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Research Article

Seroprevalence and Risk Factors of Toxoplasmosis in Cats and Women Undergoing Prenatal Consultation in Coyah, Guinea

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Abstract

The objective of this study is to describe the epidemiological situation of toxoplasmosis in cats and women undergoing prenatal consultation in the city of Coyah (Guinea). During the study, 100 cat sera and 100 sera from women in prenatal consultation were analyzed with a *Toxo-Screen DA* (Modified Antigen Agglutination Test) kit. The results indicated prevalences of 73%±8.7 in antenatal women and 51%±9.8 in cats. There was no association found between the variables and Toxoplasma gondii seroprevalence in prenatal females and cats.

Keywords: *Cat; women in prenatal consultation*; *Toxoplasma gondii*; *Coyah; Guinea.*

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INTRODUCTION

Parasitic zoonoses are nowadays a major public health problem because they affect many species and are rarely or insidiously manifested [1]. Some of these include protozoonotic diseases such as toxoplasmosis. Toxoplasmosis is a major parasitic zoonosis caused by *Toxoplasma gondii.* Generally benign in felids, it occurs mainly in humans and small domestic ruminants where it leads to fetal contamination often accompanied by abortions [2] . The cat has been identified as the definitive host of *T. gondii* and responsible for the dissemination of the disease in the environment. However, the cat expresses the disease sparingly,, although it can have serious repercussions in immunocompromised or very young individuals, and can cause abortions and stillbirths, especially in women in prenatal care [3] . Humans become infected through the consumption of raw or undercooked meat containing cysts of the parasite and the ingestion of oocysts with fruits and vegetables soiled by the feces of infested cats [4] . Transmission of the agent through contact with placentas has also been demonstrated but is believed to be much less significant[5] . Abortion is possible if the female ewe is in the first half of pregnancy. Infestation occurring later in gestationmay result in stillbirths or weak lambs, but it may also be without consequence[6]. . Several studies in Africa show a prevalence of toxoplasmosis ranging from 30 to over 60% in pregnant women and 20 to 55% in domestic animals[7-9]. Despite the medical, health and economic importance of this disease, it is relegated to the background in research programs in Africa in general and in Guinea in particular, where no studies have yet been conducted on this pathology. However, its impact on the health of the newborn and child is not inconsiderable. In addition, the risk factors listed above are common in Guinea, which leads us to believe that this condition could exist in the country. It is in view of all these realities that we conducted this study whose objective is to describe the epidemiology of toxoplasmosis in cats and women undergoing prenatal consultation in the city of Coyah (Republic of Guinea).

MATERIALS AND METHODS

MATERIALS

Study area and period

This study was conducted for 6 months (from June 15 to November 20, 2013) in the Coyah city (**Figure 5**) located 50 km from the capital Conakry in the western part of Guinea. It covers a total area of 2177 km2 with a density of 74 inhabitants per km2. Its climate is marked by two seasons: a hot and rainy season of 7 months (May-November) and a dry season of 5 months (November-April). The average temperature is 27°C with a maximum relative humidity of 86% in August and a minimum of 56% in January.

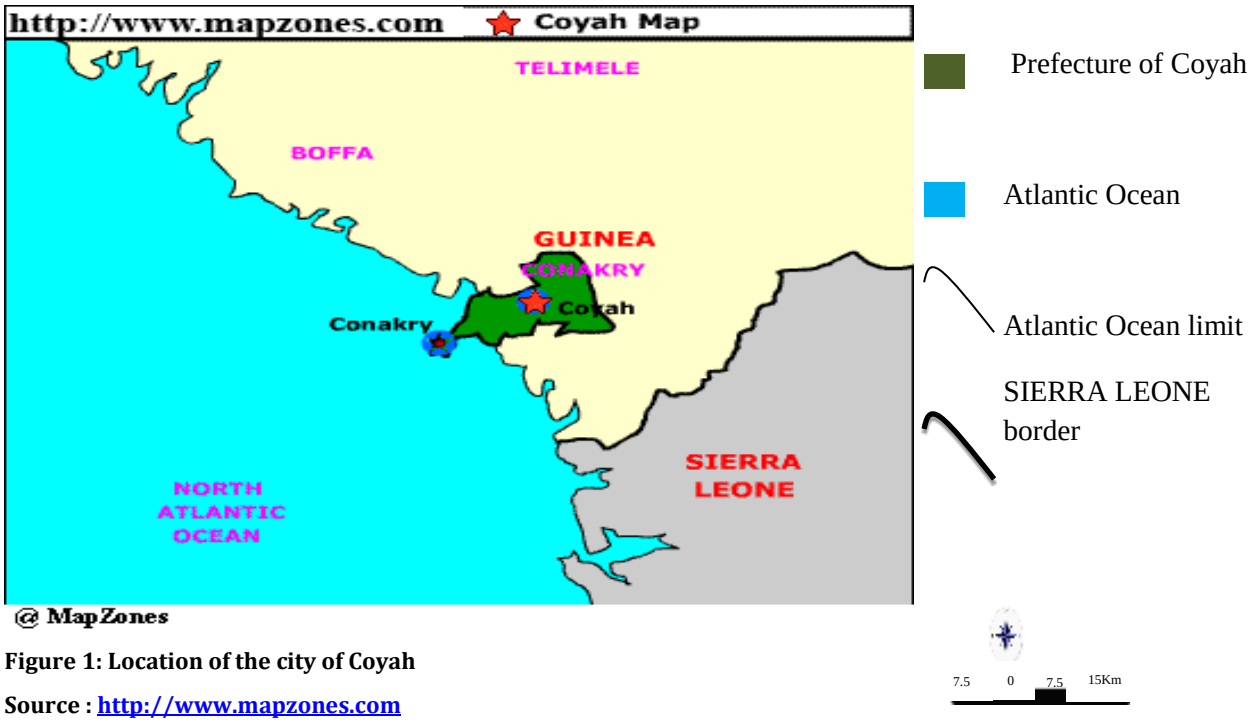

Figure 1: Location of the city of Coyah

Source : http://www.mapzones.com

Animal material and target population

This work focused on cats and pregnant women. The source population was women undergoing prenatal consultations in the city of Coyah. Concerning the animals, the source population is the cats of the city of Coyah.

Survey sheet

For data collection, two survey forms were used: one for women in prenatal care and another accompanying the cat samples. These forms included the variables of interest (age, sex, lifestyle).

METHODS

Description of the study

samples

This work is a descriptive cross-sectional study. The study population was composed of all women undergoing prenatal consultations at the Fyli and Maneyah Health Centers in Coyah. These centers were chosen because of their high attendance rate and their extensive outreach.

Thus, the study focused on women receiving prenatal consultations with their permission through the collaboration of the health center physicians involved.

The animal population was represented by cats from the same city. The cats were categorized as stray cats (without owners) and domestic cats (non-stray) with owners and their capture was done without distinction of age, sex and physiological state.

Sampling

Knowing the approximate number of cats (1205), in Coyah, the sample size was calculated using Win episcope 2.0® software with a precision of 5%. The reference prevalence was that of Bamako due to the lack of data on the disease in Guinea. This prevalence was 7.50%[10] . Thus, 100 cats were sufficient for the study. As for women undergoing prenatal consultation, 100 consenting women were recruited. These women were distinguished (Primipare = 01 maternity; Peaucipare = 02-03 maternity and multiparous ≥ 04 maternity)[9] . To respect ethical considerations, questionnaire distribution and blood sampling were done with the consent of the women being surveyed.

Collection and storage of blood and/or serum

Samples were taken from the internal femoral vein of the cats. Once the blood was collected, it was placed in a cooler containing ice. For the women, the blood collection (elbow fold) and processing was done by the medical officers in charge of the health centers.

At the Fyli Health Center laboratory, the blood samples were centrifuged at 3500 rpm for 20 minutes, then collected in cryotubes and individually labeled.

These sera were stored in a freezer at -20°C in the same laboratory and sent to the Serology Unit of the Parasitology and Mycology Laboratory of EISMV-Dakar, under cold conditions for analysis.

Laboratory Analysis

The test used to detect anti-T. *gondii* antibodies in the cats' sera was the *Toxo-Screen* DA test [REF:75,481 Sensitivity (Se) = 96.22% and Specificity (Sp) = 98.80%].

Data Management and Statistical Analysis

The analysis of the different variables was possible using descriptive statistics. To facilitate their interpretation, some qualitative variables with multiple categories were reclassified as dichotomous variables after the fact. Data on socio-demographic variables, presence of cats and dogs, presence of sheep, meat consumption and raw milk consumption were subjected to bivariate analysis. The strength of the association between two variables was calculated by the odds ratio. Apparent (**Pa** = direct estimate), true (**Pr** = corrected estimate that takes into account the sensitivity and specificity of the diagnostic method.) and confidence interval **(CI)** prevalences were calculated according to the following formulas:

(Pa) = n/N*100 with n = number of positive samples and N= total number of samples tested**.**

(CI) = P± $1.96\sqrt{P(1-P)/N}$ with P = observed prevalence in

the sample.

Pr = [(Pa + (Sp-1)] / [Sp + (Se-1)] with **Sp** the Specificity of the test and **Se** the Sensitivity of the test. The survey forms were entered using Epidata© software (version 3.1). The strength of association between the independent variables and seropositivity was measured by the odds ratio calculated with the Winepiscope software (version 2.0). The variable analyzed is a risk factor when the odds ratio is greater than 1 and the p value < 0.05. The significance level was set at 0.05. The statistical analysis software used was R © version (2.13.0).

RESULTS

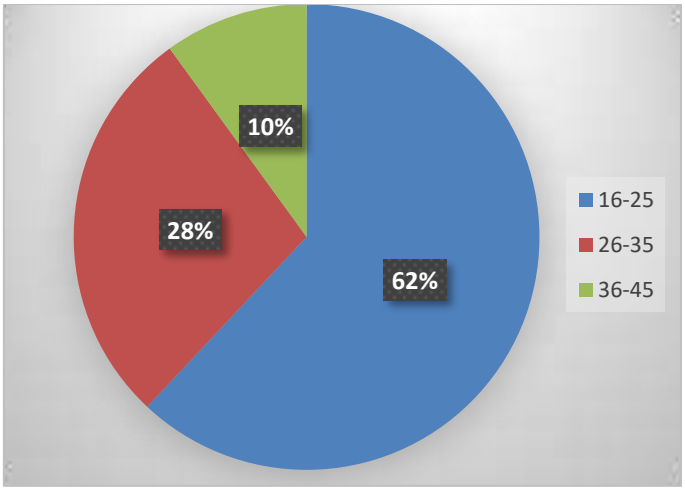

Figure 2: Distribution of pregnant women by age group in Coyah

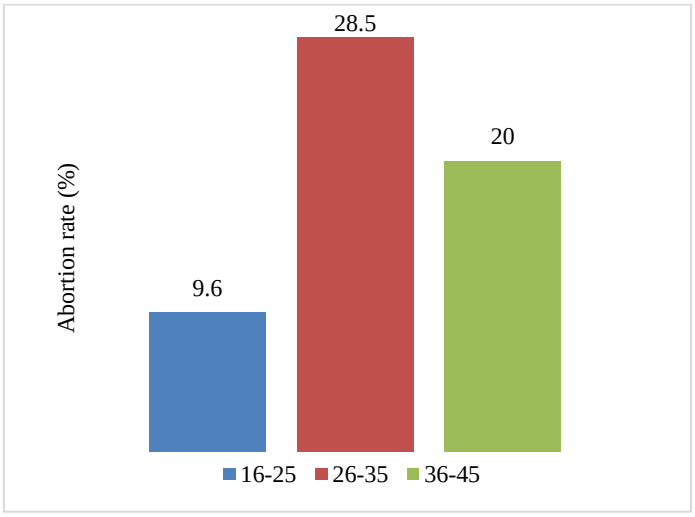

Figure 3: Distribution of Toxoplasmosis abortion rate among pregnant women by age group in Coyah

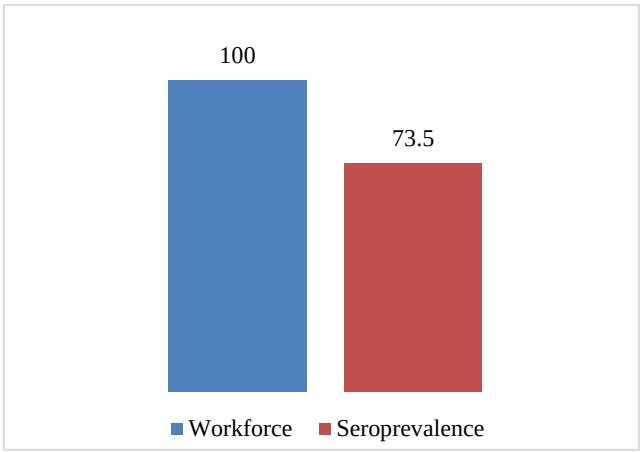

Figure 4: Overall seroprevalence among pregnant women in Coyah

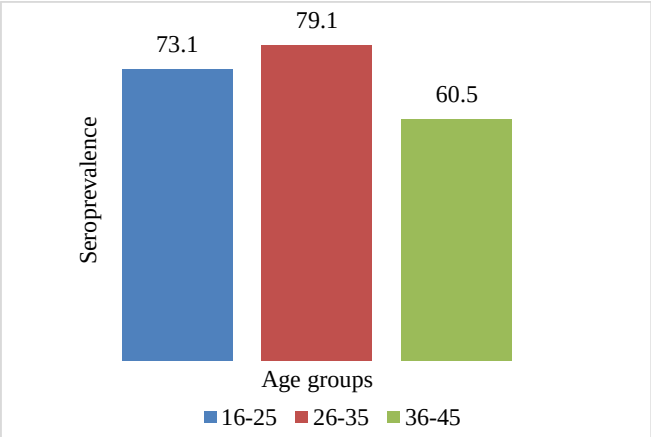

Figure 5: Distribution of toxoplasmosis seroprevalence among pregnant women by age group in Coyah

Table II: Risk factors associated with toxoplasmosis among women in consultation in the city of Coyah.

		Seroprevalence					
		Positive					
Risk factors		**Workforce**	**N**	**(%)**	**p**	**GOLD**	**CI (95%)**
Cat in the house	Yes	70	11	15,7	**0,60***	0,74	0,24-2,24
	No	30	6	20			
Dog in the house	Yes	12	2	16,6	**0,50***	1,75	0,33-9,30
	No	88	9	10,2			
Profession	Unemployed	82	14	17,1	**0,29***	0,53	0,16-1,74
	With employment	18	5	27,7			
Maternity	Primipare	23	3	13	**0,51***	NC	NC
	skincipare	14	6	42,8			
	Multipare	63	12	19			
Schooling	Not in school	28	8	28,5	**0,24***	1,81	0,65-5,01
	Educated	72	13	18			
Water consumption	Tap water	78	12	15,3	**0,26***	NC	NC
	Mineral water	16	9	56,2			
	Well water	6	2	33,3			
Presence of sheep	Yes	32	8	25	**0,50***	1,41	0,51-3,84
	No	68	13	19,1			
Consumption of raw milk	Yes	47	9	19,1	**0,14***	0,50	0,19-1,26
	No	53	17	32,1			
Meat consumption	Well cooked	93	19	20,4	**0,61***	0,64	0,11-3,56
	Bleeding	7	2	28,5			

OR: odds ratio, CI: confidence interval, *: Not significant, NC: Not calculated, p: p-value.

Table III: Seroprevalence of toxoplasmosis in cats in Coyah

		Seropositivity						
Variables		**Workforce**	**(N)**	**Pa**	**Pr**	**P**	**GOLD**	**CI (95%)**
Gender	Female	65	33	50,7	51,2	0,94*	0,97	0,42-2,21
	Male	35	18	51,4	51,9			
Age	Young	72	33	45,8	46,3	0,09*	0,47	0,19-1,15
	Adult	28	18	64,2	64,7			
Lifestyle	Non-stray	42	19	45,2	45,7	0,32*	0,67	0,30-1,49
	Stray	58	32	55,1	55,6			
Dewormed	Yes	-	-	-		NC	NC	NC
	No	100	51	51	51,5			
Vaccinated	Yes	-	-			NC	NC	NC
	No	100	51	51	51,5			
	Total	**100**	**51**	**51±9,8**	**51,5±9,8**			**0,41-0,60**

* : Not significant, Pa : apparent prevalence, Pr : true prevalence CI : confidence interval, p= P-value, OR : odds ratio.

DISCUSSION

The objective of this study was to describe the epidemiological situation of toxoplasmosis in cats and women undergoing prenatal consultation in the city of Coyah (Guinea). As results, we found prevalences of 73%±8.7 among women in prenatal consultation and 51%±9.8 among cats.

Among women in prenatal consultation, the majority of pregnant women (90%) received in hospitals are young (16 to 35 years). In Senegal, these observations were also found in Kaolack (84.1%) by Kamga-Waladjo *et al*, (2012)[11] and in Dakar (95.5%) by Faye *et al*, (1998)[8]. Indeed, the average age of marriage of girls in Coyah is 20 years and 18% of girls under 19 years have already given birth to, at least one child; This is also observed for 65% of women aged 20 to 26 (Guinea, 2012). These facts can be explained by the high illiteracy rate but also by poverty among women. Young girls are subjected to marriage where they perform domestic activities; this prevents them from going to school. No cause was given for the previous abortions recorded among women in prenatal consultations. This situation is linked to the fact that the diagnosis of certain abortive diseases common to humans and animals (toxoplasmosis, trichomoniasis, neosporosis, brucellosis, etc.) is not compulsory and to the lack of financial resources for laboratory diagnosis. The high IgG level (25%) related to *T. gondii* in aborted women could be one of the causes of abortion in pregnant women. Toxoplasma seroprevalence was 73%±8.7 in Coyah. This value is higher than that found in Kaolack by Kamga-Waladjo *et al*, (2012) [11] which was 24.2%. Comparing our results to those of West (18-78%), Central (20-71.2%), and North (32-51.5%) African countries, we find that most remain lower than our result (73%±8.7). The high prevalence in Coyah may be related to climatic conditions and alimentary preferences. Indeed, in Coyah there is a high humidity (86%) and a heat that favors the conservation of *Toxoplasma gondii* oocysts in the soil. This climatic characteristic facilitates the rapid and complete sporulation of oocysts. This climatic reality would explain the high prevalence in Coyah. Another reason would be the lack of application of food hygiene rules by the population of this locality. On the other hand, results similar to ours were noted in Gabon (71.2%) by Nabias *et al*, (1998) [12] In Coyah, seroprevalence does not increase with age or maternity. The opposite cases were noted [17] in Dakar (Senegal), in Kaolack (Senegal) [11] and in Ivory Coast [9]. Our finding is that the possibility of contamination of a woman by the parasite is variable and does not depend a priori on age or number of children. In our study area, women, whether young or old, primiparous or multiparous, could have the same possibility of being infected by *T. gondii.* The fact that seroprevalence was not influenced by age would be due to the sampling, which considered only women with ages ranging from 16-45 years. The presence of a cat in the homes of antenatal women was not associated with seropositivity in our study. Our observations are contrary to those made by Kamga-Waladjo *et al*, (2012)[11] who had noted an association between HIV status and the presence of cat in women's homes in Kaolack. The presence of a cat in the homes was not a risk factor in our study (OR= 0.74 CI = 0.24-2.24). Our findings are consistent with the findings of authors [13] in Saint Louis. Level of education was also not a risk factor for pregnant women. Our findings are contrary to the findings of Laboudi *et al,* (2009)[14] who mentioned that toxoplasmosis seropositivity was significantly related to the level of education among pregnant women in Morocco. This would be related to our sample size. Meat consumption did not affect seropositivity among pregnant women. This observation is contrary to that of Kamga-Waladjo et *al*, (2013)[13] in St. Louis who found that women who consumed undercooked meat were more exposed than those who consumed well-cooked meat. In contrast, meat consumption did not appear in the study in Morocco [14] as a risk for acquisition of toxoplasmic antibodies. All variables studied as risk factors did not predispose a woman to infestation. Similar observations were noted in Gabon by **Nabias, (1998)**[12] and Senegal (Saint Louis) [13]. Indeed, contact with soil remains a significant risk factor for exposure of women.

The apparent prevalence of 51%±9.8 was noted among cats in Coyah compared to 24% [16], 26.66% [17] in Dakar and 43.1% [18] in France. In this study, stray cats were found to be more infested than domestic cats with respective seroprevalences of 55.1% and 45.2%. Several authors have shown the difference in seropositivity between stray and domestic cats. Indeed, stray cats have a higher seroprevalence than domestic cats. Thus, Darabus *et al*, (2011)[19] state that the major source of environmental contamination could be stray cats. High seroprevalences were also noted in work done in Senegal in

Kaolack[11], St. Louis [13] and Romania[19] on stray cats with 78%, 60% and 80.6% respectively. The environmental conditions of Coyah could also explain this high prevalence in our study. Indeed, hygienic conditions are poor in Coyah and much of the solid waste is dumped in the peripheral areas at the edge of the city. This garbage is a favorite place for stray cats; this would explain why seroprevalence is high among cats in Coyah. In addition, work conducted in Senegal [11] , Burkina Faso [15] , and France [18] has shown an influence of age on prevalence. Our results are contrary to these observations. In our study, gender had no impact on prevalence as was the case with observations in Senegal[11] . While Jittapalapong *et al*, (2007)[20] in Thailand showed the influence of sex on seroprevalence. The chance of a cat becoming infected increases over the years and is higher for stray cats than for domestic cats. This would explain the high prevalence in cats in our work. Several authors agree that adult cats are more likely to be infected than young cats, because adults feed on the street. They often go out in search of food in garbage dumps and thus encounter several intermediate hosts (mice, cockroaches, etc.) and constitute sources of contamination. In addition, the intimate contact between cats and domestic sheep would contribute to the transmission of the disease to the cats.

CONCLUSION

This study provided useful information. These data show that in the city of Coyah (Guinea), the prevalences of toxoplasmosis in cats and women at the prenatal consultation were respectively.51%±9.8 and 73%±8.7.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

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