Characteristics of the Prevalence of Helicobacter Pylori in Some Rivers of Georgia Against the Background of the Infection Caused by H.Pylori

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Abstract

Dyspepsia is complex disturbance of gastrointestinal tract leading to certain discomfort, in particular, stomach ache and then to such complications as gastritis, stomach ulcer and stomach cancer. Frequently these complications are related to the infection caused by Helicobacter pylori (H. pylori). The aim of our study was to investigate the characteristic and source of the prevalence of Helicobacter infection in some regions of Georgia, the frequency of H. pylori and dyspepsia caused by it in some patients and volunteers. Subjects: patients' descriptive study in policlinics, volunteer fishermen who fish in the river Mtkvari, Gardabani municipality agricultural workers who use the river Mtkvari water to irrigate. Materials: The river Vere water sample (Vere ravine-Gachiani bridge) and the river Mtkvari (Rustavi-Gardabani areas) water sample, population questionnaires.

Methods: Blood serum study by immunosorbent analysis methods (ELISA), microbiological assays. Results: 110 volunteers were participating in the experiment -42 (38.1%) men and 68 (62.8%) women. Out of 110 volunteers 82(74.5%) had positive reaction to H.pylori presence by ELISA method [46 (56%) in women and 36 (44%) in men]
Conclusion: Helicobacter pylori was detected in the river Vere water sample (Vere ravine-Gachiani bridge) and the river Mtkvari (Rustavi-Gardabani areas) water sample.

Keywords: Helicobacter pylori, rivers, microbiologic methods, population

Introduction

Chronic gastritis is a group of chronic diseases that are morphologically characterized by inflammatory and dystrophic changes of gastric mucous membrane (Crew K.D, 2006). Discussion upon the true prevalence of chronic gastritis is difficult. It is associated first of all with the necessity of its morphological diagnostics that threatens patients, while on the other hand, it is associated with the course of less pronounced symptom disease. That's why not all patients refer to medical centers to seek medical treatment. According to various data, in 50-80% adults with chronic gastritis, its prevalence increases along with their age (Grande M,2008). The highest rate of chronic gastritis (80-90%) is associated with the infection by Helicobacter pylori, the ethological role of which is proved by various studies. The pathogenic relationship between H. pylori infection and some diseases of gastroduodenal zone was discovered by J. Robin Warren and Barry Marshal in 1983, when they stated about the existence of spiral shaped (later referred as H. pylori) bacterium.

The role of this microorganism in the development of chronic gastritis and peptic ulcer was also proved. H. pylori is the main cause of the development of chronic gastritis (Kuipers EJ 2007). Infection occurs through fecal-oral and oral-oral routes. The development of infection is contributed by unfavorable socio-economic conditions. In developed countries H. pylori infection is detected in 30-40% population. It mainly occurs in children (<2 years old), adolescents and young people. In developing countries H. pylori infection is much higher (90%). There are some virulence factors that enables H. pylori to be "implanted" and then to be persisted in host body (Grande M, 2008). Most of H. pylori strains develop VacA cytotoxin that has the ability to be vacuolated. This ammonia produced by the destruction of cytotoxin and urease cause vacuolization of epithelial cells and thus their death. As a result of the action of bacterial enzymes (A and C phospholipasa) the entrance of duodenum (pancreas enzymes, bile acids and their salts, lizolecitin) in stomach is deteriorated leading to the damage of gastric

mucous membrane. Moreover, histamine content increases (because of alkaliniziation of gastric content), in gastric mucous membrane causing swelling and blood circulation disorder, the development of bruises and erosion (Crew K.D 2006). Chronic gastritis developed during long-term nonsteroidal anti-inflammatory drugs use is caused by the inhibition of prostaglandin synthesis that in its turn causes the decrease in synthesis of protective mucoplysacharides and disruption of reparation processes in mucous membrane.

It is registered, that there is a significant increase of this disease in Georgia, in particular, peptic ulcer disease (PUD), although almost nothing is known about the relationship of Helicobacter pylori with it. The reason of this is that there is no systemic study in this direction in Georgia. Distribution of H.pylori is caused by social-economic conditions and poor hygiene. It is known, that main point sources of water site pollution are: agricultural areas, household and industrial waste waters and sewage waters. Until 1993, in Georgia, sewage waters were app. 60% of the total volume of waste water, while after 2007 it was app. 90%. In such medium there are plenty of microorganisms that are the source of the spread of infectious diseases. Hence, our goal is to study microbiological condition of the river Mtkvari and Vere, in particular the probability of prevalence of H. pylori in these waters.

Materials and methods

We studied a group of adults of the municipalities of Rustavi and Gardabani (Towns in Georgia) (110 volunteers). Urban participants were selected from 3 districts of Rustavi city. There were mostly engaged in fishing. While some participants were selected from Gardabani and they are mostly farmers who use the river Mtkvari water to irrigate fruit and vegetables. We randomly selected 10 families. Adolescents (17-18) were not taking part in this study. H. pylori active infection was measured in blood serum. In order to collect information, the participants answered the following questionnaire: gastrointestinal symptoms over the past 12 months: gastritis, frequent belching, heartburn, pain in gastric area. Participants were volunteers who were against revealing their personal requisites (Tarkhashvili N, 2009).

Out of 110 subjects who met study criteria, 99% voluntarily took part in the study, the average age was 42 (range 19-79) among them 42 (38.1%) were men and 68 (62.8%) were women). In 82 (74.5%) positive H.pylori was detected [(46 (56%) women and 36 (44%) men)]. We studied the presence of **H**. **pylori** specific **IgG antibody** by the enzyme-linked immunosorbent assay (ELISA) in blood serum that has high sensitivity and specificity >90%. H. pylori investigation by ELISA kits is recommended as it is a good

diagnostics test kit, especially for determination of H. pylori primary public health parameters where other kits are not available. Hence, our main goal was to detect the presence of **H**. **pylori** specific **IgG antibody** by ELISA kit in patients and volunteers. Besides, we studied 98 healthy individuals' blood serum for the presence of H.pylori specific **IgG antibody by** ELISA method. The study was performed in patients who were admitted to hospitals as well as in volunteers complaining of frequent belching, heartburn, and gastric pain. Tests were performed by **H**. **pylori** specific **IgG** Enzyme-Linked Immunosorbent Assays. As a result of the test positive reaction to H.pylori was proved. In volunteers gastrointestinal diarrhea remained for 1-2days-1 week. In 72 patients complete blood count was done and positive reaction to H.pylori was proved. The average age of patients of both sexes was 19-55.

We also studied water samples for the presence of Helicobacter pylori in the river Vere (in the ravine at Gachiani Bridge) in Tbilisi and in the river Mtkvari in Rustavi by ELISA and microbiological methods. Water samples were taken based on requirements of normative document (general requirements for water sampling SSM, III, #13.2004) . Surface samples were taken at depth of 10-15 cm. If sampling was required at the bottom we were taking them at depth of 30-50 cm.

At sampling the following conditions were met:

- ✓ At sampling accidental moments were ruled out
- ✓ In order to avoid the change of the properties of water we were conducting taking the samples as soon as possible.
- ✓ For bacteriological analyses 0.5L of sample was required.
- ✓ Samples were taken using sterile bathometers and sterile dishes

Dishes were opened directly before taking a sample. Paper caps were taken off as well as a stopper so that they would not touch utensil throat and stopper with a hand. On the tape it is written sampling place, time and/or sample finder number. The sample with a blank was taken to the laboratory for analyses as soon as possible. The "gold standard" for H. pylori testing (Lane JA 2006), biopsy material was placed in formalin and then was molded in paraffin. Slices were taken by Geimza Romanovsky method. H.pylori histological preparations were stained using haematoxylin and eosin, Giemsa, the Warthin-Starry silver stain.

Results and discussions

Out of 72 patients, we have studied, H., pylori was detected in 54.1% (they had LgG high concentration). It should be noted that the prevalence of H. pylori was increasing with age. While its presence in conditionally healthy people who were not complaining of gastrointestinal problems, were detected in 22.8%. Its prevalence was also high in those people who did not

have the following gastrointestinal symptoms: heartburn, regurgitation and pain.

A high prevalence of Helicobacter pylori LgG, detected by us, in 110 volunteers reached 42 (38.1%) in men and 68 (62.8%) in women. Overall a positive reaction to H. pylori was detected in 82 (74.5%). [46 (56%) women and 36 (44%) men] (Tarkhashvili N,2009).

We selected volunteer fishermen, the average age of whom was 31-75. In their families they are main breadwinners and their income is app. 250-450 Gel or are retired (approximately 180 Gel pension). Thus, most of them fish for a living. We also selected volunteers (Gardabami village) – Gardabani Municipality agricultural workers who use the water of the river Mtkvari to irrigate. That's why we selected the river Mtkvari adjoining territory in Rustavi, the population of which mostly fish, sell them, and also take home. We also selected the village Gardabani nearby Rustavi city, the population of which irrigates their lands with the water of the river Mtkvari, sell them and also use them. The results are shown in the table 1 and figure 1. Out of 82 volunteers 15 (18.2%) had <200 Gel monthly income and 13(86.6%) out of 15 was H. pylori positive.

Table 1. Volunteers distribution according to monthly income (n=82)

Volunteers	Rustavi city fishermen Helicobacter +ve	Gardabani village Helicobacter +ve
income <200 Gel	14(11,48) 10 (71,4%)	15 (18,2%) 13 (86.6%)
income 250-350	20(16,4) 11 (55%)	22 (26,8%) 16 (72%)
income 350-450	30 out of 45 10(33%)	25 out of 30 14 (56%)
income >450	Out of 11 (13.4%) 3 (27%)	Out of 11 (13.4%) 5 (45,4%)

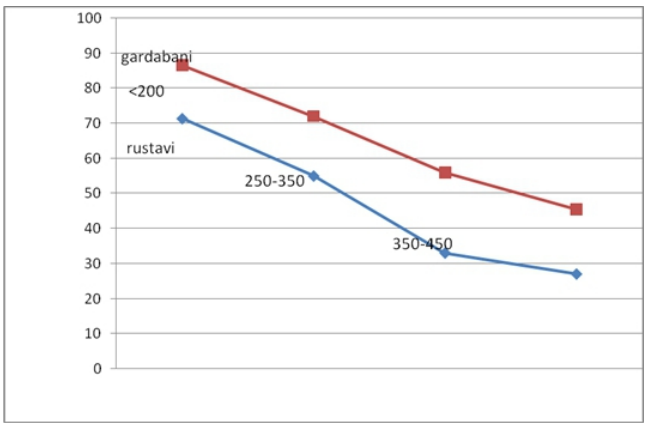

Figure 1. Volunteers distribution according to monthly income (n=82)

22 volunteers (26.8%) had 250-300 Gel income and 16 (72%) was H. pylori positive. While 30 people out of 45 had 350-450 Gel income and only 10 (33%) appeared H. pylori positive in urban and rural population with 56% difference which is statistically reliable $p<0.001$. 11 had >450 Gel income and 3(27%) was H. pylori positive. As regards Gardabani, we obtained higher percentage of H. pylori among volunteers,. 5(45,4%) is statistically reliable $p<0.001$, as rural population are more likely lack of comfort compared with city dwellers. They have latrines outside and mostly do not have sewerage system; water supply is by schedule thus they have to obtain water from the well; also they have frequent contact with wastewater. They drink water from wells (Lacy BE, 2001, Shiota S 2009).

According to data the distribution of H. pylori is closely related to socioeconomic conditions of the population. The results of our research prove this fact. If we compare the case of Rustavi City population with Gardabani population, city dwellers were less infected by this bacterium than rural population (71.4% versus 86.6%) as city dwellers have sewage system and water in the toilets. The difference is statistically reliable $p<0.05$. The same reliability is regarding the increase in salary in Gel (200, 350-450, >450) in Gel in rural and urban population (33% versus 56%), which is statistically reliable $p<0.001$. The direct relationship between personal hygiene and spread of infection was detected.

As a result of the study of volunteers in gardabani, it was also detected that 48 (43,6%) participants at the age of >50, were positive to the infection. 10 (9,09%) participants (<50 years) was infected in Rustavi city, whilst 24 (22%) participants (>55 years) was positive. As table 2 shows, there was statistical difference between rural and urban population was 43,6% versus 22%; $p<0.001$. It was revealed that the infected individuals, who had various symptoms, including pain, did not suffer from the pain more than the individuals, who did not have an infection at all (Riazul-Hassan S 2007). This aggravates the condition more, as the infected part of the population is more likely to postpone a visit to the doctor, since their symptoms are not severe enough that increases the probability of infection spreading (Todorovic M, 2008,). As it turns out, the symptoms: regurgitation, pain, heartburn were similar in urban and rural participants, the difference was only in severity. (table 2, figure2).

Table2. Distribution of population according to age/sex and serologic positivity of Helicobacter pylori (n=110)

Age of volunteers	Helicobacter +ve N(%)	Helicobacter-ve N(%)
31-50 Rustavi	10 participants (9,09)	14 (12,7)
50-79 Gardabani	48 participants (43,6)	9 (8,1)
>46-55 Rustavi	24 participants (22)	5(4,5)

Women	46 (56)	8(7,27)
men	36 (44)	20(18,1)

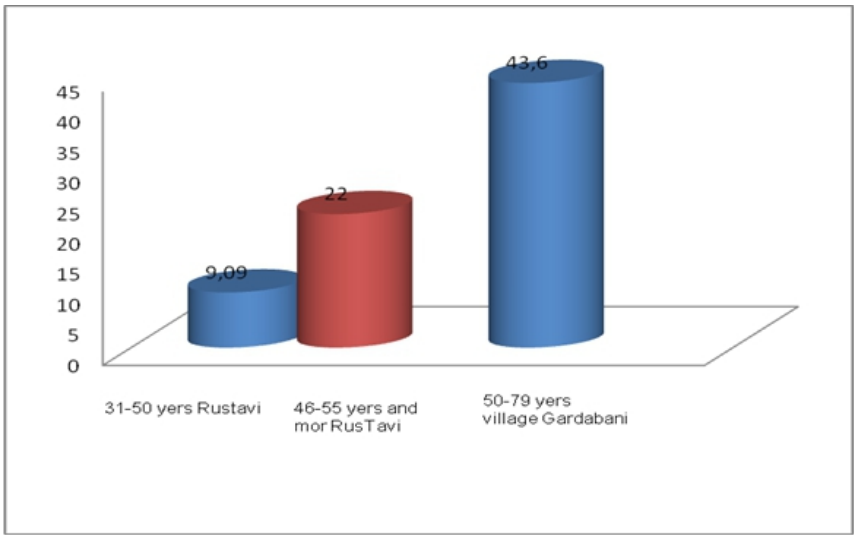

Figure 2. Distribution of population according to age/sex and serologic positivity of Helicobacter pylori (n=82)

Table 3 . Population distribution according to frequency and severity of symptoms

Rustavi City	heartburn	regurgitation	Epigastric pain	Epigastric burning
mild	31-50 30 (36,5)	22 (26,8)	2 (2,43)	0
moderate	17 (20,7)	18 (21,9)	0	0
Moderately severe	12 (14,6)	10 (12,1)	8 (9,75)	8(9,75)
Severe	10 (12,1)	17 (20,7)	12 (14,6)	17 (20,7)
Gardabani village	46-55			
Moderately severe	8(9,75)	8(9,75)	39 (47,5)	31 (37,8)
Severe	5(6,09)	7 (8,53)	21 (25,6)	26 (31,7)

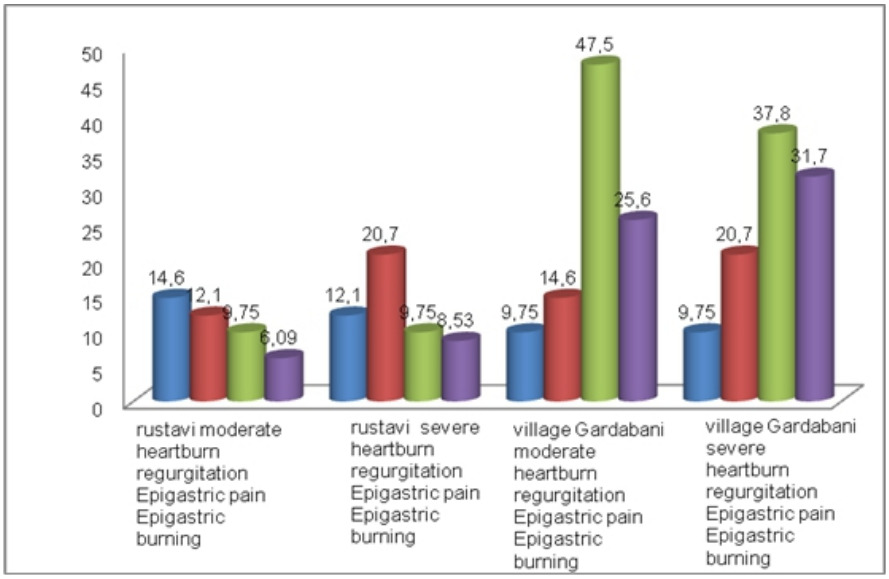

Figure 3 . Population distribution according to frequency and severity of symptoms

In the figure 3 and table 3 there is a distribution of symptoms in urban and rural population. As it is shown moderate severity of epigastric pain in 31-50 aged participants is respectively 47,5% and 9,75% and heartburn is respectively 37,8% and 9.75% and $p<0.001$ in Gardabani and Rustavi. As regards the severity of infection the severity of epigastric pain is respectively 14,6% and 25,6% and burning 20,7% and 31,7% respectively. The difference between them is also statistically reliable $p<0.001$.

Thus, the spread of H. pylori in Gardabani village is much higher than in Rustavi that increases with age by 82% in >55 individuals. According to the obtained results the risk factor is age, poor education, poor hygiene, poor living conditions, lack of sewage collectors, frequent contact with wastewater and frequent contact with pets that are not groomed properly. e.g.. They are not vaccinated, are not given drugs against parasites etc. The improvement of living conditions and social-economic conditions will likely to decrease the spread of infection. The prevention of infection is not only the problem of medicine but of the improvement of social conditions (Valle JD, 2008).

As it was found out, such symptoms as heartburn, belching and pain were similar in urban and rural participants. The study of the sample of water of the river Mtkvari and River Vere showed that the quantitative increase in H. pylori taken from the river Mtkvari water sample was consistent with 2 – moderate sowing. While in the water sample, taken from the river Vere ravine, H.,pylori growing was consistent with 3-modearte sowing-that is obvious sowing. As it turns out, one of the most significant objects of the prevalence of H. pylori in Georgia is water, where because of the lack of

cleansing collectors, 90% of sewage water mixes that moves into fish by food chain. Likely the same situation is on other rivers, such as Alazani in the east, Iori in the west etc. Above all, we should also note the use of drinking water from wells that are also polluted by wastewaters in villages.

Hence, water could be considered one of the most important objects for the prevalence of H. pylori. The study of Georgian rivers in this direction enables us to achieve effective prevention of the infection caused by these microorganisms.

Conclusion

Thus, the spread of H. pylori is characterized for low social-economic layers. According to literature data (Suerbaum S,2002, Shiota S,2009) the spread of it by 80-90% is characterized for developing countries since the large part of population do not visit the doctors when they have for example dyspepsia: digestive disorder, epigastric pain, discomfort etc. 110 volunteers were participating in the experiment. [42 (38.1%) men and 68 (62.8%) women]. Out of 110 volunteers 82(74.5%) had positive reaction to H.pylori . In women it was found in 46 (56%) whilst in men in 36 (44%). It could be explained by the fact that most of women do not visit the doctors because of lack of time (Shiota S,2009) etc. In the work it was also shown the positive value of H. pylori with age that is directly related to the decrease in immune system with age. It is also related with monthly income (Lane JA, 2006, Lacy BE, 2001). Hence we divided the participants into rural and urban population and found that monthly income, hygiene, education and low social condition is directly related to the positive value of H.pylori infection (Khan MQ 2008).

Thus, we can conclude that patients and volunteers must be tested for H. pylori in case of dyspepsia so that all the seropositive people are proposed eradication therapy.

Summary

Dyspepsia is complex disturbance of gastrointestinal tract leading to certain discomfort, in particular, stomach ache and then to such complications as gastric ulcer and gastric cancer. Frequently these complications are related to the infection caused by Helicobacter pylori. The aim of our study was to investigate the characteristic and source of the prevalence of Helicobacter infection in some regions of Georgia, the frequency of H. pylori and dyspepsia caused by it in some patients. Subjects: patients' descriptive study in policlinics, volunteer fishermen who fish in the river Mtkvari, Gardabani municipality agricultural workers who use the river Mtkvari water to irrigate. Materials: The river Vere water sample (Vere ravine-Gachiani bridge) and the river Mtkvari (Rustavi-Gardabani areas)

water sample. Population questionnaires. Methods: Blood serum study by immunosorbent analysis methods (ELISA) , Immunoassay analyses ELISA RE 58891. Results: 110 volunteers were participating in the experiment. (42 (38.1%) men and 68 (62.8%) women). Out of 110 volunteers 82(74.5%) had positive reaction to H.pylori presence by ELISA method. Conclusion: Helicobacter pylori was detected The river Vere water sample (Vere ravine-Gachiani bridge) and the river Mtkvari (Rustavi-Gardabani areas) water sample.

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