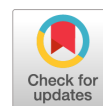


SOME ASPECTS OF PREVALENCE AND INTRAFAMILIAL TRANSMISSION OF *HELICOBACTER PYLORI* AMONG POPULATION OF THE REPUBLIC OF ARMENIA



A.V. Tsakanyan, A.Sh. Akinyan, T.S. Khachatryan, A.V. Margaryan, G.G. Melik-Andreasyan

National Center of Disease Control and Prevention, Ministry of Health Republic of Armenia, Yerevan, Republic of Armenia

Abstract. *Helicobacter pylori* (HP) continues to be a serious public health issue worldwide, causing significant morbidity and mortality due to peptic ulcer disease and stomach cancer. This study was conducted to investigate the prevalence and intrafamilial transmission of HP infection among the population of Armenia. **Materials and methods.** In this study, the immunochromatographic method was used to detect HP microorganisms in stool samples. **Results.** The average age of the patients tested for HP was 29.9 ± 2.0 years, with an age range from 2 months to 75 years. The study included 316 female patients, of whom 37.7% (95% CI: 32.4–43.0) tested positive for HP microorganisms, and 180 male patients, of whom 39.4% (95% CI: 32.3–46.5) tested positive. The highest prevalence of infection was observed in the following age groups: 50–59 years (65.1%), 40–49 years (47.1%), 30–39 years (41.1%), 20–29 years (40.4%), and 60–69 years (40.0%). **Conclusion.** Our research on patients with inflammatory diseases of the upper gastrointestinal tract, their family members, and others revealed a high infection rate of HP across all age groups. The study demonstrated a significant prevalence of HP infection among the population of Armenia, indicating a high likelihood of intrafamilial transmission.

Key words: prevalence, *Helicobacter pylori* infection, immunochromatographic method, intrafamilial transmission of *H. pylori*.

НЕКОТОРЫЕ АСПЕКТЫ РАСПРОСТРАНЕННОСТИ И ВНУТРИСЕМЕЙНОЙ ПЕРЕДАЧИ *HELICOBACTER PYLORI* СРЕДИ НАСЕЛЕНИЯ РЕСПУБЛИКИ АРМЕНИЯ

Цаканян А.В., Акинян А.Ш., Хачатрян Т.С., Маргарян А.В., Мелик-Андреасян Г.Г.

ГНКО «Национальный центр по контролю и профилактике заболеваний» Министерства здравоохранения Республики Армения, Ереван, Республика Армения

Резюме. *Helicobacter pylori* (HP) продолжает оставаться серьезной проблемой общественного здравоохранения во всем мире, определяя существенную заболеваемость и смертность при язвенной болезни и раке желудка. Настоящее исследование было проведено с целью изучения распространенности и внутрисемейной передачи инфекции HP среди населения Армении. **Материалы и методы.** Для обнаружения микроорганизмов HP в образцах кала использовался иммунохроматографический метод. **Результаты.** Средний возраст пациентов, прошедших тестирование на HP, составил $29,9 \pm 2,0$ года, возрастной диапазон — от 2 месяцев до 75 лет. В исследование были включены 316 пациентов женского пола и 180 пациентов мужского пола, из которых 37,7%

Адрес для переписки:

Анаида Цаканян
0025, Республика Армения, Ереван, ул. Мхитара Гераца, 12,
ГНКО «Национальный центр по контролю и профилактике
заболеваний».
Тел.: +37412 80-80-83; +37410 62-99-20.
E-mail: tsakanyananaida@gmail.com

Contacts:

Anaida V. Tsakanyan
0025, Republic of Armenia, Yerevan, Mkhitar Heratsu str., 12,
National Center of Disease Control and Prevention.
Phone: +37412 80-80-83; +37410 62-99-20.
E-mail: tsakanyananaida@gmail.com

Для цитирования:

Цаканян А.В., Акинян А.Ш., Хачатрян Т.С., Маргарян А.В.,
Мелик-Андреасян Г.Г. Некоторые аспекты распространенности
и внутрисемейной передачи *Helicobacter pylori* среди населения
Республики Армения // Инфекция и иммунитет. 2025. Т. 15, № 2.
С. 361–365. doi: 10.15789/2220-7619-SAO-17817

Citation:

Tsakanyan A.V., Akinyan A.Sh., Khachatryan T.S., Margaryan A.V., Melik-
Andreasyan G.G. Some aspects of prevalence and intrafamilial transmission
of *Helicobacter pylori* among population of the Republic of Armenia //
Russian Journal of Infection and Immunity = Infektsiya i immunitet, 2025,
vol. 15, no. 2, pp. 361–365. doi: 10.15789/2220-7619-SAO-17817

(95% ДИ: 32,4–43,0) и 39,4% (95% ДИ: 32,3–46,5) соответственно имели положительный результат на обнаружение НР. Наибольшая распространенность инфекции наблюдалась в следующих возрастных группах: 50–59 лет (65,1%), 40–49 лет (47,1%), 30–39 лет (41,1%), 20–29 лет (40,4%) и 60–69 лет (40,0%). **Заключение.** Проведенное исследование пациентов с воспалительными заболеваниями верхних отделов желудочно-кишечного тракта, членов их семей и других лиц выявило высокую инфицированность НР во всех возрастных группах, а также значительную распространенность инфекции НР среди населения Армении, что указывает на высокую вероятность внутрисемейной передачи.

Ключевые слова: распространенность, инфекция *Helicobacter pylori*, иммунохроматографический метод, внутрисемейная передача *H. pylori*.

Introduction

Helicobacter pylori (HP) is a common bacterium, with an estimated 60 percent of the world's population infected [8, 11, 14, 15, 22]. Humans are the primary reservoir [9]. The prevalence of HP infection varies significantly by geographic area, age, race, ethnicity, and socioeconomic status [4, 7, 9, 14, 15, 22]. Infection rates are higher in developing countries compared to developed countries. Most infections occur during childhood and decrease with improved sanitary and hygienic conditions [8, 9, 10, 14, 20].

HP is recognized as an opportunistic pathogen that can lead to serious health consequences. It causes chronic gastritis and is associated with diseases such as duodenal ulcers and gastric cancer [2, 5, 13, 16, 21]. The transmission of HP infection can occur vertically within families, often from older to younger individuals, typically from mother to child or between siblings [6, 9, 14, 15, 17, 23]. Children who are HP-positive are more likely to come from families where members, especially mothers, are infected compared to families without HP infection. Additionally, having a large family is a risk factor for HP infection [9, 12, 14, 21].

Vertical transmission is more common in economically developed countries where families live in modern, comfortable housing and have limited extra-family contacts regulated by social norms. In contrast, horizontal transmission is more prevalent in developing countries, particularly in rural areas [9, 15, 23].

The carriage of HP in healthy individuals may be linked to colonization by less virulent strains or a decrease in the number of receptors on the stomach surface that aid in microorganism adhesion [8, 12, 14]. Rates of HP infection are 30–40% higher in densely populated areas or homes lacking proper facilities like sewage systems, heating, and hot water. The infection rate tends to increase with age [9, 22]. However, these factors alone do not fully explain the prevalence of HP. Infection levels in populations of different ages living in similar socio-economic conditions are influenced by age cohorts. Individuals born in the same year (age cohort) have a specific risk of HP infection, which may differ from other age groups [7, 12, 19, 24].

In the Republic of Armenia (RA), there are few studies examining the prevalence of HP infection.

However, earlier research has established the prevalence of HP and its role in various inflammatory diseases of the upper gastrointestinal tract [3]. Additionally, studies have highlighted the involvement of HP in Familial Mediterranean fever among children in Armenia [1].

The study aimed to determine the prevalence of HP infection among individuals with inflammatory diseases of the upper gastrointestinal tract and their family members.

Materials and methods

In this study, an immunochromatographic method was used to detect HP microorganisms in stool samples. The test is a lateral flow chromatographic immunoassay. The test strip in the cassette includes a colored conjugate pad containing anti-HP-specific antibody conjugated with colloidal gold (anti-HP conjugate) and a nitrocellulose membrane strip with a test line (T line) and control line (C line). The T line is pre-coated with anti-HP antibody, and the C line is pre-coated with a control line antibody.

The absence of the T line indicates a negative result for the HP Ag Rapid test. The test also includes an internal control (C line), which should exhibit a colored line of the immunocomplex of the control antibodies regardless of the color development on the T line. If no control line (C line) develops, the test result is invalid, and the specimen must be retested with another device. The collection of fecal samples from patients with inflammatory diseases of the upper gastrointestinal tract was conducted at various clinics in Yerevan, including Nork Republican Infectious Diseases, Clinical Hospital and Muracan University Hospital Complex, etc. The material for the study was a 496 individuals, including 259 patients with upper gastrointestinal tract inflammatory diseases and 237 of their family members. The sample consisted of 316 females and 180 males. To detect the presence of microorganisms, individuals from various age groups were examined: 226 individuals were under 14 years old, 16 were aged 15–19, 50 were aged 20–29, 56 were aged 30–39, 34 were aged 40–49, 43 were aged 50–59, 47 were aged 60–69, and 24 were 70 years old or older.

Statistical analysis of the results was conducted by calculating the mean error (m) and the confidence interval (CI) at a 95% probability level.

Table 1. The results of HP research on sex

	Total number of investigated patients		Positive result		CI
	abs.	%±m	abs.	%±m	95% CI
Female	316	63.7±2.7	119	37.7±2.7	32.4–43.0
Male	180	36.3±3.6	71	39.4±3.6	32.3–46.5
Total	496	100	190	38.3±2.2	34.0–42.6

Table 2. The results of the study on HP

Investigated people	Total quantity of investigated		Positive results		95% CI
	abs.	%±m	abs.	%±m	
Patients suffering from inflammatory diseases of the upper gastrointestinal tract	259	52.2	100	38.6±3.0	32.7–43.5
Family members and other	237	47.8	90	37.9±3.1	31.8–44.0
Total	496	100	190	38.3±2.2	34.0–42.6

Results

A total of 496 individuals were examined, including 259 patients with upper gastrointestinal tract inflammatory diseases and 237 of their family members. Among these individuals, 190 were found to be infected with HP, indicating a prevalence rate of 38.3% (95% CI: 34.0–42.6). The sample comprised 316 females (63.7%) and 180 males (36.3%). The prevalence of HP infection was 37.7% (95% CI: 32.4–43.0) among females and 39.4% (95% CI: 32.3–46.5) among males. There was no significant difference in the prevalence of HP infection between females and males ($p < 0.05$) (Table 1).

In a study involving 259 patients with inflammatory diseases of the upper gastrointestinal tract, 100 individuals (38.6%; 95% CI 32.7–43.5) tested positive for *Helicobacter pylori* (HP) infection. Among 237 family members and others tested, 90 individuals (37.9%; 95% CI 31.8–44.0) were found to be infected with HP (Table 2).

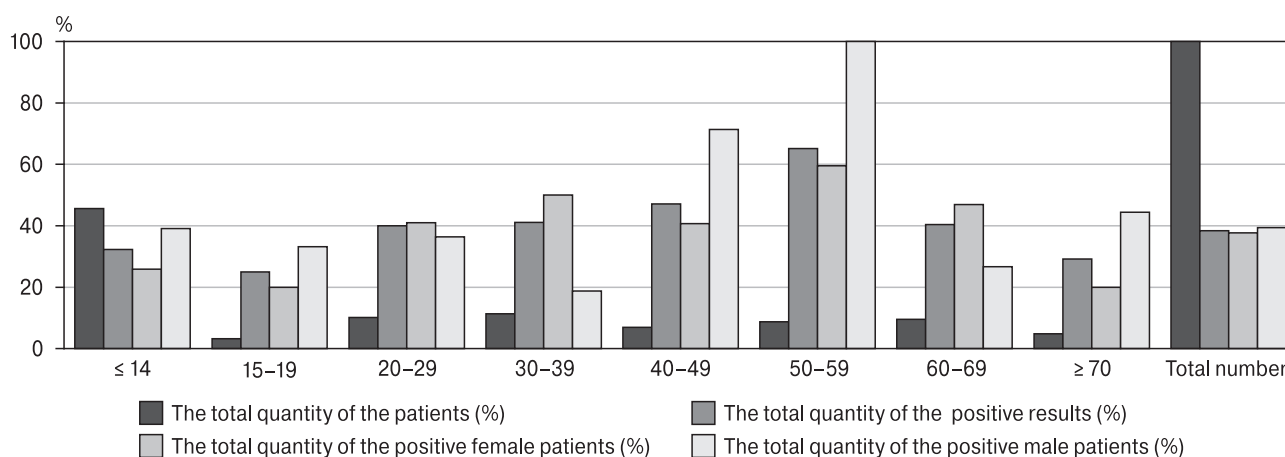
The research indicated no significant difference in HP infection rates between those with inflammatory diseases of the upper gastrointestinal tract and their family members and others, suggesting a similar

proportion of infected individuals ($p < 0.05$). The ages of the studied individuals ranged from 2 months to 75 years, with an average age of 29.9 ± 2.0 years.

To detection of microorganisms HP, individuals of different age groups were examined: 45.6% (226 people) were up to 14 years old, 3.2% (16 people) were 15–19 years old, 10.1% (50 people) were 20–29 years old, 11.3% (56 people) were 30–39 years old, 6.9% (34 people) were 40–49 years old, 8.7% (43 people) were 50–59 years old, 9.5% (47 people) were 60–69 years old, and 4.8% (24 people) were 70 years old or older.

Our earlier studies on patients with various pathologies of the upper gastrointestinal tract revealed a high rate of HP infection across all age groups [3]. Recent studies indicate that this trend continues. The research found that the highest infection rates were detected in the following age groups: 50–59 years (65.1%), 40–49 years (47.1%), 30–39 years (41.1%), 60–69 years (40.4%), and 20–29 years (40.0%). Lower infection rates were observed in the age groups up to 14 years (32.3%), 70 years and older (29.2%), and 15–19 years (25.0%) (Fig.).

Notably, in the age group up to 14 years, HP was found in 32.3% (73) of the 226 children studied, including 26 (53.1%) individuals under one year of age.

**Figure. The results of the study of HP on sex and age**

This suggests a high likelihood of intrafamilial infection and potential transmission of HP from parents to children. It is important to highlight that young children in Armenia are primarily infected by their infected mothers.

A total of 43 families (129 individuals) were examined for HP carriage. Among these individuals, 63 (48.8%) were found to be infected. Intrafamilial circulation of HP infection was observed in 18 families (41.9%). In 8 of these 18 families (44.4%), both spouses were infected. In 19 families (44.2%), HP was detected in only one family member.

Discussion

Our previous studies revealed the prevalence and role of HP in diseases of the upper gastrointestinal tract (UGT), and high infection rates were found in all age groups. The present study showed high infection rates in both the “conditionally healthy” population of RA and the population with UGT diseases [3, 18]. Recent studies indicate that this trend continues.

This study was conducted to investigate the prevalence and intrafamilial transmission of HP infection among the population of Armenia and potential transmission of HP from parents to children. As in other countries, studies have shown that in Armenia, young children are mainly infected by their infected mothers, and transmission of the in-

fection between spouses is also possible through kissing [12, 23]. It is believed that the higher the population's infection rate with HP, the higher the incidence of cancer. Individuals infected with HP are 4–8 times more likely to develop stomach cancer compared to healthy individuals [5, 16].

Until recently, in Russia, Armenia and other countries stomach cancer continued to occupy a leading position in the structure of oncological morbidity, as evidenced by statistical data and data from the V.A. Fanarjyan National Center of Oncology, Ministry of Health of Armenia [2].

Conclusion

The study has revealed high prevalence of HP infection among Armenian population and detected intrafamilial circulation and transmission of HP among family members, including intrafamilial transmission, particularly from infected mothers to children under one year of age. Further comprehensive studies are needed to determine the true extent of HP infection in the Armenian population in Armenia.

However, the true prevalence of HP infection can only be established through large-scale studies. Primary prevention of HP infection among the population in the region is very important, as it will ultimately reduce the incidence of diseases associated with HP infection.

References

1. Вартазарян Н.Д., Геворкян Дж.К., Члоян А.Е., Мирзабекян К.Г., Цаканян А.В. Патоморфология слизистой оболочки желудка детей при периодической болезни, ассоциированной с *Helicobacter pylori* // Медицинская наука Армении. 2004. Т. 44, № 3. С. 36–41. [Vartazaryan N.D., Gevorgyan Dzh. K., Chloyan A.E., Mirzabekyan K.G., Tzakanyan A.V. Pathomorphological changes of gastric mucosa induced by *Helicobacter pylori* in children suffering from periodical disease. *Meditsinskaya nauka Armenii* = *Medical Science of Armenia*, vol. 44, no. 3, pp. 36–41. (In Russ.)]
2. Белая О.Ф., Волчкова Е.В., Паевская О.А., Зуевская С.Н., Юдина Ю.В., Пак С.Г. Роль *Helicobacter pylori* в процессе канцерогенеза путем дисрегуляции экспрессии микроРНК // Эпидемиология и инфекционные болезни. 2014. Т. 19, № 6. С. 43–47. [Belaia O.F., Volchkova E.V., Paevskaya O.A., Zuevskaya S.N., Yudina Y.V., Pak S.G. The role of *Helicobacter pylori* in the process of 43 carcinogenesis by means of dysregulation of miRNA expression. *Epidemiologiya i infektionnye bolezni. Aktual'nye voprosy* = *Epidemiology and Infectious Diseases*, 2014, vol. 19, no. 6, pp. 43–47. (In Russ.)] doi: 10.17816/EID40847
3. Цаканян А.В., Алексанян Ю.Т. Эпидемиология хеликобактериозов в Республике Армения // Медицинская наука Армении. 2009. Т. 49, № 2. С. 51–56. [Tsakanyan A.V., Aleksanyan Yu.T. Epidemiology of *Helicobacter pylori* in the Republic of Armenia. *Meditsinskaya nauka Armenii* = *Medical Science of Armenia*, 2009, vol. 49, no. 2, pp. 51–56. (In Russ.)]
4. Щербаков П.Л. Эпидемиология инфекции *Helicobacter pylori* // Российский журнал гастроэнтерологии, гепатологии и колопроктологии. 1999. Т. 2. С. 8–11. [Shcherbakov P.L. Epidemiology of *Helicobacter pylori* infection. *Rossiiskii zhurnal gastroenterologii, gepatologii, koloproktologii* = *Russian Journal of Gastroenterology, Hepatology, Coloproctology*, 1999, vol. 2, pp. 8–11. (In Russ.)]
5. An international association between *Helicobacter pylori* infection and gastric cancer. The EUROGAST Study Group. *Lancet*, 1993, vol. 341, no. 8857, pp. 1359–1362.
6. Bamford K.B., Bickley J., Collins J.S., Johnston B.T., Potts S., Boston V., Owen R.J., Sloan J.M. *Helicobacter pylori*: comparison of DNA fingerprints provides evidence for intrafamilial infection. *Gut*, 1993, vol. 34, no. 10, pp. 1348–1350. doi: 10.1136/gut.34.10.1348
7. Banatvala N., Mayo K., Megraud F., Jennings R., Deeks J.J., Feldman R.A. The cohort effect and *Helicobacter pylori*. *J. Infect. Dis.*, 1993, vol. 168, no. 1, pp. 219–221. doi: 10.1093/infdis/168.1.219
8. Blaser M.J. Hypothesis: the changing relationships of *Helicobacter pylori* and humans: implications for health and disease. *J. Infect. Dis.*, 1999, vol. 179, no. 6, pp. 1523–1530. doi: 10.1086/314785
9. Brown L.M. *Helicobacter pylori*: epidemiology and routes of transmission. *Epidemiol Rev.*, 2000, vol. 22, no. 2, pp. 283–297. doi: 10.1093/oxfordjournals.epirev.a018040
10. Carvalho M.de A., de Oliveira J.F., Silva R.G.C., Penatti D.A., Tedesco J.T.D., Machado N.C. *Helicobacter pylori* chronic gastritis in children and adolescents was not associated with anaemia. *European Journal of Medical and Health Sciences*, 2022, vol. 4, no. 4, pp. 6–11. doi: 10.24018/ejmed.2022.4.4.1332

11. Cave D.R. How is Helicobacter pylori transmitted? *Gastroenterology*, 1997, vol. 113, no. 6 (suppl.), pp. S9–S14. doi: 10.1016/s0016-5085(97)80004-2
12. Dominici P., Bellentani S., Di Biase A.R., Saccoccio G., Le Rose A., Masutti F., Viola L., Balli F., Tiribelli C., Grilli R., Fusillo M., Grossi E. Familial clustering of Helicobacter pylori infection: population based study. *BMJ*, 1999, vol. 319, no. 7209, pp. 537–540. doi: 10.1136/bmj.319.7209.537
13. Forman D. Review article: Is there significant variation in the risk of gastric cancer associated with Helicobacter pylori infection? *Aliment. Pharmacol. Ther.*, 1998, vol. 12, suppl. 1, pp. 3–7. doi: 10.1111/j.1365-2036.1998.00011.x
14. Kayali S., Manfredi M., Gaiani F., Bianchi L., Bizzarri B., Leandro G., Di Mario F., De'Angelis G.L. Helicobacter pylori, transmission routes and recurrence of infection: state of the art. *Acta Biomed.*, 2018, vol. 89, no. 8-S, pp. 72–76. doi: 10.23750/abm.v89i8-S.7947
15. Kheyre H., Morais S., Ferro A., Costa A.R., Norton P., Lunet N., Peleteiro B. The occupational risk of Helicobacter pylori infection: a systematic review. *Int. Arch. Occup. Environ. Health*, 2018, vol. 91, no. 6, pp. 657–674. doi: 10.1007/s00420-018-1315-6
16. Kivi M., Tindberg Y. Helicobacter pylori occurrence and transmission: a family affair? *Scand. J. Infect. Dis.*, 2006, vol. 38, no. 6–7, pp. 407–417. doi: 10.1080/00365540600585131
17. Lacout C., Savey L., Bourguiba R., Giurgea I., Amselem S., Hoyeau N., Galland J., Amiot X., Grateau G., Ducharme-Bénard S., Georjin-Lavialle S. Helicobacter pylori in familial mediterranean fever: a series of 120 patients from literature and from france. *Helicobacter*, 2021, vol. 26: e12789. doi: 10.1111/hel.12789
18. Morgan D.D., Clayton C., Kleanthous H., McNulty C., Tabaqchali S. Molecular fingerprinting of Helicobacter pylori: an evaluation of methods. In: Gasbarrini G., Pretolani S. (eds). Basic and clinical aspects of Helicobacter pylori infection. *Springer, Berlin, Heidelberg*, 1994. doi: 10.1007/978-3-642-78231-2_39
19. Mourad-Baars P., Hussey S., Jones N.L. Helicobacter pylori infection and childhood. *Helicobacter*, 2010, vol. 15, suppl. 1, pp. 53–59. doi: 10.1111/j.1523-5378.2010.00776.x
20. Palanduz A., Erdem L., Cetin B.D., Ozcan N.G. Helicobacter pylori infection in family members of patients with gastroduodenal symptoms. A cross-sectional analytical study. *Sao Paulo Med J.*, 2018, vol. 136, no. 3, pp. 222–227. doi: 10.1590/1516-3180.2017.0071311217
21. Pounder R.E., Ng D. The prevalence of Helicobacter pylori infection in different countries. *Aliment. Pharmacol. Ther.*, 1995, vol. 9, suppl. 2, pp. 33–39.
22. Rakhmanin Iu.A., German S.V. [Prevalence and transmission pathways of the pyloric Helicobacter infection. Transmission from person to person (literature review)]. *Gig. Sanit.*, 2014, no. 4, pp. 10–13.
23. Roma E., Panayiotou J., Pachoula J., Kafritsa Y., Constantinidou C., Mentis A., Syriopoulou V. Intrafamilial spread of Helicobacter pylori infection in Greece. *J. Clin. Gastroenterol.*, 2009, vol. 43, no. 8, pp. 711–715. doi: 10.1097/MCG.0b013e318192fd8a

Авторы:

Цаканян А.В., к.м.н., старший научный сотрудник микробиологической лаборатории ГНКО «Национальный центр по контролю и профилактике заболеваний» Министерства здравоохранения Республики Армения, Ереван, Республика Армения;

Акинян А.Ш., магистр наук, младший научный сотрудник, микробиолог, ГНКО «Национальный центр по контролю и профилактике заболеваний» Министерства здравоохранения Республики Армения, Ереван, Республика Армения;

Хачатрян Т.С., к.м.н., старший научный сотрудник референтного лабораторного центра ГНКО «Национальный центр по контролю и профилактике заболеваний» Министерства здравоохранения Республики Армения, Ереван, Республика Армения;

Маргарян А.В., к.м.н., старший научный сотрудник референтного лабораторного центра ГНКО «Национальный центр по контролю и профилактике заболеваний» Министерства здравоохранения Республики Армения, Ереван, Республика Армения;

Мелик-Андреасян Г.Г., д.м.н., профессор, зам. директора референтного лабораторного центра ГНКО «Национальный центр по контролю и профилактике заболеваний» Министерства здравоохранения Республики Армения, Ереван, Республика Армения.

Authors:

Tsakanyan A.V., PhD (Medicine), Senior Researcher of Microbiology Laboratory, National Center of Disease Control and Prevention, Ministry of Health Republic of Armenia, Yerevan, Republic of Armenia;

Akinyan H.Sh., MS, Subsidiary Researcher, Microbiologist, National Center of Disease Control and Prevention, Ministry of Health Republic of Armenia, Yerevan, Republic of Armenia;

Khachatryan T.S., PhD (Medicine), Senior Researcher of Reference Laboratory Center, National Center of Disease Control and Prevention, Ministry of Health Republic of Armenia, Yerevan, Republic of Armenia;

Margaryan A.V., PhD (Medicine), Senior Researcher of Reference Laboratory Center, National Center of Disease Control and Prevention, Ministry of Health Republic of Armenia, Yerevan, Republic of Armenia;

Melik-Andreasyan G.G., DSc (Medicine), Professor, Deputy Director of Reference Laboratory Center, National Center of Disease Control and Prevention, Ministry of Health Republic of Armenia, Yerevan, Republic of Armenia.

Поступила в редакцию 17.11.2024
Отправлена на доработку 21.12.2024
Принята к печати 23.03.2025

Received 17.11.2024
Revision received 21.12.2024
Accepted 23.03.2025