EXPERIENCE REPORT
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Outbreaks of infectious-contagious diseases notified in the state of Mato Grosso do Sul from 2020 to 2022

Surtos de doenças infectocontagiosas notificados no estado de Mato Grosso do Sul de 2020 a 2022

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ABSTRACT

Introduction: Due to the importance of infectious diseases for global public health, the investigation of disease outbreaks that can be prevented and controlled by health services is essential. **Objective:** Describe outbreaks reported in the state of Mato Grosso do Sul, Brazil, from 2020 to 2022, to demonstrate the importance of surveillance in situations of disease outbreaks and/or public health problems. **Method:** This is a cross-sectional, descriptive, retrospective, qualitative-quantitative epidemiological study with temporal secondary data collected from the outbreak notification system developed by the team at the Strategic Health Surveillance Information Center (CIEVS/Estadual) of Mato Grosso do Sul. **Results:** In the period, 599 outbreaks were reported, involving 8,076 suspected and 5,191 confirmed individuals. Among the outbreaks, 569 (95%) were caused by Sars-CoV-2, at 32 municipalities, most occurring in industries and hospital. Twenty-six deaths occurred in the period, of which 15 were caused by SARS-CoV-2 outbreaks. **Conclusions:** The use of tools for the notification of outbreaks is effective and helps in quick decision-making when applied efficiently.

KEYWORDS: Emergency Identification; Health Information Systems; Health Risk; International Health Regulations; Public Health Surveillance

RESUMO

Introdução: Devido à importância das doenças infectocontagiosas para a saúde pública mundial, a investigação de surtos de doença passível de prevenção e controle pelos serviços de saúde é fundamental. **Objetivo:** Descrever os surtos notificados no estado de Mato Grosso do Sul, nos anos de 2020 a 2022, e demonstrar a importância da vigilância em situações de surtos de doenças e/ou agravos de saúde pública. **Método:** Trata-se de um estudo epidemiológico transversal, descritivo, retrospectivo, qualiquantitativo com dados secundários temporais coletados do sistema de notificação de surtos criado pela equipe do Centro de Informações Estratégicas de Vigilância em Saúde (CIEVS/Estadual) de Mato Grosso do Sul. **Resultados:** No período foram notificados 599 surtos, envolvendo 8.076 indivíduos suspeitos e 5.191 confirmados. Dentre os surtos, 569 (95%) foram provocados pelo SARS-CoV-2, notificados por 32 municípios, e a maioria ocorreu em indústrias e hospitais. Ocorreram 26 óbitos no período, e destes 15 foram provenientes dos surtos por SARS-CoV-2. **Conclusões:** As utilizações de ferramentas para notificação de surtos são efetivas e auxiliam na tomada rápida de decisão quando aplicadas de maneira eficiente.

PALAVRAS-CHAVE: Identificação de Emergência; Regulamento Sanitário Internacional; Risco à Saúde; Sistema de Informação em Saúde; Vigilância em Saúde Pública

INTRODUCTION

Infectious diseases are responsible for high rates of morbidity and morbidity and mortality, which makes them of great importance to public health worldwide. Pandemics and epidemics are caused by agents that cause infectious diseases and can be considered determinants of human existence[1].

A population is considered to be at risk when new cases of a disease that can be prevented and controlled by health services are detected[2]. Therefore, if an outbreak is suspected, the investigation must be precise and immediate, so that measures to contain and prevent new cases (outbreaks) are efficient.[3]

An outbreak is considered a public health emergency which, in the absence of surveillance interventions, can cause an increase in cases and even deaths and spread to other areas. For this reason, actions related to epidemiological investigations of outbreaks and correct decision-making can prevent the number of cases from increasing and even the occurrence of an epidemic/pandemic[4].

Factors related to rampant urbanization, social inequality, poverty, and health crises can act as determinants of the occurrence of outbreaks, however, the potential for problems related to outbreaks may be inherent in society itself, so in the event of an outbreak, its sources and motivations should always be analyzed[1].

When outbreak surveillance and containment measures are not implemented, health services end up being overloaded with patient care, in addition to the social and economic damage that occurs in the affected municipality and also the possibility of the disease remaining endemic in places that were previously free[5].

In order to block the global spread of diseases, the International Health Regulations recommend that member countries of the World Health Organization take measures related to protection, prevention, control and response to the disease in a timely manner so as to minimize the risk to public health[2]. In this way, as much information as possible should be obtained during the epidemiological investigation of an outbreak in order to make the best decision and, to this end, the use of tools capable of answering more specific questions about the case are important, following basic and systematized steps[6].

The use of the Notifiable Diseases Information System (SINAN) was regulated from 1993 onwards, making it compulsory for municipalities, states, and the Federal District to feed the national database on a regular basis, through SINAN DOS and later SINAN WINDOWS. As the years went by and technology advanced, the system had to adapt to globalization and SINAN was remodeled into the NET version, which is still in force today[7].

The outbreak investigation form was a notification tool created in 2006, available on SINAN NET, consisting of identification data, characterization of the location of the outbreak and the initial diagnosis. Every outbreak should be notified, investigated, tests collected, relevant control measures advised, and data updated for epidemiological surveillance[8].

In this context, the aim of this study was to describe the outbreaks reported in the state of Mato Grosso do Sul between 2020 and 2022 and to demonstrate the importance of surveillance in situations of outbreaks of diseases and/or public health problems.

METHOD

This is a cross-sectional, descriptive, retrospective, qualitative and quantitative epidemiological study with secondary temporal data. These data were collected from the outbreak notification system, a tool produced by the team at the Strategic Health Surveillance Information Center (CIEVS/State) in Mato Grosso do Sul and made available in the Guidelines for Action in Situations of Outbreaks of Diseases and/or Public Health Problems in the State of Mato Grosso do Sul[9] for access by municipalities and completion by epidemiological surveillance.

The tool developed and used to collect data on outbreaks does not identify the subjects involved, it is easy to fill in, the information collected from the cases under investigation is entered directly into the Google Forms form, which favors rapid information, since the notification of outbreaks preconized by the Ministry of Health occurs through the use of the outbreak investigation form, available on SINAN NET.

The sample was delimited from March 2020 to December 2022 and consisted of the following information: year and month of notification, municipality where the outbreak occurred, type of place affected, causative agent, number of suspected cases, confirmed cases and deaths, tests carried out on the case, and initial measures adopted by the investigation team.

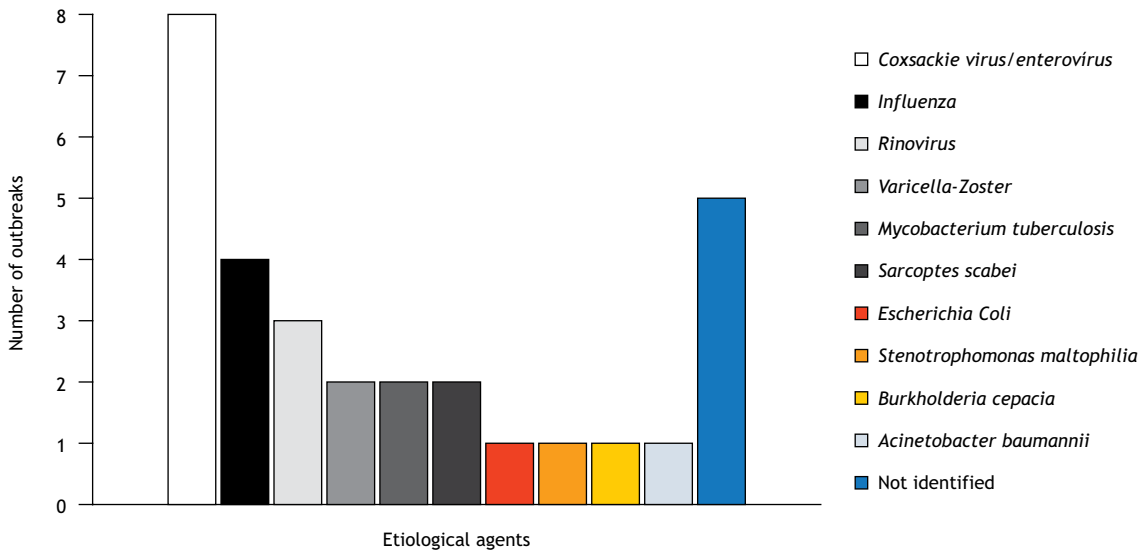
Once obtained, the data was analyzed using simple descriptive statistics and the results presented in graphs and tables.

The database used does not provide information on the subjects involved in the outbreak, which means that this research does not need to be approved by an ethics committee.

RESULTS AND DISCUSSION

During the period under review, 599 outbreaks were reported in the state of Mato Grosso do Sul and, of these, 569 (95%) were caused by SARS-CoV-2. Information on the other agents causing outbreaks in the state is described in Figure 1.

Chickenpox, caused by the varicella zoster virus, is a disease that can cause complications and is highly contagious[10,11]. In the outbreaks reported, the disease was detected through clinical diagnosis in children from two schools. The occurrence of this case may be related to vaccine failure in the municipality, as the disease is vaccine-preventable[11].



Source: Prepared by the authors, 2023.

Figure 1. Etiological agents detected in cases of outbreaks registered in the state of Mato Grosso do Sul, from 2020 to 2022, except SARS-CoV-2 outbreak.

The outbreak caused by *Stenotrophomonas maltophilia* occurred in a hospital. This microorganism is opportunistic and can be found in water, with a high capacity to colonize surfaces[12]. In hospitals, the bacterium is usually found in venous catheters, hemodialysis equipment, nebulizers, deionized water, mechanical ventilation systems, and the hands of healthcare workers.[13]

There were two outbreaks of *Sarcoptes scabei* during the period, detected in a hospital and a long-term care facility for the elderly. In the case of the hospital, the patient was confirmed by laboratory examination and his contacts by clinical examination, while in the long-term care facility confirmation occurred only by clinical examination. *S. scabei* is the causative agent of scabies, which is generally characterized by the formation of erythematous papules and itching in response to the presence of the mite[14].

Burkholderia cepacia was also responsible for an outbreak in the state that occurred in a hospital. This microorganism is found in the environment and in hospitals it is associated with contamination of antiseptics, water, and medicines[15].

Acinetobacter baumannii caused an outbreak in a hospital. This microorganism is of high health importance, as it is an opportunistic pathogen involved in nosocomial infections, which can cause pneumonia, septicemia, and meningitis, especially in immunocompromised patients[16].

Two outbreaks caused by *Mycobacterium tuberculosis* have been reported in prisons. The agent is considered opportunistic and easily disseminated through airborne salivary droplets eliminated by an infected patient[17].

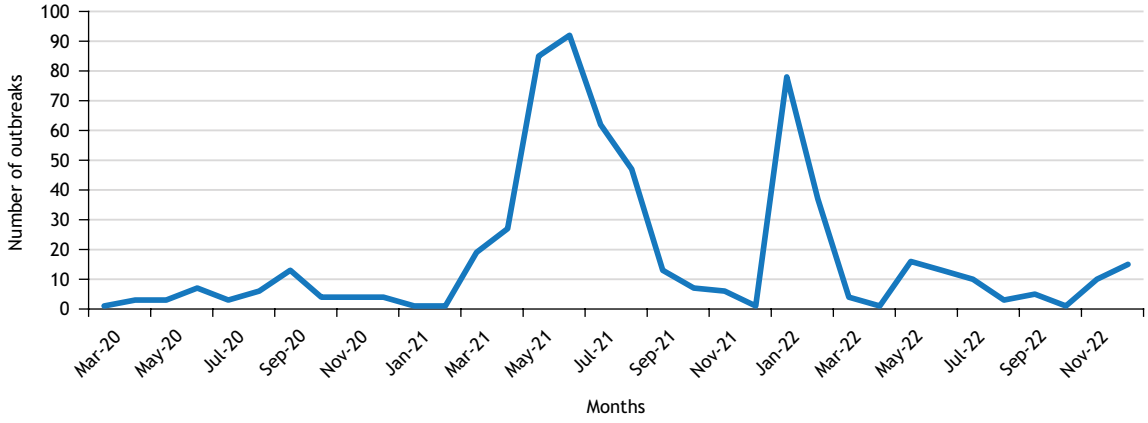
Eight outbreaks have occurred in schools caused by the *Coxsackie* virus/enterovirus. These pathogens have fecal-oral, oral-oral and respiratory transmission and cause hand, foot, and mouth disease (HFMD), which is not generally considered to have a major impact, but there have been reports of cases with evidence of neurological complications[18,19].

Of the four influenza outbreaks, two were reported in schools, one in a prison unit and one in a slaughterhouse. Human influenza is a disease caused by the influenza virus, a pathogen that affects the respiratory system, causing infections that are generally seasonal and endemic, with outbreaks in winter all over the world, affecting individuals of all ages, but with accentuated severity in the elderly and children[20,21,22].

The outbreaks caused by rhinovirus occurred in a hospital, a school, and a children's long-term care facility. The rhinovirus is the virus most often associated with respiratory infections in humans, causing the common cold, whose symptoms are associated with: sneezing, nasal obstruction, runny nose, sore throat, headache, cough and malaise. However, with the advent of molecular biology techniques, it was discovered that this virus is also associated with alterations in the lower respiratory tract, causing pneumonia and bronchiolitis, especially in patients with comorbidities such as asthma, cystic fibrosis, and chronic obstructive pulmonary disease (COPD)[23].

Escherichia coli caused an outbreak in a higher education school due to the ingestion of water contaminated with the bacteria. This microorganism is found naturally in the intestinal flora of humans and animals, without causing harm, but some more pathogenic strains can trigger more serious intestinal infections and cause diarrhea[4]. The distribution of outbreak notifications is shown in Figure 2.

Figure 2 shows that there was a high concentration of outbreak notifications between May and August 2021. This may



Source: Prepared by the authors, 2023.

Figure 2. Monthly distribution of notifications of outbreaks registered in the state of Mato Grosso do Sul, from 2020 to 2022.

be related to the publication of the Guidelines for Action in Situations of Outbreaks of Diseases and/or Public Health Problems in the state of Mato Grosso do Sul. This document contains clarifying information about outbreaks, the importance of notification and constant surveillance. In addition, an outbreak notification spreadsheet was created via Google Forms, the link to which was published in this guideline and sent directly to those responsible for municipal surveillance through a contact made by CIEVS/State.

Before the tool was implemented, outbreaks were only notified via SINAN. In a brief data survey carried out on SINAN in the state of Mato Grosso do Sul to notify outbreaks, from January 2020 to May 2021, only 32 outbreaks were recorded. This fact showed that the system does not present adequate timeliness, accessibility, representativeness and quality in its data, and that data collection through the online tool developed demonstrated its relevance, agility, timeliness, practicality, decentralization, when compared to the system currently made available for this purpose by the Ministry of Health, the SINAN.

The motivation for the CIEVS/State team to build this guiding instrument and draw up an online outbreak notification form arose from the need for rapid notification for a quick response, as well as the opportunity to make decisions on mitigating actions, which does not occur through notification via SINAN, as the system is not decentralized to all health services and is obsolete, not allowing real-time notifications.

Thus, it is possible that the outbreaks reported in 2020, retroactively, are underreported, especially regarding SARS-CoV-2 outbreaks, since in this period the pandemic was in a more serious situation than in the same period in 2021. Similarly, in 2022, the number of outbreak notifications in January and February increased. It is worth noting that these months saw the majority of COVID-19 cases in the state of Mato Grosso do Sul in 2022 and, from March onwards, there was a sharp drop with a low number of cases being maintained until December of the same year.

Planning actions aimed at ascertaining the existence of the outbreak, the cause, the epidemiological characteristics (individuals involved, time, and place) and what actions are needed to extinguish or prevent the spread must be instituted[24] for the surveillance system to be effective and successful in controlling and preventing public health diseases/illnesses.

Regarding the municipality where the outbreak occurred, 32 municipalities in the state reported an outbreak of SARS-CoV-2, and Três Lagoas was responsible for notifying 77.1% of the cases. This high number of notifications made by the municipality of Três Lagoas may demonstrate efficiency in the search for outbreaks, as the outbreak notification spreadsheet was created in June 2021, and retroactive notification was requested.

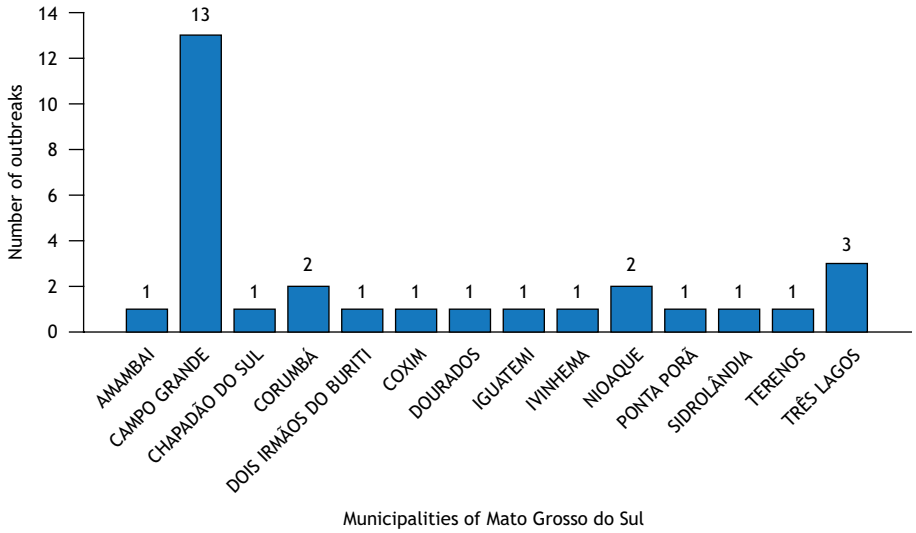
Outbreaks by other agents (except SARS-CoV-2), according to the municipality of notification are shown in Figure 3.

The municipality that recorded the highest number of outbreaks by agents other than SARS-CoV-2 was Campo Grande. The agents involved in the reported outbreaks were: *A. baumannii*, *S. maltophilia*, *B. cepacia*, *S. scabei*, Coxsackie virus/enterovirus and varicella zoster viruses, influenza, rhinovirus, and *E. coli*. The outbreaks occurred in various locations. The main ones are described in Figure 4.

It is worth noting that the outbreaks caused by Coxsackie virus/enterovirus and varicella zoster virus occurred in schools, the two outbreaks of *M. tuberculosis* occurred in prisons, and the other outbreaks (*A. baumannii*, *S. maltophilia*, *B. cepacia*, and one of *S. scabei*) occurred in hospitals.

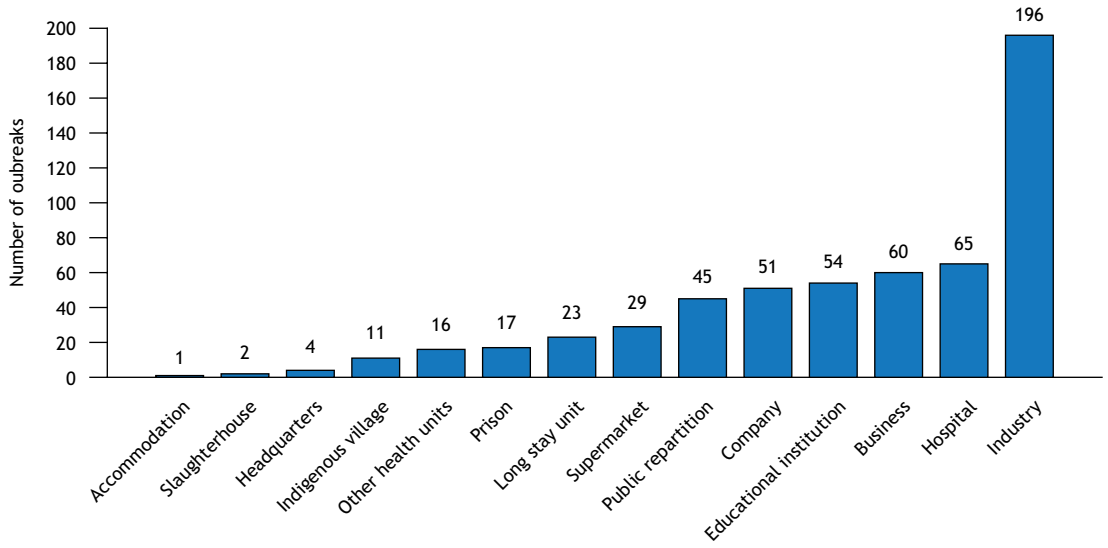
An outbreak is an epidemic situation limited to a localized space, which usually has an agglomeration of people. Thus, cases appear suddenly and in geographically restricted places, such as schools, hospitals, industries, villages[25]. The number of individuals involved in the outbreaks is shown in Table 1.

In all the reported outbreaks (599), 8,076 suspected individuals were involved, and of these 5,191 were diagnosed with the



Source: Prepared by the authors, 2023.

Figure 3. Distribution of notifications of outbreaks registered in the state of Mato Grosso do Sul, according to the municipalities affected, from 2020 to 2022, except for SARS-CoV-2.



Source: Prepared by the authors, 2023.

Figure 4. Main places of occurrence of outbreaks registered in the state of Mato Grosso do Sul, in the years 2020 to 2022.

presence of the etiological agent in question. Due to the high number of individuals affected, an outbreak is considered the initial expression of an epidemic and should therefore be identified as soon as possible to prevent the spread of cases[25].

The cases whose etiologic agent was not identified were suspected COVID-19 cases involving 24 individuals from a rehabilitation clinic for drug addicts who presented with flu-like symptoms. A timely RT-PCR test was carried out, and the result was undetectable for SARS-CoV-2 and the respiratory viral panel, so the outbreak was classified as a flu-like syndrome caused by an unspecified etiological agent.

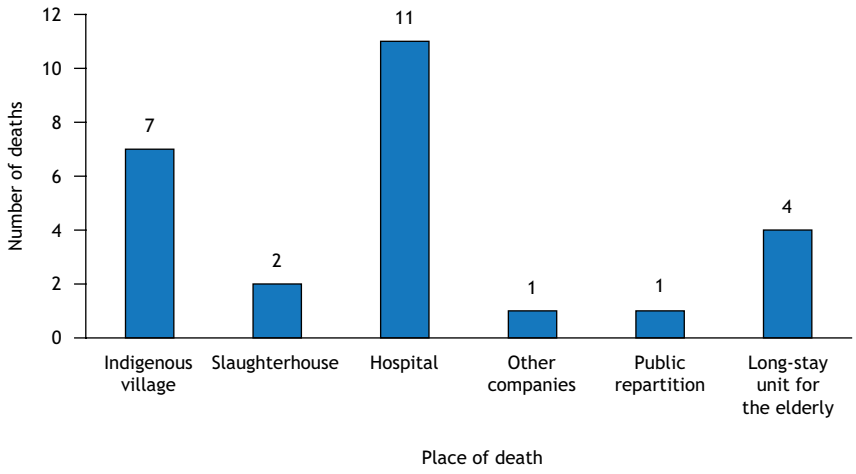
Another outbreak involved three children who were admitted to a hospital after a self-limiting syndrome with diarrhea contamination, with no causative agent identified by the clinical picture. No test was carried out to confirm the etiological agent, so the case was classified as an outbreak due to an unspecified etiological agent.

Finally, the other three reported outbreaks whose etiologic agents were not identified were cases of water and food-borne diseases (WFBD), in which 14 patients were confirmed to have similar gastrointestinal signs and symptoms, but the etiologic agent was not identified through laboratory tests.

Table 1. Number of suspected and confirmed individuals involved in outbreaks reported in the state of Mato Grosso do Sul, from 2020 to 2022.

Agent	Outbreak quantity	Suspect	Confirmed
Acinetobacter baumannii	1	14	14 (100.0%)
Burkholderia cepacia	1	2	2 (100.0%)
Coxsackie/Enterovírus	8	271	97 (35.8%)
Mycobacterium tuberculosis	2	33	13 (39.4%)
Sarcoptes scabei	2	11	11 (100.0%)
SARS-CoV-2	569	7,557	4,920 (65.1%)
Stenotrophomonas maltophilia	1	5	5 (100.0%)
Varicella zoster	2	7	7 (100.0%)
Rhinovirus	3	44	19 (43.2%)
Influenza	4	76	47 (61.8%)
Escherichia coli	1	15	15 (100.0%)
Not identified	5	41	41 (100.0%)
Total	**599**	**8,076**	**5,191 (64.3%)**

Source: Prepared by the authors, 2023.



Source: Prepared by the authors, 2023.

Figure 5. Places of occurrence of deaths from outbreaks registered in the state of Mato Grosso do Sul, from 2020 to 2022.

There were 26 deaths in the period, of which 15 were from SARS-CoV-2 outbreaks, one from *A. baumannii*, and ten from *B. cepacia*. There were no deaths from outbreaks reported in the state of Mato Grosso do Sul in 2022. The distribution of the places where these deaths occurred is shown in Figure 5.

Measures to control and prevent outbreaks are extremely necessary to minimize their impact on public health. This study revealed the death of 26 individuals, with the majority of outbreaks coming from hospitals and indigenous villages.

It is worth noting that there were only 11 outbreaks in indigenous villages, all caused by SARS-CoV-2, comprising 541 confirmed indigenous people and seven deaths. There have been 65 outbreaks of SARS-CoV-2 in hospitals, with 306 confirmed cases and 11 deaths. It is believed that the number of deaths is higher in these publics due to the susceptibility of those affected.

Regarding the initial measures adopted by the investigation team, the following were mentioned: isolation of suspected cases; isolation of confirmed cases; contact tracing; notification to the State CIEVS; communication to the municipal Health Surveillance and municipal managers; definition of the flow of medical care; collection and sending of samples for laboratory tests; guidance on the use of personal protective equipment (PPE); promotion of training in biosafety measures and cross-transmission, including the importance of hand hygiene; provision of a means of rapid communication of new suspected cases; local cleaning/disinfection.

In order to prevent and control outbreaks, timely action must be taken, mainly related to identifying the source of infection. All

the findings of a case assessment should be used to identify the needs for control and prevention of the outbreak in question, as well as the occurrence of new cases[2].

CONCLUSIONS

This research led to the conclusion that the use of outbreak notification tools is effective and aids rapid decision-making when applied efficiently. The state of Mato Grosso do Sul intensified outbreak reporting after implementing this tool in the municipalities.

Due to the occurrence of the SARS-Cov-2 pandemic, most of the outbreaks reported in the state were caused by this pathogen, as well as most of the deaths reported from outbreaks.

It is important to note that investigating outbreaks makes it possible to find the answers needed to control, prevent, and protect individuals from events of public health interest, which helps to create health education actions, as well as developing effective measures to minimize their impact and prevent their spread, which will act positively in preventing epidemics.

REFERENCES

1. Andrade CDR, Lopes GAH. Brasil república: uma história de surtos, pandemias e epidemias. Bol Conjunt. 2021;5(14):70-92. https://doi.org/10.5281/zenodo.4513763%20%20%20
2. Ministério da Saúde (BR). Guia para investigações de surtos ou epidemias. Brasília: Ministério da Saúde; 2018.
3. Brachman OS, Thacker SB. Evolution of epidemic investigations and field epidemiology during the MMWR era at CDC-1961- 2011. Morb Mort Weekly Rep. 2011;60(4):22-26.
4. World Health Organization – WHO. Guidelines for drinking-water quality. 4a ed. Geneva: World Health Organization; 2011[acesso 11 jan 2023]. Disponível em: http://www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/
5. Dworkin MS. Outbreak investigations around the world. Burlington: Jones & Bartlett; 2010.
6. Krämer A, Kretzschmar M, Krickeberg K. Modern infectious disease epidemiology: concepts, methods, mathematical models, and public health. Berlin: Springer Science+ Business Media; 2010.
7. Laguardia J, Domingues CMA, Carvalho C, Lauerman CR, Macario E, Glatt R. Sistema de informação de agravos de notificação em saúde (Sinan): desafios no desenvolvimento de um sistema de informação em saúde. Epidemiol Serv Saúde. 2004;13(3):135-46. https://doi.org/10.5123/S1679-49742004000300002
8. Ministério da Saúde (BR). Sistema de informação de agravos de notificação Sinan: normas e rotinas. 2a ed. Brasília: Ministério da Saúde; 2007.
9. Secretaria de Estado de Saúde de Mato Grosso do Sul - SES/MS. Diretriz para atuação em situações de surtos de doenças e/ou agravos de saúde pública do estado de Mato Grosso do Sul. Campo Grande: Secretaria de Estado de Saúde de Mato Grosso do Sul; 2021[acesso: 10 jan 2023]. Disponível em: https://www.vs.saude.ms.gov.br/wp-content/uploads/2021/09/Diretriz-para-atuacao-em-situacoes-de-surtos-de-doencas-e_ou-agravos-de-saude-publica-Revisao-1-2-1.pdf
10. Berezin EM, Feldman C. Varicela-zoster. In: Focaccia R, Veronesi R. Tratado de infectologia. 5a ed. São Paulo: Atheneu; 2015. p. 723-34.
11. Ministério da Saúde (BR). Guia de vigilância em saúde: volume único. 3a ed. Brasília, DF: Ministério da Saúde; 2019.
12. Biocanin M, Madi H, Vasiljevic Z, Kojic M, Jovcic B, Lozo J. Temperature, pH and Trimethoprim-Sulfamethoxazole are potent inhibitors of biofilm formation by *Stenotrophomonas maltophilia* clinical isolates. Pol J Microbiol. 2017;66(4):433-8. https://doi.org/10.5604/01.3001.0010.6996
13. Dias VC, Diniz CG, Peter AC, Bastos NA, Bastos VQ, Bastos LQ, Silva VL. Epidemiological characteristics and antimicrobial susceptibility among carbapenem-resistant non-fermenting bacteria in Brazil. J Inf Develop Countries. 2016;10(6):544-53. https://doi.org/10.3855/jidc.6640
14. Oliveira-Filho AD, Bezerra LTCN, Alves NS, Neves SJF. Aumento do consumo de ivermectina no Brasil e o risco de surtos de escabiose. Res Soc Develop. 2021;10(10):1-8. https://doi.org/10.33448/rsd-v10i10.18991
15. Freitas MR, Costa RMM, Silva EF, Diniz SRD, Neto FVA, Medeiros WDA et al. Surto de *Burkholderia cepacia* em pacientes cirúrgicos. Rev Para Med. 2007;21(4):77.
16. Giamarellou H, Antoniadou A, Kanellakopoulou K. *Acinetobacter baumannii*: a universal threat to public health? Int J Antimicrob Agents. 2008;32(2):106-19. https://doi.org/10.1016/j.ijantimicag.2008.02.013
17. Melo FA, Klautau GB, Rodrigues DSS, Afiune JB, Hijjar MA, Gomes M et al. Tuberculose. In: Veronesi RF, Focacia R. Tratado de infectologia. 5a ed. São Paulo: Atheneu; 2015.
18. Ventarola D, Bordone L, Silverberg N. Update on hand-footandmouth disease. Clin Dermat. 2015;33(3):340-6. https://doi.org/10.1016/j.clindermatol.2014.12.011
19. Esposito S, Principi N. Hand, foot and mouth disease: current knowledge on clinical manifestations, epidemiology, aetiology and prevention. Eur J Clin Microb Infect Dis. 2018;37(3):391-8. https://doi.org/10.1007/s10096-018-3206-x
20. Taubenberger JK, Morens DM. The pathology of influenza virus infections. Annu Rev Pathol. 2008;3(4):499-522. https://doi.org/10.1146/annurev.pathmechdis.3.121806.154316

21. Costa CML, Merchan-Hamann E. Pandemias de influenza e a estrutura sanitária brasileira: breve histórico e caracterização dos cenários. Rev Pan-Amaz Saúde. 2016;7(1):11-25. https://doi.org/10.5123/s2176-62232016000100002

22. Fernanda G, Andrade VRM. O vírus influenza: revisão narrativa da literatura. Rev Interdis Cienc Saúde Biol. 2019;3(2):74-82. https://doi.org/10.31512/ricsb.v3i2.3298

23. Tapparel C, Cordey S, Junier T, Fanirelli L, Van Belle S, Soccal PM et al. Rhinovirus genome variation during chronic upper and lower respiratory tract infections. PLOS One. 2011;6:1-8. https://doi.org/10.1371/journal.pone.0021163

24. Gregg M. Field epidemiology. 3a ed. New York: Oxford University; 2008.

25. Pan American Health Organization – PAHO. Módulo de princípios de epidemiologia para o controle de enfermidades (Mopece). Washington: Pan American Health Organization; 2010[acesso 2 dez 2022]. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/modulo_principios_epidemiologia_5.pdf

Authors' Contribution

Frias DFR, Oliveira RL, Barbosa KF - Conception, planning (study design), acquisition, analysis, data interpretation, and writing of the work. Romera GRR, Maziero LMA, Tebet DGM - Data interpretation and writing of the work. All the authors approved the final version of the work.

Conflict of Interest

The authors inform that there is no potential conflict of interest with peers and institutions, political or financial, in this study.