was assigned the following weights (2, 1), respectively.
5. **Participation in guidance activities:** This variable was measured by identifying (8) activities and providing them with the following alternatives (participant, non-participant). The values were assigned to them (2, 1), respectively, with the participation level ranging from (8-16) degrees.
6. **Contact with information sources:** To measure this

variable, the researcher used (7) sources and provided three alternatives for each source (often, sometimes, I don't get it). The numerical values were assigned from (1, 2, 3), respectively, with the contact level ranging from (7-21) degrees.

Second: Dependent variable: Measuring breeders' level of knowledge about diseases transmitted from animals to humans:

The level of knowledge was measured through (105) questions, each paragraph providing information about a specific disease, distributed according to specialized fields. A scale was developed using three answer options: (I know well, I know sometimes, I don't know). The numbers were assigned upon data entry (3, 2, 1), respectively. Thus, the final score ranged from 105 to 315 points, as shown in Table (1) below:

Table 1: Shows the theoretical scope of knowledge fields

Field	Number of paragraphs	Domain score
Rabies	15 questions	15-45
Toxoplasmosis	15 questions	15-45
Brucellosis	15 questions	15-45
Hemorrhagic Fever	15 questions	15-45
Anthrax	15 questions	15-45
Salmonellosis	15 questions	15-45
Hydatid Disease	15 questions	15-45
Total	105 questions	15-45

Statistical Methods

To achieve the study objectives, data must be classified, analyzed, conclusions drawn, and final presentations presented. We used the following statistical methods (percentage, class length, range, mean, frequency distribution, Pearson's correlation coefficient, standard deviation, Spearman's correlation, and significance test).

Results and Discussion

First Objective: To assess breeders' awareness of animal-to-human diseases and preventative strategies in each of the following research regions in Al-Alam District, Salah al-Din Governorate, Iraq: (rabies, toxoplasmosis, Malta fever, hemorrhagic fever, anthrax, salmonella, and hydatid disease).

First Area: Rabies

The results showed that the level of knowledge of breeders about diseases transmitted from animals to humans in the field of rabies ranged between (15-45) degrees, with a general average of (30.75), and a standard deviation of (2.197). The respondents were divided according to the range law into three categories, as shown in Table No. (2).

Table 2: Shows the distribution of respondents according to their level of knowledge in the field of rabies

Knowledge Categories	Number	Percentage	Average knowledge
Low (15-25)	27	19.86	20.26
Medium (26-36)	75	55.14	30.12
High (37 and above)	34	25	41.32
Total	136	100%	

X^{-}= (30.75) S.d = (2.197)

Table (2) shows that the average level of knowledge category reached 55.14%, while the low category reached 19.86% and the high category reached 25%. That is, the level of knowledge of breeders in the field of rabies is average and tends to increase. This result may be due to several scientific factors that contribute to this result. The most prominent reason is that rabies is a disease known for its direct danger to humans and animals, which makes information related to it more widespread and important. Media attention to rabies, especially with incidents of bites or deaths, may play a major role in increasing knowledge. In addition, health or veterinary authorities in the region may provide some limited campaigns that focus on this disease specifically.

Second Domain: Toxoplasmosis

The findings indicated that the breeders' knowledge level concerning toxoplasmosis varied from 16 to 45 points, yielding an overall average of 28.16 and a standard deviation of 1.92. The respondents were classified into three categories based on the range law, as detailed in Table No. 3.

Table 3: Shows the distribution of respondents according to their level of knowledge in the field of toxoplasmosis

Knowledge Categories	Number	Percentage	Average knowledge
Low (16-25)	65	47.79	20.06
Medium (26-35)	55	40.44	30.10
High (36-45)	16	11.77	39.31
Total	136	100%	

X^{-} = (28.16) S.d = (1.92)

Table No. (3) shows that the average level of knowledge category reached 40.44%, while the low category reached 47.79%, while the high category reached 11.77%, meaning that the level of knowledge of breeders in the field of toxoplasmosis is low. This may be due to several possible scientific reasons. First, the disease is less well-known compared to other common diseases such as rabies. Second, the symptoms of the disease appear in an unclear manner in many cases, which makes its impact less known to breeders.

Third Domain: Brucellosis

The results showed that the level of knowledge of the breeders regarding Brucellosis ranged between (15-44) points, with an overall average of (32.19) and a standard deviation of (2.82). The respondents were divided according to the range law into three categories, as shown in Table No. (4).

Table 4: Shows the distribution of respondents according to their level of knowledge in the field of brucellosis

Knowledge Categories	Number	Percentage	Average knowledge
Low (15-24)	30	22.06	21.46
Medium (25-34)	69	50.74	31.12
High (35-44)	37	27.20	40.38
Total	136	100%	

X^{-}= (32.19) S.d = (2.82)

Table No. (4) shows that the average level of knowledge among the breeders was 50.74%, while the low level was 22.06%, and the high level was 27.20%. The average level

of knowledge, which tends to be high among the breeders regarding brucellosis, indicates that the disease is linked to the nature of their direct work with animals, especially cattle, which are the main source of infection. The increased awareness may be a result of the recurrence of disease cases in rural areas, which makes the breeders more likely to hear or know about the symptoms of brucellosis and its methods of transmission.

Fourth Domain: Hemorrhagic Fever

The findings indicated that educators' knowledge concerning hemorrhagic fever varied from (15 to 43) points, yielding an overall average of (26.11) and a standard deviation of (2.02). The respondents were classified into three categories based on the range law, as illustrated in Table No. (5).

Table 5: Shows the distribution of respondents according to their level of knowledge in the field of hemorrhagic fever

Knowledge Categories	Number	Percentage	Average knowledge
Low (15-24)	49	36.02	18.49
Medium (25-34)	59	43.39	27.92
High (35 and above)	28	20.59	36.32
Total	136	100%	

$\bar{X}$= (26.11) S.d = (2.02)

Table No. (5) shows that the average level of knowledge category reached 43.39%, while the low category reached 36.02%, while the high category reached 20.59%. The average level of knowledge tending to decline among educators about hemorrhagic fever indicates several possible scientific reasons, as the disease is less common compared to some other diseases, which reduces public awareness of it. In addition, hemorrhagic fever is often associated with limited or seasonal outbreaks, which makes it outside the scope of ongoing interest.

Fifth Domain: Anthrax

The findings indicated that educators' knowledge of anthrax varied from (15 to 45) points, with an overall average of (26.01) and a standard deviation of (1.98). The respondents were categorized into three groups based on the range law, as shown in Table No. (6).

Table 6: Shows the distribution of respondents according to their level of knowledge in the field of anthrax

Knowledge Categories	Number	Percentage	Average knowledge
Low (15-25)	70	51.48	17.09
Medium (26-36)	50	36.76	27.99
High (37 and above)	16	11.76	38.02
Total	136	100%	

Table (7) shows that the low-level category accounted for 24.26% of the knowledge level, while the medium category accounted for 51.48%, and the high category accounted for 24.26%. The results indicate that the level of knowledge of salmonella among farmers is average. This may be due to the disease being considered relatively common and affecting humans and animals, making it a generally well-known topic. However, awareness of its details and transmission methods may remain limited. This level of knowledge may come from farmers' personal experiences or field observations of the disease.

Seventh Domain: Hydatid Disease

The results showed that the level of knowledge of farmers regarding hydatid disease ranged between (19-44) points, with an overall average of (31.91) and a standard deviation of (2.79). The respondents were divided into three categories according to the range law, as shown in Table (7).

Table 7: Shows the distribution of respondents according to their level of knowledge in the field of hydatid disease

Knowledge Categories	Number	Percentage	Average knowledge
Low (19-27)	22	16.17	23.49
Medium (28-36)	78	57.35	31.99
High (37 and above)	36	26.48	39.12
Total	136	100%	

$\bar{X}$= (31.91) S.d = (2.79)

Table No. (7) shows that the low level of knowledge category reached 16.17%, while the medium category reached 57.35% and the high category reached 26.48%. The result indicates that the level of knowledge of breeders in the field of hydatid disease is average and tends to rise. This may be due to the fact that the disease is relatively common in rural environments, in addition to direct experiences or repeated observations of cases of infection among animals or humans around them, which may contribute to increasing awareness of the seriousness of the disease.

The second objective is to determine the relationship between the independent variables under investigation, which include: Breeders' awareness of animal-to-human illnesses and prevention strategies in Al-Alam District/Salah Al-Din Governorate, Iraq

1. **Size of land holdings:** The results showed that the smallest holding size was (7) dunums and the largest holding size was (201) dunums. The respondents were classified into three different categories based on the range law, as indicated in Table No. (8).

Table 8: Distribution of respondents according to holding size categories

Categories	Number	Percentage	Average knowledge	Value r	Value t
7-71	94	69.13	237.404	0.023	apparent relationship
72-136	35	25.73	219.942		
137-201	7	5.14	206.857		N.S
Total	136	100%			

* The relationship is not significant

Table No. (8) shows that 69.13% of the respondents were within the small holding size and 5.14% of the respondents were within the large holding size. Pearson's correlation coefficient, valued at 0.023, was used to ascertain the association between breeders' knowledge levels and holding size. This signifies the lack of a substantial link at the 0.05 probability level. Consequently, we adopt the null hypothesis, which posits that there is no link between breeders' awareness of zoonotic diseases in Al-Alam District, Salah Al-Din Governorate, and the extent of their land holdings. The reason may be that knowledge depends more on factors such as practical experience, the number and type of animals, and not on the area of land owned.

Common diseases are related to the direct interaction of breeders with animals and not to the area of land, which makes the size of the holding ineffective on the level of knowledge.

2. **Animal husbandry profession:** The respondents were divided into two categories: a secondary profession category and a primary profession category, as shown in Table No. (9).

Table 2: Distribution of respondents according to animal husbandry profession categories

Categories	Number	Percentage	Average knowledge	Value r	Value t
Secondary Occupation	51	37.5	207.104	0.083	apparent relationship
Primary Occupation	85	62.5	237.241		N.S
Total	136	100%			

* The relationship is not significant.

Table No. (9) shows that 37.5% of the respondents are in the secondary profession category and 62.5% of the respondents are in the primary profession category. Spearman's correlation coefficient was used to determine the relationship between breeders' level of knowledge and the profession of animal husbandry; the coefficient's value of 0.083 indicates that there is no significant correlation at the probability level of 0.05, supporting the null hypothesis that there is no relationship between breeders' level of knowledge about diseases that are spread from animals to humans in Al-Alam District/Salah Al-Din Governorate and the profession of animal husbandry. The reason may be that knowledge depends mainly on direct interaction with animals and the number of years of experience, and not on whether the profession is primary or secondary. In both cases, breeders are exposed to common diseases through their daily interaction with animals and their observation of disease cases, which makes the nature of the profession (primary or secondary) an indecisive factor in determining their level of knowledge of diseases.

3. **Income contribution ratio:** As shown in Table (10) the respondents were categorized into three categories, which were low, medium, and high contribution.

Respondent distribution by income contribution ratio category is seen in Table 10.

Table 10: Income contribution ratio category

Categories	Number	Percentage	Average knowledge	Value r	Value t
Low Contribution	31	22.79	198.5	0.099	apparent relationship
Medium Contribution	65	47.80	228.92		
High Contribution	40	29.41	215.22		N.S
Total	136	100%			

* The relationship is not significant.

Table No. (10) shows that 22.79% of the respondents are in the low contribution category, which is the lowest percentage, and 47.80% of the respondents are in the large contribution category, which is the highest percentage. The Spearman correlation coefficient was used to ascertain the relationship between breeders' knowledge levels and their income contribution percentage, yielding a result of 0.099. This signifies the lack of a substantial link at the 0.05 probability level. Consequently, we accept the null hypothesis, which posits that there is no association between the knowledge level of breeders about zoonotic diseases in Al-Alam District, Salah al-Din Governorate, and the proportion of revenue contribution. The reason may be that knowledge depends primarily on practical experience and the number of years of breeding, and not on the relative importance of raising animals as a source of income, whether the contribution of this income is large or small. Breeders continue to deal with animals daily and are exposed to common diseases through observation or direct accidents, regardless of the percentage of contribution.

4. **Participation in extension activities:** The respondents were divided into three categories based on the extension activities they had previously participated in, which were related to animal husbandry (8), as shown in Table No. (11).

Table 11: Distribution of respondents according to categories of participation in extension activities

Categories	Number	Percentage	Average knowledge	Value r	Value t
(8-10) Weak Participation	88	64.70	190.83	0.452	5.909**
(11-13) Moderate Participation	35	25.74	243.93		
(14-16) High Participation	13	9.56	291.33		probability level 0.01
Total	136	100%			

** Indicates that the relationship is significant at the 0.01 probability level.

Table No. (11) shows that 64.70% of the respondents had weak participation in the extension activities, and 25.74% of the respondents had average participation, while only 9.56% of the respondents had high participation, which is the lowest percentage. Pearson's correlation coefficient was employed to ascertain the relationship between breeders' knowledge levels and their participation in extension activities, yielding a value of 0.452. To validate the significance of this correlation, a t-test was conducted, resulting in a value of 5.909**, which exceeds the critical t

value. This finding indicates a significant correlation at a probability level of 0.01. Consequently, we reject the null hypothesis, which posits that there is no correlation between breeders' knowledge of zoonotic diseases in Al-Alam District/Salah Al-Din Governorate and their participation in extension activities, and we accept the alternative hypothesis. The reason may be that these activities contribute directly to enhancing the awareness of breeders, and extension activities provide accurate and simplified information about common diseases, their transmission methods, symptoms, and methods of prevention, which helps breeders to link This information is based on their practical experiences.

5. **Sources of information:** The respondents were divided into three categories based on their contact with information sources from which they could obtain information on common diseases, a total of (7) sources, as shown in Table No. (12).

Table 12: Distribution of respondents according to the categories of sources of information

Categories	Number	Percentage	Average knowledge	Value r	Value t
(7-11) Weak Contact	39	28.67	182.80	0.483	6.432**
(12-16) Moderate Contact	93	68.39	213.5		
(17-21) High Contact	4	2.94	294.70		probability level 0.01
Total	136	100%			

** Indicates that the relationship is significant at the 0.01 probability level

Table No. (12) shows that 28.67% of the respondents had weak contact with information sources, 68.39% had average contact with information sources, while only 2.94% of the respondents had high contact, which is the lowest percentage. Pearson's correlation coefficient, valued at 0.483, was employed to assess the relationship between breeders' knowledge levels and their involvement with information sources. The relationship's significance was assessed using the (t) test, yielding a value of 6.432**, surpassing the tabular t value. This demonstrates a substantial correlation at a probability level of 0.01. Consequently, we reject the null hypothesis, which posits that there is no correlation between the level of knowledge of breeders regarding diseases transmitted from animals to humans in Al-Alam District/Salah al-Din Governorate and the sources of obtaining information, and we accept the alternative hypothesis. The reason may be that the quality and reliability of these sources play a fundamental role in shaping the awareness of breeders who rely on reliable sources such as veterinary guidelines, awareness programs, or specialized.

Conclusion

1. The study indicated that the classification of diseases reflects their impact on human and animal health. Accordingly, brucellosis ranked first due to its association with livestock farming, followed by hydatid disease due to its prevalence in rural areas. Rabies ranked third due to its severity and rapid transmission, while salmonella dropped to fourth place due to the lack of distinctive symptoms. Toxoplasmosis ranked fifth due to its association with a specific source, followed by hemorrhagic fever in sixth place due to its low prevalence, and finally, anthrax in seventh place due to its rarity and lack of awareness.
2. The study results showed that some factors, such as the size of agricultural holdings, livestock farming (main or supplementary), and the percentage of livestock income contributing to total income, did not demonstrate any statistically significant relationship with farmers' knowledge of diseases common to humans and animals. We conclude from this that economic or organizational factors related to land size or the status of livestock as a primary or secondary business may not have a significant impact on the level of knowledge of breeders, suggesting that awareness is more related to experience, participation in educational events, and available information media.

Recommendations

1. The Ministry of Health, the Guidance Center, and the Ministry of Agriculture should organize and hold training courses, workshops, and periodic meetings for breeders on diseases common to humans and animals and methods of prevention.
2. Strictly implement and enact laws and regulations prohibiting butcher shop owners from slaughtering animals without a health inspection or oversight.
3. The Border Ports Authority should not be lenient in its quarantine regime for all imported animals.

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