Epidemiological control model for hepatitis A

Modelo de control epidemiológico de la hepatitis A

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ABSTRACT

Introduction: In the coastal region of Ecuador in epidemiological week (SE) 20 of the year 2020 (increased cases of hepatitis A.

Objective: Our goal is to provide a detailed description of this hypothetical epidemiological model, which will enable us to develop an effective contingency plan.

Methods: Retrospective, observational cohort study. Information collected through epidemiological surveys of OAB patients from SE23 to SE31/2020. Sociodemographic characteristics are recorded (sex, education, occupation, affiliation to the health system, trips outside the RM [VFRM]), eating habits (consumption of food outside the home [AFH], in public [AVP] and of seafood and fish). raw [AMP] 60 days before getting sick), sexual habits (history of sexually transmitted infection [STI], sexual activity in the last 60 days [AS], sexual orientation and oro-anal sexual practice [SOA]). Absolute values were tabulated and attack rates (AT) and descriptive statistics were calculated, and an epidemic curve was constructed graphically.

Results: 718 VHA in SE 20-31/2020. 449 VHA in SE23/2020: TA: AFH: 30.6 %, AVP: 45.1 %, AMP: 38 %. 673 VHA in SE25/2020: 37.2 % had STIs. 718 VHA in SE28/2020, with 421 responses: 84.3 % men (n=355), 57.9 % university education, 40.9% professionals and 59.1 % belonged to the private health system. 78.6 % not VFRM. Of the men, 84.3 % AS, 63.1 % homosexuals where 97.3 % SOA. In SE31/2020 VHA was highest among those 25-34 years of age.

Conclusions: HAV affected SOA homosexual men more and secondly, transmission through food. Epidemiological surveillance, health promotion and prevention, is essential to prevent outbreaks in these segments.

Keywords: hepatitis A virus; coastal region; epidemiological week; homosexuals; contingency plan.

RESUMEN

Introducción: En la región costera de Ecuador en la semana epidemiológica (SE) 20 del año 2020 (aumentaron los casos de hepatitis A.

Objetivo: Nuestro propósito fue describir este modelo epidemiológico hipotético, lo cual permitirá desarrollar un plan de contingencia efectivo.

Métodos: Estudio de cohorte observacional, retrospectivo. Información recogida mediante encuestas epidemiológicas a pacientes VHA de SE23 a SE31/2020. Se consignan características sociodemográficas (sexo, escolaridad, ocupación, afiliación a sistema de salud, viajes fuera de RM [VFRM]), hábitos alimenticios (consumo de alimentos fuera del hogar [AFH], en vía pública [AVP] y de mariscos y pescados crudos [AMP] 60 días antes de enfermar), hábitos sexuales (antecedentes de infección de transmisión sexual [ITS], actividad sexual últimos 60 días [AS], orientación sexual y práctica sexual oro-anal [SOA]). Se tabularon valores absolutos y se calcularon tasas de ataque (TA) y estadística descriptiva, además de construir gráficamente una curva epidémica.

Resultados: 718 VHA en SE 20-31/2020. 449 VHA en SE23/2020: TA: AFH: 30,6 %, AVP: 45,1 %, AMP: 38 %. 673 VHA en SE25/2020: 37,2 % tuvo ITS. 718 VHA en SE28/2020, con 421 respuestas: 84,3 % hombres (n=355), 57,9 % escolaridad universitaria, 40,9 % profesionales y 59,1 % pertenecían a sistema privado de salud. 78,6 % no VFRM. De los hombres, 84,3 % AS, 63,1 % homosexuales donde el 97,3 % SOA. En SE31/2020 VHA fue mayor entre los 25-34 años de edad.

Conclusiones: VHA afectó más hombres homosexuales SOA y, en segundo lugar, la transmisión por alimentos. La vigilancia epidemiológica, la promoción y prevención en salud, es fundamental para prevenir brotes en estos segmentos.

Palabras Clave: virus hepatitis A; región costera; semana epidemiológica; homosexuales; plan de contingencia.

Introduction

Hepatitis A virus (HAV) is a pathological agent that causes liver inflammation. HAV is distributed human to human by ingesting contaminated water and/or food with feces and buco-anal sex. It occurs sporadically, producing epidemic outbreaks throughout history, such as in 1988 in Shanghai-China.[1]

HAV is an RNA virus, whichis able to persist for months in wastewater because it protein rich containing naked capsule protects it against adverse conditions. Generally, outbreaks that are caused by single outbreaks have sharp rises and falls, while those that spread person to person have a plateau shape as it represents the overlap of exposures and incubation periods. On the other hand, those outbreaks that spread uncontrolled have progressively higher peaks.[2].

The incubation period of HAV is 15 to 50 days. It has the ability to replicate in liver cells, producing secondary viremia that occurs during the second half of the incubation period. This triggers a very characteristic clinical symptomatology such as jaundice. Most cases are probably not infectious after the first week of jaundice appearance and some people may be asymptomatic carriers.[3]

According to the Ministerio de Salud Pública del Ecuador (MSP) Epidemiological Gazette of 2020, in Ecuador a total of 3,175 confirmed cases were reported with a cumulative rate of 17.3 cases per hundred inhabitants". Despite the fact that mortality by HAV infectionremains low, in the last 4 years the notification of cases has remained in an alert zone due to the endemic channel.[4]

Routine epidemiological surveillance and control of HAV is considered of great importance for the public health system, to assist the generation of health policies,

prevent and/or control outbreaks. Here, the evaluation of theepidemiological variables, such as reported cases,possible sources of infection,food and water consumption in the area in a determined time help to control the incidence of the disease, thus, containing the spread.[5]

Epidemic outbreaks are episodes in which two or more pcases of the same disease have some relationship with each other. Here, characteristics like the time of onset of symptoms, the place where they occurred or signs and symptoms of the sick people are important to consider the occurrence of similar cases, since they are epidemiologically related.[6]

According to the total number of HAV cases reported in Ecuador during 2020represented an increase of 10 % compared toSE3. Experts suggest a possible relationship between the buco-annal sexual practices and eating habits with HVA infection.

The main objective of this research is to develop a hypothetical epidemiological strategy aimed at studying the transmission mechanism of hepatitis A during the outbreak that occurred in Ecuador in 2020. This strategy will explore, in a hypothetical manner, the correlation between the social determinants of the population through surveys, with the aim of obtaining more accurate and realistic results

Methods

Retrospective observational cross-sectional study that aims to characterize the epidemiological surveillance process in the hypothetical case of a Hepatitis A outbreak. As a data collection technique, surveys were conducted based on

outbreak notification, and epidemiological records were used to define the reported cases as:

- Probable case for patients who present jaundice

- Suspected case: any patient with jaundice in the clinical or paraclinical results and also in the prodromal period presenting Anorexia, asthenia, low-grade fever, nausea, vomiting, gastrointestinal discomfort, acholia, choluria, liver pain, hepatomegaly, jaundice, with liver function tests Alaninoamino transferase (ALT), Aspartate transferase (AST) elevated 5-10 times the normal range

- Confirmed case to patients with jaundice in clinical results, laboratory tests that determine altered liver function, as well as positive serological markers, specifically anti-HAV IgM and

- Case confirmed by epidemiological link to the patient in contact with another person who has laboratory-confirmed hepatitis A during the 15 to 50 days preceding the appearance of symptoms.

Epidemiological surveillance of a hepatitis A outbreak involves a series of essential steps to control and understand the spread of the disease. Below are the typical steps to carry out this surveillance:

1. Outbreak Detection: Early detection is crucial. An alert system should be established to enable healthcare professionals to identify suspected cases of hepatitis A.

2. Diagnosis Confirmation: Suspected cases must be confirmed through specific laboratory tests for hepatitis A.

3. Data Collection: Data from affected patients is collected, including demographic information, symptoms, travel history, and exposures.

4. Case Investigation: Health professionals will investigate the source of infection, possible points of exposure, and close contacts of affected patients.

5. Identification of Secondary Cases: Close contacts will be identified and investigated to determine if they have been infected and if they can spread the disease.

6. Transmission Assessment: An analysis will be conducted to understand how the disease is spreading in the community and identify common risk factors.

7. Control Measures: Control measures will be implemented, including vaccination, promotion of hygiene and sanitation, and education on safe food practices and personal behavior.

8. Risk Communication: The community will be informed about the outbreak's existence, preventive measures, and the importance of seeking medical attention if they have symptoms.

9. Continuous Monitoring: The situation will continue to be monitored to assess the effectiveness of control measures and detect any increase or change in the outbreak's spread.

10. Evaluation and Analysis: An evaluation of the entire epidemiological surveillance process will be conducted to determine which measures were effective and what improvements are necessary for future outbreaks."

This proposed epidemiological surveillance model study presents the distribution of cases reported by the Epidemiology Subdepartment considering all patients affected in the disease outbreak.

The sample size was 718 participants, to determine the characteristics of the population, a correlational study was carried out with a survey as a data collection technique, characterizing the population by: type of diet, whether it is done outside the home and in public roads, consumption of raw seafood, trips made inside or outside the RM of Ecuador, previous sexually transmitted infections, sexuality and sexual misconduct such as gold-anal sex.

The surveys were carried out with the consent of the patients infected with HAV and an Epidemic Curve of notified and accumulated cases was constructed to evaluate the incidence of the disease and as an epidemiological measure, the attack rate of the epidemic outbreak was calculated based on the notified cases. with HAV and exposed patients.

Results

Any food contaminated by the virus can be a source of infection. It is important to highlight that food contamination through infected food handlers occurs frequently.[7]

A virus usually follows a short, benign and self-limited course without causing chronic hepatitis; however, in some cases it can manifest itself through atypical forms.[8]

In the year 2020 in the Coastal Region of Ecuador, 449 cases were reported in week 20, but as the weeks passed the reported cases increased considerably, for the

month of June 673 were reported and for the month of July 718 reported cases, considering the increase in infections as an epidemic outbreak.[9]

Starting from week 20, active epidemiological surveillance was carried out with immediate notification of cases. For this purpose, a correlational study was designed with a survey as a data collection technique, obtaining the following results detailed in Table 1. The attack rate is the incidence rate of an epidemic outbreak. In this case the rate of Incidents is calculated based on the number of patients with OAB in relation to those exposed.

Table 1- Results of the surveys carried out on the population affected by HAV

| Habits of the population infected by HAV	General Results	Results according to sex	Attack rates
Food outside the home	25.2 % of the population 53 people out of 210 respondents	87.6 % of the population were men.	30.6 %
Food on public roads	43.8 % of the population 92 people out of 210 respondents	87.6 % of the population were men.	45.1 %
Consumption of seafood and raw fish	36.2 % of the population 76 people out of 210 respondents	90.8 % of the population were men.	38 %
Travel within or outside the RM of Chile	21.3 % of the population 90 people out of 421 surveyed traveled	--	21.3 %
Diagnosed with a type of STI	37.3 % of the population 251 people out of 673 surveyed	--	24.5 %
Homosexual and Bisexual Patients	56.9 % of the population 239 people out of 421 respondents	98.2 % of the homosexual population were men	56.8 %
Bad sexual practices: Gold sex - anal	53.7 % of the population 226 people out of 421 surveyed	96.4 % of this group were men	53.7 %

HAV: Hepatitis A virus; RM: Metropolitan Region; STI: Sexually transmitted infection.

In Figure 1, an epidemic curve is specified with the number of cases per week and the median of the past 5 years. When proposing an epidemic corridor, we assess that in the month of May the number of cases is in the highest quartile, while in the month of June and July, 673 and 718 reported cases have been reported respectively, illustrating an epidemic outbreak

The distribution of cases changes according to each epidemiological week due to the demographic characteristics and lifestyles of the population, observing sharp rises and falls due to the HAV incubation period, with a very high plateau in week 20, which represents an outbreak. that has spread very quickly and has not been controlled

According to the results of the survey on the characteristics of the population we can inferthat the main source of infection of this epidemic outbreak is oral-anal and fecal-oral sexual transmission through consumption of street food.

Thus, 45 % of the population feeds in places where there are no good cleanliness conditions, therefore food handlers carrying potentially pathogenic gastrointestinal microorganisms, on the other hand more than 50 % of the study population is homosexual or bisexual and 53.7 % practice oral-anal sex, which is one of the main routes of infection. It is worth emphasizing that 110 patients are HIV seropositive, which makes them predisposed to contracting any viral infection due to their low immune response, such as in this case Hepatitis infection. TO.
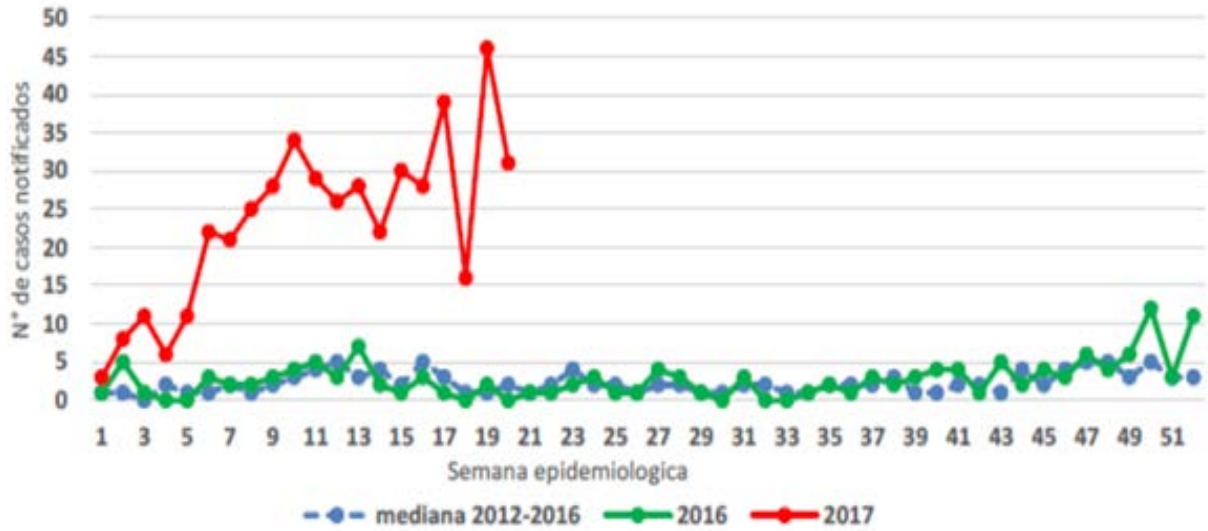
Source: ENO Database. Subdepartment of Health Epidemiology.

Fig. 1- Reported Cases of Hepatitis A and S/E per week, year 2020, RM SE 20.

To determine the incidence of the epidemic outbreak, an attack rate was created by calculating the ratio of patients with HAV in relation to exposed patients. Thus, in Table 2 it can be seen that there were 210 patients with OAB, 173 cases of OAB were isolated, of which 53 patients ate outside the home, therefore the attack rate is 3,264; While in Table 3 it can be seen that there were 200 patients with HAV, of which 10.5 % were women and 89.5 % men, 76 patients were infected with HAV due to the consumption of raw seafood consumed in public roads, therefore the attack rate is 2.63.[9]

Table 2- Contingency table for food consumption outside the home, S 20, RM, 2017.

Eat food outside the home (exposure)	Women	Man	Total
Exposed	5	48	53
Not exposed	eleven	109	120
Total	16	157	173

Table 3- Contingency table for the consumption of raw seafood and fish, S 20, RM, 2017.

Consumption of seafood and fish	Women	Man	Total
Exposed	7	69	76
Not exposed	14	110	114
Total	twenty-one	179	200

Another risk factor for increasing the number of cases reported in MRI is the sexual activity of the population in the last 60 days, where 88 % were men infected with HAV, confirming the hypothesis that men were the ones who had the most sexual activity. Unlike the female sex, it should be noted that 66.9 % of the studied population reported having homosexual sexual activity and 53.7 % carried out risky sexual practices such as oral-anal according to the surveys carried out.

Discussion

Through the evidence analyzed on hepatitis A, it is identified that the main source of infection of this epidemic outbreak is oral-anal and fecal-oral sexual transmission due to consumption of food in inadequate hygienic conditions. Regarding this last point, hepatitis A is a potential problem in places with poor hygiene and environmental sanitation, and it can spread more easily in closed, publicly accessible places such as daycare centers, homes and schools.

Overpopulated regions with poor sanitary conditions, with low-income inhabitants and low educational levels, constitute high-risk places. Some foods, such as water, seafood, and salads made with vegetables that grow at ground level, are the foods most frequently associated with outbreaks. Cold cuts, sandwiches, fruits, fruit juices, milk, dairy products, vegetables and frozen drinks have also been implicated in them.

Regarding Hepatitis A, its transmission mechanisms must be remembered, since it has been classically related to the fecal-oral transmission mechanism, characteristic of endemic countries. However, currently, its epidemiology is changing due to new routes of infection. In the case of hepatitis A, cases due to sexual transmission are increasing, especially in men who have sex with men. The changes described should promote the implementation of new diagnostic, management and prevention strategies. Acute hepatitis due to hepatitis.[9]

The incorporation of Neutrosophic into studies of the epidemiological control model for Hepatitis A (HVA) is proposed, following the successful example of other studies that have applied this tool in different contexts.[10,11,2] Neutrosophic, a discipline that seeks to balance and harmonize the neutral, positive, and negative aspects of life, could provide a new perspective to the analysis of the epidemiology of Hepatitis A. By considering not only the purely epidemiological aspects but also the emotional and psychological elements that can influence the prevention and control of the disease, a more comprehensive and effective approach could be obtained to address this public health problem.

Conclusions

The profile of patients infected by HAV in the MR epidemic outbreak of Ecuador in 2020, according to data collected by surveys by the Subdepartment of Epidemiology, were homosexual male patients with active sexual practice who engaged in high-risk sexual practices such as sex. oro-anal with a history of STIs, it was even confirmed that 110 patients were seropositive for HIV, being predisposed to microbial infections such as HAV.

On the other hand, the eating habits of the population studied were the consumption of food outside their home and on public roads, such as raw seafood and fish, which are considered the ideal mechanism for the transmission of gastrointestinal viruses.

In this way, the proposed hypothesis is verified, that there is an association between HAV infection with high-risk sexual practices, homosexual population, consumption of food in public and raw seafood, although we cannot establish causality with certainty since it is only has exposed patients with HAV, it is necessary to consider the value of exposed patients without HAV, it is recommended to carry out continuous epidemiological surveillance of the population group so that preventive strategies can be generated and encourage vaccination against hepatitis A.

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