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## Zoonotic Diseases in the eastern region of the Iraqi capital, between 2010-2016

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**Abstract.** There are several cases in geographical areas with zoonotic diseases before they were evident due to evolving human and climate patterns. This study was carried out to identify diagnosis, emerging diseases, as well as epidemics and pandemics affected by the zoonotic disease in Al-Ressafa, Baghdad. Data was collected between the years 2010-2016 by the Food Research Institute, Public Health Directorate, Iraq. This study targeted emerging infective diseases such as anthrax, brucellosis, cutaneous leishmaniasis, hydatidosis, rabies, and toxoplasmosis. Out of 20797 involved cases were presented, 29% emerging from zoonotic diseases. The zoonotic diseases were included parasite, viral and bacterial 75.4, 0.70, and 23.9%, respectively. Brucellosis showed high-frequency infections during March, April, and May, while cutaneous leishmaniasis occurred between February and June. The number of cases showed the male cases were 52.4 %, while the female 47.6 %. Cutaneous leishmaniasis, toxoplasmosis, and hydatidosis cases were increased at the age between 10-19 years old. In conclusion, zoonotic diseases still common on the Eastern side of Baghdad

**Keywords,** Gender: Orchitis: Meningitis: Parotid swelling: Zoonotic diseases

### 1. Introduction

Zoonosis can be characterized as disease transmission between humans and animals that occurs due to the contact between these two populations. Zoonotic diseases in humans began before fourteen thousand years ago when dogs were domesticated for hunting. Many species were later domesticated for meat or dairy products, such as goats, horses, cattle, and pigs, contributing to spreading these diseases [1]. Zoonosis not only disrupts human health but also impacts animals and animal life. Over 72% of emerging infectious diseases have recently been reported to be caused by zoonotic pathogens in humans [2]. While considerable progress has been made in managing the disease, there are still a variety of regions where domestic animal infection remains, and there is regular transmission to the human population as a result. Over the three decades ago, Iraq has undergone many security and socio-economic problems that have led to ideal conditions for many outbreaks of disease (including zoonotic diseases). The economic effects of endemic zoonotic diseases such as rabies and anthrax, which occur more frequently, remain largely undetermined [3]. In Baghdad, Al-Ressafa, the lack of adequate health systems and facilities, the rapid and unplanned mass migration of inhabitants, including internally displaced people, poor personal health education and hygiene can all raise the risk of the burden of zoonotic diseases. Factors associated with infection with the zoonotic disease in Al-Ressafa are not known to date. More awareness of reasons associated with zoonotic disease infection will help minimize the incidence of the disease and allow national strategies to correct effective factors that could enhance zoonotic disease infection [4]. In the current project, we hypothesize that



zoonotic disease infection in Al-Ressafa is substantially associated with bad hygiene and low economic status. In the current research, we selected the Al-Ressafa region, the most seriously affected by the zoonotic diseases in the capital city of Iraq, to recognize early diagnosis, response to emerging diseases, as well as determent epidemics and pandemics.

## 2. Materials and Methods

### 2.1. Study area

Baghdad population data were 8340711 (Female 4108515 and Male 4332 196). It is the capital city in Iraq. Baghdad is categorized as Al-Karkh and Al-Resaafa districts. Al-Ressafa is located on the eastern side of Baghdad, Iraq. This research was established in Al-Ressafa and characterized registered cases by gender and age group. The summary table on climatic conditions in the research region is shown in table 1 based on Köppen.

**Table 1:** Location and Climate Alterations of Baghdad, Iraq.

Parameters	Baghdad
Location	Latitude 33.312805; longitude 44.361488
Mean temperature (°C)	22.2
Average of maximum temperature (°C)	50
Average of minimum temperature (°C)	15
Humidity (%)	43.0
Wind speed (miles /h)	6.4

### 2.2. Data collection

This research has been conducted from 2010 to 2016 on emerging infective diseases (anthrax, hemorrhagic fever, brucellosis, cutaneous leishmaniasis, hydatidosis, rabies, and toxoplasmosis), with future targets for the different areas of Baghdad. Data obtained by the Food Research Institute, Public Health Directorate, Iraq.

### 2.3. Data Analysis

In Microsoft Excel (365 Business version 1910) spreadsheet, raw data is entered, edited, and handled. After coding and rechecking, data organization, description, and analyses were done.

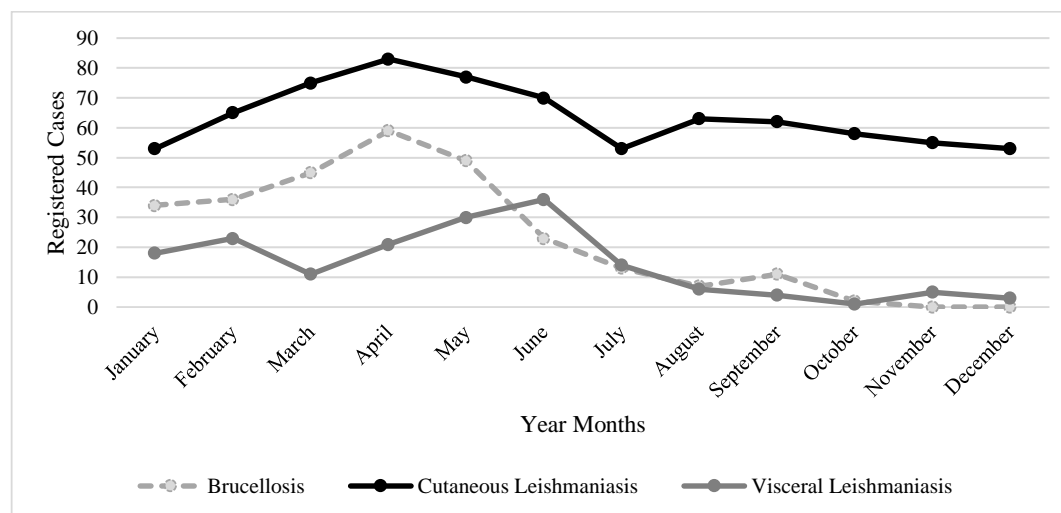
## 3. Results

From 2010 to 2016, the overall number of infectious diseases in Baghdad Al-Ressafa, Iraq, was 20797 cases. The number of zoonotic diseases was 5999 (29%), with 14798 other infectious diseases (71%). Brucellosis, rabies, cutaneous leishmaniasis, visceral leishmaniasis, hydatidosis, and toxoplasmosis were the highest five priority diseases in the descending order (Table 2). About 75.4% of zoonotic infections were parasite zoonoses, while 0.70% and 23.9% were caused by viral and bacterial zoonotic pathogens, respectively. A total of 274 cases of human brucellosis in this research area were recorded in the period from 2010 to 2016. The estimated annual prevalence of the brucellosis disease was 39.28 per 1 million people, and the highest number of cases reported in 2010 was 105 cases. Despite the total number of registered cases of animal bites were 4462 in Al-Ressafa during 2010-2016, there were 11 cases of rabies in our study. Rabies cases were the lowest among zoonotic infections recorded cases with 11 cases, whereas, in 2012, 2014, and 2015 did not register any case. However, cutaneous leishmaniasis and visceral leishmaniasis were the highest numbers of registered cases in Al-Ressafa at 957 cases. Cutaneous leishmaniosis showed an increase of number cases with time and registered; the highest number of cases is 473 in 2015, while the number of visceral leishmaniasis cases was less in 2016. Furthermore, the present study revealed 200 patients with hydatidosis have been verified over the period 2010-2016. The cases number of toxoplasmosis diagnosed each year were between 30 to zero cases during the study period.

**Table 2:** The number and ratios of zoonotic cases in Al-Ressafa during 2010-2016.

Years	Zoonotic Diseases											
	Brucellosis		Rabies		Cutaneous leishmaniosis		Visceral leishmaniasis		Hydatidosis		Toxoplasmosis	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
2010	105	38.5	5	45.5	21	2.7	54	31.4	42	21.0	26	28.3
2011	38	13.8	1	9.1	14	1.8	26	15.2	57	28.5	24	26.1
2012	41	14.9	0	0.0	20	2.5	30	17.4	41	20.5	0	0.0
2013	28	10.2	3	27.3	15	1.9	19	11.0	22	11.0	30	32.6
2014	30	10.9	0	0.0	50	6.4	15	8.7	17	8.5	10	10.9
2015	29	10.5	0	0.0	473	60.3	23	13.4	16	8.0	2	2.1
2016	3	1.2	2	18.1	192	24.4	5	2.9	5	2.5	0	0.0
Total	275	100%	11	100%	785	100%	172	100%	200	100%	92	100%

The evaluation of epidemic potential, high scores were given to endemic zoonotic diseases identified seasonality in humans in Al-Ressafa, Baghdad through the Ministry of Health and the Directorate of Public Health. This covers infections such as brucellosis, cutaneous leishmaniasis, and visceral leishmaniasis that had a seasonal distribution during the years, as presented in Figure 1. The results showed a high-frequency distribution of brucellosis cases in month March, April, and May after while the cases were declined to zero cases in November and December in the years between 2010-2016. The most confirmed cases of cutaneous leishmaniasis occurred between February and June, although the least reported cases occurred during July. Visceral leishmaniasis highest cases were in February, January, April, May, and June, where the number of cases reduced to the lowest level in October.

**Figure 1:** Distribution of seasonality registered cases of brucellosis, cutaneous leishmaniasis, and visceral leishmaniasis in Al-Ressafa.

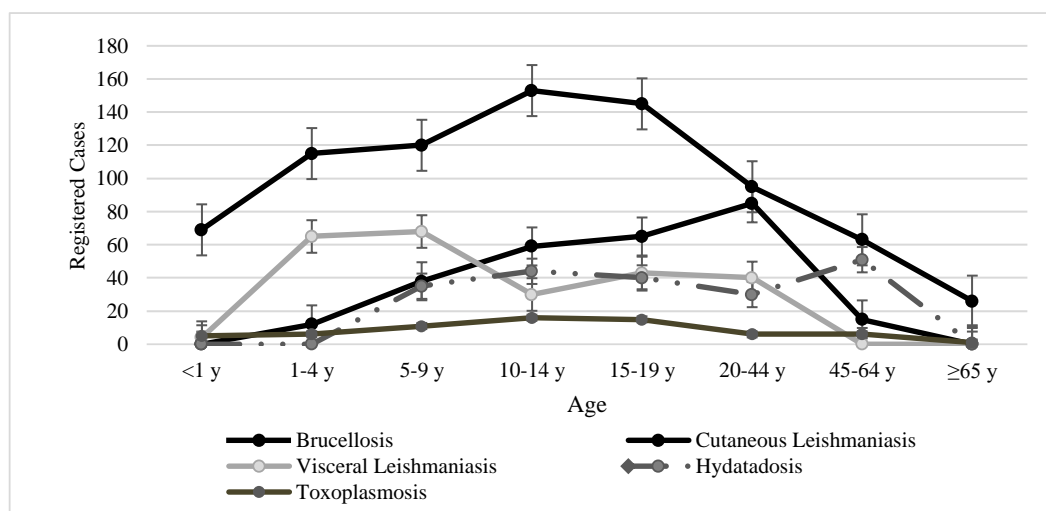
A total of 1615 cases of infectious zoonotic diseases have been recorded from 2010 to 2016, as seen in Table 3. Overall, 52.4 % of the population concerned males, while 47.6 % were involved in females. The collected data of gender stratification that shows most cases included females and was superior on males in emerging disease such as anthrax, hemorrhagic fever, visceral leishmaniasis, hydatidosis and toxoplasmosis (100, 100, 50.4, 52, and 84.8% respectively).

**Table 3:** Stratification gender of the total number of zoonotic diseases in Al-Ressafa 2010 – 2016.

Diseases	Male		Female		Total
	Frequency	Percent	Frequency	Percent	
Anthrax	0	0.00%	1	100.0%	1 (0.1%)
Hemorrhagic fever	0	0.00%	2	100.0%	2 (0.1%)
Brucellosis	161	58.76%	113	41.24%	274 (17.0%)
Cutaneous leishmaniasis	442	56.31%	343	43.69%	785 (48.6%)
Visceral leishmaniasis	124	49.60%	126	50.40%	250 (15.5%)
Hydatidosis	96	48.00%	104	52.00%	200 (12.4%)
Rabies	9	81.82%	2	18.18%	11 (0.7%)
Toxoplasmosis	14	15.22%	78	84.78%	92 (5.7%)
Total	846	52.38%	769	47.62%	1615(100.0%)

Figure 2 indicates the distribution of zoonotic cases by age classification from 2010 to 2016.

Besides, brucellosis cases were categorized by age, and their association with zoonotic disease has been checked (< 1, 1-4, 5-9, 10-14, 15-19, 20-44, 45-64, and  $\geq 65$  years). Cutaneous leishmaniasis causes infected people age between 10-19 years old, toxoplasmosis and hydatidosis cases increased for the same period, but the number of cases was the least. However, brucellosis infected patients gradually increased; it peaked between 20 to 44 years old. Visceral leishmaniasis was at the top of registered cases in patients age 1 to 9 years old after that reduced gradually.



**Figure 2:** Distribution of registered cases of zoonotic infections by age groups according to the year of registration in Al-Ressafa

#### 4. Discussion

The incidence of emerging and re-emerging diseases can be attributed to numerous causes such as a greater number of wild animals than before, increased interaction between domestic animals and humans, and lack of public knowledge. In this study, we analyzed the effects of zoonotic diseases on the data used in the province of Baghdad from 2010 to 2016 and found out the major of zoonosis comes from parasites. Weiss [5] reported the variety of parasitic zoonoses, such as cryptosporidiosis, toxoplasmosis, and leishmaniasis, have become more significant as human pathogens due to their potential to induce illness in immunosuppressive patients. However, several reports have shown that brucellosis, caused by *Brucella abortus* or by *B. melitensis* is also a major bacterial zoonosis, typically associated with the consumption of unpasteurized cheese and/or milk [6-8]. Reduced infectious cases

of brucellosis with passing years from 2010 to 2016 could be due to the rise of people awareness of boiling milk before consumption. Besides, it has been shown that the incidence rate of brucellosis decreases after the vaccination of animals, mainly after extensive vaccination acts [9].

Prior study has proved the rabies is the most common zoonotic infection in wild dogs and bats [1]. The observed difference fluctuates in rabies cases among study years in Al-Ressafa. The vaccine availability and low cost are the reason why rabies cases in Al-Ressafa have been decreased. The worldwide incidence of leishmaniasis is estimated to be roughly 12 million, with approximately 60 000 mortals a year and about 350 million people at risk [10]. Our study showed leishmaniasis the most cases in Al-Ressafa were registered between 2010 to 2016. In urban and rural areas where health services are scarce and residents lack information and understanding of the need for early access to a health center following the onset of clinical symptoms, delays in diagnosis and care are a concern [11]. However, hydatidosis is a primary parasitic zoonotic disease that is harmful to humans and animals worldwide. *Echinococcus granulosus* cause the cystic disease, and *E. multilocularis* is responsible for alveolar, and *E. vogelli* induces polycystic disease [10]. A study revealed the hydatid prevalence rate in sheep slaughtered illegally on the street was 47.9% due to the practice of raising sheep in close contact with larger stray dog populations [12]. Our findings in the number of toxoplasmosis cases are similar with [13] who stated the experts presented assessments of disease statistics based on data from the area or illnesses most closely linked to those studied, thus adding bias, in situations where illness data is inaccessible.

Seasonal changes greatly influence brucellosis, and a recent study has shown that brucellosis is closely related to seasonal changes. Increase cases of brucellosis during March, April, and May; a possible explanation for this might be indicated that temperature fluctuations could have a greater effect on human brucellosis epidemics than other climatic influences. Our finding is aligned with [14], which stated seasonality of the brucellosis dynamics could be due to the seasonal supply of forage, which is unfamiliar animal farming. However, our findings of cutaneous leishmaniasis and visceral leishmaniasis cases increased during the spring season while decreased in the other seasons could be due to climate changes have shown that the mean temperature during the rainy season has caused a rise in the disease trend of cutaneous leishmaniasis and visceral leishmaniasis. This finding was also reported by [15], who documented that leishmaniasis is influenced greatly by temperature, wind speed, air pressure, and relative humidity.

In terms of gender, brucellosis in Al-Ressafa is more prevalent in males than females, primarily due to the rise in the number of high-exposure work activities undertaken. The results of the present study are consistent with the findings of another epidemiological study [9]. In women, higher vulnerability to parasite infections, such as visceral leishmaniasis was identified in this study. The cytotoxicity of natural killer cells, with high cortisol levels induced, can help prevent the development or maintenance of immunity. The greater prevalence of women in our first pregnancy can also be clarified by these immunity processes [16]. Besides, reproductive abnormalities in women associated with toxoplasmosis were documented in this study. These results reflect those of [10], who also found that economic losses due to toxoplasmosis are mostly related to abortion and congenital illness of women and animal females. A high level of hydatidosis in females might be the housewife exposed to this parasitic disease during preparing a portion of food, especially when handling raw leafy vegetables. This study supports evidence from previous observations [3]. Regardless, in terms of rabies, men were more affected than women. The findings observed in this investigation are similar to those observed by [17].

Our study has shown increased infectious cases of zoonotic diseases for cutaneous leishmaniasis, toxoplasmosis, and hydatidosis between 10 to 19 years old. These findings support previous research linked between age and disease, [18] indicated disseminated cutaneous leishmaniasis was associated with age. They observed the most adults >37 years old had an infection through a period >60 days, while the other patients <14 years old had sickness in durations between 0 and 30 days. However, the possible explanation for toxoplasmosis incidence showed that children under 15 years of age were substantially associated with age, gender, and hematological [19]. It seems possible that these results

are due to the patients of more than 9 years of age increased prevalence of hydatid cyst, with a frequency of 71 % [20]. However, increase brucellosis cases gradually might be indicated that the immune response rises with growing not only after infection exposure but also increases the chances of being exposed to infection steadily. These findings are consistent with those of [21] whom patients <14 years old the prevalence of brucellosis was below that of other age classes. The highest risk of brucellosis was present in patients between 15 and 44 years, and the lowest occurrence in men < 1-year-old [22].

## 5. Conclusion

The conclusion of our research shows that the effects of gender, age, and area on zoonotic pathogens are essential. Age and gender might be influenced immune response, which influences the prevalence of zoonotic pathogens in humans. It can be effectively managed by controlling zoonotic disease through vaccination and quarantine.

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