

ORIGINAL ARTICLE

EPIDEMIOLOGICAL DATA ON THE DETECTION OF IMMUNOGLOBULINS OF CLASS IGM, IGG TO SARS-COV-2 AMONG POPULATION OF POLTAVA REGION

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Alla V. Marchenko, Maiia M. Ananieva, Mariia O. Faustova, Galina A. Loban', Iryna Yu. Lytovchenko, Ihor A. Nikolishyn, Nataliia V. Ilenko-Lobach
UKRAINIAN MEDICAL STOMATOLOGICAL ACADEMY, POLTAVA, UKRAINE

ABSTRACT

The aim: Of this study was to analyze epidemiological data on the detection of immunoglobulins of class M and G (IgM, IgG) to SARS-CoV-2 among urban and rural population of Poltava region.

Materials and methods: We have analyzed the research results of 2841 patients to determine IgM and IgG levels to SARS-CoV-2. The study included the results of patients in Poltava and nearby villages of Poltava region, obtained during July – December 2020.

Results: Thus, 84% of patients applied for detection of IgM in the serum of patients with the pathogen COVID-2019. We have found only 135 positive results for the detection of IgM to SARS-CoV-2, which was 5.7% of the total number of people who underwent this study from July to December 2020. Moreover, women received a positive result more often than men. The IP samples for the detection of IgM to SARS-CoV-2 in the serum of patients averaged 2.5 ± 1.04 .

It was found that patients went to the laboratory to detect IgG to SARS-CoV-2 with the vast majority among them were residents of Poltava. However, in this case the share of positive results was 47.7%, among which the female population outnumbered the male.

Conclusions: The frequency of detection of positive results on IgM to SARS-CoV-2 is about 6%. The share of positive results on IgG to SARS-CoV-2 was 47.7%, among them 76.2% were women. The frequency of detection of IgM and IgG to SARS-CoV-2 during October-December 2020 significantly exceeds the indices in July-September of the same year.

KEY WORDS: IgG, IgM, SARS-CoV-2, COVID-2019, frequency

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INTRODUCTION

Coronaviruses (CoVs) are a group of complex viruses that are characterized by high mutation rates and infectivity. They are zoonotic pathogens that affect both animals (wild/domestic) and humans, followed by the development of acute respiratory syndrome in about 10% of cases [1, 2]. Previously, coronaviruses were not included in the list of dangerous human pathogens. However, at the beginning of the 21st century, two members of this virus family – SARS-CoV and MERS-CoV caused global epidemics of pneumonia with a high mortality rate [1, 3]. Moreover, 7 years after the last outbreak of the coronavirus epidemic (2012) humanity faced a rapid spread of cases of severe atypical pneumonia caused by a new strain of coronavirus SARS-CoV-2 in December 2019 [4].

Up to now, according to the WHO, about 6 million people in more than 210 countries have been exposed to the disease caused by this pathogen – COVID-2019 [5]. The mortality rate for this disease is not much higher than for SARS-CoV and MERS-CoV. However, the new pathogen is characterized by higher infectivity and contagiousness and, as a consequence, faster human-to-human transmission. Namely abovementioned features contributed to the spread of the SARS-CoV-2 virus to all continents, causing the global COVID-2019 pandemic [1, 6].

The epidemiological situation regarding COVID-2019 is constantly changing. If previously it was thought that the virus mainly affects people in China and neighbouring countries, today the leaders in the incidence of coronavirus are the United States and Brazil. Moreover, the mortality rate varies significantly in different countries. Thus, countries with low testing capacity, imperfect health care systems, and lack of clear emergency behaviour strategies show significantly higher mortality rates than COVID-2019 [5, 7].

Statistical data concerning the presence of antibodies to SARS-CoV-2, collected from different countries, differ significantly not only from each other but also within one country at different times. After all, when analyzing WHO reports, patients with mild COVID-2019 have almost no IgG for coronavirus. Whilst in severe forms of the disease immunoglobulins disappear on average within 3-4 months. It should be noted that the genetic relatedness of different types of CoVs also negatively affects the determination of antibody levels in patients due to the frequent development of cross-reactions [5, 8].

That is why, on the way to overcoming the pandemic that engulfed humanity in 2020, the strategic vector is to monitor the formation of population immunity among re-convalescents and the development of an effective vaccine [5].

THE AIM

The aim of this study was to analyze epidemiological data on the detection of immunoglobulins of class M and G (IgM, IgG) to SARS-CoV-2 among urban and rural population of Poltava region.

MATERIALS AND METHODS

We have analyzed the research results of 2841 patients to determine IgM and IgG levels to SARS-CoV-2. The study was conducted using ELISA kits for qualitative detection of antibodies of IgM and IgG classes to SARS-CoV-2 virus (EQUI SARS-CoV-2 IgM, IgG), produced by EKVITEST-LAB LLC, Ukraine. The evaluation of the results was performed according to the index of positivity of the sample (IP), the value of which is more than 1.1 was defined as a positive result.

The study included the results of patients in Poltava and nearby villages of Poltava region, obtained during July – December 2020.

In order to determine the epidemiological data on the detection of IgM and IgG to SARS-CoV-2 among urban and rural population of Poltava region, patients were divided by place of residence (city, village), sex, and detection of immunoglobulins in the study.

The results were provided by a private certified laboratory in Poltava while maintaining the confidentiality of patients' personal data.

The studies have been carried out in accordance with the Helsinki Declaration of the World Medical Association on the ethical principles of medical research with human participation. The study protocol was approved by the Bioethics Committee of the Ukrainian Medical Stomatological Academy, Poltava, Ukraine.

The obtained data were subjected to statistical processing using the standard program SPSS 16.0 software (IBM, Armonk, NY, USA) and expressed as the arithmetic mean (M) and the arithmetic mean error ($\pm m$). The presence of differences between the indicators of the studied groups of patients was assessed by Student's t-test. The results were considered reliable at $p < 0.05$.

RESULTS

As a result of the study, it was found that during the summer-autumn period of 2020, a study to detect total antibodies (IgM, IgG) to SARS-CoV-2 among urban and rural population of Poltava region was conducted by 6 people, which is 0.2% of the total number of surveyed. In spite of all this, no positive results were found among them.

The vast majority of studies were the results of the detection of IgM in the serum of patients with the pathogen COVID-2019. Thus, 84% of patients applied for this study, i.e., 2375 patients out of 2841. This confirms the greater demand for research to detect antibodies corresponding to the acute period of the disease. It should be noted that the vast majority of people (2185, 77%) were residents of Poltava and only 190 (7%) patients were from rural areas.

We have found only 135 positive results for the detection of IgM to SARS-CoV-2, which was 5.7% of the total number of people who underwent this study from July to December 2020. Moreover, women received a positive result 1.7 times more often than men (85 and 50 people, respectively). In addition, the frequency of negative IgM results for the pathogen COVID-2019 was 94.3%, but in this case, on the contrary – women received a negative result 1.5 times more often than men. The IP samples for the detection of IgM to SARS-CoV-2 in the serum of patients did not exceed 9.53 and averaged 2.5 ± 1.04 .

Analyzing seasonal prevalence, we have found an increase in the incidence of IgM to SARS-CoV-2 during October – December by 8 times compared to July-September.

As a result of the study, it was found that patients went to the laboratory to detect IgG to SARS-CoV-2, 5 times less often (468 people), with the vast majority (445, 95%) among them were residents of Poltava. However, in this case the share of positive results was 47.7%, among which the female population (170, 76.2%) outnumbered the male 3.2 times. In turn, among the 245 negative IgG results to the pathogen COVID-2019, 132 were obtained from men. That is, in this case, males were 1.2 times more likely to go to the laboratory for IgG, compared with women. Interestingly, the maximum IP for the detection of IgG to SARS-CoV-2 in the serum of patients did not exceed 8.0 and averaged 6.05 ± 1.95 .

The frequency of IgG detection to SARS-CoV-2 during October-December 2020 increased 17.5 times compared to July-September of the same year.

DISCUSSION

Unconditionally, city residents applied to the laboratory more often to detect antibodies against coronavirus disease, which can be explained by both logistics difficulties (the need to move to the city or transportation the material in case of absence of a laboratory in the village) and financial problems.

From the obtained results, it is evidently seen that women turned to the laboratory for the detection of IgM antibodies to SARS-CoV-2 more often. For all that the vast majority of them received negative results. It indicates a higher level of anxiety, which develops against the background of stress in women compared to men. It is considered that this may be due to the neurophysiological characteristics of women associated with the relationship of low activity of enzymes that regulate catecholamine mediator systems and instability under stress [9, 10].

In their turn, men were more often interested in detecting IgG to SARS-CoV-2, which indicates a disease. According to the research, males have a more stable level of anxiety and resilience in stressful situations, so the search for late antibodies was aimed at confirming the probable asymptomatic transmission of the disease. Due to our studies, the frequency of negative results among men was high [9, 10].

It should be noted that the number of positive results for IgM and IgG in general to SARS-CoV-2 during July –

September was significantly lower than in October – December. On the one hand, such a result could be influenced by weather conditions, noticing the warm beginning of autumn in Ukraine. After all, COVID-2019 belongs to the diseases that is transmitted by airborne droplets and often develops at low ambient temperatures.

However, on the other hand – analyzing the quarantine measures to prevent the spread of coronavirus in Ukraine during this period, we can trace a certain trend. Thus, during the summer there was a weakening of preventive measures, which contributed to the return of pupils and students to educational institutions on September 1, and employees – in offices and businesses. Moreover, on September 23, Poltava and its citizens celebrated the Day of Liberation of the city in the Second World War with active mass events. Given the data on the incubation period COVID-2019, it becomes quite natural to develop the peak incidence since October.

CONCLUSIONS

Thus, residents of Poltava and surrounding villages more often turn to laboratories to detect IgM to SARS-CoV-2, with mostly negative results.

The frequency of detection of positive results on IgM to SARS-CoV-2 is about 6%. The share of positive results on IgG to SARS-CoV-2 was 47.7%, among them 76.2% were women.

The frequency of detection of IgM and IgG to SARS-CoV-2 during October-December 2020 significantly exceeds the indices in July-September of the same year.

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ORCID and contributionship:

Alla V. Marchenko: 0000-0003-2178-6383 ^{A, E, F}
 Maia M. Ananieva: 0000-0001-9435-7622 ^{B, C}
 Mariia O. Faustova: 0000-0001-5327-6324 ^{C, D}
 Galina A. Loban: 0000-0003-0055-7696 ^F
 Iryna Yu. Lytovchenko: 0000-0002-3505-1057 ^E
 Ihor A. Nikolishyn: 0000-0001-7984-3411 ^C
 Nataliia V. Ilenko-Lobach: 0000-0001-9213-9883 ^C

Conflict of interest:

The Authors declare no conflict of interest.

CORRESPONDING AUTHOR

Alla V. Marchenko

Ukrainian Medical Stomatological Academy
 23 Shevchenko st, 36011 Poltava, Ukraine
 tel; +380506059436
 e-mail: allamarchen@ukr.net

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