ISSN 1695-6141
Revista electrónica trimestral de Enfermería
N°57
Enero 2020
www.um.es/eglobal/

ORIGINALES

Epidemiological and clinical profile of microcephaly cases

Perfil epidemiológico e clínico de casos de microcefalia
Perfil epidemiológico y clínico de casos de microcefalia

Evelyn Maria Braga Quirino[1]
Clarissa Mourão Pinho[2]
Mônica Alice Santos da Silva[3]
Cynthia Angélica Ramos de Oliveira Dourado[2]
Morgana Cristina Leôncio de Lima[3]
Maria Sandra Andrade[4]

[1] Infectologist Nurse. Nursing Master's student by the Associated Graduate Program UPE/UEPB. Brazil. evelynquirino@hotmail.com
[2] Master degree in Nursing by the Associated Graduate Program UPE/UEPB. Nursing PhD Student by the Associated Graduate Program UPE/UEPB.Brazil.
[3] Nursing Master Student by the Associated Graduate Program UPE/UEPB.Brazil.
[4] Post-doctor in Public Health. Associate Professor of Nursing at the Associated Graduate Program UPE/UEPB.Brazil.

http://dx.doi.org/10.6018/eglobal.19.1.366701

Received: 27/01/2019
Accepted: 21/02/2019

ABSTRACT

Objective: To describe the epidemiological and clinical profile of microcephaly cases in Recife, Pernambuco.
Method: This was a cross-sectional, quantitative study developed at a reference hospital for cases of microcephaly. Data were collected in August 2016 from the FormSUS system. All confirmed cases of microcephaly in the period from August 2015 to July 2016 were included, making up 180 cases. Data were analyzed using descriptive statistics and the chi-square and Fisher's exact tests.
Results: The majority of cases occurred in October and November 2015, with 55 (30.56%) and 52 (28.89%) cases, respectively. Serology for the Zika virus was reagent for 79 (43.89%) of the infants. The most prevalent symptom during gestation was exanthema 105 (57.3%). Furthermore, 150 (83.33%) of the children were born at full term, 78 (43.33%) presented percentiles between 10 and 50 in relation to weight and gestational age and 108 (60%) had -3 standard deviations in the comparison of head circumference with gestational age, thus considered to indicate severe microcephaly.
Conclusions: It is necessary to guarantee comprehensive and specialized care for these children. Epidemiological and entomological surveillance and more effective control actions in the fight against the vector are necessary.

Descriptors: Microcephaly; Arbovirus Infections; Zika Virus; Public Health Nursing.

RESUMO

Objetivo: Descrever o perfil epidemiológico e clínico dos casos de microcefalia em Recife, Pernambuco.

Método: Estudo transversal, quantitativo, desenvolvido em hospital de referência para casos de microcefalia. Os dados foram coletados em agosto/2016 a partir do formulário FormSUS. Foram incluídos todos os casos de microcefalia confirmados de agosto/2015 a julho/2016, perfazendo 180 casos. Para análise dos dados utilizou-se a estatística descritiva e os testes do qui-quadrado e exato de Fisher.
Resultados: A maioria dos casos ocorreram em outubro e novembro de 2015, com 55 (30,6%) e 52 (28,9%), respectivamente. A sorologia para o vírus Zika foi reagente para 79 (43,9%) dos bebês. O sintoma mais prevalente, durante a gestação, foi o exantema 105 (57,3%). Ademais, 150 (83,3%) crianças nasceram a termo, 78 (43,3%) apresentaram percentis entre 10 e 50 na relação peso e idade gestacional e 108 (60%) possuíam -3 desvios padrões na comparação do perímetro cefálico com a idade gestacional, considerada microcefalia severa.
Conclusões: É necessário garantir a essas crianças um atendimento integral e especializado. É imprescindível a vigilância epidemiológica, entomológica e ações de controle mais efetivas no combate ao vetor.

Palavras-Chave: Microcefalia; Infecções por Arbovirus; Zika Vírus; Enfermagem em Saúde Pública.

RESUMEN
Objetivo: Describir el perfil epidemiológico y clínico de los casos de microcefalia en Recife, Pernambuco.
Método: Estudio transversal, cuantitativo, desarrollado en un hospital de referencia para casos de microcefalia. Los datos se recolectaron en agosto/2016 sobre la base del formulario FormSUS. Se incluyeron todos los casos de microcefalia confirmados de agosto/2015 a julio/2016, totalizando 180 casos. Para analizar los datos, se utilizó la estadística descriptiva y las pruebas de Chi-cuadrado y exacta de Fisher.
Resultados: La mayoría de los casos tuvieron lugar en octubre y noviembre de 2015, con 55 (30,6%) y 52 (28,9%), respectivamente. La serología para el virus Zika fue reactiva para 79 (43,9) bebés. El síntoma más prevalente durante el embarazo fue la erupción cutánea, 105 (57,3%). Además, 150 (83,3%) niños nacieron a término, 78 (43,3%) presentaron percentiles entre 10 y 50 en la relación peso y edad gestacional y 108 (60%) tuvieron -3 desviaciones estándar en la comparación del perímetro cefálico con la edad gestacional, considerada como microcefalia grave.
Conclusiones: Es necesario garantizar a estos niños una atención integral y especializada. Es imprescindible la vigilancia epidemiológica y entomológica, así como y acciones de control más eficaces en la lucha contra el vector.

Palabras clave: Microcefalia; Infecciones por Arbovirus; Virus Zika; Enfermería en Salud Pública.

INTRODUCTION

In 2015, an epidemic caused by arboviruses transmitted by the mosquito Aedes aegypti occurred in Brazil. Zika virus (ZIKV) infection stood out among these arboviruses because it was linked to cases of microcephaly, and led to a change in the epidemiological scenario and congenital abnormalities in newborn children [1-3].

ZIKV was first isolated in 1947 from a monkey's blood in the Zika Valley in Uganda and the earliest reports of human infection occurred in 1952 in Uganda and Tanzania[2-5]. Few cases of human infection were reported until 2007, when the first ZIKV epidemic occurred in the state of Yap, one of the four Federated States of Micronesia. In 2013, a new outbreak was reported in French Polynesia, New Caledonia, and in 2015 Brazilian researchers isolated the virus for the first time in Bahia[6,7].

ZIKV is transmitted by arthropod mosquitoes, and it causes an usually asymptomatic infection, or with mild symptoms such as fever, erythema and arthralgia, presenting a tropism for the nervous system[4,8]. Besides vectorial transmission, other reported forms of contamination include congenital, sexual and blood transfusion [9,10]. In most cases, the disease is asymptomatic, but it may become serious when involves cases of microcephaly and Guillain-Barré syndrome associated with the virus[11].

Studies indicate that the increase in the number of microcephaly cases in Brazil, mainly in the Northeast of the country, was due to infection caused by ZIKV in women of childbearing age. These findings were confirmed after isolation of the virus in the amniotic fluid of two pregnant women who had a diagnosis of fetal microcephaly and who manifested signs and symptoms of this arbovirosis, in addition to an autopsy of a fetal abortion of a European woman who lived in the country in the beginning of gestation [2,3]. These data corroborate with the findings presented in a systematic review, where there was a causal relationship between ZIKV and congenital anomalies[12].

Microcephaly is a clinical finding resulting from genetic or non-genetic factors. The World Health Organization (WHO) characterizes microcephaly as cases when the newborn has a cephalic perimeter (CP) below - 2 or more standard deviations, and severe microcephaly when this measure is less than -3 standard deviations. This measure must be made by a qualified professional, with standardized equipment and techniques, after 24 hours of birth and within the first week of life (up to 6 days and 23 hours) [13].

After the diagnosis of microcephaly, periodic follow-up is necessary to assess its severity and possible mental retardation. The correlation between head circumference and mental retardation was confirmed in a study with 212 children presenting microcephaly published in 1968, that is, the smaller the circumference, the greater the severity of the case [14]. Neuroimaging examination is necessary to establish the etiology and severity of microcephaly, for it allows a better visualization of the affected areas. International studies describe a major reduction in the size of the central nervous system (CNS), especially in the cerebral cortex [13-15].

Microcephaly associated with ZIKV is a worldwide Public Health emergency[16] that needs to be better studied. Thus, knowing the clinical and epidemiological aspects related to this arbovirosis is considered relevant to offer subsidies for health professionals to develop lines of care that are essential to act in the different phases of development of these children. In this perspective, the present study aims to describe the epidemiological and clinical profile of microcephaly cases in Recife, Pernambuco.

METHOD

Scenario and type of study

This is a cross-sectional quantitative study developed at the Center for Epidemiological Surveillance of Hospital Scope of the Oswaldo Cruz University Hospital (VEAH-HUOC), a reference unit in the state for the care of children with microcephaly.

Data were collected in August 2016 from reports of the FormSUS system.

Population

The study population consisted of 455 reported cases of microcephaly assisted from August 2015 to July 2016.

Sample definition

The following criteria were considered: reported cases of newborns (NBs) with less than 37 weeks of gestational age and with a head circumference less than -2 or more standard deviations below the average, according to the Intergrowth table, and NBs with 37 weeks or more of gestational age presenting head circumference less than or equal to 31.5 cm for girls and 31.9 cm for boys, confirmed by imaging tests [transfontanelle ultrasonography (TF-US) and/or cranial computed tomography (CT) or magnetic resonance imaging] and/or laboratory tests (related to STORCH congenital infection and/or Zika virus infection in newborns and mothers)[16,17].

Inclusion and exclusion criteria

Live births, reported by the VEAH-HUOC nucleus, who had an intrauterine and/or post-birth diagnosis of microcephaly. Cases discharged after rulling out the possibility of microcephaly and those under investigation at the time of data collection were excluded from the study. The sample consisted of 180 confirmed cases of microcephaly.

Study variables

The variables used were taken from the FormSUS system and classified into sociodemographic data (sex, housing area and mesoregion); data related to gestation and birth (mother's age, month of birth, gestational age at birth, head circumference at birth, weight x gestational age, cephalic perimeter x gestational age); data related to the presence of signs and symptoms of ZIKV infection during gestation (exanthema, presence of fever, joint pain, and gestational trimester in which signs and symptoms were manifested); data related to imaging tests for confirmation of ZIKV infection (TF-US, CT); and finally, data related to complementary exams (echocardiogram, hearing screening test, fundoscopy, coinfection of the RN, serology for ZIKV in the NB).
Results of CT with calcifications and head circumference at birth x gestational age were used to verify associations with the following variables: gender, serology for ZIKV in the newborn, coinfection of the newborn, and trimester of gestation when the exanthema appeared.

Analysis and treatment of data

The data were stored in a Microsoft Excel 2013 spreadsheet and exported to the PASW Statistics 18. Data were analyzed using descriptive statistics and the results presented in absolute frequencies, percentages, means and standard deviations. The Chi-square and Fisher's exact tests were used. All conclusions were taken considering the level of significance of 5%.

Ethical aspects

The research project was approved by the Research Ethics Committee of the Oswaldo Cruz University Hospital, in compliance with Resolution 466/2012 of the National

Health Council, with CAAE: 57736116.9.0000.5192 and Opinion nº 1.675.612 issued in 2016.

RESULTS

Of the 455 cases reported as suspected microcephaly, 180 were confirmed by clinical criteria and laboratory tests, including serological tests (IgM ZIKV-ELISA), polymerase chain reaction (ZIKV RT-PCR), and imaging tests (TF-US and CT). In addition, 57 patients were under investigation at the time of collection and 218 reported cases were discarded after imaging and clinical care. The sample studied (n = 180) showed a predominance of females, coming from the Metropolitan Region of Recife and living in the urban zone (Table 1).

Table 1 - Distribution of confirmed cases of microcephaly according to gender, residence area, and mesoregion. Recife, PE, Brazil, 2016.

Variables	n	%
Sex		
Female	140	77.8
Male	40	22.2
Residence area		
Urban	174	96.7
Rural	6	3.3
Mesoregion of residence		
Metropolitan Region of Recife	117	65.0
Zona da Mata	27	15.0
Agreste	23	12.8
Sertão	10	5.6
Vale do São Francisco	1	0.6
Other state	2	1.1

Source: Center for Epidemiological Surveillance of Hospital Scope of the Oswaldo Cruz University Hospital (VEAH-HUOC). Recife, PE, Brazil, 2016.

In August 2015, assistance to suspected cases of microcephaly was started. The majority of diagnosed babies were born in October and November 2015, with 107 (59.4%) cases being studied. More than half of the infants had -3 standard deviations in the comparison of head circumference with gestational age, thus considered severe microcephaly (Table 2).

Table 2 - Birth and gestation data of confirmed cases of microcephaly. Recife, PE, Brazil, 2016.

Variables	n	%
Mother's age		
Under 15	2	1.1
15 to 24	80	44.4
25-34	72	40.0
35 to 44	23	12.8
Not informed	3	1.7
Minimum - Maximum	14 - 43	
Mean ± Standard deviation	26.07 ± 7.23	

Month of birth		
February 2015	1	0.6
April 2015	1	0.6
May 2015	2	1.1
June 2015	1	0.6
July 2015	6	3.3
August 2015	4	2.2
September 2015	19	10.6
October 2015	55	30.6
November 2015	52	28.9
December 2015	24	13.3
January 2016	12	6.7
February 2016	2	1.1
July 2016	1	0.6
Gestational age at delivery		
Preterm < 37 weeks	22	12.2
Term 37 to 41 weeks	150	83.3
Post-term 42 weeks or more	8	4.4
Head circumference at birth		
Minimum - Maximum	25.0 – 33.0	
Mean ± Standard deviation	29.64 ± 1.94	
Weight x Gestational age		
Below the 3 percentile	35	19.4
Between the 3 and 10 percentiles	44	24.4
Between the 10 and 50 percentiles	78	43.3
Between the 50 and 90 percentiles	18	10.0
Between the 90th and 97 percentiles	1	0.6
Below the 97 percentile	2	1.1
Not informed	2	1.1
Head circumference x Gestational age		
0 Standard deviations	9	5.0
-1 Standard deviations	25	13.9
-2 Standard deviations	38	21.1
-3 Standard deviations	108	60.0

Source: Center for Epidemiological Surveillance of Hospital Scope of the Oswaldo Cruz University Hospital (VEAH-HUOC). Recife, PE, Brazil, 2016.

The most frequent symptoms reported by mothers during pregnancy related to the arbovirosis were exanthema, fever and joint pain. Of the 39 (21.7%) mothers who reported these symptoms in the first trimester of gestation, 25 (64.1%) had children diagnosed with severe microcephaly (Table 3).

Table 3 - Distribution of signs and symptoms of the arbovirosis and gestational trimester reported by mothers. Recife, PE, Brazil, 2016.

Variables	n	%
Exanthema		
Yes	103	57.2
No	70	38.9
Does not remember/Does not know	7	3.9
Presence of fever		
Yes	52	28.9
No	90	50.0

Does not remember/Does not know	38	21.1
Joint pain		
Yes	50	27.8
No	91	50.6
Does not remember/Does not know	39	21.7
Gestational trimester		
First	39	21.7
According to	18	10.0
Third party	8	4.4
Does not remember	47	26.1
Not applicable	68	37.8

Source: Center for Epidemiological Surveillance of Hospital Scope of the Oswaldo Cruz University Hospital (VEAH-HUOC). Recife, PE, Brazil, 2016.

After the first consultation at the health unit, the infants underwent imaging tests such as TF-US and CT. Of the 68 patients who underwent TF-US, 58 (32.2%) presented image alterations such as calcifications, two had problems in the test (because they had the fontanelle closed), and five had their imaging tests considered normal. Of the 180 infants, 164 (91.1%) presented changes in the CT, 155 (86.1%) presented calcifications, 64 (35.6%) had cortical development malformation, 41 (22.8%) presented altered brain white matter, 43 (23.9%) had lysencephaly, and 106 (58.9%) ventriculomegaly.

To better monitor and investigate the 180 children, a clinical and epidemiological protocol was recommended in the state of Pernambuco, with the request for complementary tests, the results of which are shown in Table 4. These serologies were also requested for 53 mothers. Of the examinations performed on the infants, 63 (35%) were done through collection of cerebrospinal fluid (CSF).

Of the assisted and confirmed cases, 119 (66.1%) were diagnosed after birth, 163 (90.6%) are still on follow-up, 16 (8.9%) were transferred, and one progressed to death.

Table 4 - Distribution of the results of the complementary tests performed in confirmed cases of microcephaly. Recife, PE, Brazil, 2016.

Variables	n	%
Echocardiogram		
Not performed	21	11.7
Waiting for the result	34	18.9
Normal	71	39.4
Altered	54	30.0
Hearing screening test		
Not performed	23	12.8
Waiting for the result	46	25.6
Normal	90	50.0
Failure in the right ear	5	2.8
Failure in the left ear	2	1.1
Failure in both ears	10	5.6
Altered	4	2.2
Fundoscopy		
Not performed	27	15.0
Waiting for the result	48	26.7
Normal	59	32.8

Altered	46	25.6
Coinfection of the NB		
Not performed	34	18.9
Negative	141	78.3
HIV	1	0.6
Cytomegalovirus	2	1.1
Toxoplasmosis	0	0.0
Syphilis	2	1.1
Serology for Zika virus in the NB		
Positive	79	43.9
Non-reactive	5	2.8
Not performed	77	42.8
No results	19	10.6

Source: Center for Epidemiological Surveillance of Hospital Scope of the Oswaldo Cruz University Hospital (VEAH-HUOC). Recife, PE, Brazil, 2016.

Among the 155 children with calcifications in the CT, there was a higher prevalence of females (94.6%), as well as a head circumference measure of -3 SD below the average (62.9%). The independence tests were not significant for the factors evaluated (Table 5).

Table 5 - Distribution of computed tomography results of calcifications and head circumference x gestational age, according to sex, serology for Zika, coinfections, and trimester of manifestation of exanthema.

Evaluated factor	CT with calcifications		HC x GA	
	Yes	**No**	**0 to -2 SD**	**-3 SD**
Sex				
Female	122(94.6%)	7(5.4%)	52(37.1%)	88(62.9%)
Male	33(94.3%)	2(5.7%)	20(50.0%)	20(50.0%)
p-value	1.000^2		0.143^1	
Serology for Zika				
Positive	65(90.3%)	7(9.7%)	28(35.4%)	51(64.6%)
Non-reactive	5(100.0%)	0(0.0%)	4(80.0%)	1(20.0%)
p-value	1.000^2		0.067^2	
Coinfection				
Yes	4(100.0%)	0(0.0%)	2(40.0%)	3(60.0%)
No	124(95.4%)	6(4.6%)	54(38.3%)	87(61.7%)
p-value	1.000^2		1.000^2	
Trimester of exanthema				
1st trimester	33(94.3%)	2(5.7%)	14(35.9%)	25(64.1%)
2nd or 3rd trimester	24(100.0%)	0(0.0%)	10(38.5%)	16(61.5%)
Does not remember	43(93.5%)	3(6.5%)	17(36.2%)	30(63.8%)
Not applicable	55(93.2%)	4(6.8%)	31(45.6%)	37(54.4%)
p-value	0.721^2		0.689^1	

Source: Center for Epidemiological Surveillance of Hospital Scope of the Oswaldo Cruz University Hospital (VEAH-HUOC). Recife, PE, Brazil, 2016.

DISCUSSION

Until July 30, 2016, 8,801 suspected cases of microcephaly were reported in Brazil, of which 1,773 were confirmed. Of these, 1,510 occurred in the Brazilian Northeast, and

Pernambuco leads the number of reports with 376 cases. The reference unit studied reported 10.2% of cases at the national level, 11.9% from the Northeast, and 47.9% from the state of Pernambuco [16,17].

In order to improve the monitoring of cases at the national level, since August 2016, the report of microcephaly cases has been made through Public Health Events Records. In 2017, the disease ceased to be an emergency public health problem; however, the existing cases require actions to promote life-long health and clinical follow-up [13,17].

The care of children with suspected microcephaly since December 2015 has been carried out in 18 reference units divided into 4 macro-regions distributed in the Metropolitan Region of Recife, Agreste, Sertão, Vale do São Francisco, and Araripe in the state of Pernambuco. The unit in which this research was conducted is located in the macro-region I, which along with 6 other units, covers 72 municipalities of the Metropolitan Region [16,12].

Several environmental factors cause fetal malformations, among them the use of ethanol, drugs, mercury, exposure to radiation, and certain viral agents that can result in problems in the cortical development of the fetus. Intrauterine viral infections associated with damage to the CNS are considered rare, but after the onset of the Zika virus epidemic in the country, cases of microcephaly related to this virus have been observed[18]. In the present study, of the 84 children who underwent laboratorial examination and whose results were made available, 94% had positive results for ZIKV.

The scientific evidence on the association between ZIKV and microcephaly is very consistent. A Brazilian study, published in May 2016, which analyzed 5 suspected ZIKV cases, had varied results. In the first case, a baby born at term did not present microcephaly, although his mother presented signs and symptoms and positive serology for ZIKV during the eighth month of gestation. The second case was a 31-year-old woman who underwent abortion weeks after presenting signs of the disease. The last three cases were neonates presenting positive tests for the virus, who died less than 24 hours after birth [19].

Preliminary results from a control case study with 32 cases and 64 controls suggest that the microcephaly epidemic is a result of congenital infection, because 80% of the cases were positive for ZIKV-specific antibodies. The final results of this study, which aimed to evaluate the associations of microcephaly with congenital infection by ZIKV and with the use of vaccines and larvicides, demonstrated the association between microcephaly and congenital infection by ZIKV and the non-association of microcephaly with vaccination during pregnancy and the use of the larvicide pyriproxyfen[20].

The analysis of signs and symptoms of ZIKV infection in pregnant women showed that the exanthema was reported by just over half of the interviewees. Other signs and symptoms typical of the disease were absent in approximately half of the cases, or the pregnant women reported not remembering or not knowing such information to report, which may characterize asymptomatic or oligosymptomatic conditions. In a study carried out in 2009, 80% of the infected individuals did not report the characteristic symptoms of the disease [21].

In a Brazilian study, among 88 pregnant women of different gestational ages presenting the typical signs and symptoms of this arbovirosis, 72 had a positive result for ZIKV; 46 (63.9%) had joint pain and 20 (27.8%) presented fever [22]. Exanthema was observed in all pregnant women because this was an inclusion criterion of the study, and it was therefore not comparable to the sample of the present study.

The largest number of children with microcephaly were concentrated in October and November 2015. When segmenting the gestational trimesters of a full-term pregnancy, it was observed that the first and second trimesters corresponded to the Brazilian summer, a period when the number of *Aedes aegypti* mosquitos increases. These mosquitoes are well adapted to urban zones and are transmitters of arboviruses such as Dengue, Zika, and Chikungunya [(23)]. Thus, the increase in the number of cases of arbovirosis and malformation of children may be related to the seasonal period of higher incidence of the mosquito. Furthermore, 96.7% of the mothers lived in urban areas.

Countries with a tropical climate stand out in terms of transmission of arboviruses. In addition to the territorial extension of Brazil, there are regional differences and inequalities in the distribution of the basic sanitation and water network, leading to greater risks of diseases transmitted by Aedes aegypti [(24)].

In this study, it was possible to observe the presence of cases of microcephaly with a head circumference of up to 33 cm. This is due to the protocol adopted at the beginning of the outbreak, which instructed to report newborns between 37 and 42 weeks of gestation presenting a head circumference at birth equal to or less than 33 cm in the curve of the WHO [(25)]. Then, after new evidence from field studies emerged, the reference measure was reduced to 32 cm in full-term children of both sexes [(26)]. In March 2016, an international standard definition for microcephaly was adopted, in line with the WHO guidelines, in which the measures in full-term children to be adopted were 31.5 cm for girls and 31.9 cm for boys[(27)] . Although these cases were not in agreement with the current protocol, they were not disregarded in this study.

According to the analysis of head circumference values based on the standard deviations, severe microcephaly was present in 60% of the cases. It is understood that the lower the standard deviation, the worse the microcephaly and consequently the greater the dependence of this child [(15)].

A study carried out in Colombia, a country where zika is endemic, showed that during embryonic development, there is an increase in the cerebrospinal fluid of the subarachnoid space and of the ventricular volume, as well as a reduction of the supratentorial brain parenchyma, resulting in decreased brain tissue and microcephaly ssociated with ZIKV [(28)]. The virus has tropism for nervous tissue with teratogenic effects, especially in the brain of the fetus; thus, newborns with microcephaly associated with Zica present deficits of neurological development [(29)]. Therefore, support and help to the health, education and psychological aspects of families who have a children affected by ZIKV are necessary.

It is also important to use appropriate measurement and monitoring standards for children, in addition to continuous monitoring of cases of microcephaly potentially associated with ZIKV. Suspicious cases should be investigated and confirmed based on laboratory or radiological evidence [(30)].

In the present study, 164 children presented radiological alterations in the CT, and these alterations were segmented according to the occurrence, among which the more frequent were calcifications, followed by malformations of the cortical development, alterations of the white matter, lysencephaly, and ventriculomegaly. It is noteworthy that such data must be evaluated more thoroughly by specialists and that the examination depends on numerous factors such as sedation of the child, the operator, and the interpreter of the examination.

In studies that included children with or without radiological alterations, abnormalities were found in 41% of the cases, including calcifications, ventriculomegaly and lysencephaly [24]. Laboratory tests for ZIKV and CT performed in 79 cases showed that 21 (27%) had major brain anomalies on the CT scan [25].

Regarding the weaknesses of the study, it is emphasized that secondary data were used to evaluate the epidemiological profile of microcephalic patients. Further studies are needed to demonstrate clinical and epidemiological aspects in the long term in order to contribute to improve the quality of life of these patients.

CONCLUSIONS

The study ha the goal to describe the clinical and epidemiological profile of children with microcephaly diagnosed in the outbreak of 2015; it is hoped that this study contributes to future investigations about this disease. It is emphasized that the majority of children presented severe microcephaly, and will consequently require specialized multiprofessional care throughout their lives. As this is an avoidable public health problem that calls for continuous high surveillance, professionals will need specific training and qualification.

Furthermore, the need for full attention to infants who present impaired cognitive and motor skills is likely to have a socioeconomic impact and a direct impact on the quality of life of their families. Thus, not only specialized care but also social support for these families is necessary, as well as the guarantee of fulfillment of the rights related to health, education and rehabilitation.

Another essential aspect is the need for prevention in order to avoid new cases, with epidemiological and entomological surveillance, consistent educational measures, and more effective control actions in the fight against the vector.

REFERENCES

1. Weaver SC, Costa F, Garcia-Blanco MA, Ko AI, Ribeiro GS, Saade G, et al. Zika virus: history, emergence, biology, and prospects for control. Antiviral Res. [Internet] 2016 [cited 2016 Nov 20]; 130:69–80. Available from: https://doi.org/10.1016/j.antiviral.2016.03.010.
2. Oliveira Melo AS, Malinger G, Ximenes R, Szejnfeld PO, Alves Sampaio S, Bispo de Filippis AM. Zika virus intrauterine infection causes fetal brain abnormality and microcephaly: tip of the iceberg? Ultrasound Obstet Gynecol. [Internet] 2016 [cited 2016 Nov 20]; 47:6-7. Available from: http://onlinelibrary.wiley.com/doi/10.1002/uog.15831/epdf.
3. Mlakar J, Korva M, Tul N, Popović M, Poljšak-Prijatelj M, Mraz J, et al. Zika virus associated with microcephaly. N Engl J Med [Internet] 2016 [cited 2016 Nov 20]; 374:951-8. Available from: http://www.nejm.org/doi/full/10.1056/NEJMoa1600651#t=article.
4. Campos GS, Bandeira AC, Sardi SI. Zika virus outbreak, Bahia, Brazil. Emerg Infect Dis. [Internet] 2015 [cited 2016 Nov 20]; 21:1885-6. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4593454/.
5. Dupont-Rouzeyrol M, O'Connor O, Calvez E, Daures M, John M, Grangeon JP, et al. Co-infection with Zika and dengue viruses in 2 patients, New Caledonia, 2014.

Emerg Infect Dis. [Internet] 2015 [cited 2016 Nov 20]; 21:381-382. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4593454/
6. Baronti C, Piorkowski G, Charrel RN, Boubis L, Leparc-Goffart I, de Lamballierie X. Complete sequence of Zika virus from a French Polynesia outbreak in 2013. Genome Announc [Internet] 2014 [cited 2016 Nov 20]; 2(3):e00500-14. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4047448/pdf/e00500-14.pdf
7. Ioos S, Mallet HP, Leparc Goffart I, Gauthier V, Cardoso T, Herida M. Current Zika virus epidemiology and recent epidemics. Med Mal Infect [Internet] 2014 [cited 2016 Nov 20]; 44:302-7. Available from: https://www.ncbi.nlm.nih.gov/pubmed/25001879
8. Oliveira CS, Vasconcelos PFC. Microcephaly and Zika virus. J Pediatr (Rio J) [Internet] 2016 [cited 2016 Nov 20]; 92(2):103–5. Available from: http://www.scielo.br/pdf/jped/v92n2/pt_0021-7557-jped-92-02-0103.pdf
9. Esposito DLA, Moraes JB, Fonseca BAL. Current priorities in the Zica response. Immonology [Internet] 2017 Nov [cited in 17 december 2018];135 (4): 435-442 Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/imm.12878.
10. Javed F, Manzoor KN, Ali M, Haq IU, Khan AA, Zaib A, Manzoor S. Zika virus: what we need to know? J Basic Microbiol. 2018 Nov; 58(1): 3-16.
11. Göertz GP, Abbo SR, Fros JJ, Pijlman GP. Functional RNA during Zika vírus infection. Virus research 2018 Aug; 254: 41-53.
12. Krauer F, Riesen M, Reveiz L, Oladapo OD, Martínez-Veja R, Porgo TV et al. Zika virus Infection as a cause of Congenital Brain Abnormalities and Guillain-Barré Syndrome: Sistematic Review. Plos Med [internet] 2017 Jan[cited in 17 december 2018]; 1-27 Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5207634/.
13. Organização mundial da saúde. Microcephaly. [Internet] 2016 2007 [cited 2016 Jun 14]; Available from: http://who.int/mediacentre/factsheets/microcephaly/en/
14. Pryor HB, Thelander H. Abnormally small head size and intellect in children. J Pediatr [Internet] 1968 [cited 2016 Nov 20]; 73:593–598. Available from: http://www.jpeds.com/article/S0022-3476(68)80275-6/pdf
15. Coronado R, Ruíz AM, Arjonilla JG, Roig-Quilis M. Concordancia entre una función de crecimiento del perímetro cefálico y la discapacidad intelectual em relación con la etiología de la microcefalia. An Pediatr (Barc). [Internet] 2015 [cited 2016 Nov 20]; 83(2):109-116. Available from: http://www.analesdepediatria.org/es-pdf-S1695403314005311
16. Brasil. Centro de Operações de Emergências em Saúde Pública Sobre Microcefalias - COES – MICROCEFALIAS. Monitoramento dos Casos de Microcefalia no Brasil. Informe epidemiológico nº 37 – Semana Epidemiológica (SE) 30/2016 (24/07/2016 a 30/07/2016). Brasília; 2016. Disponível em: http://combateaedes.saude.gov.br/images/sala-de-situacao/informe_microcefalia_epidemiologico37.pdf
17. Pernambuco. Secretaria Estadual de Saúde de Pernambuco. Secretaria Executiva de Vigilância em Saúde. Protocolo Clínico e Epidemiológico para investigação de casos de microcefalia no estado de Pernambuco. Versão N° 02; 2015. Disponível em: http://portal.saude.pe.gov.br/sites/portal.saude.pe.gov.br/files/protocolo_microcefalia_versao02.pdf
18. Nunes ML, Carlini CR, Marinowic D, Neto FK, Fiori HH, Scotta MC, et al. Microcephaly and Zika virus: a clinical and epidemiological analysis of the current outbreak in Brazil. J Pediatr (Rio J) [Internet] 2016 [cited 2016 Nov 20]; 92(3):230–240. Available from: https://doi.org/10.1016/j.jped.2016.02.009
19. Noronha Ld, Zanluca C, Azevedo ML, Luz KG, Santos CN. Zika virus damages the human placental barrier and presents marked fetal neurotropism. Mem Inst Oswaldo Cruz [Internet] 2016 [cited 2016 Nov 20]; 111(5):287–293. Available from:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4878297/pdf/0074-0276-mioc-111-5-0287.pdf
20. Araújo TVB, Ximenes RAA, Filho DBM, Rodrigues LC, Souza WV, Montarroyos UR, Melo APL, et al. Association between microcephaly, Zika virus infection, and other risk factors in Brazil: final report of a case-control study. Lancet Infect Dis [Internet] 2018 [cited 2018 Jul 22]; 18:328–36. Available from: https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(17)30727-2.pdf
21. Duffy MR, Chen TH, Hancock WT, Powers AM, Kool JL, Lanciotti RS, et al. Zika virus outbreak on Yap Island, Federated States of Micronesia. N Engl J Med [Internet] 2009 [cited 2016 Nov 20]; 360:2536-43. Available from: http://www.nejm.org/doi/pdf/10.1056/NEJMoa0805715
22. Brasil P, Pereira JP Jr, Raja Gabaglia C, Nogueira RMR, Damasceno L, Wakimoto M, et al. Zika virus infection in pregnant women in Rio de Janeiro — preliminary report. N Engl J Med. [Internet] 2016 [cited 2016 Nov 20]; 24(375): 2321-34. Available from: http://www.nejm.org/doi/pdf/10.1056/NEJMoa1602412
23. Serpa LLN, Costa KVRM, Voltolini JC, Kakitani I. Variação sazonal de *Aedes aegypti* e *Aedes albopictus* no município de Potim, São Paulo. Rev Saúde Pública. [Internet] 2006 [citado 20 Nov 2016]; 40:1101-1105. Disponível em: http://www.scielo.br/pdf/rsp/v40n6/20.pdf
24.Vissoci JRN, Rocha TAH, Silva NC, Queiroz RCS, Thomaz EBAF, Amaral PVM et al. Zica virus infection and mycrocephaly: Evidence regarding geoespatial associations. PloS Neg Trop Des [Internet] 2018 Apr [cited in: 17 december 2018] 12(4): e0006392. Available from: https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0006392
25. Brasil. Ministério da Saúde. Nota Informativa Nº01/2015 – COES Microcefalias. Brasília (DF), 17 de novembro de 2015. Disponível em: http://www.cosemspa.com.br/wordpress/wp-content/uploads/2015/11/microcefalia-nota-informativa-17nov2015-c-1.pdf
26. Brasil. Ministério da Saúde. Protocolo de vigilância e resposta à ocorrência de microcefalia relacionada à infecção pelo vírus Zika. Brasília, 2015. Disponível em: http://portalarquivos.saude.gov.br/images/pdf/2015/dezembro/09/Microcefalia---Protocolo-de-vigil--ncia-e-resposta---vers--o-1----09dez2015-8h.pdf
27. Brasil. Ministério da Saúde. Protocolo de vigilância e resposta à ocorrência de microcefalia e/ou alterações do sistema nervoso central (SNC) Brasília, 2016. Disponível em: http://combateaedes.saude.gov.br/images/sala-de-situacao/Microcefalia-Protocolo-de-vigilancia-e-resposta-10mar2016-18h.pdf
28. Cortes MS, Rivera AM, Yepez M, Guimaraes CV, Yunes ID, Zarutskie A et al. Clinical assessment and brain findings in a cohort of mothers, fetuses and infants infected with Zika virus. Am J Obstet Gynecol [Internet] 2018 Apr [cited in 17 decmber 2018]; 218(4):440.e1-440.e36. Available from: https://www.ajog.org/article/S0002-9378(18)30013-9/fulltext
29. Pereira AM, Monteiro DLM, Werner E, Daltro P, Fazecas T, Guedes B et al. Zica virus and pragnancy in Brazil: what hapenned? J Turk Ger Gynecol Assoc [Internet] 2018 [cited in 17 december 2018]; 19(1): 39-47. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5838777/
30. Victora CG, Schuler-Faccini L, Matijasevich A, Ribeiro E, Pessoa A, Barros FC. Microcephaly in Brazil: how to interpret reported numbers? Lancet 2016 Feb;387(10019):621-4.

ISSN 1695-6141