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Determination of Helicobacter pylori antigen in adults in low socio-economic conditions in a neighborhood of Juigalpa

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ABSTRACT

Helicobacter pylori, is a negative gram bacterium capable of surviving gastric acidity causing chronic gastritis, peptic ulcer, and gastric cancer. The techniques used for the detection of this bacterium are divided into invasive and non-invasive, which provide a reliable diagnosis for the population, (Cruz, Guillén, & Martínez, 2015, p. 15)

The research was quantitative, descriptive, and cross-sectional. The objective of the study was to determine *H pylori* infection in adults in low socio-economic conditions aged 18 to 45 years in the San Antonio neighborhood of Juigalpa. The sample was 29 participants, to whom a questionnaire and the immunochromatographic test for the detection of the antigen of the bacterium were applied. The information was processed in SPSS v.21.

The results found were: 65.5% of positive cases, overcrowding in 44.8%, and 37.9% had no knowledge about the bacteria, 100% used to eat food outside the home and 93.1% had good hygienic-eating habits at home. When associating the symptoms with the presence of *H. pylori* antigen, a predominance of symptomatic infection was evidenced between 26.3 and 78.9%, except for heartburn in 100%.

In short, *H. pylori* infection is and will continue to be one of the most frequent health problems. Ignorance about the infection and food outside the home plays a fundamental role in the acquisition of it. Using diagnostic methodologies such as that applied in this investigation can allow the more global monitoring of the infection, both in symptomatic and asymptomatic patients.

1. INTRODUCTION

Helicobacter pylori infection is one of the main health problems worldwide, especially in developing countries whose contagion occurs at an early age and remains chronic unless it is eradicated with a specific treatment. The problem with this infection is that most of those infected may be asymptomatic, however, some of them may develop complications of the infection (Castro & Saldaña, 2015, p. 8).

The infection by this bacterium is characterized by presenting diversity in the clinical manifestations among patients; however, as "the colonization of the gastric mucosa by this agent is accompanied by histological signs of inflammation, the most typical symptomatology in adulthood is accompanied by pain and/or epigastric burning, heartburn, nausea, vomiting, feeling full (stomach) after meals and in some cases thinning" (Formento, Hernández, & Martínez, 2004, p. 105).

The most common complications associated with the infection are chronic gastritis and peptic ulcers. Most people who are uninfected do not have symptoms or develop these conditions and the incidence of these diseases varies considerably between different geographical regions, and especially due to host-host interactions. The infection has also been associated with MALT-like gastric lymphoma and gastric cancer. (González & Rodriguez, 2011, p. 442)

There are a variety of methods available to diagnose this bacterium. Globally these are divided into: invasive and non-invasive. Among the invasive ones we have mainly the histopathological study, which is considered as a valuable test, because, as mentioned by Bermúdez, Torres, & Rodríguez "this allows in a simple way the identification of the bacterium through different supravital stains, where currently accompanied by fluorescent markers, sensitivities, and specificities of 98 and 100% respectively are obtained (2009, p. 4).

Noninvasive tests include serological studies, urea breath tests, and stool antigen detection. Due to its low cost and being a direct method, the detection of *H. pylori* antigen in feces by immunochromatrographic cassette has made it an analysis that has been valued even above the serological results achieved by ELISA. As Expressed by Frías & Otero, "globally with this type of test, sensitivities of 94% and specificities of 97% are obtained (2017 p. 251); data very similar to those obtained by invasive tests and that involve the use of equipment and supplies of high costs.

Therefore, if we analyze from the perspective of cost-benefit, the detection of *H. pylori* by identifying the antigen in feces, is an opportunity that has not been exploited by the health system that we currently have, since it is an analysis that is not included within the inputs of the laboratories of the public health clinics, but all the tests applied of this type come from private care services. This indicates that most patients who come to the public sector are not being captured promptly in this situation and in many cases have to wait months to be evaluated by endoscopic procedures to obtain their diagnosis.

Health institutions mention a high prevalence of infection-related mainly to sociodemographic factors and low economic conditions. In general, health agencies agree that at least half of the world's population has this bacterium in their gastrointestinal tract. "The most affected areas are Africa (79.1%), Latin America and the Caribbean (63.4%) and Asia (54.7%), and the least affected Are North America (37.1%) and Oceania (24.1%)" (Otero, Gómez, Otero, & Trespalacielos, 2018, p. 54).

Regarding Nicaragua, no statistics were found that reflect the prevalence at the national level. Moreover, Obando describes that "the only studies carried out and published in the country on *Helicobacter pylori* are aimed at patients with symptoms suggestive of infection and seek to relate the presence of this microorganism to the high prevalence in gastric ulcers and peptic

ulcers" (2017, p. . 1) ; conditions that in this study are different since the study individuals were not selected by clinical characteristics.

Both nationally and internationally, researchers consider it of great importance to research *H. pylori*, mainly citing its high prevalence and because its acquisition is fundamentally associated with sociodemographic, economic factors, and poor hygienic-eating habits. , which is why they are elements present in most of the writings.

At the international level, a study was carried out in the clinic hospital endoscopy unit of the University of Chile, which aimed to evaluate the prevalence of *Helicobacter pylori*. It was found that of "276 patients referred to this unit, 124 (44.9%)) were positive by urease test, showing prevalence by age ranges of 21 and 60 years between 51.3% and 56.3%, percentage that is reduced to 25.6% in adults of 61 years" (Toledo, et al., 2007, p. 191).

As a national background, we have a study carried out by Flores & López in the digestive endoscopy service of the Montoya medical specialty center and in the Bautista Hospital of Managua. This aimed to determine the infection by this bacterium through biopsies obtained from patients with peptic acid symptoms. Se obtained that "34% of the patients tested positive for H. pylori, where 71.8% were women aged 30-40 years" (2009, p. 9).

H. pylori infection is a serious public health problem and its high prevalence demands a great development in the health service to ensure appropriate interventions. The World Gastroenterology Organization (WGO), in its practical guide on *H. pylori* infection in developing countries, reflects a set of parameters associated with the epidemiology of infection:

> A high prevalence in developing countries stands out, with significant variation between the urban and rural populations. Because the infection is oral-oral or fecal-oral, hygiene, water purification, diet, and overpopulation are important. In general, the global prevalence is greater than 50% and varies significantly between countries, including within their territory, with young people generally affected. (2010, p. 4)

The study focused on a population in low socio-economic conditions, since they present the ideal characteristics to study *H. pylori* without previously associating it with symptoms indicative of infection; in addition, because adults commonly tend to maintain a diet outside of casa (either for work, studies or simply for habit) and because it is common for them to pay little attention to sanitary and eating hygienic habits.

2. METHODOLOGY

The present research has a quantitative approach, based on the point of view that, "the quantitative approach carries out a sequential, rigorous and evidentiary process, part of an idea from which objectives and hypotheses are derived and to test these measures the variables

using statistical methods, to conclude" (Hernández, Fernández, & Pilar, 2014, p. 4). In this case, quantitative data collection instruments were used to measure the variables, which were analyzed by statistical methods and from which the consequences were extracted.

Due to its scope, it is descriptive, based on what was expressed by Hernández, Fernández, & Baptista, which express that descriptive studies "seek to specify certain characteristics of the problem that is subjected to analysis and that for this purpose the variables are measured with the collection of information and presents it in detail as it is obtained". (2014, p. 92) . Due to the temporal approach, it is transversal, since the data collection was in the period corresponding to September to October, and that is based on those expressed by Piura, which denotes that in this type of study "the approach of the variables in question is in a certain and short moment, without having prolonged follow-up over time" (2008, p. 84-85).

The study area overlooked the San Antonio neighborhood, specifically the houses adjacent to the Maysles river, which is located in the southern peripheral area of the city of Juigalpa department of Chontales. It has a total population corresponding to 1450 adults of both sexes without specifying ages (data provided by the municipal mayor's office) and according to a census carried out in conjunction with the community representative, 287 adults were counted between the ages of 18 to 45 years who live in the sector of interest, which would correspond to the real population under study. From these, 29 people were selected who would like to participate voluntarily, which includes the sample units and represents 10.1% of the census population.

The sample was non-probabilistic for convenience. Not probabilistic because no statistical formulas were used to calculate the number of sample units to be studied and for convenience since this type of sampling is the one that "allows to select those accessible cases that accept to be included. This is based on the convenience, accessibility, and proximity of the subjects for the researcher" (Otzen & Manterola, 2017, p. 230). These are reflected in this research by selecting a specific sample that was representative of the study that was applied.

The instrument used to collect information about biological data, overcrowding, hygienic-eating habits, and clinical characteristics was the survey, which was structured with closed questions and written with appropriate language, and which was validated. given by health professionals to corroborate the scientific attachment according to the theme. For the determination of the H. pylori antigen, the immunochromatographic method in feces described by CerTest BIOTEC was used, which reflects "sensitivity of 98.2% and specificity of 98.4% for the detection of the H. pylori antigen, compared to that performed by the q-PCR test" (2018, pp. 9). It is worth mentioning that for the collection of the stool samples, an instructive talk was given to the people and the appropriate material was dispensed for this purpose, to ensure their integrity and the validity of the results.

For people to be able to participate in the study, they first signed an informed consent, which expressed the objective of the research, detailed in a generic way what it consisted of, and highlighted that participation was voluntary, without remuneration and that it did not represent a risk to the physical and/or emotional integrity of the person. It also explained the requirement to provide a stool sample to the researchers and the completion of a survey, always ensuring the confidentiality of the information obtained.

Because the research was quantitative, it became imperative to present statistical analyses. The information collected by the survey was applied to the people of the San Antonio neighborhood and the results of the immunochromatographic tests for the detection of antigen for Helicobacter Pylori were processed in SPSS (Statistical Package for Social Sciences) version 21.

3. RESULTS

The most frequent ages were those between 18 and 34 years with 10.3% and the most recurrent sex was female with 89.7%. Overcrowding was found in 44.8%, of which 20.7% of the cases, 8 to 15 people, were housed in homes with a very small area and unfavorable conditions.

100% of people usually consume food outside the home and report that the source of water they drink in their homes is drinkable. Of the total number of respondents 93.1% properly practice hand washing before consuming food and the remaining 6.9% said they do it occasionally.

Tabla No. 1

Do you know or have you heard of *Helicobacter pylori*?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Little	16	55.2	55.2	55.2
Very little	2	6.9	6.9	62.1
Never	11	37.9	37.9	100.0
Total	29	100.0	100.0	

Source: Own elaboration

As it can be seen in Table No. 1, the problem of *H. pylori* is not known to all participants. 52.2% have little knowledge, 6.9% very little and 37.9% (just over a third of respondents) have total ignorance regarding this bacterium, which is a very worrying fact because it directly affects the acquisition of this type of infection.

Concerning the performance of diagnostic tests for the detection of *H. pylori*, 72.4% had not performed any type of analysis, while, the remaining 27.6% had performed some *H. pylori* test, 17.2% was positive at that time, where it was referred that the method used for diagnosis was the determination of antigen in feces.

Table No. 2

Helicobacter pylori antigen detection results

	Frequency	Percentage	Valid percentage	Cumulative percentage
Positive	19	65.5	65.5	65.5
Negative	10	34.5	34.5	100.0
Total	29	100.0	100.0	

Source: Own elaboration

In Table No. 2 we can show that when analyzing the stool samples for the detection of the *Helicobacter pylori* antigen by the immunochromatographic method, it was found that 65.5% (n = 19) of the people were positive and that 34.5% (n = 10) missing was negative in the test, thus determining a frequency greater than 50% of infection as mentioned in most literature.

Table Nº3

Stomach pain or burning and *H. pylori* antigen results

		Pain or burning of the stomach			Total
		Always	Sometimes	Never	
Test results	**Positive**	42.1	10.5	47.4	100

Source: Own elaboration

By associating the symptomatology presented by the participants with the cases that were positive, very significant values were obtained. Table No. 3 refers to stomach pain or burning, thus, it was possible to identify that 52.6% (42.1% always and 10.5% sometimes) of the positive cases found were associated with this symptom, either before or after eating food. Other related symptoms were heartburn in 100%," feeling full and belching after meals in 78.9%," nausea and vomiting in 26.3%, and loss of appetite in 31.6%.6%.

4. DISCUSSION

Helicobacter pylori are the cause of the most common gastrointestinal infection in humans, being distributed worldwide and generally of high prevalence. In adults, the prevalence usually varies according to risk factors. Marcelle, Gayoso, Sueiro, & Fernández report that "of the

multiple studies carried out to relate the risk factors involved in the infection of this bacterium, the results are often discordant, although age, overcrowding, and socioeconomic status are always maintained. " (2006, p. 336).

These characteristics were found in this study because when addressing people from 18 to 45 years old, which is a young-adult population that is constantly involved in different social areas, accompanied by the low socioeconomic conditions they have, this allowed finding a high frequency of *H. pylori* infection.

On the other hand, in this research it is important to emphasize that there was no direct contribution of hygienic habits such as poor hand washing in the acquisition of the infection, rather the worrying factors were eating out (100%), overcrowding (44.8%) and lack of knowledge (37.9%) about the bacteria.

The consumption of food away from home is taken into consideration since there is a lot of evidence that guides that this is an important factor to address, especially when referring to what palomino & Tomé explained, where it shows that "handwashing plays an important role in the transmission of *H. pylori* and that is related to consumption of food by street vendors and increases the likelihood of infection" (2012, p. 87).

It should be remembered that in this particular case, due to the growing consumption of time factor that our society currently demands in the labor sector and the occupations of young people in educational systems and even as a result of their recreation habits, a large majority of this population has the habit of consuming food outside a home where the hygienic rigor conditions with which the food is prepared are not known, which is consistent with the above.

Likewise, we can relate the overcrowding and the lack of knowledge, since the characteristics of oral-oral and fecal-oral transmission of this bacterium are very possible that the chronic dissemination and permanence are occurring within the relatives of the affected people and this is further aggravated due to the little knowledge they have about this problem. It is worth mentioning that it was not a question of interest in this study to demonstrate the positivity of *H. pylori* in association influenced by overcrowding since only one inhabitant was taken per dwelling of the chosen ones, this by the cost-time factor, which would be an important point to consider for the follow-up of this type of research.

Although we know that the Nicaraguan health system stands out for providing free health care, it has not normalized the diagnosis of *Helicobacter pylori* by immunological methods (antigen or antibody detection). In the public sector, detection is carried out by tests applied to biopsy taken by endoscopies and usually in cases where the patient has shown to have the symptoms related to the infection.

Therefore, this type of diagnostic strategy must be implemented, since some countries have identified the need and have included this type of test, for example in Mexico, where Cano & collaborators explain that "regarding the diagnosis of *H. pylori*, the main tests to look for and treat this problem are the breath test with urease and the detection of antigen in feces" (2018, p. 18).

From this perspective, a great problem has been exposed, since, as shown in this study, the infection can become very frequent, in this case, 65.5%. Values that are supported by those found by Toledo and others with 44.9%, by Flores & López with 34%, and by those registered by the WGO (> 50%), despite not being similar, they continue to reflect significant data to be taken into account.

As for the results obtained in this research and those of Toledo and others, although the same methods were not used, we can say that the information in the two studies agrees with what is reflected in the medical literature, where the capture of cases by the method of breath with urea is lower, where Frías & Otero mention a greater specificity in the detection of antigens in feces.

Although the gold test was not used, as it is the histopathology used in the Flores & Flores research for the identification of *H. pylori* infection and an immunochromatographic method was chosen, results were obtained that far exceeded the expected expectations, which supports the implementation of this diagnostic method in the public sector to obtain promptly the positivity of the cases and thus preventing to practice invasive methods to those who do not need it, where there could also be iatrogenic transmission by endoscopic procedures.

As Castro & Saldaña mentions, possibly, many of the infections found were acquired in childhood, may have been latent and asymptomatic during adolescence, and presented a clinical picture in adulthood. In this research, most positive cases were associated with classic clinical characteristics, such being more notorious pain and heartburn (52.6%), heartburn (100%), feeling of fullness and belching after meals (78.9%); Clinical picture that in the medical literature remains consistent, especially referring to those expressed by Formento, Hernández, & Martínez.

Neither the research developed by Toledo and others nor carried out by Flores & Flores have the ideal characteristics to compare the results obtained, being the main reason that the same methods were not used and the approaches are different, since, both studies mentioned focus on demonstrating only the positivity of the infection in people with gastrointestinal clinical characteristics, and not associating or reflecting other aspects associated with the subject. For this reason, it is that no in-depth comparison is made with the results found in these investigations.

It is appropriate to emphasize that at the time of this study, the country was going through the problem that COVID-19 represented and continues to represent. But this did not impede the population to highlight that other problem have to be addressed, such as the one addressed in this document. In the same way, it is mentioned that the positive cases found were treated and attended to by the health personnel of the MINSA, which occurred through the management of the researchers and academic authorities of the National Autonomous University of Nicaragua FAREM-Chontales.

5. CONCLUSIONS

Helicobacter pylori are and will continue to be one of the most frequent problems worldwide. In our country, as long as diagnostic methodologies such as the one applied in this research are not implemented, a large part of the infections caused by this bacterium will continue to be neglected. On the other hand, by applying the diagnosis only to symptomatic people through endoscopic biopsies, a large group of significant people is being discovered, which are asymptomatic patients, who can maintain the infection for a large part and even all their lives and serve as a source of contamination and dissemination of *H. pylori*.

In recent years, the economy of many Nicaraguans has aimed to offer informal food services, unfortunately, many of them could be considered unhealthy, which may be allowing the increase of different infections including the one addressed, which in this case occurred in a high frequency of 65.5%.5% As preventive measures, these meal sites, especially the street ones, will have to be regulated and focus primarily on the education of the population so that it can identify the form of acquisition, transmission, and symptoms associated with the infection.

It is important to use methodologies based on immunological principles, because they are a timely and low-cost diagnostic tool that can present high sensitivity and specificity to *H. pylori*, so much so that we can compare them with diagnostic figures found in studies that used different techniques and that also related the symptomatology with the finding of the infection.

As an additional point, it is that being low-cost tests can be carried out on asymptomatic people who are frequently exposed to risk factors, allowing the infection to be associated with its causal origin and not necessarily with its clinical characteristics, on which most research is based.

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