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Mini Review

The role of Brazilian National Health Information Systems in assessing the impact of Zika virus outbreak

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Abstract

The Zika virus (ZIKV) epidemic has become a public health emergency following its association with severe neurological complications. We aim to discuss how the Brazilian National Health Information Systems can help to assess the impact of the ZIKV epidemic on health outcomes potentially related to ZIKV. Health outcomes potentially related to ZIKV infection were described based on a literature review of published studies on ZIKV infection outcomes and on recent protocols developed and published by the Brazilian Ministry of Health for different stages of the life cycle. These outcomes were correlated with the International Classification of Diseases 10th Revision (ICD-10) classification system, as this is the diagnostic classification registered in the Health Information System. A suggested list of 50 clinical manifestations, dispersed into 4 ICD chapters, and their information sources was created to help monitor the ZIKV epidemics and trends. Correlation of these selected ICD-10 codes and the HIS, as well as, a review of the potentialities and limitations of health information systems were performed. The potential of the Health Information System and its underutilization by stakeholders and researchers have been a barrier in diagnosing and reporting ZIKV infection and its complications. The ZIKV outbreak is still a challenge for health practice and the Brazilian Health Information System.

Keywords: Zika virus. Infection. Outbreak. Brazil. Health information systems.

INTRODUCTION

The Zika virus (ZIKV) epidemic has become a public health emergency. Recent studies have shown that ZIKV infection damages the central nervous system, causing fetal malformations[1] and certain neuropathies such as Guillain-Barré Syndrome[2-5]. The virus's neurotropic behavior and its ability to cross the placental barrier and cause brain damage during fetal development have been demonstrated in laboratory experiments[6,7].

ZIKV is an arthropod-borne virus, and the key vectors for its natural transmission are *Aedes aegypti* and *Aedes albopictus*[8,9], the same vectors of other febrile illnesses, such as dengue and chikungunya[10,11]. Recently, ZIKV infection has also been associated with several neurological complications, including microcephaly[5,7,12]. The virus was first isolated from rhesus monkeys in the Zika Forest of Uganda, Africa, in 1947[13]. In 2007, an outbreak of ZIKV disease occurred on Yap Island, Federated States of Micronesia. In this outbreak, mild symptoms were commonly observed, such as rash, fever, arthralgia, and conjunctivitis. No neurological complications or deaths were reported[14].

From October 2013 to early 2014, an outbreak of ZIKV disease occurred in French Polynesia, with a large number of symptomatic patients and severe cases, including neurological disorders[2,15]. Until this epidemic, no severe cases of ZIKV disease had been described[2] . Forty-two cases of Guillain-Barre Syndrome (GBS) were reported during the outbreak in French Polynesia[15,16]. According to Weaver et al., after this epidemic, ZIKV reached several other islands in Oceania, including New Caledonia, the Cook Islands, and Easter Island[16].

In Brazil, an outbreak of a febrile rash illness of unknown etiology appeared in October 2014 in Rio Grande do Norte, northeastern Brazil. The clinical manifestations were low fever or no fever, maculopapular rash, pruritus, arthralgia, and limb edema[17]. In early 2015, in Camaçari, Bahia, Brazil, a similar outbreak was described[18]. In May 2015, ZIKV was confirmed by reverse transcription-polymerase chain reaction (RT-PCR) tests in samples from patients in the states of Bahia, and Rio Grande do Norte[8,17,18].

Studies reported a high identity between sequences of ZIKV circulating in Brazil and the ZIKV Asian lineage[8,19-21]. Some authors report the hypothesis of introduction of ZIKV in Brazil

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during the 2014 World Cup soccer competition[8,22]; however, Musso argued that, since there no ZIKV-endemic Pacific countries competed in the 2014 World Cup, ZIKV was most likely introduced after the Va'a World Sprint Championship canoe race held in Rio de Janeiro, southeastern Brazil, where four Pacific countries in which ZIKV circulated during 2014 participated in this competition[23].

During the 2013 outbreak in French Polynesia, neurological complications after ZIKV disease were described[24]. However, Brazil was the first country to report a high increase in the incidence of fetal microcephaly, especially in the State of Pernambuco. By January 2016, a total of 3,530 suspected cases of microcephaly had been reported to the Brazilian Ministry of Health. According to Oliveira et al., the peak number of microcephaly cases coincided with cases of a febrile rash illness compatible with ZIKV disease, considering a pregnancy duration of 38 weeks[4]. Until early April 2016, a total of 1,384 cases of microcephaly and/or other congenital malformations had been confirmed in Brazil, 89% of them in the northeastern region[25].

A previous time-series analysis of data from the Brazilian Hospitalization System indicated an unprecedented increase in hospitalizations in the northeastern region due to several neuropathies starting in mid-2014. In this study, hospitalizations registered with several International Classification of Diseases (ICD) codes, and even different chapters, were considered. This finding suggests that identifying ICD codes potentially related to ZIKV infection might be able to answer the new challenges posed by ZIKV epidemics, bringing evidence about the relevance of using health information systems to capture possible traces of ZIKV infections related to neurological complications[26].

Population health information systems may have a major impact in promoting health actions, programs and policies as they can improve the decision-making process through data analysis. The Brazilian National Health Information Systems (HIS) cover the entire life cycle, from birth to death, and can be used to analyze the health situation and trends in different Brazilian regions, identifying potential epidemics and their impacts on health outcomes.

BRAZILIAN HEALTH INFORMATION SYSTEMS COVER LIFE CYCLES

It is important to note that the HIS covers several stages of the population life cycle, as shown in **Figure 1**. Health professionals can search for information regarding a specific disease outbreak or its associated complications from multiple sources and stages of the life cycle, such as prenatal period, birth, childhood, adulthood, old age, and death. For each stage of the life cycle, different health systems can be assessed and used, depending on the information one is searching for. For example, there is information about the mortality of newborns in the Mortality Information System (SIM), information on pregnancy and childbirth in the Live Birth Information System (SINASC), and information on newborn hospitalizations in the Hospital Information System (SIH).

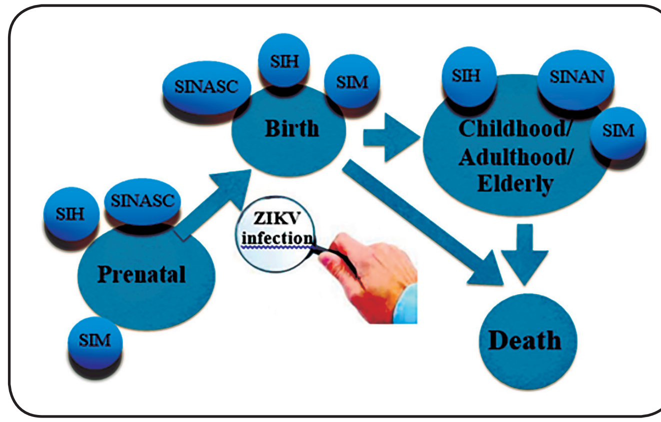

FIGURE 1 - Brazilian Health Information Systems (SIM, SINASC, SIH, SIAB, and SINAN) where indicators of ZIKV infection could be found in different stages of life. **ZIKV:** Zika virus; **SIM**: Mortality Information System; **SINASC**: Live Birth Information System; **SIH:** Hospital Information System; **SIAB:** Primary Care Information System; **SINAN:** Notifiable Diseases Information System.

Figure 1 shows the Brazilian HIS where indicators of ZIKV infection can be found in different stages of the life cycle: the SIM, SINASC, SIH, Primary Care Information System (SIAB), Notifiable Diseases Information System (SINAN), and Public Health Events Registry (RESP). Although health professionals can find information regarding different life stages using the HIS, it is not possible to follow-up one patient in different life stages, as the information is available for population levels.

Eventually, in the context of outbreaks, the Ministry of Health can develop complementary health systems, such as the RESP, created in response to ZIKV outbreak. This system covers information related to pregnancy and childbirth, and is filled online by health professionals, making the registration of such events easier and faster.

The RESP is a web form developed by *Departamento de Informática do Sistema Único de Saúde* (DATASUS) to record public health events related to ZIKV infection such as microcephaly. Even though this form is not an information system itself, it generates useful information for the SINASC. Per the protocols of the Brazilian Ministry of Health, suspected cases of microcephaly, related or unrelated to ZIKV infection, should be reported by public and private health facilities using RESP. Furthermore, these cases still need to be reported in the SINASC[27,28].

A REVIEW OF ICD CODES IN THE CONTEXT OF ZIKV OUTBREAKS AND ASSOCIATED COMPLICATIONS

We reviewed the ICD-10 codes potentially related to ZIKV and its complications to provide tools for searching for health information in those systems, and to indicate which system could provide each information (**Table 1** and **Table 2**). The correct description of ICD codes, their search in health systems and further analysis are essential to the success of the research and the quality of the results found. Furthermore, ICD code identification, description and understanding can

TABLE 1

Health outcomes potentially associated with the ZIKV outbreak, by ICD-10 code: viral infections, and neurological manifestations.

	Health outcome	Event	Health Information System	ICD-10 code
viral infections	Dengue fever (classical dengue)	Hospitalization, death	SIH, SIM, SINAN	A90
	Chikungunya virus disease	Hospitalization, death	SIH, SIM, SINAN	A92.0
	Other specified mosquito-borne viral fevers	Hospitalization, death	SIH, SIM, SINAN	A92.8
	Mosquito-borne viral fever, unspecified	Hospitalization, death	SIH, SIM, SINAN	A92.9
Neurological manifestations associated with viral infections (dengue, chikungunya and zika)	Mosquito-borne viral encephalitis	Hospitalization, death	SIH, SIM	A83
	Other mosquito-borne viral encephalitis		SIH, SIM	A83.8
	Mosquito-borne viral encephalitis, unspecified		SIH, SIM	A83.9
	Other viral encephalitis, not elsewhere classified	Hospitalization, death	SIH, SIM	A85
	Unspecified viral encephalitis	Hospitalization, death	SIH, SIM	A86
	Viral meningitis	Hospitalization, death	SIH, SIM	A87
	Other viral meningitis		SIH, SIM	A87.8
	Viral meningitis, unspecified		SIH, SIM	A87.9
	Meningitis in other infectious and parasitic diseases classified elsewhere	Hospitalization, death	SIH, SIM	G02
	Meningitis in viral diseases classified elsewhere		SIH, SIM	G02.0
	Meningitis due to other and unspecified causes	Hospitalization, death	SIH, SIM	G03
	Meningitis due to other specified causes		SIH, SIM	G03.8
	Meningitis, unspecified		SIH, SIM	G03.9
	Encephalitis, myelitis and encephalomyelitis	Hospitalization, death	SIH, SIM	G04
	Acute disseminated encephalitis		SIH, SIM	G04.0
	Other encephalitis, myelitis and encephalomyelitis		SIH, SIM	G04.8
	Encephalitis, myelitis and encephalomyelitis, unspecified		SIH, SIM	G04.9
	Encephalitis, myelitis and encephalomyelitis in diseases classified elsewhere	Hospitalization, death	SIH, SIM	G05
	Encephalitis, myelitis and encephalomyelitis in viral diseases classified elsewhere		SIH, SIM	G05.1
	Guillain-Barré syndrome	Hospitalization, death	SIH, SIM	G61.0
	Hemiplegia	Hospitalization, death	SIH, SIM	G81
	Flaccid hemiplegia		SIH, SIM	G81.0
	Paraplegia and tetraplegia	Hospitalization, death	SIH, SIM	G82
	Flaccid paraplegia		SIH, SIM	G82.0
	Paraplegia, unspecified		SIH, SIM	G82.2
	Flaccid tetraplegia		SIH, SIM	G82.3
	Paralytic syndrome, unspecified	Hospitalization, death	SIH, SIM	G83.9

ZIKV: Zika virus; **ICD-10**: International Classification of Diseases 10; **SIH:** Hospital Information System; **SIM:** Mortality Information System; **SINAN:** Notifiable Diseases Information System. *Data available from February, 2016.

help evaluate the impact of the ZIKV epidemic and its associated complications, and can also be used to build a dashboard to monitor ZIKV epidemics and trends.

Therefore, initially, health outcomes potentially related to ZIKV infection were selected based on a literature review of published studies on ZIKV outbreaks and recent protocols developed and published by the Brazilian Ministry of Health for different stages of the life cycle[27,28]. These health outcomes were correlated with the ICD-10 (2007 version), as this is the diagnostic classification registered in the Brazilian HIS[29]. These selected ICD-10 codes were correlated with distinct systems in the Brazilian HIS in the following stage.

Regarding birth outcomes, the Brazilian Ministry of Health's Surveillance and Response Protocol for microcephaly investigates cases with one of the following characteristics: newborn with microcephaly; stillborn with microcephaly and/or central nervous system malformations suggestive of congenital infection; spontaneous abortion suggestive of congenital infection; and fetus with microcephaly and/or central nervous system malformations suggestive of congenital infection[28]. The Surveillance Protocol of cases with neurological manifestations with a previous viral infection history defines suspected cases as patients attending the surveillance unit with neurological problems of unknown origin and reporting a prior viral infection up to 60 days before the onset of neurological problems. In this protocol, neurological manifestations are defined by the following diagnoses: encephalitis, meningoencephalitis, myelitis, acute flaccid paralysis, acute disseminated encephalomyelitis (ADEM), and GBS[27].

After describing the health outcomes potentially associated with the ZIKV epidemic using ICD-10 codes, we identified related events (such as hospitalizations and deaths) that could be detected and reported, and the section of the Brazilian HIS where they could each be found.

Table 1 and **Table 2** show health outcomes with their respective ICD-10 codes potentially related to the ZIKV outbreak in Brazil, in four domains: viral infections, neurological manifestations associated with viral infections (dengue, chikungunya, and zika disease), types of abortions potentially associated with ZIKV infection, and congenital malformations associated with ZIKV infection, based on the evidence presented in the paragraphs below.

TABLE 2

Health outcomes potentially associated with the ZIKV outbreak, by ICD-10 code: types of abortion and congenital malformations.

Types of abortion potentially associated with zikv infection	Spontaneous abortion	Hospitalization, fetal death or pregnant death	SIH, SIM	O03
	Medical abortion	Hospitalization, fetal death or pregnant death	SIH, SIM	O04
	Other abortion	Hospitalization, fetal death or pregnant death	SIH, SIM	O05
	Unspecified abortion	Hospitalization, fetal death or pregnant death	SIH, SIM	O06
	Failed attempted abortion	Hospitalization, fetal death or pregnant death	SIH, SIM	O07
Congenital malformations associated with zikv infection	Anencephaly and similar malformations	Birth, fetal death, newborn hospitalization	SINASC, SIM, SIH	Q00
	Microcephaly	Birth, fetal death, newborn hospitalization	SINASC, SIM, SIH	Q02
	Congenital hydrocephalus Other congenital hydrocephalus Congenital hydrocephalus, unspecified	Birth, fetal death, newborn hospitalization	SINASC, SIM, SIH SINASC, SIM, SIH SINASC, SIM, SIH	Q03 Q03.8 Q03.9
	Other congenital malformations of brain Other reduction deformities of brain *(including hydranencephaly)* Congenital malformation of brain, unspecified	Birth, fetal death, newborn hospitalization	SINASC, SIM, SIH SINASC, SIM, SIH SINASC, SIM, SIH	Q04 Q04.3 Q04.9
	Congenital malformations of eyelid, lacrimal apparatus and orbit	Birth, fetal death, newborn hospitalization	SINASC, SIH	Q10
	Anophthalmos, microphthalmos and macrophthalmos	Birth, fetal death, newborn hospitalization	SINASC, SIH	Q11
	Congenital lens malformations	Birth, fetal death, newborn hospitalization	SINASC, SIH	Q12
	Congenital malformations of anterior segment of eye	Birth, fetal death, newborn hospitalization	SINASC, SIH	Q13
	Congenital malformations of posterior segment of eye	Birth, fetal death, newborn hospitalization	SINASC, SIH	Q14
	Other congenital malformations of eye	Birth, fetal death, newborn hospitalization	SINASC, SIH	Q15

ZIKV: Zika virus; **ICD-10**: *I*nternational Classification of Diseases 10; **SIH:** Hospital Information System; **SIM:** Mortality Information System; **SINASC:** Live Birth Information System. *Data available from February, 2016.

In Brazil, besides ZIKV disease, dengue and chikungunya may also play a role in the ZIKV outbreak, as there is evidence of co-circulation of the three viruses[21]. Therefore, it is important to investigate the neurological manifestations associated with different viral infections, especially dengue, chikungunya, and ZIKV infection. Throughout the list, we considered the possibility of uncertainty among healthcare professionals when filling out health forms with ICD-10 codes; we, therefore, included some non-specific ICD-10 categories to circumvent this issue.

Many studies have suggested a possible association between ZIKV disease and microcephaly[7,30]. A recent laboratory study showed that ZIKV affects human brain cells, reducing their viability and growth[31]. ZIKV disease has also been associated with other neurological complications, including GBS[15,32], meningoencephalitis[33], microcephaly with agyria and hydrocephalus[7], hydranencephaly, intracranial calcifications[5,7], and ocular findings such as bilateral macular and perimacular lesions, and optic nerve abnormalities[34].

Furthermore, two cases of ADEM have been found to be associated with ZIKV disease in an as yet unpublished study conducted in Recife, Pernambuco, Brazil. To assess the association between ZIKV disease and GBS, a case-control study was conducted in French Polynesia to compare laboratory-confirmed ZIKV antibodies among GBS cases and controls. The authors found that 98% of patients with GBS had ZIKV antibodies, compared to only 56% among the controls, a statistically significant result[32].

We believe the association between ZIKV infection and abortion should be assessed, as it is not implausible to assume that women whose fetuses are found to have congenital malformations (e.g. microcephaly), or are aware of this risk, may opt for an abortion. Moreover, some studies have suggested that severe congenital malformations may be related to spontaneous abortion or fetal demise[5,35].

Finally, congenital malformations associated with ZIKV infection described in recent studies[4,5,6,7,30,34] and a protocol of the Brazilian Ministry of Health[28] were classified according to ICD-10. These include a broad range of congenital malformations of the brain and eye.

POTENTIALITIES AND LIMITATIONS OF HEALTH INFORMATION SYSTEMS

The ZIKV outbreak is a challenge for health practice. The Brazilian Health Surveillance System has been facing difficulties in diagnosing and reporting ZIKV infection and its complications. These represent difficulties in promptly detecting ZIKV health effects similar to those of other countries in which ZIKV is spreading, with the infection not being properly and timely confirmed by laboratory tests. The symptoms of ZIKV infection can be similar to other infectious diseases including dengue and chikungunya. Currently available laboratory tests are expensive, may cross-react with other etiologic agents, and are limited to the first weeks after infection. However, several neurological complications have been described in ZIKV-infected individuals. In future, as further studies are published, the classification system of diseases may need to be changed.

Similarly, as new evidence emerges about the disease and its pathogenesis, the health outcomes potentially associated with ZIKV infection (**Table 1** and **Table 2**) may be modified, confirmed, discarded, or replaced. At present, these outcomes are considered by the authors as potentially related to ZIKV infection and may be useful as markers of information about the disease (and its epidemic situation in Brazil) in the main Brazilian Information Systems, in a context where the disease and its determinants are still incompletely understood.

All of these health outcomes can be properly detected and recorded in information systems during health events when a person receives medical care in a healthcare facility. Health events such as births, hospitalizations, outpatient visits, and deaths represent opportunities for diagnosing and recording ZIKV infection and potentially associated neurological complications. These events are obviously associated with the provision of health services and rely on patients entering the healthcare system. Therefore, an initial barrier to diagnosing and recording health problems associated with ZIKV infection is access to health services and their quality.

Since the HIS captures isolated health events in different data sources, it is impossible to follow up the development of disease and its manifestations at the individual level. New investments can be made to link these events and allow for long-term monitoring of people affected by ZIKV. It is exactly these opportunities for diagnosing and recording ZIKV infection and potentially associated neurological complications which we are attempting to capture using data science strategies and tools, as shown in **Figure 1**.

Data science applied to health[36-38] is a promising field of study due to its ability to provide useful information from large and diverse databases. It comprises a set of strategies and techniques that bring together multidisciplinary teams with knowledge of the problem and on methods, including, statistical, mathematical and scientific computing. It combines traditional methods of analysis with sophisticated algorithms to process large volumes of data in various formats; structured and unstructured. This process of data analysis involves I) extracting, transforming and loading data; II) selection of records and creation of data subsets; III) pre-processing, linkage, and data cleansing and enrichment; IV) transformation, reduction and standardization; and V) data mining through classification, association, clustering, anomaly detection and prediction; VI) interpretation of patterns, filtering and visualization, coupled to decision support systems. This set of techniques and knowledge may contribute to support health surveillance activities and epidemiological studies about Zika and potentially associated neuropathies. Besides the large amount of data on the usage of the Brazilian Unified Health System (SUS), it is important to add general information to outline scenarios and conditions in which the disease processes take place, by integrating available information from external databases, such as social networks, blogs and digital media, as well as environmental and climatic data, which will be produced and associated with health data through geographic information systems and spatial analysis tools.

Another limiting factor for adequately diagnosing and recording these health outcomes is the context in which they are produced. The data included in the SINASC is gathered from birth declarations, which are filled soon after birth. About 95% of births in Brazil are recorded in this system, with 85% of births occurring in hospital settings. There is, therefore, a high coverage of birth records, but this does not guarantee adequate reporting of birth defects. Furthermore, as the SINASC's updating time for newborns can be as high as 90 days, other reporting methods need to be developed for public health emergencies, such as the RESP, to help collect and compile data and characterize the emergency[28]. Studies in Brazil have suggested under-reporting of about 40% for congenital anomalies in live births[39]. The World Health Organization estimates that about 2 to 3% of children are born with some congenital anomaly; in Brazil, this percentage is 0.8%, according to SINASC data. Regarding microcephaly, measurement of brain diameter in the first hours after birth can produce a large number of false positives[39]. However, a recent study, which evaluated the SIM and SINASC, showed improvement in adequacy levels of information from 2008-2010, compared to 1999-2001[40]. Confirmation of severe and irreversible microcephaly can only be done through additional tests and adequate follow-up, and is not recorded in the birth declaration. With the increasing number of congenital malformations associated with Zika, the number of congenital anomalies should approach expected levels as the reporting system improves[41].

Fetal and neonatal deaths can be retrieved in the SIM, but this system has further problems, such as low coverage and poor reporting of the primary cause of death[42]. A large number of fetal or neonatal deaths occur outside the hospital, and under no medical care, which complicates the assessment of congenital malformations using this information system.

The SIH records hospitalizations in public and private hospitals in Brazil associated with the SUS. Payment for these services is done after the SUS issues and certifies an Authorization for Hospitalization. Since this is a public healthcare system, hospitalizations cover most of the needs of the low-income population, but not about 25% of the population who are privately insured[43] or who pay out-of-pocket for private services, as only about 71% of Brazilians use the SUS as their main healthcare provider. The SIH includes financial and administrative information, as it is used for reimbursing expenses. It is occasionally used as a source of epidemiologic data, but can be used as a secondary data source for conducting research and epidemiologic surveillance. Still, because of the high coverage of these services, relatively stable and standardized data production, and rapid production and dissemination of data through TABNET/DATASUS, it can be used as an epidemiological alert system, especially for severe infectious diseases[44,45].

The SIH records hospital procedures, initial diagnosis, primary and secondary diagnoses, and the cause of death (if applicable). These fields can be used to examine possible neurological complications of ZIKV infection (**Table 1**). However, it should be noted that the diagnosis is recorded in the first days of hospitalization or soon after discharge, although it can be changed throughout the hospital stay after additional tests are performed, such as imaging tests and laboratory confirmation of the infection. Adequate diagnosis and reporting of ICD codes depends on the complexity of the procedures and the quality of health services, which can be a complicating factor in the case of neuropathies.

The HIS can provide important information for analyzing and monitoring the impact of ZIKV transmission on the health of the population. However, there is a lag between the production and release of data from national information systems; for the SIH and SINAN, the release of data can take a few months, while for the SIM and SINASC, this delay can be up to two years or more.

On the other hand, public health alerts have a great potential for changing health care practices and the way they are recorded. In future, false outbreaks of diseases related to ZIKV infection may arise, due to greater attention to clinical pictures previously overlooked or incorrectly reported. The broad press coverage of malformations, especially microcephaly and, to a lesser extent, neuropathies such as GBS, puts pressure on the health system, with pregnant women, healthcare providers, researchers, and governments playing a central role. Investigation of a possible relationship between the various neurological problems mentioned here and ZIKV infection is becoming routine in health services and causing anxiety among patients.

Future research based on the retrieval and matching of historical series should consider potential over-reporting, changes in the way causes are reported, new diagnostic methods and clinical and laboratory routines, and the effect of changes in the quality of reporting of Zika-associated diseases.

Several causes for hospitalization have been reported in the absence of a diagnostic protocol for neurological complications caused by ZIKV infection[26]. In future, with the introduction of new clinical entities to the ICD list and their incorporation into health service practices, a new profile of diseases to be reported and recorded in information systems will probably emerge. The World Health Organization recommends, since December 2015, that ZIKV infection is classified under codes U06 (Zika virus disease) or U06.9 (Zika virus disease, unspecified)[46].

Until the end of 2015, a set of clinical manifestations were used to represent the neurological complications of ZIKV infection, not only due to difficulties in laboratory diagnosis (because there was no test to detect the infection), but also because no alert had been issued regarding the epidemic. PCR is currently used, but it is expensive and only used for detecting recent infections. These data are scattered over the various national HIS, under different names and covering diverse health events, such as hospitalizations, deaths (fetal or not), births, and clinical and laboratory tests, making assessment of this information challenging.

It must be noted that during the epidemic and because of the epidemiological alerts, there should be a migration of the basic causes (classified according to ICD-10) of major health events recorded in HIS: births and malformations, hospitalizations due to neurological problems, births and spontaneous abortions, deaths due to neuropathies, and arbovirus infections. With the introduction of new standards and diagnostic procedures and the publication of alerts about the new epidemic, the reporting of ZIKV infection-related neuropathies is likely to increase, using a new taxonomy and case classification.

Before the Zika epidemics, diagnosing neuropathies was not a priority for health systems and even less so for the information systems of the SUS. The introduction of new routine procedures and protocols may change the accuracy of diagnosis, affecting the quality of morbidity indicators for neuropathies. We believe that the HIS is currently underutilized and an appropriate understanding of its role by health professionals, stakeholders and researchers can help to produce and analyze information regarding important diseases, especially recent outbreaks and their associated complications, such as ZIKV infection.

Conflict of interest

The authors declare that there is no conflict of interest.

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