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Analysis of the cases of cytomegalovirus, toxoplasmosis and rubella in pregnant women in a reference hospital in João Pessoa, Paraíba, from August to November 2015

Análise dos casos de citomegalovírus, toxoplasmose e rubéola em gestantes em um hospital de referência em João Pessoa, Paraíba, no período de agosto a novembro de 2015

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ABSTRACT

Introduction: Infectious diseases are common during pregnancy and can be transmitted from mother to fetus. **Objective:** The present study investigated socio-economic and demographic factors associated with cytomegalovirus, toxoplasmosis and rubella, in pregnant women in the reference hospital for high-risk pregnancy, Candida Vargas Institute, located in Joao Pessoa, Paraiba. **Method:** A descriptive observational study was conducted, using cross-sectional design, by the application of questionnaires and evaluation of the tests, from August to November 2015. Results: By the descriptive data's analysis, it was verifi that from the 242 pregnant women included in the study, 39.50% were 20 to 29 years old, 70.00% had a family income under a salary under the minimum wage; 90.00% lived in the urban area and 34.70% were primiparas. From the pregnant women with serological data on the pregnancy's record, IgM seroreactivity was 88.90% for cytomegalovirus, 67.70% and 70.80% for toxoplasmosis and rubella, respectively. **Conclusions:** Thus, the found cases of susceptible and acutely ill pregnant women evidences the need of to institute guidelines for prevention, control and treatment of those diseases in order to avoid vertical transmission as much as their deleterious eff in newborns.

KEYWORDS: Seroepidemiological Studies; Pregnancy; Infectious Disease

RESUMO

Introdução: As doenças infecciosas são frequentes durante o período gestacional e podem ser transmitidas da mãe para o feto. **Objetivo:** O presente estudo investigou fatores socioeconômicos e demográficos associados à citomegalovírus, toxoplasmose e rubéola, em gestantes atendidas no hospital de referência na gestação de alto risco, Instituto Cândida Vargas, localizado em João Pessoa, Paraíba. Método: Realizou-se um estudo observacional descritivo, com delineamento transversal, a partir da aplicação de questionários e avaliação dos exames, no período de agosto a novembro de 2015. **Resultados:** A partir da análise descritiva dos dados, verificou-se que das 242 gestantes incluídas no estudo, 39,50% tinham 20 a 29 anos, 70,00% possuíam renda familiar inferior a um salário, 90,00% residiam na zona urbana, 34,70% estavam na primeira gestação. Das gestantes com registros de dados sorológicos no cartão da gestante, a sororeatividade para IgG foi 88,90% para citomegalovírus, 67,70% e 70,80% para toxoplasmose e rubéola, respectivamente. **Conclusões:** Assim, tem-se que os casos encontrados de gestantes suscetíveis e com doenças agudas demonstram a necessidade de instituir medidas de orientação para a prevenção, controle e tratamento, de modo a evitar a transmissão vertical e os efeitos deletérios destas doenças nos recém-nascidos.

PALAVRAS-CHAVE: Estudos Soroepidemiológicos; Gravidez; Doença Infecciosa

INTRODUCTION

Infectious diseases are frequent during the pregnancy period and can be transmitted from the mother to the fetus if they are not diagnosed and treated in a timely manner. They can also increase maternal and perinatal morbidity and mortality[1]. In this period women undergo various changes in their bodies, with endocrine and immunological changes. Modifications of the immune system increase the likelihood of complications[2].

Prenatal care is usually performed with simple procedures at the primary care level. Patients with some type of problem need more complex procedures that can be performed at the secondary and tertiary levels. The definition of the type of assistance will depend on the problem and the type of intervention that is required[3].

Thus, public health faces some challenges in the planning of screening strategies for infectious diseases that affect pregnant women, seeking a practical and comprehensive approach that facilitates clinical management with adequate diagnosis[4].

The diagnosis of congenital cytomegalovirus (CMV) infection is only possible when the virus is detected in the urine, saliva and cerebrospinal fluid during the first three weeks of life. It can also be performed by polymerase chain reaction (PCR) to detect viral DNA. Determination of viral presence beyond 3 weeks of age does not allow differentiation of whether the infection was congenital or perinatal[3]. The diagnosis of toxoplasmosis is usually carried out by serological tests, based on the detection of different classes of immunoglobulins, in particular IgG and IgM serum antibodies specific for *Toxoplasma gondii*[3,4]. Finally, laboratory diagnosis for rubella in pregnant women is carried out by means of virus isolation or by serological methods for the detection of specific antibodies. The most commonly used serological method is the enzyme-linked immunosorbent assay (ELISA) for the detection of specific IgM and IgG antibodies and/or virus identification from nasopharyngeal and urine secretions up to the fifth day after birth, preferably on the third day[5].

Serological screening for CMV, toxoplasmosis and rubella is of great relevance during pregnancy, since it can prevent congenital malformations and/or late problems[6]. In Brazil, public health policies recommend the serological screening for toxoplasmosis and rubella when there are suggestive symptoms. On the other hand, it is not indicated for CMV[3].

In view of the lack of recent epidemiological data on the aforementioned maternal infections for the city of João Pessoa, state capital of Paraíba, Brazil, the present study aimed not only at the collection of information about vertically transmitted infections and their association with socioeconomic and demographic factors, but also at making them available for adoption in public policies to reduce the transmission of these infections.

METHOD

A descriptive, cross-sectional, observational study was carried out based on the application of structured questionnaires to assess socioeconomic, demographic, behavioral and serological variables. We also checked the patient card of women attending the outpatient clinic of the Cândida Vargas Institute, in the city of João Pessoa.

The Cândida Vargas Institute has more than 70 years of experience in health care and is considered a reference hospital in high-risk prenatal care. The place has an adequate structure for the integral care of women, including three wards for pregnant women, Intensive Care Units (ICU), a Step-Down Unit (SDU), first-aid rooms, delivery rooms and a surgical ward. Additionally, there are outpatient services, with social, psychological, dental and medical assistance. The Institute currently hosts about 700 deliveries per month[7].

The recruitment of pregnant women was randomized and performed from August to November 2015. Initially, women with pregnancy confirmed clinically or through laboratory examination were invited to a separate room called screening room. At that moment, the objectives of the research and the Term of Free and Informed Consent (TFIC) were presented to them. Patients who fulfilled the inclusion criteria and agreed to participate in the study were asked to fill out the questionnaire. Pregnant women who did not present their prenatal follow-up card were excluded.

For statistical data analysis, we used IgM^+ and/or IgG^+ for CMV, rubella and toxoplasmosis as dependent variables. In this study, the following variables were addressed: age; marital status; schooling; city; provenance; occupation/professional activity; family income; educational attainment; number of persons at the household; habits of life; breeding of domestic animals; water origin; sewer destination; waste destination; raw meat consumption; washing procedure of fruits and vegetables; contact with dogs or cats; contraceptive methods; shared toothbrush; gestational age; parity; number of abortions; morbid conditions.

As for ethical aspects, this study was approved by the Research Ethics Committee of the Health Sciences Center of the Federal University of Paraíba (UFPB) under number 159/09 and by the Department of Health of the city of João Pessoa under number 08.898/2015.

RESULTS AND DISCUSSION

In the recruitment phase, only one of the pregnant women refused to participate in the study. The 242 pregnant women included in the study were between 13 and 45 years old, with a mean of 28.3 ± 7.4 years. According to Table 1, the most frequent age group was 20 to 29 years (39.50%), followed by the age range between 30 and 39 years (38.20%). Approximately two out of three women declared that they did not perform any professional activity and had steady relationships or were married; 70% had family income below one minimum wage; and 90% lived in urban areas. Most respondents were in their first or second pregnancy; 34.7% and 32.6% of them, respectively. On the other hand, 27.7% of the respondents said they had had at least one abortion. About 50% of them were in the third quarter of their

pregnancy. The profile of the pregnant women treated at the high-risk pregnancy reference hospital corroborates the data recently collected in the same service[8].

Of the pregnant women with serological data records on the pregnant woman's card (Table 2), 41 presented CMV seroreactivity: 40 (88.9%) were IgG reactive and only one case (2.2%) was IgM reactive. In the present study, the number of susceptible pregnant women is low, four cases (8.9%), compared with studies conducted in developed countries such as Canada, where almost half of the pregnant women were at risk of primary infection[9]. In Brazil, in a study carried out with 32,512 pregnant women in the state of Mato Grosso do Sul, 0.05% of IgM cases were reactive for CVM, with 17.9% of susceptible pregnant women and 82% previously exposed pregnant women[10].

Toxoplasmosis was reported in 46 pregnant women, of whom 44 were IgG reactive; the others were IgM reactive and IgG/IgM reactive, with a 1.5% occurrence rate, respectively. It is important to highlight that, among the 64 women with test records, 18 (27.7%) were susceptible to infection, a rate higher than the 13.8% recorded between May 2004 and April 2006 in the city of João Pessoa[11].

Rubella occurred in 32 cases, with 31 (70.8%) reactive serology for IgG and one (2.4%) IgG/IgM reactive. The seronegativity was 23.8%, even after the national immunization campaign in 2008. In contrast, in the state capital of Alagoas, this campaign promoted a reduction of the susceptibility index to less than 5%[12].

An important fact observed in the study is the high number of women who did not have a prenatal test record on their pregnant woman's card. According to Table 2, for example, the serological test for rubella was not performed or recorded in 82.6% of the pregnant women interviewed, although the serological diagnosis during pregnancy is important to preserve the health of the fetus. Zanchi et al.[13] previously reported, in a study carried out in southern Brazil, that the high-risk pregnancy reference service may not be performing these examinations with due frequency or that there may even be poor quality in the data filled in by health care professionals. In contrast, the Ministry of Health suggests its correct completion to assist health care professionals who will attend to possible complications during pregnancy[3].

Of the total number of pregnant women, 23 (9.5%) had no knowledge of the infection caused by any of the three investigated diseases. Despite this low rate, the collection of this data is essential to inform and guide public policies of awareness-raising directed at the target audience. Additionally, as stated by Oliveira and Madeira[14], humanized assistance by a multidisciplinary team is pointed out as a great ally in the quality of care.

Despite the low incidence rate of congenital toxoplasmosis in the world, of about 1.5 per 1,000 live births during the pregnancy period, it is important to inform the population and prevent the disease, since newborns may present sequelae such as chorioretinitis, intracranial calcification, hydrocephalus and central

Table 1. Frequency of descriptive factors of pregnant women attending the Cândida Vargas Institute, João Pessoa, 2015.

Socioeconomic and epidemiological factor	Character status	Pregnant women	
		Frequency	%
Age group	< 19 years	36	15.00
	20 to 29 years	96	39.40
	30 to 39 years	92	38.20
	> 40 years	18	7.30
Professional activity	Yes	160	66.11
	No	83	34.30
Marital status	Single	89	36.80
	Steady relationship	153	63.20
Family income	< 1 minimum wage	54	22.30
	1 minimum wage	117	48.30
	1 to 2 minimum wages	60	24.80
	> 2 minimum wages	11	4.55
Household	Urban area	211	87.19
	Rural area	31	12.81
Number of pregnancies	1	84	34.70
	2	79	32.60
	3	39	16.10
	4	21	8.70
	5	10	4.10
	6	7	2.90
	9	1	0.40
	10	1	0.40
Number of abortions	0	175	72.30
	1	49	20.20
	2	10	4.10
	3	6	2.50
	4	1	0.40
	6	1	0.40
Gestational age	1st quarter	30	12.40
	2nd quarter	87	36.00
	3rd quarter	125	51.70

Table 2. Frequency of seroreactivity of pregnant women attending the Cândida Vargas Institute, João Pessoa, 2015.

Disease	IgG⁺ (%)	IgM⁺ (%)	IgM⁺/IgG⁺ (%)	IgM⁻/IgG⁻ (%)	Total of pregnant women*	NI/Total (%)
Cytomegalovirus	40/45 (88.90)	1/45 (2.2)	- -	4/45 (8.90)	45	197/242 (81.40)
Toxoplasmosis	44/64 (67.70)	1/64 (1.5)	1/64 (1.50)	18/64 (27.7)	64	178/242 (73.60)
Rubella	31/42 (70.8)	--	1/42 (2.4)	10/42 (23.8)	42	200/242 (82.6)

Caption: NI = not informed, pregnant women who did not did the test or a pregnant woman's card without record.
+ reactive
- non-reactive
* pregnant women with a test record on their pregnant woman's card

Table 3. Frequency of socioeconomic and demographic factors for Cytomegalovirus. Cândida Vargas Institute, João Pessoa, 2015.

Factors	IgG⁺	IgM⁺	IgM⁺ / IgG⁺	IgG⁻ / IgM⁻	Total*
Provenance					
Urban area	39	1	-	2	42
Rural area	1	-	-	2	3
Marital status					
Steady relationship	25	1	-	-	26
Single	9	-	-	1	10
Separated or divorced	6	-	-	3	9
Water origin					
Treated water (Public network)	40	1	-	2	43
Untreated water (other)	-	-	-	2	2

Caption: IgG = immunoglobulin G reactive; IgM = immunoglobulin M.
+ reactive
- non-reactive
pregnant women with a serological test record on their pregnant woman's card

Table 4. Frequency of socioeconomic and demographic factors for Toxoplasmosis. Cândida Vargas Institute, João Pessoa, 2016.

Factors	IgG⁺	IgM⁺	IgM⁺ / IgG⁺	IgG⁻ /IgM⁻	Total*
Provenance					
Urban area	41	1	0	14	58
Rural area	3	0	1	4	8

Caption: IgG = immunoglobulin G reactive; IgM = immunoglobulin M.
+ reactive
- non-reactive
* pregnant women with a test record on their pregnant woman's card

Table 5. Frequency of socioeconomic and demographic factors for Rubella. Cândida Vargas Institute, João Pessoa, 2016.

Factors	IgG⁺	IgM⁺	IgM⁺ / IgG⁺	IgG⁻ / IgM⁻	Total*
Origin					
Urban area	30	-	-	7	37
Rural area	1	-	1	3	5
Water origin					
Treated water (Public network)	31	-	1	8	40
Untreated water (other)	-	-	-	2	2

Caption: IgG = immunoglobulin G reactive; IgM = immunoglobulin M.
+ reactive
- non-reactive
* pregnant women with a test record on their pregnant woman's card

nervous system anomalies. In severe cases, fetal loss after 24 weeks or neonatal death[15].

Most pregnant women who tested positive for rubella antibodies live in urban areas and consume treated water from the public network (Tables 3, 4 and 5). In an underdeveloped country of the African continent, the highest prevalence of specific IgG antibodies was observed in the 25-34 age group; additionally, female farmers and entrepreneurs presented significantly higher seropositivity rates than wage earners[15].

The main limitations to this study were the short period of collection, sample size and absence of information or incomplete filling of the pregnant woman's card.

CONCLUSIONS

Despite the methodological limitations of the present study, cases of susceptible and acutely ill pregnant women have demonstrated the need to establish guidelines for prevention, control and treatment in order to avoid vertical transmission and the deleterious effects of these diseases in newborns. Furthermore, health education measures should be strengthened, focusing on priority groups.

Thus, the aim is to encourage public administration and scientific community to establish policies on health education for communities with poor socioeconomic conditions, through the implementation or even improvement of existing programs for the health of women and children.

REFERENCES

1. Johnson HL, Ghanem KG, Zenilman JM, Erbelding EJ. Sexually transmitted infections and adverse pregnancy outcomes among women attending inner city public sexually transmitted diseases clinics. Sex Transm Dis. 2011;38(3):167-71. https://doi.org/10.1097/OLQ.0b013e3181f2e85f

2. Proença C. O sistema imunológico na gestação. Rev Pesq Med. 2009;11:35-8.
3. Ministério da saúde (BR). Gestação de alto risco: manual técnico. 5a ed. Brasília, DF: Ministério da saúde; 2012.
4. De Paschale M, Ceriani C, Cerulli T, Cagnin D, Cavallari S, Cianflone A et al. Antenatal screening for *Toxoplasma*
5. *gondii*, Cytomegalovirus, rubella and *Treponema pallidum*
6. infections in northern Benin. Trop Med Int Health.
7. 2014;19(6):743-6. https://doi.org/10.1111/tmi.12296
8. Centers for Disease Control and Prevention. Pregnancy and rubella. Atlanta: Centers for Disease Control and Prevention; 2016[acesso 4 jun 2016]. Disponível em: http://www.cdc.gov/rubella/pregnancy.html
9. Avelino MM, Amaral WN, Rodrigues IMX, Rassi AR, Gomes MBF, Costa TL et al. Congenital toxoplasmosis and prenatal care state programs. BMC Infect Dis. 2014;14(33):1-13. https://doi.org/10.1186/1471-2334-14-33
10. Prefeitura Municipal de João Pessoa. Instituto Cândido Vargas completa 70 anos de assistências integral à saúde da mulher. 28 ago 2015 [acesso 4 jul 2016]. Disponível em: http://www.joaopessoa.pb.gov.br/instituto-candida-vargas-completa-70-anos-de-assistencia-integral-a-saude-da-mulher/
11. Sousa LF, Lira DP. Avaliação ambulatorial da diabetes gestacional em maternidade pública de João Pessoa-PB. J MedHealth Prom. 2016;1(1):51–67.
12. Wizman S, Lamarre V, Coic L, Kakkar F, Meur JL, Rousseau C et al. Awareness of cytomegalovirus and risk factors for susceptibility among pregnant women , in Montreal, Canada. BMC Pregnancy Childbirth. 2016;16:54. https://doi.org/10.1186/s12884-016-0844-9
13. Figueiró-Filho EA, Senefonte FRA, Lopes AHA, Morais OO, Souza Júnior VG, Maia TL et al. Freqüência das infecções pelo HIV-1, rubéola, sífilis, toxoplasmose, citomegalovírus, herpes simples, hepatite B, hepatite C, doença de Chagas e HTLV I/II em gestantes, do Estado de Mato Grosso do Sul. Rev. Soc Bras Med Trop. 2007;40(2):181-7.
14. Junior CEOC, Monteiro CH. Perfil sorológico da toxoplasmose na Grande João Pessoa/PB. Rev Bras Anal Clin. 2010;42(2):149-54.
15. Moura AA, Mello MJD, Correia JB. Serological statuses of pregnant women in an urban Brazilian population before and after the 2008 rubella immunization campaign. Vaccine. 2016;34(4):445-50. https://doi.org/10.1016/j.vaccine.2015.12.019
16. Zanchi M, Gonçalves CV, Cesar JA, Dumith SC. Concordância entre informações do Cartão da Gestante e do recordatório materno entre puérperas de uma cidade brasileira de médio porte. Cad Saúde Pública. 2013;29(5):1019-28. https://doi.org/10.1590/S0102-311X2013000500019
17. Oliveira VJ, Madeira AMF. Interagindo com a equipe multiprofissional: as interfaces da assistência na gestação de alto risco. Escola Anna Nery. 2011;15(1):103-9. https://doi.org/10.1590/S1414-81452011000100015
18. Hoffman JIE. The global burden of congenital heart disease. Cardiovasc J Afr. 2013;24(4):141-5. https://doi.org/10.5830/CVJA-2013-028
19. Mwambe B, Mirambo MM, Mshana SE, Massinde AN, Kidenya BR, Michael D et al. Sero-positivity rate of rubella and associated factors among pregnant women attending antenatal care in Mwanza, Tanzania. BMC Pregnancy Childbirth. 2014;14(1):95. https://doi.org/10.1186/1471-2393-14-95

Conflict of Interest

The authors certify they have no potential conflict of interest with peers and institutions, nor any political or financial conflicts in this study.

Collaborators

Authors SOF, ACD, SAS, UMBC, FISF, CMBLL participated equally in all stages of production of this article.

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