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EVALUATION OF THE CHIKUNGUNYA FEVER SURVEILLANCE SYSTEM IN CEARÁ

AVALIAÇÃO DO SISTEMA DE VIGILÂNCIA DA FEBRE DE CHIKUNGUNYA NO CEARÁ

EVALUACIÓN DEL SISTEMA DE VIGILANCIA DE LA FIEBRE CHIKUNGUNYA EN CEARÁ

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ABSTRACT
Objective: To assess the data quality and representativeness of the chikungunya surveillance system in the state of Ceará from 2019 to 2023. **Method:** An evaluative study with a quantitative approach, based on an analysis of Chikungunya data recorded on SINAN. The evaluation followed CDC guidelines. **Results:** 104,850 suspected cases of chikungunya were reported, of which 56,691 were confirmed. Data completeness was excellent for all mandatory variables, except for the essential variable schooling, which showed low completeness. Data consistency ranged from excellent to fair. The system showed good representativeness. **Conclusion:** The surveillance system had satisfactory data quality and good representativeness. It is recommended that strategies be implemented to improve the training of health teams, with a view to sensitizing them to the importance of quality in recording notifications, guaranteeing more accurate and complete information for public health decision-making.
Keywords: *Epidemiologic Surveillance Services; Chikungunya fever; CDC.*

RESUMO
Objetivo: Avaliar a qualidade dos dados e a representatividade do sistema de vigilância da chikungunya no Estado do Ceará no período de 2019 a 2023. **Método:** Estudo avaliativo de abordagem quantitativa, baseado na análise dos dados da Chikungunya registrados no SINAN. A avaliação seguiu as diretrizes do CDC. **Resultados:** Foram notificados 104.850 casos suspeitos de chikungunya, dos quais 56.691 foram confirmados. A completitude dos dados foi excelente para todas as variáveis obrigatórias, exceto para a variável essencial escolaridade, que apresentou baixa completude. A consistência dos dados variou de excelente a regular. O sistema demonstrou boa representatividade. **Conclusão:** O sistema de vigilância apresentou qualidade satisfatória dos dados e boa representatividade. Recomenda-se a implementação de estratégias para aprimorar a capacitação das equipes de saúde, visando sensibilizá-las sobre a importância da qualidade no registro das notificações, garantindo informações mais precisas e completas para a tomada de decisão em saúde pública.
Descritores: *Serviços de vigilância epidemiológica; Febre de Chikungunya; CDC.*

RESUMEN
Objetivo: Evaluar la calidad y representatividad de los datos del sistema de vigilancia de chikunguña en el estado de Ceará entre 2019 y 2023. **Método:** Estudio evaluativo con enfoque cuantitativo, basado en el análisis de los datos de chikunguña registrados en el SINAN. La evaluación siguió las directrices de los CDC. **Resultados:** Se notificaron 104.850 casos sospechosos de chikunguña, de los cuales 56.691 fueron confirmados. La integridad de los datos fue excelente para todas las variables obligatorias, excepto para la variable esencial, escolaridad, que mostró una integridad baja. La consistencia de los datos varió de excelente a regular. El sistema mostró una buena representatividad. **Conclusión:** El sistema de vigilancia presentó una calidad de datos satisfactoria y una buena representatividad. Se recomienda implementar estrategias para mejorar la capacitación de los equipos de salud, con el fin de sensibilizarlos sobre la importancia de la calidad en el registro de las notificaciones, garantizando así una información más precisa y completa para la toma de decisiones en salud pública.
Descriptores: *Servicios de Vigilancia Epidemiológica; Febre de Chikungunya; CDC.*

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INTRODUCTION

Chikungunya fever is a mosquito-borne viral disease caused by *Alphavirus* (CHIKV - chikungunya virus) belonging to the virus family of Togaviridae virus and transmitted by the bite of infected female mosquitoes most commonly of *Aedes* gender, specifically *Ae. Aegypti* species, widely distributed and adapted to Brazilian territory. The disease emerged in 2014 after the discovery of CHIKV 06.21 variant with better vector adaptation to different climatic zones, associated with disorderly urban expansion with higher demographic density[1,2,3].

In 2024, Chikungunya fever reached 383,573 new cases around the world, with 140 deaths in 21 countries. Among them, Brazil with 353,495 (92%) new cases[4]. In Ceará until the epidemiologic 33rd week of 2024, 8,522 suspected cases were notified and 671 cases were confirmed, the towns of Fortaleza, Juazeiro do Norte, Caucaia and Viçosa do Ceará concentrated most of the confirmed[5] cases.

The Chikungunya surveillance process begins of suspect case (Figure 1) with individuals presenting abrupt onset of fever > 38ºC, intense or not, joint pain in acute phase not explained by other conditions to traveler or resident individuals of endemic areas or with epidemic phase until 14 days after the beginning symptoms or epidemiologic link with confirmed imported case[1], and compulsory notification to every suspected and confirmed case.

The collected information of surveillance data allows the monitoring of epidemics and pathogen disseminations for exposure, improving the actions of control and prevention[6]. Therefore, the strategies of combat to *Ae. Aegypti* goes through most relevant, considering the vector dynamic on territory causes significant impact to public costs, and as a consequence cause an overload on the health system with the necessity of direction to disease mitigation actions and vectors[7,8].

Considering that Chikungunya fever has a higher epidemic potential to cause after-effect and extending a chronic disease with economic lack related to absenteeism in work and elevated costs to the patient assistance, it's necessary to evaluate the surveillance system of Chikungunya fever to notified cases in Ceará, in order to supply health professionals with accurate and suitable information, contributing to planning the actions to better the attention, surveillance and control of vector-borne, preventing new cases, with focus in vector control and sanitary education as social responsibility.

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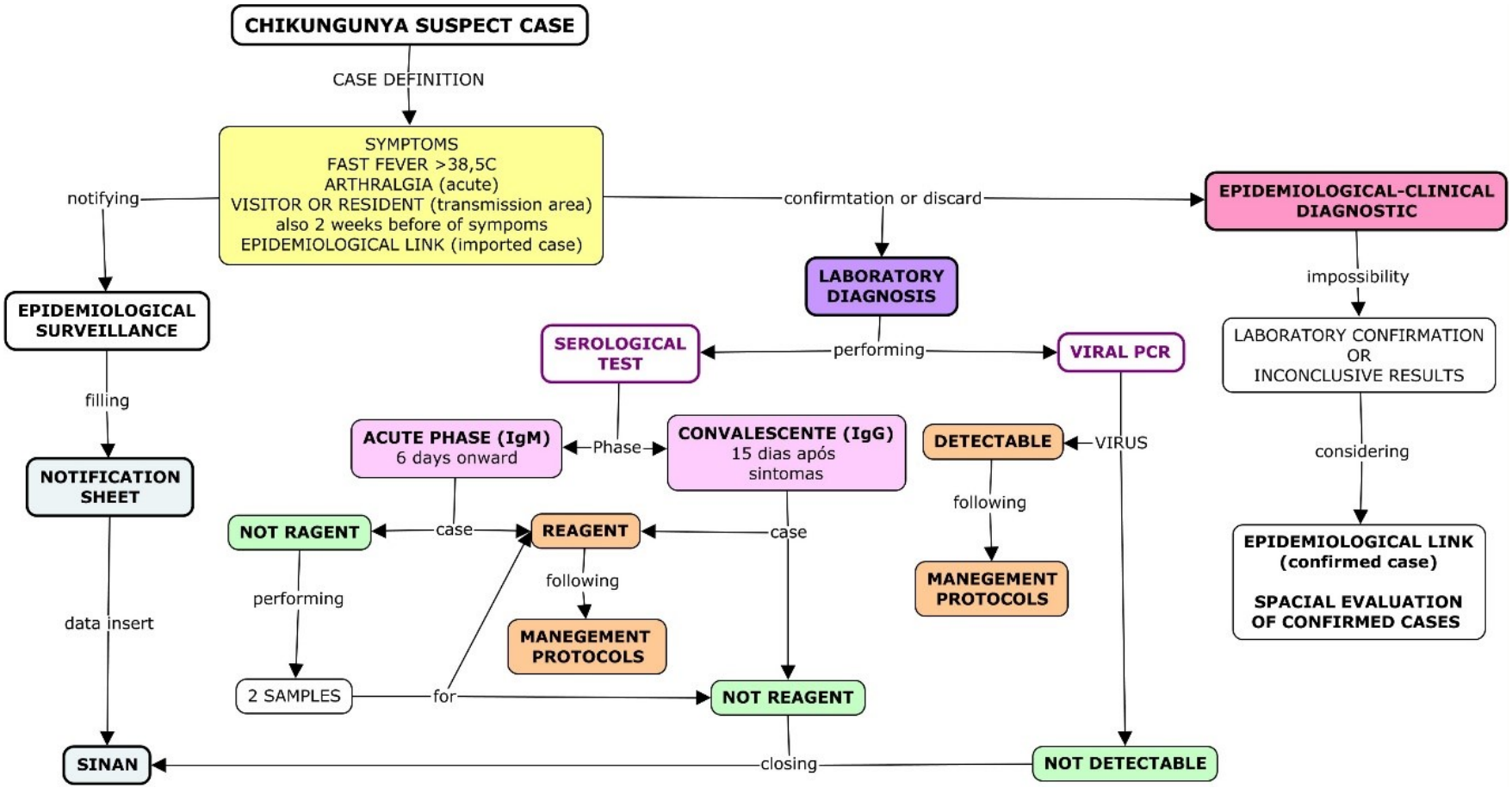
Figure 1 - Flowchart of Chikungunya Surveillance



Source: Elaborate by author 2024.

METHODS

Epidemiologic and descriptive study with retrospective approach, guided in analysis of Surveillance system of Chikungunya, considering the Centers for Disease Control and Prevention – CDC guideline in Updated guidelines for evaluating public health surveillance systems (2001)[7] to evaluate of quantitative attributes (representative) and qualitative of data quality (completeness of filling and consistency data).

Data collect happened during access to Tabnet in Datasus homepage with selection of data base relating the Chikungunya cases in Ceará state in period of 2019 to 2023. The files were downloaded, decompression, ordination and analysis through Tabwin software. Due the data being secondary data, and the data bank is not nominal with public access, the study dispenses the submission to the Ethical Summit in Search, observing the ethic aspects of resolution nº 466/2012 e nº 510/2016 of the Health National Council.

The notification sheet and investigation to Dengue and Chikungunya fever contemplate the case definition with 71 fields to mandatory and essential filling, with reserved gaps to register of complementary and observation information that there is no compilation and tab that data. With that, the mandatory fields were considered such as criteria of analysis in search, and excluded the fields directly related to Dengue fever cases.

The data was analyzed using the Tabwin software, organized in sheets in Microsoft Excel®, and evaluated based on quantitative attributes of representativeness and qualitative to data quality[7]. Statistical analysis was conducted using the Epi Info™ software.

DATA QUALITY

The data quality reflects the completeness and consistency data registered in the surveillance system of health public, considering the essential, mandatory or not mandatory fields present in the notification sheets of diseases or grievances[7].

Completeness data was analyzed selecting the mandatory variables such as clinical signs, pre-existant disease, age, gender, final classification data, confirmation criteria, and investigation year; and essential variables such as race/color, education, and case evolution, had been evaluated the percentage of determination of variables filling or not filling or with not valid data to variable ignored/white. The percentage calculated was analyzed as of a reference point to classify the incompleteness data using the parameters of excellent (< 5%), good (5 to <10%), regular (10 to <20%), bad (20 to <50%), and very bad (>= 50% or above) conform adapted of Romero and Cunha, (2007)[9].

The percentage of filled fields were analyzed such as “ignored” and “not filled or empty” to measure the data quality attributes. Surveillance systems with down percentage of answers will have quality data[7].

Evaluation criteria had evaluated variables such as “good” in three or more fields that classify the surveillance system as of “good quality”, and those with less of three fields evaluated as “good”, will be classified as “bad quality”. The adequate filling with

necessary information mean an intervention of surveillance group was adequate, beside subsidizing epidemiologic analysis different[10].

Consistent data analysis Search to identify the incorrect data filling in the notification sheets, for that reach a better of quality data. It's understandable for consistent the coherence between the categories marked in two fields interconnected. The coherence between two fields data analyzed are the base to calculate basic indicators[11,12]. Thus, to evaluate the Variable about the data consistency were adopted parameter subsequent as "excellent" to equal or higher 90%; "regular" of 70% to 89%; and "down" to less than 70%[12].

REPRESENTATIVENESS

Representativeness attribute in a surveillance system in public health is directly related to the data quality[9]. A representative system describes with precision an occurrence of sanitary events for a long time, and his distribution on population considering place and person with base data registers in SINAN during the period of study.

As for obtained results about the representativeness were realized relations of the information available in epidemiologic reports and scientific articles. A surveillance system is representative when the results present similarity with other results in the scientific literature.

Representativeness was evaluated with a base in three categories such as person, time and place. The classification followed the criteria subsequent: high representativeness – when three categories were satisfied; regular representativeness – when two categories were satisfied; and down representativeness – when one category was satisfied.

RESULTS

DATA QUALITY

Data completeness evaluation had data analysis of mandatory and essential variables using the incompleteness classification purpose for Romero e Cunha (2007)[9]. By and large, it was constated an excellence in filling those variables.

Table 1 presents the incompleteness of some variables that are important to characterization of a grievance or event in public health. Characteristics such as age, gender, gestational condition, collab to description of effected people profile. Just to variables as confirmatio criteria and investigation year demonstrated an active surveillance, and a qualifying health service when its adequately completed, and in appropriated time.

2A and 2B tables are possible to observe that mandatory variables as clinic signs and pre-existence disease present incompleteness under 1%, it's good to surveillance system, can be justified by fact those variables belong only one entry to the kind of "yes" or "no".

In 2021 analysis singly the evolution variable was classified as "good", with percentage of 6,98% (Table 3). Same that the allocated variables in the section "individual

notification" is not directly related the capacity of surveillance system in outbreak and epidemies, they demonstrate relevant to be economic social variables.

The consistency was evaluated according to purpose parameters for Abath *et al.* (2014)[11], and it was grouped in three scenarios of correlation: GENDER and pregnant; hospitalization and hospitalization year; 1º igm exam year to chikungunya and result of 1º IgM exam to Chikungunya. Therefore, the proportion of case notification was made with those interrelated variables interrelated filled in consistent way, in other words, with values and categories no conflicting.

Data consistency was considered "excellent" to pregnant and gender variables (Table 4A), with 100% of consistency. Coherence level was evaluated to hospitalization and hospitalization year (Table 4B), only the year 2020 to 2021 were classified as "excellent", over year were analyzed as "regular".

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Table 1 - Incompleteness of mandatory and essential variables of surveillance system of Chikungunya in Ceará State, 2019 – 2023.

	EMPTY AND IGNORED FIELDS												CLASSIFICATION
	2019		2020		2021		2022		2023		MEAN		
MANDATORY VARIABLES	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	
Age	0	0	0	0	0	0	0,2	13	0,1	1	0	2,8	Excellent
Gender	0	0	0	0	0	4	0	62	0	6	0	14,4	Excellent
Pregnat	1,6	94	2,6	100	3,7	199	6,8	5549	2,8	265	3,5	1241	Excellent
Final classification	1,4	86	1,7	66	3,1	169	1,3	1052	1,3	122	1,6	280	Excellent
Confirmation criteria	1	59	1,2	47	2,6	139	1,2	1037	1,2	120	1,4	280	Excellent
Investigation year	0,5	29	0,5	19	0,8	43	0,1	120	0,5	56	0,5	53,4	Excellent

Source: Made by author. SINAN online data, 2019-2023. N = 104.850

Table 2 – Mandatory variables incompleteness of clinic signs (2A) and pre-existence disease (2B) of surveillence system of Chikungunya in Ceará State, 2019 – 2023.

2A	EMPTY AND IGNORED FIELDS												CLASSIFICATION
	2019		2020		2021		2022		2023		MEAN		
SIGN AND SYMPTONS	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	
Fever	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Myalgia	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Headache	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Rash	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Vomit	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Nausea	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Backache	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Conjuntivictis	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Arthritis	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Joint pain	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Parishes	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Leukopenia	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Positive loop test	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent
Retroorbital pain	0,5	29	0,5	19	0,8	43	0,1	115	0,5	56	0,5	262	Excellent

Source: Made by author. SINAN online data, 2019-2023. N = 104.850

Table 3 - Essential variable incompleteness of surveillance system of Chikungunya in Ceará State, 2019 – 2023.

ESSENTIAL VARIABLES	EMPTY AND IGNORED FIELDS												CLASSIFICATION
	2019		2020		2021		2022		2023		MEAN		
	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	
Race/color	2,3	137	3,7	141	2	111	7,8	6337	2,4	226	3,6	1390	Excellent
Education	30,4	1762	40,1	1513	36,5	1954	54,8	44147	38,4	3616	40	10598	Bad
Evolution	2	118	3,3	128	6,9	373	2,1	1761	3,9	373	3,7	551	Excellent

Source: Made by author. SINAN online data, 2019-2023. N = 104.850

Table 4 – Pregnant and male gender consistency (4A), hospitalization (4B), and 1ª. IGM serology collect (4C) to the Chikungunya cases in Ceará State, 2019 – 2023.

4A – PREGNANCY IN MALE GENDER			
NOFICATION YEAR	CONSISTENT REGISTERS (n)	CONSISTENCY (%)	CLASSIFICATION
2019	118	100	Excellent
2020	161	100	Excellent
2021	128	100	Excellent
2022	1016	100	Excellent
2023	117	100	Excellent
General mean	**308**	**100**	**Excellent**

4B – HOSPITALIZATION WITHOUT ADMISSION DATE			
NOFICATION YEAR	CONSISTENT REGISTERS (n)	CONSISTENCY (%)	CLASSIFICATION
2019	350	88,6	Regular
2020	231	91,6	Excellent
2021	135	92,4	Excellent
2022	921	78,1	Regular
2023	380	84	Regular
General mean	**403,4**	**87**	**Regular**

4C – COLLECT YEAR OF 1ª. CHIKUNGUNYA SOROLOGY WITH RESULT			
NOFICATION YEAR	CONSISTENT REGISTERS (n)	CONSISTENCY (%)	CLASSIFICATION
2019	2074	92,9	Excellent
2020	2003	90,7	Excellent
2021	2261	87,6	Regular
2022	24591	97,3	Excellent
2023	3731	90,1	Excellent
General mean	**6932**	**91,7**	**Excellent**

Source: Made by author. SINAN online data, 2019-2023. N = 36423

Laboratorial confirmation data (Table 4C), to case percentage with register of collect data to 1a. IgM serology to Chikungunya present result of exam with variation between 87,6% to 97,3%, demonstrated "excellent" consistency to majority of years. However, in 2021 the consistency percentage was of 87,6% has been classified as "regular".

REPRESENTATIVENESS

In 2019 to 2023 were notified 104,850 suspect cases to Chikungunya in Ceará State, with 56,691 (54,06%) confirmed cases, including 862 hospitalizations, and 45 deaths by disease. In 2022 had emphasis a incidence rate of disease of 581,51/100 thousand inhabitants, while in 2020 had down incidence rate of 11,17/ thousand inhabitants to period studied.

The epidemiologic profile of confirmed cases was characterized by average of registers, indicating a predominance of female gender, that corresponding 61,2% of individuals. The majority of cases belong the age between 15 to 39 years, with average age of 47,1 years, and presents level of middle education of 23,8% cases.

Effected population by disease is majority compound for 82.7% of individuals self-declared brown, followed by 9,6% white, 2,3% black, 0,4% yellow, and 0,3% indigenous to period analyzed.

It can be stated that the surveillance system of Chikungunya used is geographically representative, since finds implanted in every city of State, and the period analyzed had at least one notification realized by cities of State, except Poranga town remained without registration to the disease. However, it's important to state that being a passive surveillance, the notifications are spontaneous form, become most vulnerable the sub notification, can interfere in the representativeness.

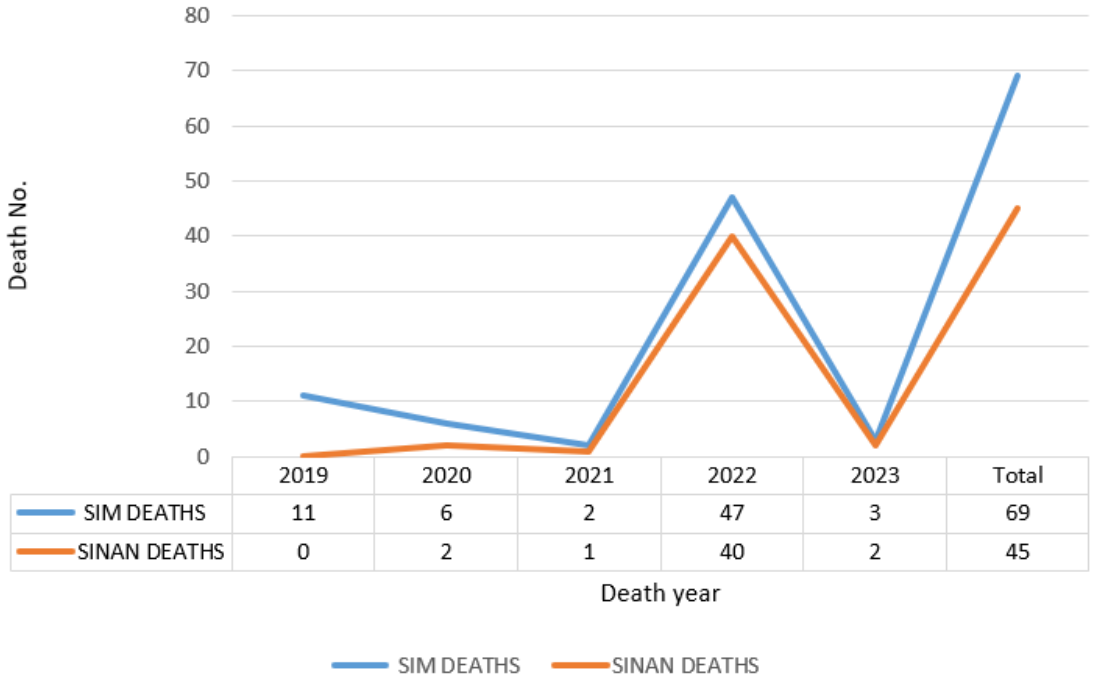
When compared the death numbers registered in the information system about mortality (SIM) to category CID 10 A92 with SINAN data, it was observed that the death dynamic is similar conform demonstrated in Graphic 1. When analyzed the data to fields "case evolution versus death by grevience", identified a difference of 24 deaths, can suggest that SINAN sheets are not been closed correctly, beside amount of 283 (0,5%) of confirmed cases to field case evolution being registered as ignored and/or empty.

Mortality rate to Chikungunya in period studied, demonstrated down value of 1% with 0,61% since classified with chronic clinic presentation. Though, it's valid to affirm that characteristic of study is not most adequate to evaluate the chronicity, because the disease is divided into three phases, acute, post-acute, and chronic. The chronic phase has a duration higher than three months of symptoms[13], and the recommendation to SINAN is that notified cases being closed until 60 days after notification.

Chikungunya fever had a down lethality when compared with other vector-bone as Dengue fever, but the cases evolution of disease to extended chronic profile can reach most half of patients[13], that requesting a higher time of permanence of monitoring in health services, with use of a relief aid most complex and interdisciplinary.

SINAN presented geographically representative in identification of seasonality of Chikungunya confirmed cases, has been possible to observe the characteristics of disease to person, time and place in Ceará State between the years 2019 to 2024. It's possible to consider a limited analyze to the variable "chronic clinic presentation", is not representative by condition that symptom continuous above three months, and the notification sheets in SINAN must be closed until 60 days after notification.

Graphic 1 – Number of Chikungunya death registered in SIM, and SINAN in Ceará state in period between 2019 to 2023.



	2019	2020	2021	2022	2023	Total
SIM DEATHS	11	6	2	47	3	69
SINAN DEATHS	0	2	1	40	2	45

Source: Elaborate by author, 2024

DISCUSSION

The adequation of registers was analyzed with data quality attribute, considering the consistency and completeness components. To evaluate the consistency was excluded the sheets without information to analyzed fields, influencing the total of notification sheets to each couple of fields evaluated.

In study realized for Silva *et al.* (2018)[14] evaluated the surveillance system of Chikungunya in Brazil, 90% or most registers were in accordance with completeness of mandatory variables. In contrast with a most variability of filling of essential variables. Thus, Ceará State follows a national standard of quality filling of notification sheets.

No mandatory variables evaluated, the filling showed "bad" only to education, since in 2022 with higher percentage of incompleteness, probably being an epidemic year to Chikungunya. The number of variables to be completed by health professionals during daily demand for service, mainly in the periods with overcrowding of health services, can upset the quality of information, as well as when the professionals unknow the importance of created information as for filled notification sheets[15].

Pedroso *et al.* (2020)[16] evaluate the surveillance system of Chikungunya in Pará State, and identified the variables had a "excellent" as value, except the variable to date of first symptoms and classification of disease no differing of our study.

In study realized for Couceiro *et al*. (2022)[17], it was investigated the epidemiology of Chikungunya in Brazil in 2017 to 2021, identifying similarities between the results of our search. A total of 457,567 individuals were notified to disease through of laboratory criteria confirmation or epidemiologic clinic with a proportion of 58,3% individuals with education of 44,1% to middle school, and age between intervals of 15 to 39 years (37,4%), and 40 to 69 years (39,1%) that in turn are similar the result found to period in our study, had been the second interval predominantly with average age 33,3% of.

The same performance was observed to results in studies of Couceiro *et al*. (2020)[17] e Silva *et. al*. (2018)[14] to describe the epidemiologic profile of Brazilian population suffered by Chikungunya in period of 2014 to 2016. For the study, 65,2% of individuals belong female gender, and 47,9% were self-declared as brown, inside interval of age with 35,8% of 20 to 39 years, and 29,7% of 40 to 59 years as second interval predominant.

CONCLUSION

Initial evaluation of surveillance system of Chikungunya in Ceará State, with emphasize in data quality and indicators of completeness and consistency, allowed identification of potentially and fragility of system. The potentially must be strengthened while the fragility needs to be mitigated by systematic monitoring of activities of health groups, and strengthening of education permanent strategies directed to health service.

It's fundamental that the responsible groups by filling in the disease notification sheets events and grievance can understand the importance of complete and accurate registers. Good, structured data is fundamental to giving confinable information supporting the decisions taken effectively by political and health administrators.

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