

Study on the occurrence of food outbreaks in a region of the Jequitinhonha Valley, Minas Gerais

Estudo sobre a ocorrência de surtos alimentares em uma região do Vale do Jequitinhonha, Minas Gerais

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ABSTRACT

Introduction: The occurrence of water and food transmission diseases is a worldwide concern in Public Health. **Objective:** The objective of this study was to characterize the occurrence of food outbreaks in a region of the Jequitinhonha Valley in the State of Minas Gerais between 2008 and 2014, before and after the intervention of the PET-Health/Surveillance in Health. **Method:** Data were taken from printed reports and information sheets available in information systems. **Results:** Seventy-six outbreaks were investigated, of which only 34.1% were reported in a timely manner. The actions carried out by the PET-Health/Health Surveillance team between 2010 and 2012 positively impacted on the increase in the number of notifications of food outbreaks. Most of these outbreaks occurred in households (47.4%), reached adult individuals (30.4%) and presented as clinical manifestations: diarrhea (29.5%), vomiting (23.5%) and abdominal pain (16.3%). In the analysis of the notifications, 81.6% did not present the causal factor and only 31.0% reported the etiological agent. **Conclusions:** The intervention of PET-Health/Surveillance in Health represented an important factor for the strengthening surveillance of food outbreaks in the region studied of the Jequitinhonha Valley studied, but there are still difficulties related to late notification, presence of gaps and gaps in the data record and the low number of clinical and bromatological collections.

KEYWORDS: Foodborne Diseases; Disease Outbreaks; Food; Public Health Surveillance; Disease Notification

RESUMO

Introdução: A ocorrência de Doenças de Transmissão Hídrica e Alimentar é uma preocupação mundial na Saúde Pública. **Objetivo:** O objetivo deste trabalho foi caracterizar a ocorrência dos surtos alimentares em uma região do Vale do Jequitinhonha em Minas Gerais, entre os anos de 2008 a 2014, antes e após a intervenção do PET-Saúde/Vigilância em Saúde. **Método:** Os dados foram retirados de relatórios impressos e de fichas de notificações disponíveis nos sistemas de informação. **Resultados:** Foram investigados 76 surtos, destes, apenas 34,1% notificados oportunamente. As ações realizadas pela equipe PET-Saúde/Vigilância em Saúde entre 2010 e 2012 impactaram, positivamente, no aumento do número de notificações de surtos alimentares. A maioria destes surtos ocorreu em residências (47,4%), atingiu indivíduos adultos (30,4%) e apresentou como manifestações clínicas: diarreia (29,5%), vômitos (23,5%) e dores abdominais (16,3%). Na análise das notificações, 81,6% não apresentavam o fator causal e apenas 31,0% informaram o agente etiológico. **Conclusões:** A intervenção do PET-Saúde/Vigilância em Saúde representou um fator importante no fortalecimento da vigilância de surtos alimentares na região do Vale do Jequitinhonha estudada, contudo persistem dificuldades relacionadas a notificação tardia, a presença de falhas e de lacunas no registro dos dados e o baixo número de coletas clínicas e bromatológicas.

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INTRODUCTION

Water and Food-borne Diseases (WFBD) are those illnesses that occur after ingestion of contaminated food or water. Their main symptoms are nausea, vomiting, abdominal pain and diarrhea. The clinical condition may vary from mild to critical, depending on the etiological agent responsible for the contamination¹.

The occurrence of WFBD has been increasing significantly worldwide. The serious consequences for vulnerable or more exposed population groups and the great economic repercussions due to medical expenses, absence at work and productivity drops make this increase a public health concern^{2,3,4}.

According to United Nations Children's Fund (Unicef) and the World Health Organization (WHO), approximately 2 million children worldwide die from diarrhea every year⁵. In Brazil, according to data from the Mortality Information System (SIM) of the Ministry of Health, there were more than 24,000 deaths from diarrhea and gastroenteritis from 2007 to 2012⁶. Diarrheal diseases, in the majority of cases, are mainly caused by the ingestion of contaminated water or food⁷.

WFBD can give rise to outbreaks, defined as an episode where two or more people experience similar symptoms after ingesting contaminated food or water in the same place and period^{3,8}. Outbreaks of WFBD are considered Public Health Events (ESP), that is, situations that may constitute a potential threat to the health of the population. Notifying this type of event is mandatory for physicians and other healthcare professionals in the exercise of their profession, as well as for people in charge of organizations and public and private healthcare establishments³.

According to the Ministry of Health, WFBD are underreported, requiring notification and correct investigation of the cases, for the search of the etiological agents and specific food involved, among other pieces of information. It is based on the notification of the outbreak that the investigation will take place. The investigation must be carried out by the Sanitary and Epidemiological Surveillance body of the municipalities. It is extremely important to notify WFBD in a timely manner to enable proper investigation³.

Correct investigation may assist in identifying the source of the food outbreak to control the source of transmission and eliminate the risk of the disease spreading. This identification might help to reduce the severity of the problem and, consequently, the number of hospitalizations, deaths and new cases⁹.

Information from the correct investigation of the outbreaks should support the planning of actions with healthcare professionals and the population, aiming at the control and reduction of these diseases^{3,9}.

The monitoring and the conduction of studies on WFBD will improve our knowledge of the problem and its extension and, with that, inform decisions related to the adoption of public health prevention and control measures.

In this sense, the present work aims to characterize the outbreaks of WFBD occurred and investigated in a region covered

by a Regional Health Superintendence (SRS) located in the Jequitinhonha Valley, in the state of Minas Gerais, Brazil, before and after the intervention of PET-Health/Health Surveillance (PET-Saúde/VS).

METHOD

We conducted a descriptive, retrospective study based on epidemiological data from outbreaks of Water or Food-borne Diseases occurred in municipalities within the scope of the Jequitinhonha Valley SRS, northeastern Minas Gerais, from January 2008 to December 2014.

The SRS used in this study technically assists 33 municipalities in its area of coverage, of which 23 municipalities are in the Jequitinhonha expanded health region, six in the northeastern expanded region and four in the state center expanded region. According to data from the Brazilian Institute of Geography and Statistics (IBGE) - 2010, the population under the jurisdiction of this SRS is of about 428,593 inhabitants¹⁰.

The information collected was obtained through a secondary database, that is, information available on the Sinan Information System and data already collected during the investigation of WFBD outbreaks through specific forms, reports and laboratory reports provided by the Regional Health Superintendence in which the study was conducted.

To collect data for the present study, we used the Final Report on Outbreaks of Foodborne Diseases (VE-DTHA System/form five, one of the instruments created by the Ministry of Health to collect information during an outbreak investigation) reporting of Sinan outbreaks. The Final Report was chosen to be used in this study because it contains consolidated data related to the outbreaks. Additional information to complement the survey was taken from the Laboratory Analysis Report and the descriptive report written by the person responsible for the outbreak investigation, whenever available.

The variables used to characterize the occurrence of WFBD outbreaks in the Jequitinhonha Valley region were: gender and age group of the people affected by the outbreaks; number of outbreaks and cases; notification and end of the outbreak on Sinan; number of hospitalizations; interval between the onset of symptoms and the reporting of outbreaks; major signs and symptoms; place of occurrence of the outbreak; causal factors; collection of clinical and food samples and etiological agent.

The data was tabulated and processed on Excel for Windows, version 2010 (Microsoft®).

The present study was approved by the Research Ethics Committee of the Federal University of the Jequitinhonha and Mucuri Valleys under n. ETIC 220/2010 and conducted so as to ensure compliance with the provisions of Resolution 466 of December 12, 2012, of the National Commission of Ethics in Research.



RESULTS AND DISCUSSION

In the analyzed period, 76 outbreaks of WFBD were investigated, totaling 1,794 people involved. Regarding gender, females accounted for 20.1% of the cases and males accounted for 18.6%. A total of 61.3% of the notifications did not have the gender field filled out. Regarding the age group, the highest incidence was 20 to 49 years (30.4%), followed by 1 to 4 years (13.3%). In 3.8% of the forms the age group was classified as ignored.

Similar to the results found in this study, a study conducted in Manaus, state of Amazonas, Brazil, from 2005 to 2009, identified that the highest percentage of individuals affected by WFBD was in the age group of 20 to 49 years and corresponded to the female gender¹¹. In Mexico, between 2000 and 2008, the most affected age groups were children under 5 years of age and adults between 25 and 44 years old¹². It is noteworthy that the female gender was also the most affected by food poisoning (56.2%) in Campina Grande, state of Paraíba, Brazil, in 2005¹³.

The higher incidence of WFBD in the 20 to 49 age group shows that adults were more exposed to contamination. It is important to remember that children, senior citizens and the immunodeficient are the ones who suffer the most from the devastating effects of these diseases. This is due to the low resistance of these individuals. Their immune system is often not able to effectively fight the disease. There is then an excessive loss of electrolytes through diarrhea and vomiting which can lead to severe dehydration, and often to death¹².

In 2011 and 2012, the largest numbers of outbreak investigations (both with $n = 21$) occurred, followed by 2013 ($n = 15$), 2014 ($n = 14$), 2010 ($n = 4$) and 2008 ($n = 1$). There were no outbreak reports in 2009.

There was considerable oscillation in the number of outbreaks in the studied period. The data obtained did not mean that the occurrence of outbreaks was greater in some years, but rather that in those years with the highest number of outbreaks the flow of notifications was more efficient¹⁴.

This assertion is evidenced by the fact that training workshops were offered to the representatives of the municipalities covered by SRS at the end of 2010, with the main topic being the investigation of WFBD outbreaks. The initiative started with the Health Work Education Program/Health Surveillance (PET-Saúde/VS), funded by the Ministry of Health and built through a partnership between the SRS, the Municipal Departments of Health (SMS) and a Federal Education Institution between 2010 and 2012. After enhancing the training of the teams, an improvement in the number of reported and investigated outbreaks was observed, indicating, therefore, that underreporting was high.

After the years 2011 and 2012, there was a drop in the number of outbreaks investigated. This decrease can be justified by the high turnover of professionals in the healthcare area, changes in management and even the fact that training programs and workshops are not carried out continuously. These initiatives may have reached a small portion of the professionals, and those professionals may no longer be in that service in the following years.

Continuing education is a process aimed at updating and improving the training of professionals. It prepares individuals to better perform the functions they already perform. This should be done in order to meet the needs of ever changing practices and scientific progress, keeping professionals updated to do their work with excellence¹⁵.

According to the Table, of the 76 outbreaks investigated, 86.7% ($n = 66$) were reported on Sinan, 62 outbreaks (81.6%) had their end date filled out and 18.3% did not present this information. Until 2010, the records reported the occurrence of only 1 outbreak (in the year 2008), however, it was not reported on Sinan.

An outbreak of WFBD is an ESP because it represents a situation that may constitute a potential threat to collective health. This requires compulsory notification and the event is to be monitored throughout Brazil, as recommended by the Ministry of Health ordinances n. 204 and n. 205, of February 17, 2016¹⁶. Thus, we expected to find 100% of the WFBD outbreaks reported on Sinan during the study period (Table).

The Minas Gerais State Department of Health establishes, through Resolution SES n. 3.244, of April 25, 2012, immediate compulsory notification of outbreaks (24 hours), or aggregation of cases or death specifically by WFBD¹⁷. This notification shall be made by the health units for the epidemiological surveillance service of the Municipal Department of Health, which shall notify the State Department of Health, which, in turn, shall notify the Department of Health Surveillance of the Ministry of Health¹⁶.

Despite the high number of hospitalizations and the impact of WFBD on the healthcare system in some Brazilian states and municipalities, little is known about the real extension of the problem, since cases and outbreaks are often not notified, even if such action is required by the law^{3,18}.

When we analyzed the interval between the date of onset of symptoms and the date of notification of the outbreak on Sinan presented in the Table, we found that only 34.1% of the

Table. Epidemiological characteristics of WFBD outbreaks investigated in municipalities covered by a Regional Health Superintendency of Minas Gerais, from 2008 to 2014.

Characteristics	N	%
Interval between onset of symptoms and outbreak notification		
0 to 24 hours	26	34.1
24 to 48 hours	11	14.5
More than 48 hours	38	50.0
Not filled	1	1.3
Hospitalization		
Yes	162	9.0
No	1632	91.0
Notification of outbreaks on SINAN		
Yes	66	86.7
No	10	13.2
Outbreak end date		
Yes	62	81.6
No	14	18.3



outbreaks were reported in accordance with the deadline established by SES Resolution n. 3.244 of April 25, 2012¹⁷. This result demonstrates the great difficulty of the surveillance service in the prompt identification of cases.

The fact that the notifications often take time to be made can prolong and hinder the correct investigation of the outbreaks, due to the difficulty to find the people involved and to carry out the collection of samples, when necessary. It is common in these cases that the individual involved in the outbreak no longer present signs and symptoms, or has initiated antibiotic therapy, impairing the collection of clinical samples. The collection of food samples is also hampered as, over time, there are not enough or existing leftovers and samples are often sent to the laboratories without an efficient investigation with those involved in the outbreak, inadequately defining the suspect food³.

Investigation carried out late makes it difficult to take immediate action that could reduce the reach of the outbreak. It is these actions and measures that would restrict the outbreak to a smaller number of people, generating better interventions aimed at these individuals and reducing the severity of the disease.

In this study, diarrhea, vomiting and abdominal pain were the most common clinical manifestations in most of the episodes surveyed (Figure 1). According to data found in Chile, the most frequently reported symptoms are diarrhea and abdominal pain (73%), followed by nausea and vomiting (68%)¹⁹.

The clinical manifestations of WFBD are often mild. In these cases, the victim does not usually seek healthcare services, which may explain the small number of reports¹⁸ and, consequently, the late start of the epidemiological investigation.

From the findings presented in Figure 2, households were the main place where people ate the food that caused the outbreaks (47.4%).

Similar results were obtained in the analysis of outbreaks occurred in the state of Rio Grande do Sul, Brazil, from 2006 to 2007¹⁸, as well as in the state of Paraná, Brazil, from 2005 to 2008⁷. The high rate of outbreaks in households can be justified by the fact that a large part of the population, especially in small and medium-sized municipalities, still have their meals at home¹⁴.

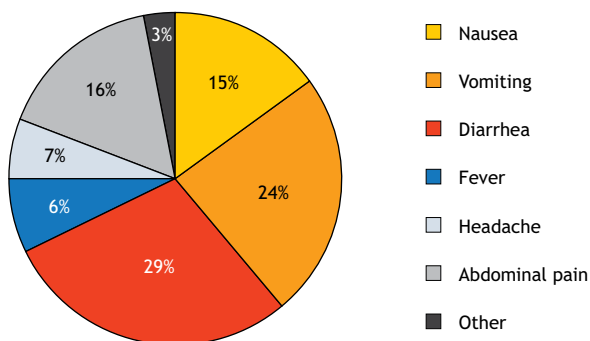


Figure 1. Most common signs and symptoms reported in outbreaks of Water and Food-borne Diseases, in municipalities covered by a Regional Health Superintendence of Minas Gerais, from 2008 to 2014.

These results may indicate that the occurrence of WFBD is due to inadequate handling practices in households, as well as the possibility of the consumer being using products or raw materials obtained already contaminated in the marketplace²⁰.

There are several shortcomings in food processing, whether in refrigeration, inadequate preservation of the raw material or ready food, improper handling, inappropriate sanitation of equipment and utensils or even the labeling of products that can lead to the proliferation of pathological agents and the occurrence of WFBD^{21,22}.

Stores often do not have adequate conditions for the storage of products and the labeling is not always in accordance with the characteristics of the food and the Consumer Protection Standards^{23,24}. Therefore, the competent bodies must supervise and inspect these activities as regards the origin, transportation, storage and hygiene of food production, thus avoiding health problems²⁴.

In the distribution of the causal factors of WFBD presented in Figure 3, we observed that 81.6% of the outbreaks had the ignored option as the predominant factor and 34.1% of the outbreaks did not report the causal factor. Furthermore, inadequate food handling/preparation achieved 28.8%, followed by other factors with 26.2% and inadequate preservation with 22.4%.

The percentage of causal factors exceeds 100% due to the fact that two or more factors may have contributed to the occurrence of a single outbreak. Shortcomings in the epidemiological investigation are perceived, since a large percentage of the documents did not adequately bear the necessary information or used the ignored option very often. These problems stem mainly from the late notification of outbreaks to the SMS, thus leading to late and ineffective investigations^{3,7}.

As can be seen in Figure 4, 43.3% of the WFBD outbreaks did not have any type of collection. However, in 21.1% of the outbreaks, food samples were collected and in 17.0% clinical samples were collected. Only in 17.0% of the outbreaks were both collections performed.

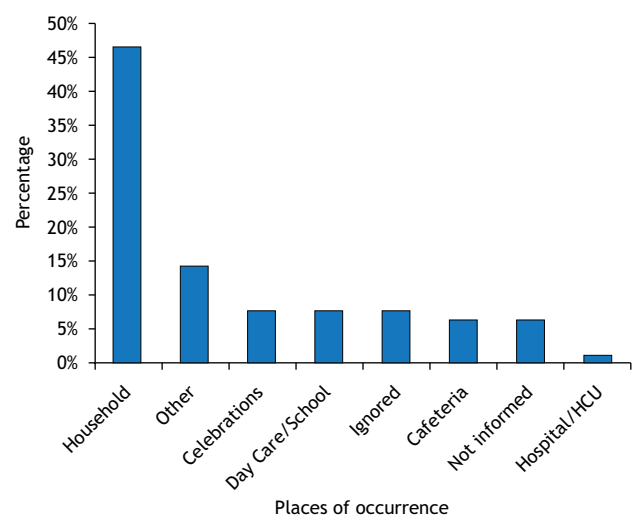


Figure 2. Distribution of occurrences of water and food-borne disease outbreaks, according to the place of food ingestion, in municipalities covered by a Regional Health Superintendence of Minas Gerais, from 2008 to 2014.

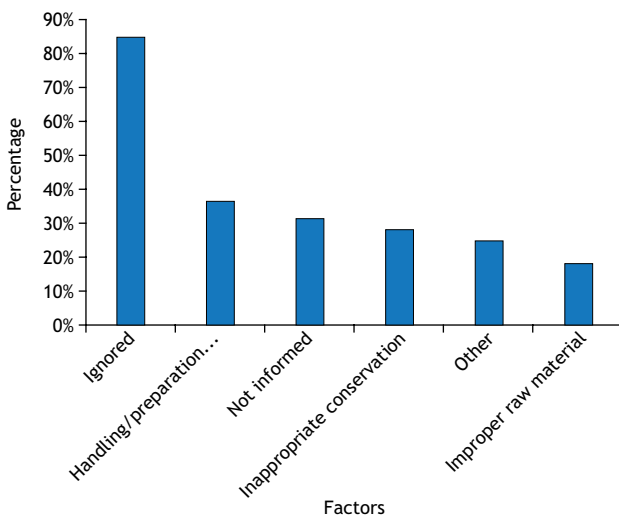


Figure 3. Most common factors causing the reported in outbreaks of Water and Food-borne Diseases, in municipalities covered by a Regional Health Superintendence of Minas Gerais, from 2008 to 2014.

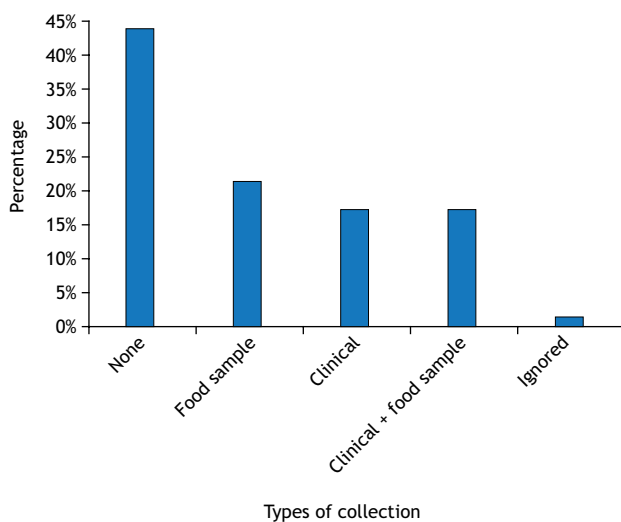


Figure 4. Type of collection done during the investigation of outbreaks of Water and Food-borne Diseases, in municipalities covered by a Regional Health Superintendence of Minas Gerais, from 2008 to 2014.

The collection of clinical samples from patients or leftovers from food or water should be performed properly and as early as possible. The collection of these samples is fundamental for the identification of the etiological agent responsible for the contamination³.

It is through the combination of data obtained through epidemiological, laboratory and environmental investigations that we will be able fully understand an outbreak episode, associating the characteristics of the agent, the host and the environment. With this, control and prevention measures can be adopted quickly and effectively²⁵.

In total, 42 collections were made. Of these, only 13 (31.0%) had any etiological agent and 29 (69.1%) had no contamination. The etiological agent that was most present in the samples was

Escherichia coli (30.8%), followed by *Staphylococcus aureus* (15.4%). A similar result was found in a study conducted in Havana, Cuba, from 2006 to 2010, where 25% of the 130 outbreaks investigated had *Escherichia coli* as the main pathogen⁴.

Escherichia coli is considered a harmless microorganism belonging to the normal microbiota of the intestines of some warm-blooded animals, including human beings. When present in food or drinking water it indicates direct or indirect contamination of fecal origin^{20,26,27}. The high frequency of *E. coli* as the agent causing the outbreaks of WFBD suggests the violation of several principles of good hygiene practices in food handling⁴. This kind of bacteria can produce a deadly toxin that is usually found in undercooked meat, raw milk and agricultural products. Contamination by this microorganism has as its main symptom the bloody diarrhea. Children, senior citizens and individuals with low immunity present more intense episodes, with higher mortality rates²⁸.

Staphylococcus aureus is a pathogenic microorganism with much ability to adapt to various environmental conditions. Its natural habitat is the skin and mucous membranes of mammals and birds. In human beings, it is often found in the nostrils and throat. The carrier, often asymptomatic, is a potential source of infection, since he or she may be disseminating the pathogen without knowing it. The presence of *S. aureus* in food may indicate contamination by handlers due to insufficient hygienic conditions during the processing of meals. Therefore, strict techniques involving hygienic care are required during the food production process^{29,30,31,32}.

Samples that have not been contaminated may be related to delayed collection, which occurs as a consequence of late notification; to the fact that the etiological agent is inactivated, since the preservation and transportation of the samples are often inadequate; to the non-uniform distribution of the microorganisms in the analyzed samples, thus generating false-negative results; in addition to the absence of timely clinical and/or food sample collection^{14,18}.

CONCLUSIONS

WFBD outbreaks occurring in the Jequitinhonha Valley region can be characterized as events that have a higher occurrence of cases in households, affect predominantly adults and present as main clinical manifestations diarrhea, vomiting and abdominal pain. Moreover, the results of the present study demonstrate that most reports of these outbreaks occur at a later stage, making it difficult to investigate the cases.

The research also showed that the intervention of the PET-Saúde/Vs in WFBD Surveillance appeared as an important factor in the improvement of the epidemiological surveillance of food outbreaks. However, there are still many difficulties in the investigation, especially those related to flaws and gaps in data recording, as well as the small number of clinical and food sample collections performed. This fact shows that health surveillance teams need to be continuously trained in epidemiological investigation of WFBD outbreaks in order to improve the quality of the information and the establishment of the causal link.



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Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.



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