

Observational Study

## Cross-sectional study to determine viral hepatitis knowledge in different urban populations in Brazil

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## Abstract

### AIM

To evaluate viral hepatitis knowledge among individuals from different resource areas and health conditions to identify possible gaps.

### METHODS

A cross-sectional, descriptive study was carried out among 447 individuals from five distinct populations in Brazil: Southeast Viral Hepatitis Ambulatory ( $n = 100$ ), South ( $n = 89$ ) and Northeast ( $n = 114$ ) Health Center, Southeast ( $n = 77$ ) and Northeast ( $n = 67$ ) low resource areas. All individuals answered a questionnaire assessing sociodemographic characteristics and viral hepatitis awareness. The perception was scored based on the average number of correct answers of all participants and categorized as "low" (0-28 correct answers) or "desirable" (29-46 correct answers). Associations between sociodemographic characteristics and perception were also evaluated.

### RESULTS

A low level of knowledge was observed in individuals from Northeast Health Center, Northeast and Southeast low resource areas while desirable knowledge was observed in individuals from Viral Hepatitis Ambulatory and South Health Center. According to sociodemographic characteristics, desirable scores were more common among those with secondary education (47.1%), those who declared themselves as white (46.3%), and those who lived in houses with three individuals (25.5%). Multivariate analysis showed an association between viral hepatitis perception and type of population.

### CONCLUSION

The results demonstrated high level of knowledge among study participants from health clinics from the Southeast region of Brazil and the importance of education programs in increasing the level of knowledge in low resource areas.

**Key words:** Viral hepatitis; Knowledge; Perception; Urban population; Brazil

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**Core tip:** This study evaluated viral hepatitis knowledge among individuals from five different resource areas and health conditions in Brazil. Participants responded to a questionnaire and the perception was scored as "low" or "desirable". Individuals from Northeast Health Center and Northeast and Southeast low resource areas exhibited low perception, while Southeast and South Health Center exhibited a desirable perception. A positive association was observed between perception and education level, race, number of individuals living in the same house and population type. The results showed the importance of prevention campaigns, especially among individuals living in low resource areas.

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## INTRODUCTION

Hepatitis is the name given to liver inflammation resulting from autoimmune disease, excessive consumption of alcohol or drugs, bacteria and viruses. Viral hepatitis is a group of viruses (hepatitis A, B, C, D, E, G known as HAV, HBV, HCV, HDV, HEV, HGV) that are etiologically and epidemiologically distinct<sup>[1-3]</sup>.

Ingestion of contaminated food or water transmits HAV and HEV; in this fashion, washing food and hands and treating water are methods of prevention. On the other hand, HBV, HCV and HDV can be transmitted by contact with infected bodily fluids (transfusion of blood or blood products, or invasive medical procedures), unsafe sexual practices, or from transmission from mother to child. Prevention of HBV, HCV and HDV is made by blood and organ donor selection, using disposable or sterilized materials and the use of condoms in sexual intercourse<sup>[1,4-6]</sup>.

There are vaccines to prevent HAV and HBV that are safe and effective; one vaccine for HEV is commercialized only in China, but there are no Federal Drug Administration-approved vaccines for HCV and HDV<sup>[7]</sup>. The clinical course of hepatitis viruses can be acute and chronic for HBV, HCV, HDV and HEV. The clinical manifestations of hepatitis can be absent or appear when the disease is advanced, with cirrhosis or liver cancer<sup>[1,2]</sup>. Viral hepatitis laboratory diagnosis is performed through the detection of specific antigens, antibodies and viral genome, mainly by enzyme immunoassays and molecular assays such as the polymerase chain reaction<sup>[8]</sup>.

HBV and HCV occur chronically in 257 and 71 million people respectively, causing more than 1.2 million deaths annually<sup>[2]</sup>. Approximately 15 million people are infected with HDV<sup>[2]</sup>. Annually, there are an estimated 126 million new cases of HAV and 3.3 million new cases of HEV<sup>[2,9,10]</sup>. In 2016, 61297 deaths were related to viral hepatitis in Brazil. HEV prevalence in Brazil varies from 2% to 29%<sup>[11-15]</sup>.

The evaluation of knowledge is assessed to verify how far community knowledge corresponds to biomedical concepts<sup>[5]</sup>. Some factors, such as education, health literacy, family income, age, and access to information, could be associated with gaps in knowledge<sup>[16,17]</sup>.

Around the world studies have been conducted in order to evaluate viral hepatitis perception among health professionals and students, viral hepatitis patients or other risk groups<sup>[17-21]</sup>. There are still few reports regarding viral hepatitis knowledge in low resource areas<sup>[5,22-24]</sup>. In view of these gaps, the aim of the present study is to evaluate the viral hepatitis knowledge among individuals from different resource areas and health conditions in Brazil to identify possible gaps and help authorities in the development of prevention and education programs.

## MATERIALS AND METHODS

### *Population studied*

This was a cross-sectional study conducted from March 2015 to November 2015, wherein a minimum sample size of 50 participants per group was defined. A nonprobability sampling method with consecutive sampling was used in which every subject meeting the criteria of inclusion was selected until the required sample size was achieved in this setting.

Individuals were previously informed about the study and participant eligibility criteria were: Both genders, more than 18 years of age, free from psychoactive drug use, agreement to inclusion, and signed, informed consent. The local ethical committee approved the study (CAEE 38846914.5.0000.5248).

The final sample was made up of a total of 447 questionnaires about hepatitis knowledge obtained from five groups belonging to different geographic regions in Brazil, as follows: (1) Southeast Viral Hepatitis Ambulatory, comprising 100 individuals living in the Rio de Janeiro state, both in nearby cities and in different districts of the city of Rio de Janeiro, who were referred to the outpatient clinic. These individuals included not only those with acute, chronic or suspected cases of viral hepatitis but also those accompanying patients to the Brazilian Referral center for viral hepatitis diagnosis. The recruitment was performed prior to medical consultation. The Rio de Janeiro state is situated in the Southeast region of Brazil, with a human development Index (HDI) of 0.761<sup>[25]</sup>; (2) South Health Center, comprising 89 individuals residing in the city of Curitiba (Paraná State) that were recruited in the Guidance and Monitoring Center prior to medical consultation. This center performs

anonymous testing for hepatitis, syphilis and human immunodeficiency virus. Curitiba is situated in the South region of Brazil with an estimated population of 1908359, an HDI of 0.823, and poverty rate of 31.71%<sup>[25]</sup>; (3) Northeast Health Center, comprising 114 individuals resident in the city of Fortaleza (Ceará State) and who were users of the Brazilian Unified Health System seeking care in Medical Care Center integrated to the University of Fortaleza. Recruitment was carried out prior to medical consultation. Fortaleza is situated in the Northeast region of Brazil, with an estimated population of 2627482, an HDI of 0.754, and a poverty rate of 43.17%<sup>[25]</sup>; (4) Southeast low resource areas, comprising 77 individuals living in low resource communities from the Southeast region of Brazil (Complex of Manguinhos district of Rio de Janeiro city). Interviewers visited residents in their homes and only applied the questionnaires to those who agreed to participate. Rio de Janeiro city is situated in the Southeast region of Brazil, with an estimated population of 6520266, an HDI of 0.799, and a poverty rate of 23.85%. Manguinhos complex exhibited the fifth worst HDI (0.726) among the 126 neighborhood groups in the city of Rio de Janeiro, and the average family income in population was below a minimum Brazilian income<sup>[25]</sup>; and (5) Northeast low resource areas, comprising 67 individuals resident in a low-resource community from the Northeast Region of Brazil (Nossa Senhora de Nazaré city, Piauí State). This city had approximately 5000 inhabitants and residents had a low income. Interviewers visited residents in their homes and only applied the questionnaires to those who agreed to participate. Nossa Senhora de Nazaré is situated in the Northeast region of Brazil, with an estimated population of 4786, an HDI of 0.586, and a poverty rate of 56.6%<sup>[25]</sup>.

To assess knowledge scores, five populations were further aggregated into three groups, which were categorized as Southeast Viral Hepatitis Ambulatory ( $n = 100$ ), medical centers ( $n = 203$ , South and Northeast) and under-privileged communities ( $n = 144$ , Southeast and Northeast low resource areas).

### *Data collection instrument*

The questionnaire was composed of two parts: (1) Social-demographic characteristics; and (2) viral hepatitis perception. Social-demographic characteristics included gender, age, education level, race, monthly family income, marital status and number of people in-house. Monthly family income was considered in relation to the Brazilian minimum salary and classified as "low" (< US \$276.00 approximately), "intermediate" (US \$276.00 to \$828.00 approximately) or "high" (> US \$828.00 approximately).

Viral hepatitis perception was assessed by the participants' understanding of the proposed questions. The questionnaire was composed of nine groups of questions covering aspects about viral hepatitis including general information (questions 1 to 4), transmission (question 5), prevention (question 6), clinical manifestations (question 7), risk factors (question 8), and

complications (questions 9). All questions except items 3 and 4 had subdivisions (*i.e.* 1a, 1b, 1c and 1d); thus, a total of 46 answers could be correctly pointed out. Additionally, in items 3, 4, 5 and 6, individuals were asked to report which type of hepatitis virus related to their response.

The initial version of the questionnaire was structured in the Brazilian Portuguese language and developed from a questionnaire applied in a previous study<sup>[24]</sup> and through literature review about knowledge in viral hepatitis<sup>[5,16,17]</sup>. The questionnaire was then piloted with 30 respondents for its acceptability and consistency, including 15 self-administered and 15 interviewed. From the self-administered questionnaire, three of them had many unfilled questions, and one of them entirely unfilled. The questionnaire was modified after the pilot study and the interview format was chosen for data collection. After this evaluation, the questionnaire was made available for data collection. Data from the pilot study was not included in the final analysis. Participants were interviewed face-to-face in a confidential setting. At the end of the interview, the correct answers were shown to each volunteer.

### Score of knowledge

The viral hepatitis perception score was created based on the average of correct answers of all participants' responses (28.7). The perception was divided in two scores: "low" (0-28 correct answers) and "desirable" (29-46 correct answers). Associations between sociodemographic characteristics and perception were also evaluated.

### Statistical analysis

Descriptive statistics were generated for the responses and the chi-squared test for independence or for trend and Kruskal-Wallis test were used to compare categorical and continuous variables respectively, among the perception score groups. The variables that were associated with perception score categories were inserted into the logistic regression model, using a forward stepwise method. The 95% CIs of the estimated odds ratios were also calculated, and a *P*-value was calculated using the Statistical Package for the Social Sciences (SPSS for Windows, release 20.0; IBM Corp., Armonk, NY, United States).

## RESULTS

### Demographic characteristics

Most of the participants were female (269/60.2%), aged over 40 years (254/56.8%), had secondary education (186/41.6%), received intermediate monthly family income (250/55.9%), and declared themselves as non-white (225/50.3%), married (224/50.1%) and living in houses with three individuals (128/28.6%). Only marital status was not significantly different between the five populations (*P* = 0.909) (Table 1).

### Viral hepatitis perception

In the case of most categories, the majority of questions were correctly answered (varying from 56.4% to 77.3%), with the exception of the complications category where only 39.4% were answered correctly. Individuals from Southeast Viral Hepatitis Ambulatory showed the highest number of correct answers in general (66.4%), clinical manifestations (84.7%), complications (46.5%), transmission (81.4%) and prevention (80.6%). Participants from South Health Center showed the highest number of correctly answered questions regarding risk of acquiring hepatitis (68.1%) (data not shown).

Table 2 describes the correct responses towards viral hepatitis knowledge separated by populations. More than 70% of participants recognized that hepatitis is caused by viruses, the existence of HAV, HBV, HCV and the availability of vaccines for hepatitis. Additionally, more than 60% of individuals did not know that hepatitis can be caused by alcohol or medicines and that an individual cannot have the same type of hepatitis more than once, while more than 70% of participants were unaware of the existence of HDV and HEV.

Clinical manifestations and risk of acquiring hepatitis questions were correctly answered by most individuals. However, work in rural areas as a risk factor in the acquisition of hepatitis was incorrectly answered by more than 60% of participants. Less than 27% of interviewees were able to associate loss of body movements, blood through the mouth, loss of vision and blood in the stool as complications of hepatitis. In addition, more than 50% of participants incorrectly answered questions about transmission by seafood, the absence of transmission by mosquito bite, and modes of prevention, such as killing mosquitoes and using masks.

In general, correct answers were more common in Southeast Viral Hepatitis Ambulatory and less common in Northeast low resource areas. In questions such as "Does hepatitis D exist?", "Can hepatitis be transmitted by mosquito bite?", "Can killing mosquitoes prevent viral hepatitis?" and "Does using masks prevent hepatitis?" less than 50% were correctly answered by all participants but more than 50% of such questions were correctly answered in Southeast Viral Hepatitis Ambulatory (Table 2).

Less than 10% of correct answers were observed in questions such as "Do hepatitis D and E exist?" in Northeast Health Center, "Is loss of body movement a complication of hepatitis?" in Southeast and Northeast low resource areas, and "Is blood in the stool a complication of hepatitis?" in Northeast Health Center, Southeast and Northeast low resource areas (Table 2).

In bivariate analysis of answered questions, some were not significant, such as those informing whether hepatitis can be caused by medicines, whether jaundice, pale stools and dark urine are clinical manifestations of hepatitis, whether people working in laboratories are at risk of infection, and whether loss of blood through the



**Table 1** Participants' sociodemographic characteristics of studies, *n* (%)

Item	Total, 447	Southeast viral hepatitis ambulatory, 100	South health center, 89	Northeast health center, 114	Southeast low resource areas, 77	Northeast low resource areas, 67	<i>P</i> value
Gender							
Female	269 (60.2)	55 (55.0)	33 (37.1)	76 (66.7)	51 (66.2)	54 (80.6)	0.000
Male	178 (39.8)	45 (45.0)	56 (62.9)	38 (33.3)	26 (33.8)	13 (19.4)	
Age groups by yr							
≤ 40	193 (43.2)	29 (29.0)	28 (31.5)	68 (59.6)	27 (35.1)	41 (61.2)	0.000
> 40	254 (56.8)	71 (71.0)	61 (68.5)	46 (40.4)	50 (64.9)	26 (38.8)	
Education							
Illiterate	136 (30.4)	28 (28.0)	11 (12.4)	27 (23.7)	38 (49.3)	32 (47.8)	0.000
Primary school	66 (14.8)	16 (16.0)	12 (13.5)	15 (13.2)	13 (16.9)	10 (14.9)	
Secondary school	186 (41.6)	42 (42.0)	48 (53.9)	51 (44.7)	25 (32.5)	20 (29.8)	
College	59 (13.2)	14 (14.0)	18 (20.2)	21 (18.4)	1 (1.3)	5 (7.5)	
Family income							
Low	38 (8.5)	3 (3.0)	1 (1.1)	5 (4.4)	7 (9.1)	17 (25.3)	0.000
Intermediate	250 (55.9)	62 (62.0)	25 (28.1)	72 (63.2)	55 (71.4)	41 (61.2)	
High	145 (32.5)	35 (35.0)	61 (68.5)	34 (29.8)	11 (14.3)	4 (6.0)	
Race							
White	211 (47.2)	47 (47.0)	67 (75.3)	33 (28.9)	42 (54.5)	22 (32.8)	< 0.0001
Non-white	225 (50.3)	51 (51.0)	20 (22.4)	74 (64.9)	35 (45.5)	45 (67.2)	
Marital status							
Married	222 (49.7)	46 (46.0)	44 (49.4)	59 (51.8)	40 (51.9)	33 (49.3)	0.909
Unmarried	224 (50.1)	54 (54.0)	45 (50.6)	55 (48.2)	36 (46.8)	34 (50.7)	
People in home							
1	39 (8.7)	14 (14.0)	9 (10.1)	8 (7.0)	7 (9.1)	1 (1.5)	0.000
2	97 (21.7)	23 (23.0)	28 (31.5)	16 (14.0)	24 (31.1)	6 (9.0)	
3	128 (28.6)	34 (34.0)	23 (25.8)	30 (26.3)	24 (31.2)	17 (25.4)	
4	94 (21.0)	14 (14.0)	17 (19.1)	32 (28.1)	8 (10.4)	23 (34.3)	
5	88 (19.7)	14 (14.0)	12 (13.5)	28 (24.6)	14 (18.2)	20 (29.8)	

mouth or blood in the stool are complications of infection ( $P = 0.110$ ,  $P = 0.922$ ,  $P = 0.054$ ,  $P = 0.233$  and  $P = 0.121$ , respectively) (Table 2).

Figure 1 shows the distribution of correct answers in each population; the highest number of correct answers were found in the Southeast Viral Hepatitis Ambulatory group and the lowest number in Northeast low resource areas. Also, it was possible to observe a larger dispersion of correct-answers in Northeast low resource areas.

In 19 questions, it was necessary to determine which hepatitis type was related to the participant's response; only in three of them were more than 50% of the participants able to correctly identify at least one of the related hepatitis types. The percentage of incorrect answers (*i.e.* did not know, did not respond, or did not associate the correct hepatitis type with the question) from these three questions were 14.5% for "Selecting uninfected donors is hepatitis prevention", 40.3% for "Can hepatitis be transmitted by air?" and 41.2% for "Which hepatitis types have a vaccine?". For the other questions, the percentage of wrong answers varies from 50.6% ("Can hepatitis be transmitted by hemodialysis?") to 88.1% ("Can hepatitis be transmitted by seafood?") (data not shown).

### Perception about viral hepatitis

The average of correct answers from all individuals was  $28.7 \pm 6.1$  - which was considered as the cut off value in this analysis; in this way, scores from 0 to 28 were considered "low" and scores of 29 to 46 were

considered "desirable". Only Southeast Viral Hepatitis Ambulatory and South Health Center demonstrated a desirable knowledge ( $30.5 \pm 5.0$  and  $29.5 \pm 5.6$ , respectively) (Table 3).

Regarding the rate of correct answers, 255 (57.0%) individuals scored above average, with 87 (87.0%) from Southeast Viral Hepatitis Ambulatory, 52 (58.4%) from South Health Center, 56 (49.1%) from Northeast Health Center, 34 (44.1%) from Southeast low resource areas, and 26 (39.4%) from Northeast low resource areas.

The caveats of gender, age, marital status and number of people in the home were associated with approximately the same average number of correct answers. The majority of the individuals with both low and desirable scores received an intermediate family income; however, a lower average number of correct answers was observed in individuals who received low family income.

Desirable perception was more common among females (58.4%), subjects aged over 40 years (60.0%), with a secondary education (47.1%), receiving intermediate family income (56.9%), declaring themselves white (51.8%), married (50.2%) and living in houses with three individuals (25.5%), and belonging to Southeast Viral Hepatitis Ambulatory (34.1%) (Table 3).

Perception was associated only with education level, race, individuals living in the same home and populations in bivariate analysis (Table 3). In multivariate analysis, population-type was found to be statistically significant (Table 4).

**Table 2** Correct answers regarding viral hepatitis given by individuals from each group evaluated (*n* = 447) according to general aspects, clinical manifestations, risk of acquiring hepatitis, complications, transmission and prevention, *n* (%)

Sentence	Total, <i>n</i> = 447	Southeast viral hepatitis ambulatory, <i>n</i> = 100	South health center, <i>n</i> = 89	Northeast health center, <i>n</i> = 114	Southeast low resource areas, <i>n</i> = 77	Northeast low resource areas, <i>n</i> = 67	<i>P</i> value
General aspects							
Can hepatitis be caused by viruses	321 (71.8)	84 (84.0)	69 (77.5)	75 (65.8)	48 (62.3)	45 (67.2)	0.005
Can hepatitis be caused by bacteria	242 (54.1)	50 (50.0)	19 (21.3)	74 (64.9)	56 (72.7)	43 (64.2)	0.000
Can hepatitis be caused by alcohol	172 (38.5)	31 (31.0)	31 (34.8)	38 (33.3)	34 (44.2)	38 (56.7)	0.006
Can hepatitis be caused by medicines	154 (34.5)	45 (45.0)	29 (32.6)	32 (28.1)	24 (31.2)	24 (35.8)	0.110
Does hepatitis A exist	394 (88.1)	98 (98.0)	78 (87.6)	97 (85.1)	68 (88.3)	53 (79.1)	0.004
Does hepatitis B exist	410 (91.7)	99 (99.0)	88 (98.9)	95 (83.3)	73 (94.8)	55 (82.1)	0.000
Does hepatitis C exist	359 (80.3)	99 (99.0)	86 (96.6)	66 (57.9)	61 (79.2)	47 (70.1)	0.000
Does hepatitis D exist	121 (27.1)	56 (56.0)	18 (20.2)	10 (8.8)	18 (23.4)	19 (28.4)	0.000
Does hepatitis E exist	92 (20.6)	40 (40.0)	15 (16.9)	7 (6.1)	14 (18.2)	16 (23.9)	0.000
Does a vaccine for hepatitis exist	376 (84.1)	91 (91.0)	78 (87.6)	97 (85.1)	58 (75.3)	52 (77.6)	0.026
Can you have the same hepatitis more the once	132 (29.5)	37 (37.0)	23 (25.8)	37 (32.5)	13 (16.9)	22 (32.8)	0.040
Clinical manifestations							
No clinical manifestations	292 (65.3)	89 (89.0)	75 (84.3)	61 (53.5)	35 (45.5)	32 (47.8)	0.000
After years	311 (69.6)	81 (81.0)	75 (84.3)	61 (53.5)	47 (61.0)	47 (70.1)	0.000
Fever discomfort, nausea	369 (82.6)	76 (76.0)	67 (75.3)	99 (86.8)	64 (83.1)	63 (94.0)	0.008
Jaundice, pale stools and dark urine	410 (91.7)	93 (93.0)	81 (91.0)	103 (90.4)	72 (93.5)	61 (91.0)	0.922
People at risk of acquiring hepatitis							
People working in laboratory	235 (52.6)	61 (61.0)	39 (43.8)	67 (58.8)	38 (49.4)	30 (44.8)	0.054
People who work in hospitals	310 (69.4)	72 (72.0)	58 (65.2)	88 (77.2)	56 (72.7)	36 (53.7)	0.014
Not people who work in rural areas	157 (35.1)	36 (36.0)	41 (46.1)	46 (40.4)	18 (23.4)	16 (23.9)	0.006
People who work in the beauty areas	353 (79.0)	91 (91.0)	70 (78.7)	89 (78.1)	57 (74.0)	46 (68.7)	0.007
People who use drugs	393 (87.9)	98 (98.0)	85 (95.5)	96 (84.2)	64 (83.1)	50 (74.6)	0.000
People who receive tattoos or piercings	389 (87.0)	98 (98.0)	79 (88.8)	96 (84.2)	64 (83.1)	52 (77.6)	0.001
People who live indoors	253 (56.6)	46 (46.0)	45 (50.6)	66 (57.9)	57 (74.0)	39 (58.2)	0.004
Not people who work in offices	299 (66.9)	19 (19.0)	68 (76.4)	28 (24.6)	26 (33.8)	31 (46.3)	0.000
Complications							
Cirrhosis	361 (80.8)	91 (91.0)	82 (92.1)	79 (69.3)	62 (80.5)	47 (70.1)	0.000
Liver cancer	378 (84.6)	91 (91.0)	78 (87.6)	95 (83.3)	65 (84.4)	49 (73.1)	0.031
There is no loss of body movements	88 (19.7)	32 (32.0)	17 (19.1)	27 (23.7)	6 (7.8)	6 (9.0)	0.233
There is no loss of blood through the mouth	65 (14.5)	17 (17.0)	18 (20.2)	16 (14.0)	8 (10.4)	6 (9.0)	0.000
There is no vision loss	117 (26.2)	30 (30.0)	23 (25.8)	40 (35.1)	13 (16.9)	11 (16.4)	0.016
There is no blood in the stool	49 (11.0)	18 (18.0)	10 (11.2)	9 (7.9)	7 (9.1)	5 (7.5)	0.121
Transmission							
By transfusion and transplantation	386 (86.4)	94 (94.0)	85 (95.5)	91 (79.8)	67 (87.0)	49 (73.1)	0.000
By sex	310 (69.4)	96 (96.0)	76 (85.4)	64 (56.1)	42 (54.5)	32 (47.8)	0.000
By water and contaminated vegetables	318 (71.1)	88 (88.0)	49 (55.1)	79 (69.3)	60 (77.9)	42 (62.7)	0.000
By seafood	135 (30.2)	59 (59.0)	17 (19.1)	27 (23.7)	23 (29.9)	9 (13.4)	0.000
By tattoo and piercing	361 (80.8)	96 (96.0)	76 (85.4)	88 (77.2)	57 (74.0)	44 (65.7)	0.000
By cutting instruments	385 (86.1)	99 (99.0)	77 (86.5)	90 (78.9)	66 (85.7)	53 (79.1)	0.005
By hemodialysis	280 (62.6)	74 (74.0)	58 (65.2)	60 (52.6)	53 (68.8)	35 (52.2)	0.010
Cannot be by mosquito bite	221 (49.4)	58 (58.0)	49 (55.1)	60 (52.6)	31 (40.3)	23 (34.3)	0.000
Cannot be by air	268 (60.0)	69 (69.0)	69 (77.5)	68 (59.6)	34 (44.2)	28 (41.8)	0.000
Prevention							
Building cesspools	324 (72.5)	78 (78.0)	49 (55.1)	89 (78.1)	63 (81.8)	45 (67.2)	0.000
Channeling water	318 (71.1)	76 (76.0)	53 (59.6)	84 (73.7)	63 (81.8)	42 (62.7)	0.007
Selecting uninfected donors	363 (81.2)	90 (90.0)	71 (79.8)	105 (92.1)	58 (75.3)	39 (58.2)	0.000
Filtering water and treating drinks	372 (83.2)	88 (88.0)	57 (64.0)	101 (88.6)	71 (92.2)	55 (82.1)	0.000
Killing mosquitoes does not prevent hepatitis	189 (42.3)	53 (53.0)	41 (46.1)	41 (36.0)	33 (42.9)	21 (31.3)	0.029
Providing vaccine	405 (90.6)	94 (94.0)	80 (89.9)	107 (93.9)	70 (90.9)	54 (80.6)	0.030
Using masks does not prevent hepatitis	210 (47.0)	69 (69.0)	57 (64.0)	46 (40.4)	26 (33.8)	12 (17.9)	0.000
Using condoms	378 (84.6)	97 (97.0)	82 (92.1)	93 (81.6)	56 (72.7)	50 (74.6)	0.000

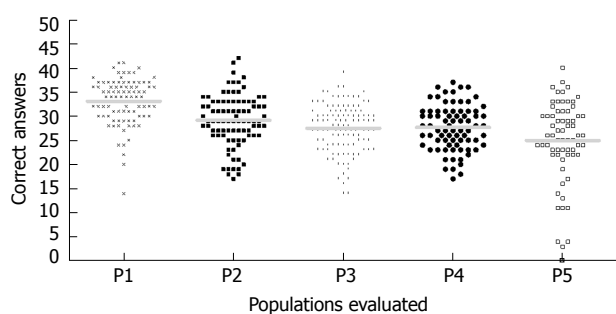
Southeast Viral Hepatitis Ambulatory showed a higher number of desirable scores while underprivileged communities showed a lower number of desirable scores compared to low scores in the same areas. Medical centers also present a larger proportion of desirable scores compared to low scores though this was less pronounced (Figure 2).

## DISCUSSION

In the present study, knowledge level was scored according to the mean number of correct answers. Individuals from Southeast Viral Hepatitis Ambulatory and South Health Center showed a desirable knowledge in contrast to those recruited at Northeast Health Center,

**Table 3 Sociodemographic characteristics according to knowledge scores for viral hepatitis, n (%)**

Item	Mean of knowledge score ( $\pm$ SD)	Knowledge score		Bivariate analysis <i>P</i> value
		Low (0-28), <i>n</i> = 192	Desirable (29-46), <i>n</i> = 255	
Gender				
Female	28.49 $\pm$ 6.16	120 (62.5)	149 (58.4)	0.430
Male	29.04 $\pm$ 6.10	72 (37.5)	106 (41.6)	
Age in yr				
$\leq$ 40	27.6 $\pm$ 6.6	91 (47.4)	102 (40.0)	0.120
> 40	27.5 $\pm$ 8.5	101 (52.6)	153 (60.0)	
Education level				
Illiterate	25.4 $\pm$ 8.3	74 (38.5)	62 (24.3)	0.002
Primary school	28.1 $\pm$ 5.1	32 (16.7)	34 (13.3)	
Secondary school	30.9 $\pm$ 5.7	66 (34.4)	120 (47.1)	
College	30.8 $\pm$ 5.4	20 (10.4)	39 (15.3)	
Family income				
Low	26.1 $\pm$ 6.9	21 (10.9)	17 (6.7)	0.200
Indeterminate	29.4 $\pm$ 7.0	105 (54.7)	145 (56.9)	
High	30.3 $\pm$ 5.5	57 (29.7)	88 (34.5)	
Race				
White	29.8 $\pm$ 7.1	79 (41.1)	132 (51.8)	0.030
Non-white	28.2 $\pm$ 6.3	107 (55.7)	118 (46.3)	
Marital status				
Married	28.4 $\pm$ 7.1	94 (48.9)	128 (50.2)	0.840
Unmarried	27.3 $\pm$ 8.0	97 (50.5)	127 (49.8)	
Individuals living in the same home				
1	30.5 $\pm$ 5.0	11 (5.7)	28 (11.0)	0.014
2	29.5 $\pm$ 5.6	41 (21.4)	56 (22.0)	
3	28.3 $\pm$ 6.3	63 (32.8)	65 (25.5)	
4	28.8 $\pm$ 6.6	31 (16.1)	63 (24.7)	
$\geq$ 5	27.6 $\pm$ 6.4	46 (24.0)	42 (16.5)	
Population				
Southeast viral hepatitis ambulatory	33.1 $\pm$ 4.5	13 (6.8)	87 (34.1)	< 0.0001
South health center	29.1 $\pm$ 5.3	37 (19.3)	52 (20.4)	
Northeast health center	27.5 $\pm$ 5.0	58 (30.2)	56 (22.0)	
Southeast low resource areas	27.6 $\pm$ 4.7	43 (22.4)	34 (13.3)	
Northeast low resource areas	25.0 $\pm$ 8.5	41 (21.3)	26 (10.2)	



**Figure 1 Distribution of correct answers plotted according to each population evaluated.** The y-axis represents the number of correct answers. The solid lines represent the average for P1 (Southeast Viral Hepatitis Ambulatory), P2 (South Health Center), P3 (Northeast Health Center), P4 (Southeast low resource areas) and P5 (Northeast low resource areas), which were respectively: 33.1  $\pm$  4.5; 29.1  $\pm$  5.3; 27.5  $\pm$  5.0; 27.6  $\pm$  4.7; and, 25.0  $\pm$  8.5.

Southeast and Northeast low resource areas. The findings of the current study are in line with previous findings<sup>[5,22,24]</sup>. However, the study in Egypt noted high baseline knowledge about HCV<sup>[23]</sup>, likely due to the scale of the HCV epidemic in this country.

Complications arising from viral hepatitis was the worst set of questions evaluated in the current study. Although more than 80% of participants can correctly

correlate cirrhosis and liver cancer with complications of viral hepatitis, most of them related complications that are not caused by hepatitis. In previous studies between health professionals, more than half of participants answered correctly to the questions about HCV complications<sup>[26]</sup>. However, an insufficient knowledge regarding HCV complications was observed in a study among health professionals<sup>[27]</sup>. Clinical manifestations of viral hepatitis were the best set of questions evaluated, contrary to previous observations<sup>[28]</sup>.

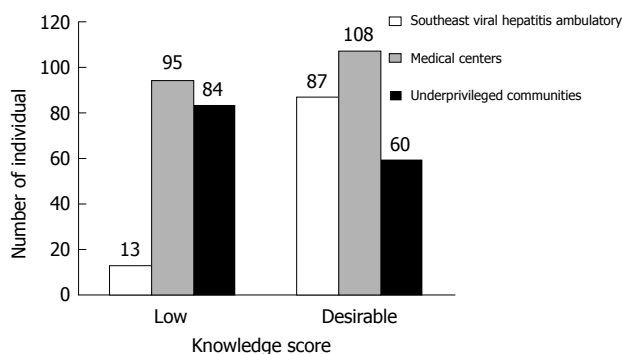
In the present study, most individuals recognize the existence of HAV, HBV and HCV and do not recognize the existence of hepatitis D or E. The same finding has previously been observed in Brazil<sup>[24]</sup>. Another study<sup>[28]</sup> observed a very weak knowledge regarding the five hepatitis types among medical science students. Transmission and prevention modes were correctly answered in general; this data was also observed among medical and health science students in Ethiopia in the evaluation of HBV knowledge<sup>[21]</sup>. A large number of individuals do not know that viral hepatitis can be transmitted by seafood, as observed previously<sup>[24]</sup>. Since HAV and HEV can be transmitted in this way<sup>[29,30]</sup>, the transmission may continue if preventive measures are not taken.

Viral hepatitis transmission by mosquito and forms to prevent it were incorrectly answered by most par-

**Table 4 Final adjusted model of multivariate logistic regression for knowledge scores for viral hepatitis**

Variable	Knowledge score			P value
	OR	95%CI		
		Lower	Upper	
<b>Education level</b>				
Illiterate	2.230	1.084	4.586	0.290
Primary school	1.799	0.807	4.009	0.151
Secondary school	1.028	0.528	2.002	0.936
College	1.000	-	-	-
<b>Individuals living in the same home</b>				
1	1.000	-	-	-
2	1.611	0.671	3.867	0.286
3	2.328	0.992	5.465	0.052
4	0.818	0.332	2.017	0.663
≥ 5	1.832	0.748	4.486	0.185
<b>Population</b>				
Southeast viral hepatitis ambulatory	1.000	-	-	-
South health center	6.154	2.900	13.058	0.000
Northeast health center	8.617	4.177	17.777	0.000
Southeast low resource areas	7.491	3.508	15.994	0.000
Northeast low resource areas	11.262	5.007	25.327	0.000

CI: Confidence interval; OR: Odds ratio.



**Figure 2** Number of individuals according to knowledge score in each group evaluated.

Participants, probably due to the country-wide presence of Dengue virus, the transmission of which is widely understood by the public. Most individuals did not cite transmission by air but, curiously, masks to avoid airborne contamination were cited. These questions highlight the need for raising awareness among the public to reinforce knowledge related to the modes of transmission and prevention.

In present study, population type was the significant demographic factor associated with knowledge level in multivariate analysis, the same as found in other studies<sup>[5,24,31]</sup>. Contrary to a previous general population study in Brazil<sup>[24]</sup>, monthly family income had no association with knowledge in the present study.

The results obtained in the present study can be used as a data source for the projection of intervention methods in health and public health policies, such as explanatory educational leaflet, educational booklets, lectures in schools, health campaigns, health fairs and others, in order to increase access to information of viral hepatitis and possibly to reduce the number of cases of

these infections, especially among individuals from low-resource areas that showed a lower level of knowledge in the present study.

The present study has some limitations. The study did not assess the information regarding the neighborhood of each participant to observe the sociodemographic diversity. The study did not assess the occupation of participants to categorize and compare with studies in specific groups, such as health or beauty professionals. In Viral Hepatitis Ambulatory and in medical centers, it was not asked whether participants had previously consulted and whether they had any prior knowledge about hepatitis.

In conclusion, in general, desirable knowledge was observed among most participants. However, Northeast Health Center and under-privileged communities showed low knowledge. Knowledge levels were associated with education level, race and number of individuals living in the same home. The results of the present study should prove useful for information and prevention campaigns targeted at the general population, especially between neglected communities, in order to reduce the transmission of viral hepatitis.

## ARTICLE HIGHLIGHTS

### Research background

Viral hepatitis is an important public health problem in the world, causing more than 1 million deaths annually. It is important to evaluate viral hepatitis perception to identify the possible gaps and help public health authorities to create strategies to increase access to information about these infections.

### Research motivation

Few studies have been done to evaluate viral hepatitis perception in uninfected individuals, particularly in Latin America.

### Research objectives

The main aim of this study was to evaluate the viral hepatitis knowledge among



individuals from different resource areas and health conditions in Brazil to identify possible gaps and help authorities in the development of prevention and education programs.

### Research methods

This was a cross-sectional study, wherein a questionnaire to evaluate viral hepatitis perception was applied among 447 individuals from five different populations in Brazil (Southeast low resource areas, Northeast low resource areas, South Health Center, Northeast Health Center, Southeast Viral Hepatitis Center). The viral hepatitis perception score was created based on the average of correct answers of all participants' responses (28.7), and associations between sociodemographic characteristics and perception were also evaluated.

### Research results

High perception level about viral hepatitis was observed in Southeast Viral Hepatitis Ambulatory and South Health Center compared to Northeast Health Center, Southeast and Northeast low resource areas. According to sociodemographic characteristics, desirable scores were more common among those with secondary education (47.1%), those who declared themselves as white (46.3%), and those who lived in houses with three individuals (25.5%). Population type was associated with knowledge level in multivariate analysis.

### Research conclusions

The study demonstrated a low level of perception about viral hepatitis among individuals from low resource areas. Identifying the knowledge gaps in this group could help to create strategies for increasing access to information and consequently reducing the transmission of these diseases.

### Research perspectives

This study demonstrates that it is necessary to improve the access to health information about viral hepatitis, especially among residents of low-resource settings. It is important to conduct a random sampling evaluation of larger numbers of individuals to confirm the results observed. A questionnaire could help to conduct these studies, the same as was used in the present work.

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