Scientia Africana, Vol. 22 (No. 3), December, 2023. Pp 211-218
© Faculty of Science, University of Port Harcourt, Printed in Nigeria *ISSN 1118 – 1931*

SERUM ANTIBODIES AGAINST ToRCH AGENTS IN PREGNANT WOMEN PRESENTING AT A TERTIARY HOSPITAL IN PORT HARCOURT, NIGERIA.

Okonko, I. O[1], Ogbonnia, M. A[1], Okonko, B. J[2], Onu, E. N[3], and Igwe, M.U.[1]
[1]Virus & Genomics Research Unit, Department of Microbiology, University of Port Harcourt, Port Harcourt, Nigeria
[2]Virology & Immunology Unit, Department of Microbiology, Ebonyi State University, Abakaliki, Nigeria
2 Department of Medical Microbiology, Faculty of Basic Clinical Medicine, Alex -Ekwueme Federal University Ndufu-Alike, Ikwo Ebonyi State Nigeria.
*Corresponding author's e-mail address: iheanyi.okonko@uniport.edu.ng;
Tel: +2347069697309, ORCID iD: 0000-0002-3053-253X

Received: 06-11-2023
Accepted: 04-12-2023

https://dx.doi.org/10.4314/sa.v22i3.19

Journal Homepage: http://www.scientia-african.uniportjournal.info
Publisher: *Faculty of Science, University of Port Harcourt.*

ABSTRACT

ToRCH infections pose a great risk to the fetus and neonates if the mother is actively infected during pregnancy. This may lead to miscarriage, stillbirth, delayed fetal growth and maturation (intrauterine growth retardation), or pre-term delivery. This study aimed to evaluate the prevalence of ToRCH infections in pregnant women in Port Harcourt. Sera from 84 pregnant women between the ages of 16 and 45 were analysed for detectable ToRCH IgM antibodies using the Dia-Pro ToRCH IgM kit. The results from the study showed an IgM seroprevalence rate of 82.1%, with the highest rate of seropositivity obtained among married women (91.0%), Civil servants (92.3%) and women within the age group 25-34 years (92.9%). There was significant relationship between the ToRCH IgM seropositivity and age, marital status and occupational status. The seropositivity of ToRCH agents among pregnant women in Port Harcourt is high, suggesting an acute infection which may adversely affect fetal health. This underscores the need for preventive antenatal screening and universal immunization schemes.

Keywords: ToRCH, pregnant women, ELISA, IgM antibodies.

INTRODUCTION

The term "ToRCH agents" refers to a class of infections that can be transmitted vertically, either intrauterinally, subpartum, or postnatally, and include pathogens such as *Toxoplasma gondii*, rubella virus, teratogenic cytomegalovirus (CMV), and types 1 and 2 of herpes simplex viruses (HSV-1 and HSV-2). These infections can cause significant congenital disabilities and even foetal death (Maldonado et al., 2011, Neu et al., 2015; Wang et al., 2019; Warnecke et al., 2020; FPDRS, 2022; Boston Children's Hospital, 2022; Li et al., 2023). Additional pathogens associated with pregnancy include human parvovirus-B19, varicella zoster virus (VZV), Epstein-Barr virus (EBV), *Bordetella pertussis*, *Chlamydia trachomatis*, parvovirus-B19, *Treponema pallidum*, Coxsackie virus, and hepatitis B (Sadik et al., 2012; Neu et al., 2015; Wang et al., 2019; Warnecke et al., 2020; Li et al., 2023).

ToRCH infections are typically without symptoms and are chronic in women, and

prevalence varies from one geographical area to the other (Surpam, 2006). Previous studies among pregnant women have shown IgM seropositivity to be 61.1% in central India (Manjunathachar et al., 2020) and 39.5% in Tanzania (Saajan et al., 2017). In Egypt, the overall prevalence of ToRCH infection was 98.8%, according to Nirmal et al. (2017). Sen et al. (2012) also observed that the prevalence of ToRCH infection in and around Varanasi, Northern India, ranged from 19.4% (toxoplasmosis), 30.4% (Rubella virus), 34.7% (CMV), and 33.5% (HSV-2). Li et al. (2023) found that ToRCH infections in southern China were 3.20 percent, 77.52%, and 75.90%. According to Karacan et al. (2014), the prevalence of IgG antibodies was 95% for rubella, 84.1% for CMV, and 23.1% for T. gondii, whereas 93.7% of pregnant women tested positive for both IgG and IgM antibodies. ToRCH infections are important causes of maternal and fetal morbidity and mortality. The infection's risk of harming the fetus is often more outstanding if the mother is infected in early pregnancy (Mahrous, 2018). In most cases, maternal illness due to ToRCH infections is mild, but the impact on the developing fetus is more severe (Boyer & Boyer, 2004). They are transmitted either through the placenta, exposure to blood and vaginal secretions during birth, or rarely, through breastfeeding (Deka et al., 2022). It has been reported that prenatally transmitted ToRCH agents cause nearly 3% of all congenital syndromes (Numan et al., 2015).

In Africa, ToRCH infections typically happen prior to pregnancy or seeking medical attention (Stegmann & Carey, 2002). To the women, it causes mild morbidity, but to the fetus, serious complications (Stegmann & Carey, 2002). Intrauterine growth retardation, hydrops fetalis, and intrauterine death are examples of in utero problems (Leung et al., 2020; Jaan & Rajnik, 2023). Failure to thrive, eye issues, developmental delays, paralysis, seizure disorders, hearing loss, congenital heart illnesses, and even mortality are examples of postnatal consequences (Leung et al., 2020; Jaan & Rajnik, 2023). This is because the fetus has limited ability to resist infectious organisms or prevent their dissemination to various tissues (Mladina et al., 2000). Congenital infections are the number one cause of sensorineural hearing loss in children (Jaan & Rajnik, 2023). Consequently, it is essential to conduct ToRCH testing in women of childbearing age to protect them and their unborn babies.

The diagnosis of ToRCH is mostly founded on the existence of serum antibodies, chiefly IgM, in the patient's serum (Sahu et al., 2019). Serological diagnosis comprises many sensitive and specific tests and is the centrepiece for diagnosing ToRCH infections (Batra et al., 2020). Hence, due to its sensitivity, the Enzyme-linked immunosorbent assay (ELISA) is the most commonly used test for detecting IgM and IgG antibodies against these pathogens (Sadik et al., 2012). This study sought to shed light on the disease burden of ToRCH infections that have serious prenatal implications because IgM testing is the accepted technique used globally to detect acute infection.

Globally, ToRCH infections during pregnancy have a major impact on the rates of maternal and newborn death (Gouda et al., 2023). There is a dearth of information in Nigeria, especially in Port Harcourt, about the seropositivity of ToRCH infections in expectant mothers. In order to provide appropriate counseling and infection control tactics, it is imperative to improve prenatal

Scientia Africana, Vol. 22 (No. 3), December, 2023. Pp 211-218
© Faculty of Science, University of Port Harcourt, Printed in Nigeria *ISSN 1118 – 1931*

care and analyze pregnant women's immune status to the ToRCH virus, as there is currently no baseline serological data on this topic in Rivers State, Nigeria. This study aimed to evaluate the prevalence of ToRCH infections in pregnant women in Port Harcourt, Rivers State, Nigeria and to collect baseline serological information regarding the immunological status of expectant mothers against ToRCH infection, to enhance prenatal care, and to offer suitable infection control measures.

MATERIALS AND METHODS

Study Area, Design and Population

A cross-sectional study was conducted among pregnant women attending the antenatal care clinic of the University of Port Harcourt Teaching Hospital (UPTH), Rivers State. About 84 pregnant women aged between 16 and 45 years, at different gestational phases of pregnancy, were randomly selected and included in this study. The University of Port Harcourt and the University of Port Harcourt Teaching Hospital (UPTH) ethics committee approved the study. Informed consent from participants was obtained. A well-structured questionnaire was used to obtain information on the socio-demographic data of each consenting pregnant woman. Non-pregnant women and those with no consent were excluded from the study.

Specimen collection and processing

Two millilitres of venous blood were collected aseptically, and sera were separated by centrifugation at 3500 rpm and stored at −20°C until testing. All the samples were analysed for the presence of IgM antibodies against ToRCH complex using commercially available enzyme-linked immunosorbent assay (DIA.PRO Diagnostic Bioprobes, Milano, Italy), following the manufacturer's protocol. Assay validity was evaluated as per manufacturer's recommended method.

Statistical analysis

Generated data were entered in Microsoft Excel 2016 for the primary analysis. Pearson Chi-square was calculated at a 95% confidence interval for the categorical data, and a p-value < 0.05 was considered significant to ascertain the association between ToRCH agents and other parameters.

RESULTS

Eighty-four pregnant women aged between 15 and 45 years were investigated. The mean age of the pregnant women was 24 ± 3.9 years. The overall ToRCH IgM seropositivity rate in these women were 82.1% (69/84). Table 1 displays the age group distribution of the ToRCH seroprevalence. The rate of IgM positivity was highest for women in the age group 25-34 years (92.9%) and lowest for those in the age group 16-24 years (47.1%). There was significant relationship between the age and ToRCH IgM seropositivity (χ^2= 18.14, df = 2, p=0.0001152).

Table 1: ToRCH IgM Seropositivity based on age

Age Group (Years)	No. Tested (%)	IgM Positive (%)	IgM Negative (%)	p value
16 – 24	17(20.2)	8(47.1)	9(52.9)	X2 =18.14
25- 34	42(50.0)	39(92.9)	3(7.1)	df=2
≥35	25(29.8)	22 (88.0)	3 (12.0)	p= 0.0001152
Total	**84(100.0)**	**69 (82.1)**	**15 (17.9)**	

Table 2 shows the seropositivity of ToRCH IgM based on marital status. A higher (91.0%) rate of IgM positivity to ToRCH antibodies occurred among married women compared to single women (47.1%). There was significant relationship between the marital status and ToRCH IgM seropositivity (χ^2= 17.89, df = 1, p=0.00002347).

Table 2: ToRCH IgM Seropositivity based on Marital status

Marital Status	No. Tested (%)	IgM Positive (%)	IgM Negative (%)	p value
Single	17(20.2)	8 (47.1)	9 (52.9)	X2 =17.89
Married	67(79.8)	61 (91.0)	6 (9.0)	df=1
Total	**84(100.0)**	**69 (82.1)**	**15 (17.9)**	p= 0.00002347

From the study, pregnant women who were civil servants had the highest seropositivity rate of 92.3% compared to traders and students with seropositive rates of 73.3% and 58.8%, respectively. There was significant relationship between the occupational status and ToRCH IgM seropositivity (χ^2= 10.76, df = 2, p=0.004611) as shown in Table 3.

Table 3: ToRCH IgM Seropositivity based on Occupation

Occupation	No. Tested (%)	IgM Positive (%)	IgM Negative (%)	p value
Students	17(20.2)	10 (58.8)	7 (41.2)	X2 =10.76
Civil Servant	52(61.9)	48 (92.3)	4 (7.7)	df=2
Trader	15(17.8)	11 (73.3)	4 (26.7)	p= 0.004611
Total	**84(100.0)**	**69 (82.1)**	**15 (17.9)**	

DISCUSSION

The findings of this study showed a high seroprevalence (82.1%) of IgM antibodies to ToRCH infections indicating active infection. The circulation of ToRCH infection can lead to concurrent infection and onward transmission to the foetus. This seropositivity contrasts with the seropositivity rate of 61.1% and 40.6% reported by Manjunathachar et al. (2020) and Saajan et al. (2017) from Central India and Tanzania, respectively. According to Zhang et al. (2022), congenital CMV infection cases accounted for the biggest proportion of cases of ToRCH infections in China, with congenital toxoplasmosis being the least prevalent infection at 2.89%, followed by HSV at 5.20%, and congenital rubella syndrome (CRS) at 15.61%. According to Warnecke et al. (2020), the prevalence of ToRCH in women of reproductive age living in Brazil, Mexico, Germany, Poland, Turkey, and China ranged from 0.5 to 98%. 33.46% seropositivity was found in Northern India by Dinkar and Singh (2020). For some of the ToRCH (CMV, rubella, and *T. gondii*) infections in the urban population tested by Karacan et al. (2014), no primary infection was found. The difference in seropositivity rate may result from the geographic variation of infection rate and risk factors, personal hygiene, eating habits, and lack of awareness of the disease before conception (Sajaan et al., 2017). According to Chung et al. (2018), screening is likely to be costly and of little use due to the low prevalence of ToRCH in the general population.

This observation was contrary to the reports of Manjunathachar et al. (2020) and Sadik et al. (2012), who respectively, found that women less than or equal to 24 years old, and women within 25 to 30 years old, had the highest levels of seropositivity. Dinkar and Singh (2020) reported that the highest

Scientia Africana, Vol. 22 (No. 3), December, 2023. Pp 211-218
© Faculty of Science, University of Port Harcourt, Printed in Nigeria *ISSN 1118 – 1931*

seropositivity of ToRCH (43.15%) was in the age group 15–25 years. However, it agreed with an earlier study in Iran (Josheghani et al., 2015) and study by Dinkar and Singh (2020) in Northern India, where ages above 30 years were associated with a higher risk of positivity for ToRCH infections. This may be because most mothers in these age groups might have lived in endemic settings, which exposed them to ToRCH agents. This highlights the necessity for antenatal ToRCH screening in pregnant women and an immunization strategy to evade the adverse foetal outcome.

Mothers who were civil servants had higher IgM seropositivity compared to traders or students. This result contradicts a previous report (Sahu et al., 2019) where seropositivity of ToRCH infection seems less in childbearing age women who are civil servants.

Infections with ToRCH agents increase the risk of maternal infection, leading to adverse outcomes. The findings of this study suggest that a significant number of these pregnant women will risk transmitting these agents to their unborn babies. Thus, adequate knowledge of the epidemiological characteristics of ToRCH agents is of paramount importance in preventing congenital infections (Li et al., 2009). Accurately diagnosing prenatally acquired infections is vital to the onset of appropriate treatment (Josheghan et al., 2015). Patients who test positive for IgG and IgM antibodies can avoid needless intervention by using IgG avidity as an additional test (Karacan et al., 2014). In light of this, testing for IgG avidity after assessing IgG and IgM antibodies may be a suitable strategy for expectant mothers whose serological status was unclear before becoming pregnant (Karacan et al., 2014). But ToRCH incidence varies by nation, and testing for ToRCH may be more expensive than testing for a particular disease (Chung et al., 2018).

CONCLUSION

The seropositivity of ToRCH infections among pregnant women at a tertiary hospital in Port Harcourt was high, and this poses a risk of infection in pregnancy. Interventions such as preventive antenatal screening and counselling, which can lead to early detection, can be administered in conjunction with implementing universal immunization schemes and monitoring to reduce the incidence of infection with ToRCH.

REFERENCES

Batra, P., Batra, M., & Singh, S. (2020). Epidemiology of TORCH infections and understanding the serology in their diagnosis. *Journal of Fetal Medicine*, 7:25–29.

Boston Children's Hospital (BCH, 2022). TORCH. https://www.childrenshospital.org/conditions/ToRCH

Boyer, S. G., Boyer, K. M. (2004). Update on TORCH infections in the newborn infant. *Newborn Infant Nurs Rev*. 4(1), 70–80.

Chung, M. H., Shin, C. O., & Lee, J. (2018). TORCH (toxoplasmosis, rubella, cytomegalovirus, and herpes simplex virus) screening of small for gestational age and intrauterine growth restricted neonates: efficacy study in a single institute in Korea. *Korean journal of pediatrics*, *61*(4), 114.

Deka, S., Kalita, D., Paul, M., Badoni, G., & Mathuria, Y. P. (2022). Seroprevalence and Determinants of TORCH Pathogens in Pregnant Women in the Sub-Himalayan Region. *Cureus*, *14*(2), e21946.

Dinkar, A., & Singh, J. (2020). Seroprevalence of Toxoplasma, Rubella, CMV and HSV infection at a teaching hospital: A 7 year study from North India. *Journal of Family Medicine and Primary Care*, *9*(5), 2253.

Fungal and Protozoan Diseases of the Reproductive System (FPDRS, 2022). https://www.coursehero.com/study-

guides/boundless-microbiology/fungal-and-protozoan-diseases-of-the-reproductive-system/

Gouda, M.A., Katawy, A.M.E., Ashry, W.M.O. *et al.* Current status of TORCH infection Seroprevalence in pregnant women: a cross-sectional study in Al Sharqia Governorate, Egypt. *Bull Natl Res Cent* **47**, 123 (2023). https://doi.org/10.1186/s42269-023-01099-6

Jaan A, Rajnik M. TORCH Complex. [Updated 2023 Jul 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK560528/

Josheghani, S. B., Moniri, R., Taheri, F. B., Sadat, S., & Heidarzadeh, Z. (2015). The prevalence of serum antibodies in TORCH infections during the first trimester of pregnancy in Kashan, Iran. *Iranian Journal of Neonatology*, *6*(1), 8-12.

Karacan, M., Batukan, M., Cebi, Z., Berberoglugil, M., Levent, S., Kır, M., Baksu, A., Ozel, E., & Camlıbel, T. (2014). Screening cytomegalovirus, rubella and toxoplasma infections in pregnant women with unknown pre-pregnancy serological status. *Archives of gynecology and obstetrics*, *290*(6), 1115–1120. https://doi.org/10.1007/s00404-014-3340-3

Leung, K. K. Y., Hon, K. L., Yeung, A., Leung, A. K. C., & Man, E. (2020). Congenital infections in Hong Kong: an overview of TORCH. *Hong Kong medical journal = Xianggang yi xue za zhi*, *26*(2), 127–138. https://doi.org/10.12809/hkmj198287

Li, R., Han, L., Xiong, W., Wang, W., Fan, C., Li, M., Liu, X., & Ling, L. (2023). The impact of migration-related characteristics on the risk of TORCH infections among women of childbearing age: a population-based study in southern China. *BMC public health*, *23*(1), 351. https://doi.org/10.1186/s12889-023-15238-1

Li, Z., Yan, C., Liu, P., Yan, R., & Feng, Z. (2009). The prevalence of the serum antibodies to TORCH among women before pregnancy or in the early period of pregnancy in Beijing.Clin Chim Acta. 403(1- 2), 212-15.

Mahrous, E. A. (2018). Evaluation of the effectiveness of erbium yttrium–aluminium–garnet fractional laser, carbon dioxide therapy and platelet-rich plasma in treating striae distensae. *Egyptian Journal of Dermatology and Venerology*, *38*(2), 65.

Manjunathachar, H. V., Singh, K. N., Chouksey, V., Kumar, R., Sharma, R. K., & Barde, P. V. (2020). Prevalence of TORCH infections and its associated poor outcome in high-risk pregnant women of Central India: time to think for prevention strategies. Indian Journal of Medicine and Microbiology, pp. 38, 379–84.

Mladina, N., Mehikic, G., & Pasic, A. (2000). ToRCH infections in mothers as a cause of neonatal morbidity. Medical Archives, 54(5–6): 273–276.

Neu, N., Duchon, J., & Zachariah, P. (2015). TORCH infections. *Clinics in perinatology*, *42*(1), 77–viii. https://doi.org/10.1016/j.clp.2014.11.001

Nirmal, K., Saha, R., Ramachandran, V. G., & Khan, A. M. (2017). TORCH infection in antenatal women: A 5-year hospital-based study. *Eastern Journal of Medical Sciences*, 54-57.

Numan, O., Vural, F., Aka, N., Alpay, M., & Coskun, A. D. (2015). TORCH seroprevalence among patients attending Obstetric Care Clinic of Haydarpasa Training and Research Hospital affiliated to Association of Istanbul Northern Anatolia Public Hospitals. *North Clin Istanb.* 2, 203–209.

Saajan, A. M., Nyindo, M., Gidabayda, J. G., Abdallah, M. S., Jaffer, S. H., Mukhtar, A. G., ... & Mmbaga, B. T. (2017). TORCH Antibodies Among Pregnant

Scientia Africana, Vol. 22 (No. 3), December, 2023. Pp 211-218
© Faculty of Science, University of Port Harcourt, Printed in Nigeria *ISSN 1118 – 1931*

Women and Their Newborns Receiving Care at Kilimanjaro Christian Medical Centre, Moshi, Tanzania. *The East African Health Research Journal*, *1*(2), 95.

Sadik M.S., Fatima H., Jamil K. & Patil C., (2012). Study of TORCH profile in patients with bad obstetric history. *India, Biology and Medicine*, 4 (2): 95-101.

Sahu, S. K., Pradhan, S. K., & Nayak, L. M. (2019). Seroprevalence of TORCH infection among pregnant women. *International Journal of Community and Medical Public Health*, 6, 2189-94.

Sen, M. R., Shukla, B. N., & Tuhina, B. (2012). Prevalence of Serum Antibodies to TORCH Infection in and Around Varanasi, Northern India. *Journal of clinical and diagnostic research : JCDR*, *6*(9), 1483–1485. https://doi.org/10.7860/JCDR/2012/4550.2538

Stegmann, B. J., & Carey, J. C. (2002). TORCH infections. Toxoplasmosis, other (syphilis, varicella-zoster, parvovirus B19), rubella, cytomegalovirus (CMV), and herpes infections. Curr Women's Health Rep, 2:253-8.

Surpam, R. B., Kamlakar, U. P., Khadse, R. K., Qazi, M. S., & Jalgaonkar, S. V. (2006). Serological study for TORCH infections in women with bad obstetric history. *Journal of Obstetrics and Gynecology India*, 56(1), 41-43.

Wang, Y., Li, S., Ma, N., Zhang, Q., Wang, H., Cui, J., & Wang, S. (2019). The association of ToRCH infection and congenital malformations: A prospective study in China. *European journal of obstetrics, gynecology, and reproductive biology*, *240*, 336–340. https://doi.org/10.1016/j.ejogrb.2019.04.042

Warnecke, J. M., Pollmann, M., Borchardt-Lohölter, V., Moreira-Soto, A., Kaya, S., Sener, A. G., Gómez-Guzmán, E., Figueroa-Hernández, L., Li, W., Li, F., Buska, K., Zakaszewska, K., Ziolkowska, K., Janz, J., Ott, A., Scheper, T., & Meyer, W. (2020). Seroprevalences of antibodies against ToRCH infectious pathogens in women of childbearing age residing in Brazil, Mexico, Germany, Poland, Turkey and China. *Epidemiology and infection*, *148*, e271. https://doi.org/10.1017/S0950268820002629

Zhang, L., Wang, X., Liu, M., Feng, G., Zeng, Y., Wang, R., & Xie, Z. (2022). The epidemiology and disease burden of congenital TORCH infections among hospitalized children in China: A national cross-sectional study. *PLoS neglected tropical diseases*, *16*(10), e0010861. https://doi.org/10.1371/journal.pntd.0010861