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A study of the prevalence of toxoplasmosis among pregnant women attending Jadu General Hospital

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دراسة مدى انتشار داء المقوسات بين النساء الحوامل المترددات على مستشفى جادو العام

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Abstract:
This study was conducted to determine the prevalence of toxoplasmosis in the city of Jadu during 2024. The study included women who visited Jadu General Hospital during this period. Using the toxoplasmosis latex test, the results showed that 200 pregnant and non-pregnant women participated in the research, and 88 out of 200 tested positive for toxoplasmosis, representing 44%. The results also showed that the most affected age group was 21-31 years (54.5%), while the least affected age group was 41-50 years (9.1%). Regarding marital status, the percentage of married women was higher than that of single women (54.5%). The study also revealed a high educational attainment among women with toxoplasmosis, with 90.9% holding university degrees, compared to other educational levels. Regarding the pregnancy variable, the cases were divided into pregnant married women, non-pregnant married women, and unmarried women, at rates of 19.3%, 35.2%, and 45.5 %, respectively. The percentage of women owning cats was 90.9%, while the percentages of those consuming undercooked meat and unsafe water were 12% and 40.9%, respectively.

Keywords: prevalence, toxoplasmosis, jadu, Libya.

الملخص:
أُجريت هذه الدراسة لتحديد مدى انتشار داء المقوسات في مدينة جادو خلال عام 2024. وشملت الدراسة النساء اللواتي زرن مستشفى جادو العام خلال هذه الفترة. وباستخدام اختبار اللاتكس للكشف عن داء المقوسات، أظهرت النتائج أن 200 امرأة، حامل وغير حامل، شاركن في البحث، وكانت نتيجة اختبار 88 منهن إيجابية لداء المقوسات، أي ما يعادل 44%. كما أظهرت النتائج أن الفئة العمرية الأكثر إصابة هي 21-31 عامًا (54.5%)، بينما كانت الفئة العمرية الأقل إصابة هي 41-50 عامًا (9.1%). وفيما يتعلق بالحالة الاجتماعية، كانت نسبة المتزوجات أعلى من نسبة العازبات (54.5%).

وكشفت الدراسة أيضًا عن ارتفاع المستوى التعليمي بين النساء المصابات بداء المقوسات، حيث بلغت نسبة الحاصلات على شهادات جامعية 90.9%، مقارنةً بالمستويات التعليمية الأخرى. فيما يتعلق بمتغير الحمل، قُسّمت الحالات إلى نساء متزوجات حوامل، ونساء متزوجات غير حوامل، ونساء غير متزوجات، بنسب 19.3%، و35.2%، و45.5% على التوالي. وبلغت نسبة النساء اللاتي يمتلكن قططًا 90.9%، بينما بلغت نسبة من يتناولن لحومًا غير مطهوة جيدًا ومياه غير آمنة 12% و40.9% على التوالي.
الكلمات المفتاحية: الانتشار، داء المقوسات، جادو، ليبيا.

Introduction:

Toxoplasma gondii is the causative agent of a zoonosis that occurs worldwide with high prevalences (up to 80% depending on region and age) [1]. it is an apicomplexa protozoan parasite with a heterogeneous life cycle [2, 3], Humans are infected by ingesting oocysts excreted by the definitive hosts (cats) or by eating unprocessed meat containing Toxoplasma cysts, Latent infections can be activated by immunodeficiencies (e.g., in AIDS patients) and may result in cerebral or generalized symptomatic toxoplasmosis. Serological surveillance in pregnant women is important to prevent prenatal infections.

Toxoplasma is a widely distributed parasite, particularly prevalent in warm and humid regions, capable of infecting a broad spectrum of vertebrate hosts. Cats and other felids serve as its definitive hosts, while humans, along with various animals, birds, and rodents, function as intermediate hosts. [4,5].

The Toxoplasmosis organism undergoes a life cycle with two distinct phases: the sexual phase, which occurs in cats as the definitive host, and the asexual phase, which can take place in any warm-blooded animal serving as an intermediate host [6,7].

Toxoplasma gondii has three distinct infective stages: (i) the rapidly dividing invasive tachyzoites, which are present during the acute or early infection in intermediate hosts and reside within pseudocysts; (ii) the slowly dividing bradyzoites, found during the chronic or late stage of the disease, which persist as tissue cysts in intermediate hosts for extended periods; and (iii) sporulated oocysts containing sporozoites, which are excreted as non-sporulated oocysts in the feces of definitive hosts. These oocysts undergo sporulation outside the body, developing into infectious sporulated oocysts that house four sporozoites. Notably, these environmentally resilient oocysts can remain infectious in cool, damp conditions for several months [8, 9]. While the primary infection often proceeds without noticeable symptoms and most infected individuals show no signs, it can still lead to serious health issues in specific populations. This includes conditions like encephalitis, chorioretinitis, congenital infection, and neonatal mortality [10,11].

Transmission to the fetus can occur if a woman contracts the primary infection during pregnancy, potentially causing visual and hearing impairments, mental and developmental delays, seizures, blood disorders, an enlarged liver and spleen, or even death [10,12].

Toxoplasma gondii infections in pregnant women and small ruminants can lead to abortion or fetal developmental abnormalities. These infections also present significant risks for immunocompromised individuals, potentially resulting in severe health complications [13,14]. Furthermore, having cats [13, 15],

Consuming raw or undercooked pork, lamb, mutton, beef, game meat, or minced products [13,16], Consuming raw or unwashed vegetables or fruits [13,17], Frequent consumption of raw vegetables outside the home, inadequate hand hygiene, infrequent washing of kitchen knives, cleaning cat litter boxes, contact with soil, and a history of working in soil-related occupations are common risk factors for toxoplasmosis [13,17].

In Tripoli, Libya, Gashout documented an infection rate of 38.5% among women. [18,19]. Furthermore, in Benghazi, positive results were identified in 47.7% of pregnant women. The study also revealed that the highest infection rate, at 63.3%, was observed among the older age group. [18, 20]. In Misurata, a prevalence rate of 26.7% was observed among pregnant women with regard to infection. [18, 21],

An infection rate of 39.3% was recorded among pregnant women in Alkhoms using the ELISA method. Notably, the detection of T. gondii infection in humans can be achieved through various diagnostic techniques, with ELISA standing out as one of the most significant. This method is a key serological approach used to identify different classes of antibodies or antigens [18,22,23, 24], Regarding antibody production against T. gondii, IgM antibodies can be detected within one week after infection and may persist for several months or even years. However, relying solely on IgM detection is insufficient to confirm an acute infection. IgA antibodies, which are produced earlier than IgM, are considered markers of acute infection, though they may also remain for several months. IgE antibodies, on the other hand, offer a stronger indication of a current infection as they persist for only a short

duration. Meanwhile, the presence of IgG antibodies indicates a past infection but does not provide information about when the infection occurred [18, 24 ,25].

Study Problem:

Toxoplasmosis is a widespread zoonotic infection caused by Toxoplasma gondii, affecting nearly one-third of the global population, with notable regional differences. It poses a significant public health risk, especially for women of reproductive age due to potential pregnancy complications, in many developing regions, including Libya, data on its prevalence and risk factors remain limited. Key risk factors include consumption of undercooked meat, poor hygiene, contact with contaminated soil, and exposure to cats. In Jadu, the lack of epidemiological data on toxoplasmosis among women restricts the development of effective prevention and control strategies , In addition, the absence or limitation of routine screening programs during pregnancy may result in undiagnosed cases, increasing the likelihood of adverse pregnancy outcomes .

To what extent is toxoplasmosis prevalent among women in Jadu city, and what risk factors are associated with it according to an analytical study approach?

Study objectives:

1. To determine the prevalence of toxoplasmosis among pregnant women attending Jadu General Hospital.
2. To identify the risk factors associated with toxoplasmosis infection among pregnant women.
3. To assess the level of awareness regarding toxoplasmosis among the study population.
4. To evaluate the association between socio-demographic factors and toxoplasmosis infection (e.g., age, education level, occupation).
5. To provide baseline data to support prevention and control strategies.

Materials and methods:

Sample collection methods:

This study was conducted to determine the prevalence of toxoplasmosis among women attending Jadu General Hospital during 2024. The study included 200 cases diagnosed with toxoplasmosis during this period, and patient data (age, education level, gestational age) were recorded. Descriptive statistics were used to summarize the data, including frequency distributions, percentages, arithmetic means, standard deviations, and chi-square tests for demographic and geographic variables, to assess statistical significance, such as differences in infection rates among age groups, gestational age, and education level. A questionnaire was used to collect data, and the Toxo Latex Test was also used in this research paper.

Results and Discussion:

Based on the data obtained in this research, **the following results were shown:**

1. Distribution of the sample based on infection rate: (Toxo Latex test results)

Figure (1) shows the number of cases participating in the research, the number of cases infected with toxoplasmosis, and their percentages. Using the Toxo Latex test, the results showed that 88 women out of 200 were confirmed to be infected, representing 44%, compared to 112 negative cases, or 56%. The results of this study are consistent with the results of several studies conducted in different regions of Libya, including the study conducted in Sirte, Libya in 2021, which reached similar results with an infection rate of 45.5% [2], in addition to the studies conducted in Benghazi in 1991, 2011 and 2024, which had results of 47.4 %, 44.8 % and 44.1 % respectively [20, 26, 27], and the study conducted in Tripoli (1987), which showed that the infection rate was 43.4 % [28]. Comparing the results of the current study, we find that these percentages were higher than those recorded in two studies conducted in the city of Sabha (2016, 2018) [29, 30] as well as a study conducted in the city of Al-Khums (2016) [22] by 39.3%, 36.8%, and 25.9% respectively.

However, when comparing the results of the current study, we find that they were lower than those found in a study conducted in Brazil (2024) [31] and also in the study conducted in both Zawiya (2024) [32] and Madagascar (1995) [33], whose results were (55.14 %), (50.7%), and (83.5%) respectively. The variation in toxoplasmosis infection rates between studies is attributed to differences in environmental and geographical factors. Infection rates are higher in humid and warm regions because the parasite cysts survive longer in these areas. Furthermore, infection rates vary among the studied groups, particularly among pregnant women. Finally, differences in infection rates may result from variations in laboratory diagnostic methods, the type of antibodies tested (IgG or IgM), and the sample size.

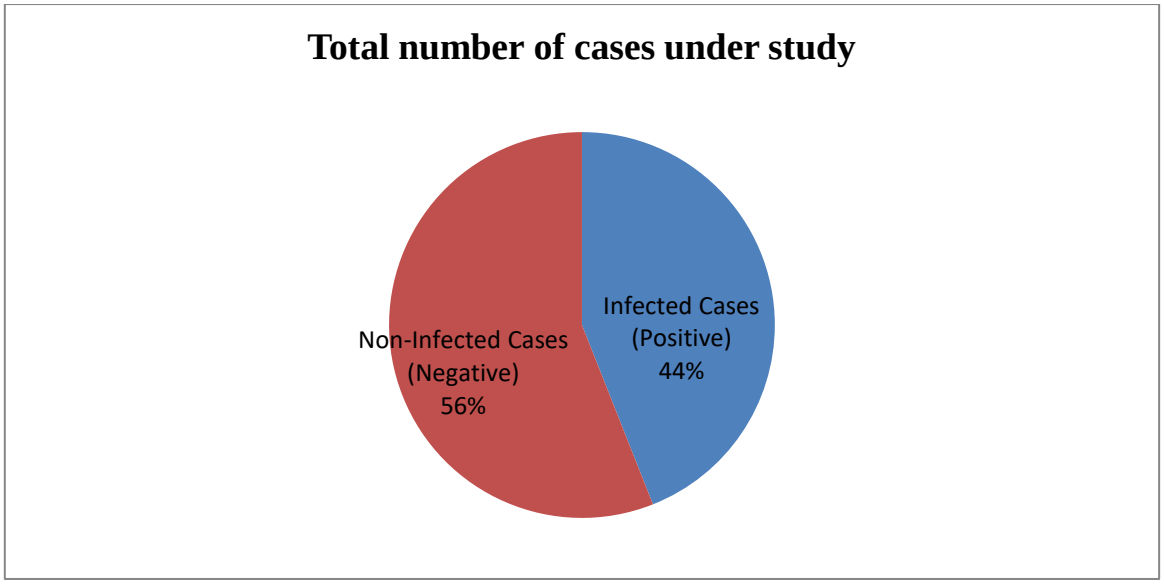

Figure (1): shows the total number of cases and the percentage.

2. distribution of sample members based on age groups:

Table (1) shows the number of cases in relation to age groups and the percentages of infected cases, with the 21-30 age group having the highest number of cases 48, representing 54.5% and the 41-50 age group having the lowest number of cases 8, representing 9.1%, The results of this study are consistent with a study conducted in Algeria (2024), which showed that the age group with the highest incidence of toxoplasmosis was 28-31 years 24.6%, while the age group with the lowest incidence was 41-44 years 3.4% [34].

This is also consistent with a study conducted in Al-Zawiya (2024), which found that the 21-30 age group had the highest incidence rate at 30.8% [32], as well as a study conducted in Iraq (2011), which showed similar age groups, indicating that the 19-35 age group had the highest incidence rate at 38.3% [4]. While the results of this study differed from those of other studies, including a 2015 study in Al-Khums that showed the 35-40 age group most affected by toxoplasmosis 40.9% [22], another study in Sirt (2021) indicated that the most affected age group was over 30, 48.15% [2]. In contrast, a 2024 study in Al-Marqab showed that the 15-25 age group had the highest infection rate 53%, while the 36-45 age group had the lowest 42% [35].

This variation in infection rates among age groups is attributed to the fact that younger age groups are often more socially and professionally active, thus increasing their likelihood of exposure to the parasite. They also represent the majority of women of reproductive age, and the number of women in this age group is usually greater in studies than in older age groups. However, older women with toxoplasmosis may have been exposed to the risk factor for a longer period compared to younger women, which may explain the variation in infection rates among different age groups.

Table (1): The distribution of sample members based on age groups

Age groups	Number of cases	Percentage	Number of infected cases	Percentage
11-20	44	22%	12	13.6%
21-30	84	42%	48	54.5%
31-40	24	24%	20	22.7
41-50	12	12%	8	9.1%
Total	200	100%	88	100%

3. Distribution of sample members based on marital status and pregnancy variable:

Figure (2) illustrates the marital status of the research participants. The results indicate that married women were more affected, with an infection rate of 54.5% compared to unmarried women, whose infection rate was 45.5%. Table (2) shows the prevalence of toxoplasmosis among these married women, indicating that 19.3% of pregnant women were infected, compared to 35.2% of non-pregnant women. These results are consistent with the results of several other studies, including a study conducted in Iraq (2024) [36]and a study conducted in Egypt (2017) [37], which showed infection rates of 13.12% for pregnant women, 87.86% for non-pregnant women, 11.81% for pregnant women, and 88.1% for non-pregnant women, respectively.

Similarly, a study conducted in Algeria in 2024 [34] reported that the infection rate of toxoplasmosis was 13.6% among pregnant women and 86.4% among non-pregnant women. However, these results differ from those of several previous studies, including a study conducted in Iraq (2011, Iraq) [4], a study conducted in Tripoli, Libya (2017) [6], and a study conducted in Al-Khums (2015) [22], which indicated relatively high infection rates among pregnant women, at 36.6%, 40%, and 39.3%, respectively. This variation in toxoplasmosis infection rates among pregnant women (high and low) is attributed to a range of interrelated factors, including immunological and biological factors, dietary habits, water sources, and the presence of cats, which are a major source of infection. Other factors specific to the studies themselves, such as sample size, study timeframe, and geographical differences, also contribute to this variation.

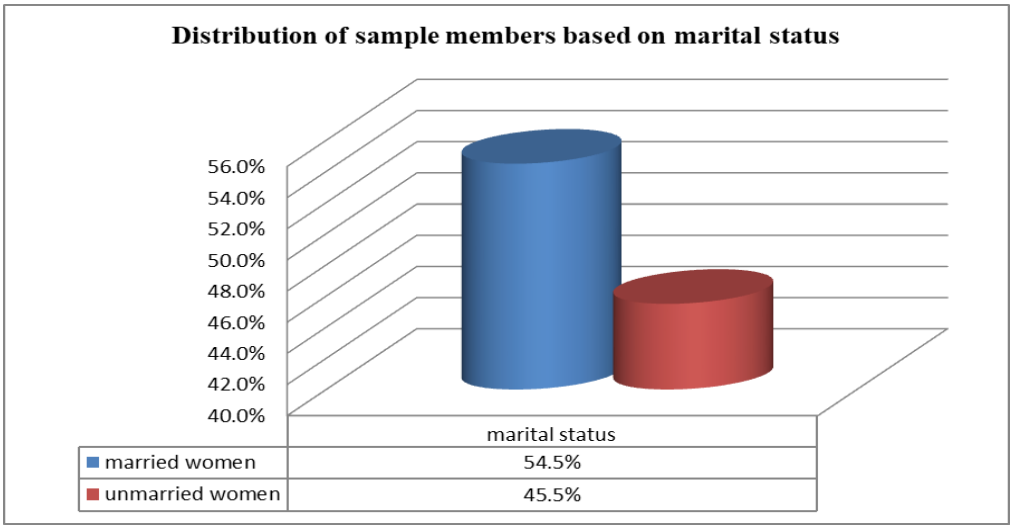

Figure (2): Distribution of sample members based on marital status

Table (3): Distribution of the sample based on the pregnancy variable and its relationship to toxoplasmosis

Pregnancy	Number of tests	Percentage	Number of infected cases	Percentage
Pregnant married women	72	36%	17	19.3%
Non-pregnant married women	36	18%	31	35.2%
others	92	46%	40	54.5%
Total	200	100%	88	100%

4. Distribution of sample members based on educational level:

Table (4) shows the data results according to the educational qualification variable. The results showed that women with a university degree had the highest incidence rate at 90.9%, compared to other qualifications. The percentages were distributed among them, with the lowest incidence rate recorded among women with a doctorate at 2%. Comparing the results of the current study, these rates appear lower than those of several previous studies, including one conducted in Brazil (2023), another in Zambia (2017), and one in France (2021). These studies showed the following infection rates: 56.7% among those with secondary education, 35.6% among those with primary education or less [38], and 7.8% among those with higher education. Specifically, the percentage of those with secondary education was 51.7% [39], while the percentage of those with higher education was 48.3%.

The percentage of those with primary education was 47.4%, and the percentage of those with university education or its equivalent was 25.5% [40]. The higher incidence of toxoplasmosis among pregnant women with low levels of education (primary/secondary) compared to those with higher levels of education is likely due to their limited knowledge of the parasite's transmission routes (level of health awareness, living and environmental conditions, and socioeconomic status related to education). The higher incidence among women with higher levels of education in this study is attributed to the larger sample size in this group, as well as the significant role of geographical variations in the spread of infection.

Table (4): shows the data results according to the educational qualification

educational qualification	frequency	Percentage	Number of infected cases	Percentage
Preparatory stage	8	4%	0	0%
Secondary Education Phase	16	8%	4	4.5%
University stage	160	80%	80	90.9%
Master's stage	12	6%	4	4.5%
Doctoral stage	4	2%	0	0%
Total	200	100%	88	100%

5. Distribution of the study sample according to cat ownership:

Table (5) shows a high rate of cat ownership among the studied cases, with 116 cases owning cats, of which 80 (90.9%) were infected, while 84 cases did not own cats, of which 8 (9.1%) were infected. The results of this study indicate a higher incidence of toxoplasmosis among cat owners. Comparing these results with other studies, we find they align with a study conducted in Sirt (2021, Sirt), which indicated that 60.87% of individuals owned cats and 53.25% had contact with pets, compared to 36% of individuals who did not have contact with such animals [2].

Similarly, these results are consistent with a 2015 study in Al-Khums, which showed that contact with pets, including cats, plays a significant role in infection, with 64% of cases linked to cat contact [22]. These findings are further corroborated by a 2019 study in Al-Asaba, which showed that 82.6% of cases were associated with contact with pets [13]. All these studies, and perhaps others to varying degrees, point to the pivotal role that pets, especially cats, play in increasing the incidence of toxoplasmosis.

Table (5): shows Distribution of the study sample according to cat ownership

Cat breeding	Samples tested	Percentage	Infected samples	Percentage
yes	116	58%	80	90.9%
No	84	42%	8	9.1%
Total	200	100%	88	100%

6. The relationship between the prevalence of toxoplasmosis and the consumption of undercooked meat and drinking water:

The results of the current study showed that 24 women (12%) consumed undercooked meat, while 176 women (88%) did not. The results also showed that 40.9% of the women participating in this study drank unsafe drinking water, while 59.1% drank safe drinking water, as shown in Table (6). These results were low compared to several other studies, including a 2019 study in Tripoli, Libya, which showed high rates of raw meat and unwashed vegetables consumption (82.5% and 83.9%, respectively) [41], and another study in Sirte (2021), which showed that the rate of unwashed vegetables consumption was 58.3%, while the consumption of treated water and rainwater was 46.69% [2]. Another study in Al-Khums (2015) showed that the rates of undercooked meat and unsafe water consumption were 40% and 68%, respectively [22]. All these studies, and others to varying degrees, indicate a relationship between incidence rates and different risk factors.

Table (6): The relationship between the prevalence of toxoplasmosis and the consumption of undercooked meat and drinking water

consumption of undercooked meat - unwashing vegetable	Number of Cases	Percentage	drinking water unsafe	Number of Cases	Percentage
yes	24	12%	yes	36	40.9%
No	176	88%	No	164	59.1%
Total	200	100%		200	100%

Conclusion:

This study highlights that toxoplasmosis (Toxoplasma gondii) poses a significant health concern for women attending Jadu General Hospital, with an infection rate of 44% observed in the sample population. The findings revealed that women aged 21–30 were the most affected compared to other age groups, and married women demonstrated a higher likelihood of infection. A strong association

was noted between toxoplasmosis infection and particular risk factors, with cat ownership emerging as a major contributor. Additionally, the consumption of unsafe water and undercooked meat was identified as significant risks.

The study further pointed out that the infection rate in Jadu aligns with figures reported in various Libyan cities, emphasizing the ongoing challenge of addressing this disease. It particularly raises concerns for women of reproductive age due to the potential for severe pregnancy complications and adverse effects on fetal development. To address these issues, the study emphasizes the need to enhance health awareness initiatives about toxoplasmosis transmission and prevention. Key recommendations include promoting regular screening for pregnant women both before and during pregnancy, encouraging improved personal and dietary hygiene, and minimizing exposure to common sources of infection. The authors also advocate for further large-scale research utilizing advanced diagnostic methods such as specific serological tests and molecular assays. Such measures would help provide a more comprehensive understanding of the disease's prevalence and its associated risk factors across various regions of Libya.

References:

1. Kayser, F. H., Bienz, K. A., Eckert, J., & Zinkernagel, R. M. (2005). Medical microbiology. Thieme.
2. Zaed, H. A. A., Elgobbi, A. M., & Faraj, F. S. (2021). The incidence of Toxoplasma gondii infection in some patients from Sirte, Libya. Sirte University Scientific Journal, 11(1), 75–84.
3. Petersen, E., Vesco, G., Villari, S., & Buffolano, W. (2010). What do we know about risk factors for infection in humans with Toxoplasma gondii and how can we prevent infections? Zoonoses and Public Health, 57(1), 8–17. doi.org/10.1111/j.1863-2378.2009.01278.
4. Kadir, M. A., Ghalib, A. K., Othman, N. F., & Ahmed, I. S. (2011). Seroprevalence of Toxoplasma gondii among pregnant women in Kirkuk, Iraq. Journal of Kirkuk University Scientific Studies, 6(2), 1–11.
5. John, D. T., & Petri, W. A. (2006). Markell and Voge's medical parasitology (9th ed.). W.B. Saunders.
6. Elgodwi, S. (2017). Study of risk factors for Toxoplasma gondii infection in Tripoli. AlQalam Journal of Medical and Biological Research, 1(1), 52–59.
7. Dubey, J. P. (1994). Toxoplasmosis. Journal of the American Veterinary Medical Association, 205, 1593–1598.
8. Elsalem, R. M. A. (2024). A review of toxoplasmosis in humans and animals in Libya. Journal of Pure & Applied Sciences, 23(1), 64–71. https://doi.org/10.51984/jopas.v23i1.2447
9. Dubey, J. P. (2010). Toxoplasmosis of animals and humans (2nd ed.). CRC Press.
10. Gashout, A., Amro, A., Erhuma, M., Al-Dwibe, H., Elmaihub, E., Babba, H., Nattah, N., & Abudher, A. (2016). Molecular diagnosis of Toxoplasma gondii infection in Libya. BMC Infectious Diseases, 16, 157. https://doi.org/10.1186/s12879-016-1491-5**.**
11. Weiss, L. M., & Dubey, J. P. (2009). Toxoplasmosis: A history of clinical observations. International Journal for Parasitology, 39(8), 895–901.
12. Montoya, J. G., & Remington, J. S. (2008). Management of Toxoplasma gondii infection during pregnancy. Clinical Infectious Diseases, 47(4), 554–566. https://doi.org/10.1086/590149
13. Ali, W. K., Shubar, H., Ramadan, A., Saadawi, W. K., Annajar, B., Alkhanfas, S. R., & Doro, B. (2019). Screening of Toxoplasma gondii antibodies and risk factors among patients in Asabieh City, Libya. Journal of Medical Biomedical and Applied Sciences, 7(6), 255–259.
14. Krause, J., Ruxton, G. D., & Krause, S. (2010). Swarm intelligence in animals and humans. Trends in Ecology & Evolution, 25(1), 28–34. https://doi.org/10.1016/j.tree.2009.06.016
15. Baril, L., Ancelle, T., Goulet, V., Thulliez, P., Tirard-Fleury, V., & Carme, B. (1999). Risk factors for Toxoplasma infection in pregnancy: A case-control study in France. Scandinavian Journal of Infectious Diseases, 31(3), 305–309. https://doi.org/10.1080/00365549950163626
16. Cook, A. J. C., Gilbert, R. E., Buffolano, W., Zufferey, J., Petersen, E., Jenum, P. A., Foulon, W., Semprini, A. E., & Dunn, D. T. (2000). Sources of Toxoplasma infection in pregnant women: European multicentre case-control study. BMJ, 321(7254), 142–147. https://doi.org/10.1136/bmj.321.7254.142
17. Jones, J. L., Dargelas, V., Roberts, J., Press, C., Remington, J. S., & Montoya, J. G. (2009). Risk factors for Toxoplasma gondii infection in the United States. Clinical Infectious Diseases, 49(6), 878–884. https://doi.org/10.1086/605433
18. Elammari, N. E., Sariti, S. R., Muftah, H. H. B., & Al Abbar, M. Y. (2021). Seroprevalence of IgG and IgM of Toxoplasma gondii among pregnant women at El-Beida City, Libya. International Journal of Medical Science in Clinical Research and Review, 4(5), 7–13.
19. Gashout A, Amro A, Erhuma M, Al-Dwibe H, Elmaihub E, Babba H, Nattah N, Abudher A. 2016. Molecular diagnosis of Toxoplasma gondii infection in Libya. BMC Infectious Diseases, 16, 157.

20. Kassem HH, Morsy TA. 1991. The prevalence of anti-Toxoplasma antibodies among pregnant women in Benghazi, (S.P.L.A.J.) Libya. Journal of the Egyptian Society of Parasitology, 21, 69–74.
21. Sariti, S. R., Al-Gazal, M. A., & Elsalhi, R. M. (2015, September 5). Seroprevalence of Toxoplasma gondii among pregnant women in Misurata, Libya. In Second Symposium on Theories and Applications of Basic and Biosciences, Misurata, Libya.
22. Gamal MAB, Jaroud RB. 2015. Seroprevalence study of IgG antibodies to Toxoplasma, and risk factors for Toxoplasma infestation among pregnant women in Alkhoms state, Libya. Lebda Medical Journal, 1, 15–19.
23. Dubey JP. 2010. Toxoplasmosis of animals and humans, 2nd edn. CRC Press Inc, Boca Raton, New York.
24. Liu, Q., Wang, Z. D., Huang, S. Y., & Zhu, X. Q. (2015). Diagnosis of toxoplasmosis and typing of Toxoplasma gondii. Parasites & Vectors, 8, 292. https://doi.org/10.1186/s13071-015-0903-1
25. Nasiru, W. M., Moklas, M. A. M., Watanabe, M., Nordin, N., Unyah, N. Z., Abdullahi, S. A., Alapid, A. A. I., Mustapha, T., Basir, R., & Abd. Majid, R. (2020). A review on the prevalence of Toxoplasma gondii in humans and animals reported in Malaysia from 2008–2018. International Journal of Environmental Research and Public Health, 17, 4809. https://doi.org/10.3390/ijerph17134809
26. Mousa, D. A., Mohammad, M. A., & Toboli, A. B. (2011). Toxoplasma gondii infection in pregnant women with previous adverse pregnancy outcome. Medical Journal of Islamic World Academy of Sciences, 19(2), 95–102.
27. Agelah, A. (2024). Prevalence of toxoplasmosis among pregnant women in Benghazi City, Libya. Tobruk University Journal of Medical Sciences, 8(1), 28–33.
28. Khadre, M. A., & El Nageh, M. M. (1987). Serological survey for toxoplasmosis in Tripoli, S.P.L.A.J., Libya. Transactions of the Royal Society of Tropical Medicine and Hygiene, 81(5), 761–763.
29. El-Sayed, N. M., & Almannoni, S. A. S. (2016). Seroprevalence of Toxoplasma gondii infection and associated risk factors among pregnant women in Sebha region, Libya. International Journal of Allied Medical Sciences and Clinical Research, 4(3), 383–391.
30. Bernawi, A. A. A., Ramadan, K. M. O., & Khan, A. (2018). Prevalence rates of toxoplasmosis among pregnant women in Sebha, Libya. Journal of Pure & Applied Sciences, 16(2).
31. Lozano, T. S. P., Benitez, A., dos Santos, J. C., Navarro, I. T., Nagata, W. B., Pinto, M. S., Gomes, J. F., Debortoli, G. Z. T., Santos-Doni, T. R., & Bresciani, K. D. S. (2024). Seroprevalence of Toxoplasma gondii and associated risk factors in pregnant women in Araçatuba, São Paulo, Brazil: A multi-level analysis. Pathogens, 12(11), 2183.
32. Al Bashier, W. A., Khalleefah, M. A., Bshena, F. I., Twair, F. A., & Alkhboli, A. Y. (2024). Prevalence of Toxoplasma gondii and cytomegalovirus in sera of aborted women in Zawia City. AlQalam Journal of Medical and Applied Sciences, 7(3), 583–589.
33. Lelong, B., Rahelimino, B., Candolfi, E., Ravelojaona, B. J., Villard, O., Rasamindrakotroka, A. J., & Kien, T. (1995). Prevalence of toxoplasmosis in a population of pregnant women in Antananarivo (Madagascar). Bulletin de la Société de Pathologie Exotique, 88(1), 46–49.
34. Sebaa, S., Behnke, J. M., Labed, A., & Abu-Madi, M. A. (2024). Seroprevalence of Toxoplasma gondii and associated risk factors among pregnant women in Algeria. The American Journal of Tropical Medicine and Hygiene, 110(6), 1137–1144.
35. Ajedi, A. S. S., & Wheda, R. M. (2024). Incidence rates of Toxoplasma gondii chronic infection among aborted women in Elmergib region, Libya. International Science and Technology Journal, 33(2), 1–11.
36. Almansory, R. A. A., & Altamemy, A. A. (2024). Seroprevalence of toxoplasmosis and cytomegalovirus infection in pregnant and aborted women in Wasit province-Iraq. Wasit Journal for Pure Science, 3(2), 199–206.
37. Ibrahim, H. M., Amin, A., Saleh, A., El-Missiry, A. G., & Abdelrahman, E. H. (2017). Molecular and serological prevalence of Toxoplasma gondii in pregnant women and sheep in Egypt. Veterinary World, 10 (11), 1408–1413.
38. Medeiros, J. F., Silva, A. C. R. e, Rocha, N. D. F. da, Georg, A. V., Melli, P. P. dos S., Quintana, S. M., & Duarte, G. (2023). Seroprevalence of toxoplasmosis in puerperal women treated at a tertiary referral hospital. Revista Brasileira de Ginecologia e Obstetrícia / RBGO Gynecology and Obstetrics, 45(2), 59–64.
39. Frimpong, C., Makasa, M., Sitali, L., & Michelo, C. (2017). Seroprevalence and determinants of toxoplasmosis in pregnant women attending antenatal clinic at the University Teaching Hospital, Lusaka, Zambia. BMC Infectious Diseases, 17, 10.
40. Mazzilli, S., Tourdjman, M., Noël, H., Maisa, A., Villena, I., & Le Ray, C. (2025). Estimating the national seroprevalence of Toxoplasma gondii infection in pregnant women, France 2021. Epidemiology and Infection, 153, e107.

41. Mahmoud, A. S., Alarwiy, A. O., Ganghish, K. S., Alhares, A. M., Sabei, L. T., Altaesh, M. F., & Algeriany, M. A. (2019). Seroprevalence and potential risk factors associated with Toxoplasma gondii infection in women from Tripoli, Libya. American Journal of Preventive Medicine and Public Health, 5(3), 45–49.