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Seroprevalence of Toxoplasmosis in Pregnant Women in Kinshasa, Democratic Republic of Congo

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ABSTRACT

Background: *Toxoplasmosis is a parasitic zoonosis caused by Toxoplasma gondii, a cosmopolitan intracellular protozoan parasite capable of infecting almost all warm-blooded animals including humans. Its prevalence among pregnant women in certain areas in Africa reaches 60 to 80%.*

Objective: *The objective of this study was to determine the seroprevalence of Toxoplasmosis in pregnant women in different centers in Kinshasa.*

Methods: *This was a descriptive cross-sectional study, carried out in pregnant women followed in prenatal care at the Vijana Medical Center and at the Mother and Child Center of Barumbu, from June to August 2018.*

Results: *Two hundred and sixty-nine pregnant women (269) were selected for the study. The average age was 27.48 ± 10.02 years with extremes of 15 and 50 years. The most represented age range was that of 20 to 24 years old (35.68%). The majority of them (30.85%) had no specific level of education, their median age was 22 years; they were followed by those with a grad school level (29.36%), then high school level (16.35%), with median ages 23 years and 27 years respectively. Consumption of non-potable water, raw food and undercooked meat had a significant statistical association with positive toxoplasmic serology ($p \leq 0.05$). The presence of a cat at home, and the occurrence of spontaneous abortion were unrelated to positive toxoplasmic serology ($p>0.05$). The Toxoplasmosis seroprevalence was 56.87%.*

Conclusion: *Toxoplasmosis is a real public health problem little known in Kinshasa. Its seroprevalence among pregnant women is 56.87%.*

Keywords: *Seroprevalence, Toxoplasmosis, Pregnant women, Kinshasa.*

INTRODUCTION

Toxoplasmosis is a parasitic zoonosis caused by *Toxoplasma gondii* (*T. gondii*), a cosmopolitan intracellular protozoan parasite capable of infecting almost all warm-blooded animals **[1, 2]**. Domestic cats and other felids are the final hosts (HD); all non-feline animals, including dogs and humans, are Intermediate Hosts (HI) **[3, 4]**. Human contamination occurs through the handling of dogs, cats and the consumption of raw or undercooked meat containing cysts which are a form of resistance of the parasite **[5]**. This infection is usually mild in an immunocompetent individual; however, severe forms are observed in the immunocompromised and in pregnant women, in particular for the fetus, because of the serious central neurological lesions which it causes, and because of the death in utero which it can cause **[6, 7]**. Toxoplasmic infection, asymptomatic in the majority of cases, is all the more serious since maternal primary infection occurs early in pregnancy and there is an associated placental pathology **[8-11]**.

The disease has a complex epidemiology which makes it difficult to estimate prevalence **[12, 13]**. In addition, in Europe, where serological

screening for pregnant women is compulsory, the authors report an average Seroprevalence of 38%; it is 31.3% in France and 28.3% in Italy **[14, 15]**. In Africa it varies according to wet and forest areas (> 60%) and dry or desert areas (<50%); some sources, however, report a prevalence of 60 to 80% **[16-19]**. These data show that around the world, more than half of pregnant women followed in prenatal care have a positive toxoplasmic serology; it is a dangerous situation, especially in developing countries where screening for the disease is not always systematic, this associated with the fact that the disease is transmitted in more than 30% of cases from mother to fetus, thus causing serious damage **[18, 20]**.

The data relating to the Seroprevalence of Toxoplasmosis in the population of pregnant women in Kinshasa in the Democratic Republic of Congo (DRC) remain unknown; the only data available comes from a study carried out on cats in 2016 in the town of Limete **[21]**. This work aimed to determine the Seroprevalence of Toxoplasmosis in pregnant women in Kinshasa.

METHODS

Frame

This study was carried out in two Hospital Formations, namely the Vijana Medical Center (VMC) and the Mother and Child Center of Barumbu (MCCB) both specialized in care of pregnant women in Kinshasa, DRC.

Type of Study

This was a descriptive cross-sectional study, carried out among pregnant women in the selected centers, from June to August 2018, with the aim of establishing a Seroprevalence of Toxoplasmosis in that specific population.

Study Population

These were pregnant women followed in prenatal care at the VMC and MCCB from June to August 2018.

Inclusion Criteria

All pregnant women, regardless of their age and the term of pregnancy, having an appointment during the inclusion period who had agreed to sign the consent, were included in the study.

Criteria of Non-Inclusion

All pregnant women who had not agreed to sign the consent were not included in the study.

Parameters of Interest

The parameters of interest were age, level of education, presence of a cat at home, consumption of non-potable water, consumption of raw food, consumption of undercooked meat, the notion spontaneous abortion and the toxoplasmic serological result.

Samples

Five (5) milliliters (mL) of blood was taken from each patient at the elbow, in tubes with an EDTA anticoagulant. The samples were then centrifuged at 3000 rpm to obtain the sera, which were then collected in other EDTA tubes for the toxoplasmic serological test.

Laboratory

The sera were analyzed on a VIDAS Bio Mérieux® automated system. The IgGs were determined by an immunoenzymatic sandwich method (VIDAS TOXO IgG II, Bio Mérieux®). The IgG titers were expressed in International Units per milliliter (IU/ml); the positivity threshold was set at 10 IU/ml.

Pregnant Women Data Collection and Statistical Analysis

The data relating to pregnant women were collected on an Excel sheet version 2016, cleaned to exclude all data of the outlier type, recorded in CSV format and analyzed with the statistical software RStudio version 3-6-1. A Box-plot has been made in order to cross the parameters "age" and "level of study" and also in order to verify the absence of outlier type data; a mosaic diagram has been used to study the relationship between positive toxoplasmic serology and the level of study of pregnant women. The chi-square test has been used for the qualitative analysis of the data; it helped for comparing the proportions and for seeking a link between the Seroprevalence of Toxoplasmosis and the various variables studied. The significance threshold $\alpha = 5\%$ ($p \leq 0.05$) has been retained.

Ethical Consideration

This study has received the approval of the ethics committee of the Faculty of Veterinary Medicine of the University of Kinshasa. All participants signed a free and informed consent form.

Table. *Socio-demographic data and statistics of pregnant women*

Age ranges	**Number**	**Percentage (%)**
15-19	33	12.26%
20-24	96	35.68%
25-29	88	32.71%
30-34	19	7.06%
35-39	18	6.69%
40-44	5	1.85%
45-50	10	3.71%
Level of study		
Illiterates	83	30.85%
Grade school	79	29.36%
Hight school	44	16.35%
University	63	23.42%
Total	**269**	**100%**

Statistical analyzes						
Variables	**Number/Total**	**Percentage variable**	**Number positive serology**	**Percentage of the positive serology**	**df**	**p-value**
Pet cat	92/269	34.20%	29/92	31.52%	1	0.94
Dirty water	136/269	50.55%	36/136	26.47%	1	0.05
Raw food	50/269	18.58%	24/50	48%	1	0.01
Undercooked meat	169/269	62.82%	45/169	26.63%	1	0.01
Abortion	58/269	21.56%	19/58	32.76%	1	1
Positive Toxoplasmic serology			**153**	**56.87%**	--	

RESULTS

Two hundred and ninety-four (294) pregnant women were included; of this lot, 269 were retained for the study after data cleaning. The average age was 27.48 ± 10.02 years with extremes of 15 and 50 years; the most represented age range was that of 20 to 24 years (35.68%), followed by that of 25 to 29 years (32.71%) and that of 15 to 19 years (12.26%).

The majority of them (30.85%) was illiterates, their median age was 22 years [21-25]; they were followed by those with a grade school level (29.36%), then hight school level (16.35%), with medians of 23 years [20-25] and 27 years respectively [23-28] (Figure 1).

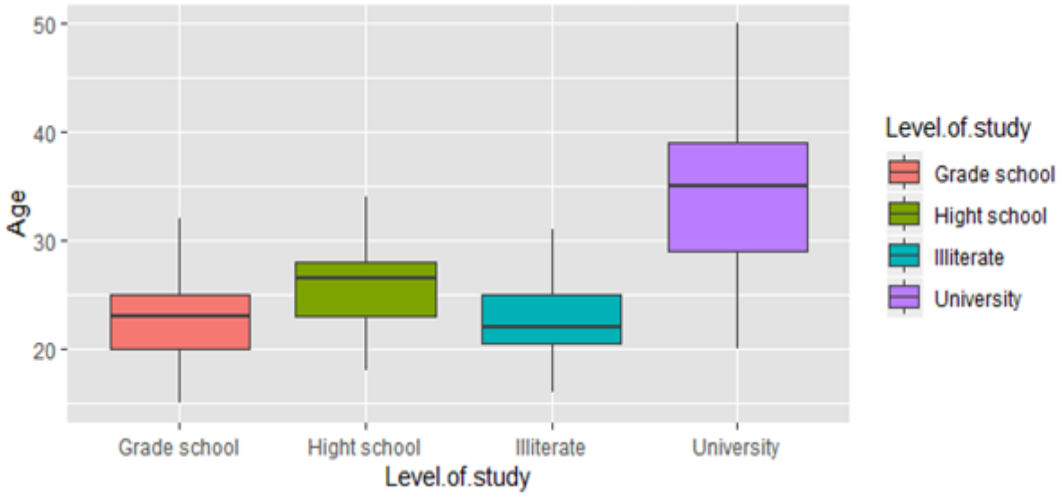

Figure1. *Box-plot for the variables "Age" and "Level of study"*

The relationship between the level of pregnancy study and positive toxoplasmic serology was not significant (Figure 2). The consumption of non-potable water, raw food and undercooked meat had a significant statistical association with positive toxoplasmic serology ($p \leq 0.05$). However, the presence of a cat at home, and the occurrence of spontaneous abortion were unrelated to positive toxoplasmic serology ($p > 0.05$). The Toxoplasmosis Seroprevalence was 56.87%.

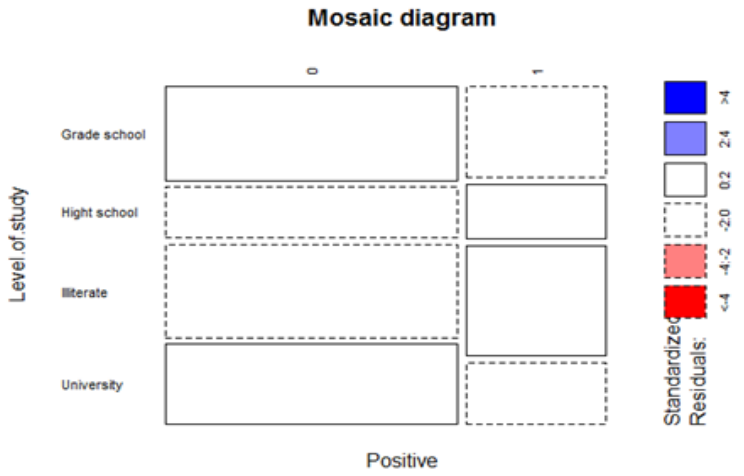

Figure2. *Mosaic diagram establishing the relationship between the level of study of pregnant women and the result of serology. « 0 » refers to negative serology and « 1 » and a positive serology*

DISCUSSION

The objective of this study was to determine the Seroprevalence of Toxoplasmosis in pregnant women followed in prenatal care at the Vijana Medical Center and at the Mother and Child Center of Barumbuboth in Kinshasa, Democratic Republic of Congo, from June to August 2018.

Two hundred and sixty-nine (269) pregnant women were selected for the study. Their average age was 27.48 ± 10.02 years with extremes of 15 and 50 years; the most represented age range was that of 20 to 24 years (35.68%), followed by that of 25 to 29 years (32.71%). These data are similar to those of Yolande SS et al. in his study on Seroprevalence and factors associated with Toxoplasmosis in pregnant women in rural areas in Benin, carried out in 2016 [18]. Three hundred and ninety-nine (399) women were included; the age was in the range of 15 to 47 years with an average of 26.56 ± 10.02 years; the most represented age range was that of 20 to 30 years (54.1%) followed by that of 30 to 39 years (28.8%). They also join those of Khaldi N. in his study on the epidemiology of toxoplasmosis in pregnant women in the Wilaya of Mostaganem in Algeria [22]. The author found that 60% of pregnant women were over the age of 30 [22]. All of these studies have one thing in common, which is the gestational age between 15 and 50, which corresponds to the theoretical limit of reproductive age [23].

The majority of them (30.85%) was illiterates, their median age was 22 years [21-25]; they were followed by those with a grade school level (29.36%), then high school level (16.35%), with medians of 23 years [20-25] and 27 years respectively [23-28]. These data are similar to those of the studies by Messerer LS and al. and Caroline P et al. who also found that the majority of pregnant women had no level of education [24, 25]. The relationship between the level of pregnancy study and positive toxoplasmic serology was assessed in the present study, and it was not significant. This is in line with observations made in a Medico-Veterinary cooperation report in France, which linked the occurrence of Toxoplasmosis in humans in general, to eating habits [26]. This is the same observation made by Bruno P et al., Who linked the contamination to poor daily eating habits, namely the consumption of non-potable water, poorly prepared plants and uncooked foods, in particular meats but also above all, room hands [27]. Moreover, fasting as found in the present study has been reported by some authors as a risk factor because the prevalence of the infection decreases with age [28].

Consumption of non-potable water, raw food and undercooked meat had a significant statistical association with positive toxoplasmic serology ($p \leq 0.05$). This corroborates data from studies by Yolande SS and al. and Bruno P et al. cited in the preceding paragraphs [18,27]. The consumption of raw or undercooked meat as well as the consumption of unwashed fruits and vegetables are the most common transmission routes in the literature [29]. As for contact with soiled soil, it seems that this is considered rather as a risk factor, even if the literature still diverges somewhat [27-29]. As far as cats are concerned, the current literature is contradictory [29-31]. On the one hand, several studies mention a correlation between T. gondii infection and the possession of a cat, while other

investigators find no link. In the present study, this link has not also been established. In the study by Radu B and al. carried out in 2015 in France, the author reaches the same conclusion by finding that the direct transmission of T. gondii from a cat is probably not possible, but that cat populations are rather at the origin of wide and lasting environmental contamination [32]. The occurrence of spontaneous abortion during pregnancy was not related to the result of the positive toxoplasmic serology in the present study. There are indeed many other causes of spontaneous abortions [33,34]. This certainly may have been the case in the population of pregnant women who were part of this study.

The Seroprevalence of Toxoplasmosis in pregnant women was 56.87%. It is one of the highest in Africa compared to the figures already reported in the literature. In Burkina Faso, it is 34.5%; it is 43.7% in Senegal, 50.6% in Nigeria, 56% in Morocco, 60% in Gabon, Côte d'Ivoire and the Central African Republic [18, 19, 35]. These figures show that in Africa, half of the pregnant women followed in prenatal care have Toxoplasmosis. This is enormous in view of the serious consequences that the disease has on the fetus, and in terms of the socio-economic conditions in our environments.

Conclusion

Toxoplasmosis is a real public health problem little known in Kinshasa because the Seroprevalence in pregnant women is 56.87%. It is imperative that measures are taken to guarantee reproductive health.

Conflicts of Interest

The authors declare no conflict of interest.

References

[1] Centers of Diseases Control and Prevention. CDC 24/7: Saving Lives, Protecting Peoples. https://www.cdc.gov/parasites/toxoplasmosis/index.html. Consulted on 15 November 2019 at 07 h 40.

[2] Rafael CB and Solange MG. Clinical Toxoplasmosis in Dogs and Cats: An Update. Frontiers in Veterinary Science. 2019; 6 (54): 1-9.

[3] Maternal SA and Neonatal Clinical Network. Clinical Guideline of the toxoplasmosis in pregnancy. South Australian Perinatal Practice Guidelines. Approved SA Health Safety and Quality Strategic Governance Committee in 2015. Latest review in 2018: 1-8.

[4] Baneth G, Thamsborg SM, Otranto D, Guillot J, Blaga R, Deplazes P and Solano LG. Major parasitic zoonoses associated with dogs and cats in Europe. Elsevier (*Journal of Comparative Pathology*). 2016; 155 (1): S54–74.

[5] Noora R, Age K, Kärt M, Maarja T, Brian L and Pikka J. *Toxoplasma gondii* Seroprevalence in free-ranging moose (*Alcesalces*) hunted for human consumption in Estonia: Indicator host species for environmental *Toxoplasma gondii* oocyst contamination. Elsevier (*Veterinary Parasitology: Regional Studies and Reports*). 2018; 11: 6-11.

[6] Bachi E, Yebbous-Bensaid SA, Gourbdji E and Marie Laure D. Première caractérisation moléculaire de deux souches algériennes de Toxoplasmagondii isolées de deux cas de toxoplasmose congénitale. Elsevier (*Médecine ET Maladies Infectieuses*). 2018; 48 (1): 78-80.

[7] Calamy L, Goudjil F, Godineau N and Bolota P. Severe congenital toxoplasmosis secondary to toxoplasma reactivation in an HIV-infected mother. Elsevier (Archives de pédiatrie). 2015; 22 (2): 181-184.

[8] Ben Miled S, Ben Miled C, Jaziri D, Hamdi A, Abid-Schlömann C et Chelli D. Toxoplasmose congénitale: Un MytheouuneRealite. Z Geburtshilfe Neonatol. 2014; 218 (6): 48.

[9] Guillard M, Delair E ET Brézin A. Toxoplasmose oculaire. Elsevier Masson (*Ophtalmologie*). 2018; 15(4):1-10.

[10] Marie-Laure D, Édouard F et Jacques B. Les médicaments de la toxoplasmose. Elsevier (Actualités Pharmaceutiques). 2018; 57 (581) : 22-26.

[11] Carole E. Toxoplasmose ET grossesse: évolutions. Elsevier (Optio/bio). 2018; 29 (573-574): 19-21.

[12] Dubey JP. Toxoplasmosis of Animals and Humans. 2nd ed. Boca Raton, FL: CRC Press (2010).

[13] Fact Sheet Toxoplasmosis 2015. Consulted on 15 November 2019 at 09 h 30.

[14] Villena I, Ancelle T, Delmas C and Garcia P. Congenital toxoplasmosis in France in 2007: first results from a national surveillance system. Euro Surveill. EuroSurveill. 2010; 15(25) : 19600.

[15] Massimo DP, Agrappi C, Manco MT, Cerulli T and Clerici P. Implementation of Screening for Toxoplasma gondii Infection in Pregnancy. J Clin Med Res. 2010; 2(3):112-11.

[16] Bamba S, Some DA, Chemla C, Geers R, Guiguemde TR, et Villena I. Analyse sérologique de la toxoplasmose pergravidique : évaluation de risques et perspectives du dépistage prénatal au centre hospitalier universitaire de Bobo-Dioulasso au Burkina Faso. Pan Afr Med J. 2012; 12: 43-48.

[17] Ndiaye D, Sene PD, Ndiaye M, Faye B, Ndiaye J-L et Ndir O. Evolution de la Seroprevalence de la toxoplasmose chez la femme enceinte à Dakar, Sénégal de 2002 à 2006. Med Trop. 2011; 71(1): 101-102.

[18] Yolande SS, Aurore OH, Mahublo VV, Arielle O, Dixou A, Damien GB, Boris H, Augustin K, Goudjo W, Sévérin A, Achille M et Dorothée K-G. Séroprévalence et facteurs associés à la toxoplasmose chez la femme enceinte en milieu rural au Bénin. The Pan African Medical Journal. 2018; 29:112.

[19] Mlatovi D, Amivi T-B, Houloud M, Abalo K, Batasse B, Kodjo A et Messanvi G. Epidémiologie de la toxoplasmose au Togo : facteurs de risque dans la capitale et ses agglomérations. International Journal of Biological and Chemical Sciences. 2018; 12(1) : 479-490.

[20] Ponlot E, Oliver L, Dommergues L, Bellec L et Vernier M. Première caractérisation moléculaire de deux souches algériennes de Toxoplasmagondii isolées de deux cas de toxoplasmose congénitale. Lettres à la rédaction / Médecineet maladies infectieuses. 2018; 48: 73–80.

[21] Kabamba MW, Miteyo B, Malengela L, Kabongo JB, Buna BP et Pyana P. Prévalence de la toxoplasmose chez les chats des quartiers Kingabwa et Limete résidentiel à Kinshasa. Rev Mar SciAgronVét. 2018; 6 (3): 314-318.

[22] Khaldi N. Etude descriptive et épidémiologique de la toxoplasmose chez la femme enceinte dans la wilaya de Mostaganem. Université Abdelhamid Ibn Badis-Mostaganem Faculté des Sciences de la Nature et de la Vie. Mémoire de Master. 2018. http://193.194.86.113/bitstream/handle/123456789/13027/fusionn%c3%a9.pdf? sequence=1&isAllowed=y. Consulted on 15/12/2019 at 8 pm.

[23] Agence Francaise de la Biomédecine. https://www.agence-biomedecine.fr/ IMG/pdf/2017-co18_age_de_procre _er_version_ finale_14_juin_2017.pdf. Consulted on 15/12/2019 at 10 pm.

[24] Messerer LS, Bouzbid S, Gourbdji E, Mansouri R and Bachi C. Seroprevalence of toxoplasmosis in pregnant women in Annaba, Algeria. Elsevier (Révue Epidémiologique et de la Santé Publique). 2014; 62 (2): 160-165.

[25] Caroline P ET Mark HY. Toxoplasmose pendant la grossesse: Prévention, dépistage et treatment. Elsevier (Journal of Obstetrics and Gynaecology Canada). 2013; 35 (1): 80-81.

[26] Isabelle V ET Radu B. Coopération médico-vétérinaire et reduction de l'incidence de la Toxoplasmose en France. Bulletin Académique et Vétérinaire et France. 2018; 171 (2): 87-91.

[27] Bruno P, Henri-Jean B, Jacques G et René C. Les zoonoses (tableaux synthétiques: animaux réservoirs de pathogènes et modes de transmission). Elsevier (Revue Francophone des Laboratoires). 2015; 477: 67-79.

[28] Elsheikha HM Congenital toxoplasmosis: priorities for further health promotion action. Public Health. 2008; 122(4): 335-53.

[29] Ferry T. Toxoplasmose congénitale: Etat des lieux et modalités de dépistage et surveillance. University of Lausanne Open Archive 2019 http://serval.unil.ch Document URN: urn: nbn:ch: serval-BIB_48D554C8CD5D2.

[30] Roghmann MC, Faulkner CT, Lefkowitz A, Patton S, Zimmerman J and Morris JG. Decreased Seroprevalence for Toxoplasma gondii in Seventh Day Adventists in Maryland. Am J Trop Med Hyg. 1999; 60(5): 82.

[31] Garcia JL, Navarro IT, Ogawa L, Oliveira RC and Kobilka E. Seroprevalence, epidemiology and ocular evaluation of human toxoplasmosis in the rural zone Jauguapita (Parana) Brazil. Rev PanamSaludPublica. 1999; 6(3): 157-63.

[32] Radu B, Dominique A, Catherine P, Régine G, Vitomir D, Villena E, Isabelle V, Emmanuelle G-F, Aurélien M and Pascal B. Animal reservoirs of Toxoplasma gondii: an update in France. Elsevier (Revue Francophone des Laboratoires). 2015; 477: 35-25.

[33] Agnès G et Clémentine R. L'avortement dans le monde. État des lieux des législations, mesures, tendances et conséquences. Population. 2018; 73: 225-322.

[34] Akinrinola B, Patrick K, Sophia C, Onikepe O, Jesse P et Crispin M. Gravité et prise en charge des complications affectant les patientes après avortement traitées dans les établissements de santé de Kinshasa. Numéro spécial. 2018. 49–57, https://doi.org/10.1363/FR04918.

[35] Ogouyèmi-Hounto A, Agbayahoun-Chokki F, SissintoSavi de TY, BiokouBankole B, Adinsi de SV, Kinde-Gazard D and Massougbodji A. Evaluation of a rapid diagnostic test in the diagnosis of toxoplasmosis in pregnant women in Cotonou (Bénin). Bull Soc Path Exot. 2014; 107(2): 85-89.

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