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ORIGINAL PAPER

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Intrafamilial Spread of COVID-19 Infection Within Population in Bosnia and Herzegovina

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ABSTRACT

Background: The corona virus is transmitted in three ways: by direct contact with an infected person, by droplets, and by air. Transmission control according to official guidelines can be prevented by keeping a distance, wearing a mask and washing hands. Sharing a space with several members of the immediate or extended family increases the risk of transmission in all three ways. In Traditional Bosnian families two or three generations live in one household. The family doctor is informed with living conditions of the residents and has the opportunity to monitor the rate of secondary transmission from the index case, and then recommend additional preventative and treatment measures.

Objective: The aim of the study was to determine the first occurrence of the symptoms and to monitor possible intrafamilial transmission of the disease through clinical examinations and microbiological-serological tests. **Methods:** The study was conducted in a family medicine clinic in the region of northeastern Bosnia and Herzegovina from March to December 2020. Patients with symptoms that could indicate the presence of COVID-19 disease were registered. If COVID-19 was proven, the patient became an index case. The other members of the family would be monitored for the secondary transmission via laboratory (PCA SARS-CoV-2 and IgM and IgG antibodies) and clinical parameters.

Results: Characteristics of 25 index cases were analyzed. All 25 of them were middle-aged men that worked outside the home. In 25 households, there was a total of 123 members that shared a home with the index patient. Secondary transmission developed in 76 out of 123 family members (61.8%). Only one patient had a severe form of the disease and was hospitalized. 2 patients died.

Conclusion: Intrafamilial transmission of Covid-19

in households of Bosnia and Herzegovina is high. The secondary attack rate of SARS-CoV-2 in households is 61,8%. In the surveyed households, family members use common rooms with an infected patient, and the customs of family gatherings are maintained, without the implementation of protective measures. The family medicine team has the opportunity to apply appropriate preventive action, education and early prehospital treatment as well as adequate selection for the hospital admission.

Keywords: COVID-19, Intrafamilial transmission, Family medicine, Education, Prehospital treatment.

1. BACKGROUND

With the onset of the pandemic, COVID-19 changed the life of all levels of the society. With the spread of the disease, there were challenges of adapting to the new living conditions, not only of the individual but also of families, immediate and wider communities, the health system, institutions and countries all over the world (1). Despite the application of the recommended measures to protect the spread of the pandemic in almost all European countries, there is still a high incidence of new infections with the virus SARS-CoV-2 (2, 3). New variants of the virus (B.1.1.7 and B1.351) have spread to many European countries, so the pandemic is still in a full swing. According to WHO reports, Bosnia and Herzegovina is one of the countries with a high incidence and number of deaths. Vaccination has not yet given the right effects in preventing the spread of the disease (3, 4).

Coronavirus, as well as other respiratory viruses, are transmitted in three ways. By direct contact with an infected person, by smaller or larger coughed droplets from an infected person

and by air. These particles can be suspended in the air for a long time which can transfer to a large number of people. Intrafamilial transmission of the virus and close contact with an infected person are the most important causes for spread of the disease (5, 6). As stated in the report from China, where the disease began, 70% of transmission occurs in families. However, there is little information on how household transmission can be prevented, if more severe forms of the disease can be prevented or how early prehospital treatment can be organized (5).

Viral culture shows that patients with SARS-CoV-2 infection became contagious a few days before and 7 days after the onset of the disease. Patients without symptoms and those with uncharacteristic symptoms play a much larger role in virus transmission. Transmission by contact, droplets and air in the common rooms in families with more members is higher and it can be expected that the secondary transmission from the first sick member (Index patient) will affect the whole family (7).

Recommended precautionary measures can work well in controlled clear spaces in the community. Sharing a space with several members of the immediate or extended family increases the risk of transmission in all three ways. In Traditional Bosnian families two or three generations live in one household so intrafamilial transmission and infection occurs very rapidly. Over 50% of family members become infected in the first week from a primarily infected index case (8). This rapid transmission of infection in families can be a major challenge for family medicine practitioners and the entire health care system. Healthcare system and public health have shown their weaknesses in this crisis situation. Hospital systems were rapidly collapsing in many countries, including BiH, due to the large number of patients arriving at the same time without adequate treatment. At the same time, such a crisis has further highlighted the important role of family medicine and its function in the community. A family doctor according to his / her scope of work can play a key role in disease prevention, early diagnosis and treatment (9-11).

During the treatment of an entire family, the doctor is informed about the living conditions of the family and has the opportunity to recommend additional protection measures, especially for older members and those who have specific risk factors which can lead to a complicated course of the disease. Most patients follow the WHO recommendations on protective measures in the community (physical distance, wearing a mask, personal hygiene, limited travel and attendance at larger gatherings), but by entering their own household they go back to their old habits: close contacts with all the members, shared meals, shared use of bathrooms, towels, kitchen and bedrooms. Preventative measures in the household are especially important since children and adolescents are mostly asymptomatic however highly contagious (5, 8, 12). Education about a healthy lifestyle, strengthening the natural defenses and immune system with a healthy diet and other alternative methods (stress control, maintaining healthy sleep and "forest bathing") can play an important role in controlling the spread of disease (13, 14). Family members that work outside the home have a higher risk of infection therefore family doc-

tor should provide adequate microbiological and serological screening of all members (11).

According to the results of family surveys in the USA, COVID-19 patients in households infect over 50% of members (15). Results of this study show that subjects had their own bedrooms, but 69% of the index patients spent over 4 hours in a common room with other family members, even after the onset of symptoms. 40% of the index patients slept in the same room with other members. Family members with a confirmed diagnosis of infection initially had no symptoms, even during the first 7 days. Since the first couple of days are crucial for the secondary transmission, epidemiologists recommend early quarantine. Serological testing of antibodies is the most important parameter for the monitoring the transmission of SARS-CoV-2 (8, 16). Most family members fell ill in the same week as the index case. In developed European countries, the secondary transmission of infection in the household is much lower, probably due to different socio-economic factors. In a population-based survey from Switzerland, 17.2% of members of the same family are infected, while the risk of transmitting the infection in the community is only 5.1% (17).

In Bosnian families, traditional customs entail visiting and caring for elderly and sick family members, so quarantine within the household is not fully accepted. After the death of a family member, customs of mourning include daily gatherings in the house of the deceased.

2. OBJECTIVE

The aim of the study was to determine the first appearance of symptoms and to monitor possible intrafamilial transmission of the disease through clinical examinations and microbiological-serological tests. Based on the obtained results, specific preventive measures and adequate early therapeutic procedures would be applied.

3. MATERIAL AND METHODS

In the study investigation were included 25 family clusters that had 3-6 household members, of which 15 came from an urban area, and 10 lived in a rural setting. The survey was conducted in the period March-December 2020.

In the family medicine clinic, the occurrence of SARS-CoV-2 virus infection was monitored in households of the urban and suburban population of one of the cities in North-east Bosnia and Herzegovina. The study included families where one member has clinical and laboratory detection of COVID-19 disease. The characteristics of the disease in the primary person with COVID-19 (Index patient) were analyzed, followed by the possibility of infection occurring in other members using the WHO protocol (18). A family doctor already has data on all the families, the number of members, living conditions and socio-economic status. When the first family member became ill (index patient), the living conditions and the degree of risk for transmission of an infection to other members were re-analyzed, especially for members with comorbidities. The possibility of strict isolation of the index patient is also determined, as well as the isolation of family members with an increased risk for more severe forms of the disease. The education of the whole family states the importance of wearing a mask,

adhering to the recommendations for physical distance and social activities during a pandemic (avoiding shared meals and staying in the same room). Family members were made aware of the importance of maintaining hygiene and ventilating the premises. The occurrence of secondary transmission of the disease to household members was monitored epidemiologically, clinically and laboratory-wise during 30 days from the appearance of the first symptoms. All household members were included to assess the secondary transmission.

The test for the presence of SARS-CoV-2 virus was performed with a sample of nasopharyngeal swab by Real-time PCR method in a licensed institution. Antibodies to SARS-CoV-2 (IgM and IgG) were made by the ECLIA Roche Diagnostic method from blood samples. These tests were performed on members of the tested families.

In addition to the clinical data listed in the WHO protocols, X-rays of the lungs or CT of the chest and abdomen were performed on family members who developed signs of moderate or severe disease. Radiological examinations were performed at the MIB Institute Tuzla. In the CT findings, a calculation of the CT score was made, which was decisive for hospital treatment and the application of oxygen therapy. Milder and moderate forms of the disease were treated at home with the protocol of prehospital diagnostic and therapeutic procedure with daily monitoring of clinical parameters and blood oxygenation status (19). Indications for hospital treatment were in addition to clinical indicators of CT score of pulmonary infiltration.

4. RESULTS

From March to December 2020, in the family medicine clinic were registered all families with a COVID-19 positive case. The study included 25 households in urban and suburban areas that met the research criteria (complete clinical and serological treatment of all family members with voluntary consent). During the research, the phenomena of secondary intrafamilial spread was analyzed. Total number of 25 index cases and 123 family members were analyzed.

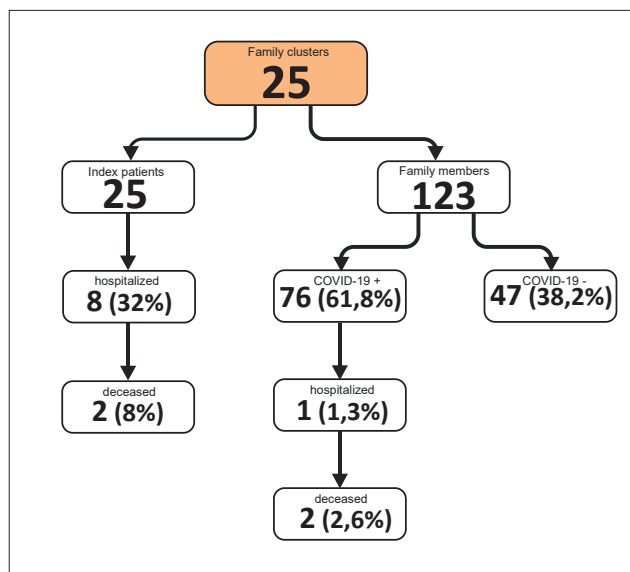


Figure 1. Intrafamilial secondary transmission of COVID-19 in Bosnia and Herzegovina

Family cluster 1	PCR	RTG	CT	Anti-bodies	Hospita-lisation	Exitus
INDEX CASE Male 50 year	+	-	-	+	NO	
Father	+	+	+	+	NO	x
Mother	-	-	-	+	NO	
Wife	-	-	-	+	NO	
Daughter	-	-	-	+	NO	
Son	+	-	-	+	NO	

Table 1. Family cluster 1, where the index patients are middle-aged men, employed in firm where they have a lot of close contact with people.

Family cluster 2	PCR	RTG	CT	Anti-bodies	Hospita-lisation	Exitus
INDEX CASE Male 45 year	+	+	+	+	YES	-
Wife	+	+	-	+	NO	-
Daughter	-	-	-	-	NO	-
Son	-	-	-	-	NO	-
Brother	+	+	+	+	YES	-
Sister-in-law	+	-	-	+	NO	-
Cousin	+	-	-	+	NO	-
Cousin	-	-	-	-	NO	-

Table 2. Family cluster 2, where index case was a 45-year-old man, employed in a firm with many employees.

15 families came from an urban area, and 10 lived in a rural setting. The average number of members in one family cluster was 5-6. In 13 households, three generations of one family lived together.

Out of 123 family members, transmission of SARS-CoV-2 virus infection was proven in 76 patients (61,8%). All affected members were older than 16 years. Overall, secondary transmission was proven in 76 members (61,8%). Figure 1 shows the research results.

The index of patients were mostly middle-aged men (72%) that work in companies with a lot of employees. Covid-19 positive Index cases or family members were isolated. They were monitored and treated by a family medicine team (2 doctors and 2 nurses). Daily communication and health checks were performed by telephone and directly during house calls. Communication and consultations with infectologists, pulmonologists, radiologists on all aspects of treatment were done according to the clinical course of the disease. 9 patients were hospitalized (9,1%). Family members with secondary transmission had a less severe forms of disease and only one person was hospitalized. Due to the load of hospital capacities, the complete management of diagnostics and treatment was performed by the family medicine team.

In the Tables 1 and 2 are presented two family clusters where the index patients are middle-aged men, employed in firms where they have a lot of close contact with people. In the family cluster 1, index patient was a 50-year-old man that works at the market. He shares a small house with parents, a wife and two children. The index patient had slightly elevated temperature and weakness and was tested

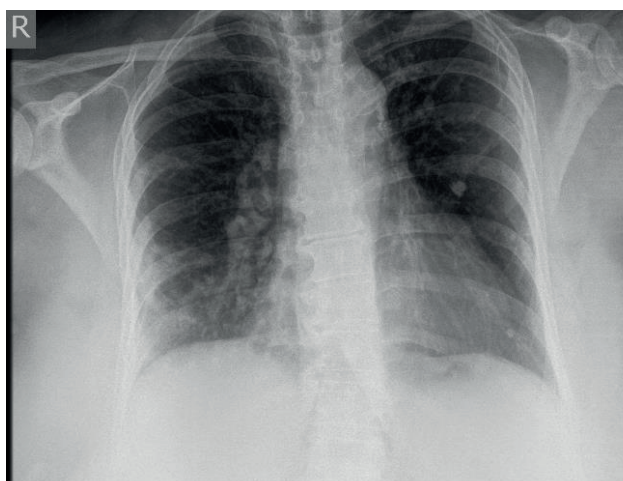


Figure 2. Chest X-Ray–bilateral lung infiltration

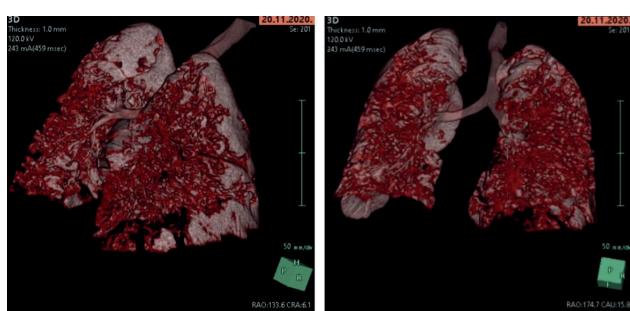


Figure 3. Chest CT of an index case

only on the 10th day of the onset of the disease. During the 15 days of isolation, all family members were tested. The father of the index patient had comorbidities and died on the 3rd day of the illness. The mother has a moderate clinical course and the therapy was carried out according to the appropriate protocol. After the X-ray examination, the patient had intensive treatment at home. Children and wife only reported mild fatigue.

In the family cluster 2, index case was a 45-year-old man, employed in a firm with many employees. In this family cluster, the index patient had all the clinical characteristics of the severe form of covid-19 with suspected ARDS. Considering that the CT chest score was 17, the patient was immediately sent to the hospital. In this family cluster, the brother of the index case (works in the same firm) also had severe form of the disease, and ended up in hospital. Both of them successfully recovered. Three of the children in this family, according to serological tests, were not infected.

5. DISCUSSION

Coronavirus as well as respiratory viruses are transmitted in three ways: by direct contact with an infected person and by coughed droplets. Transmission can be spread through air with very small droplets and particles that are suspended in the air (6).

According to official guides transmission can be prevented by keeping a distance, wearing a mask and washing hands. Virus transmission is also possible at a distance of more than 2 meters. Staying in a poor ventilated space can increase the risk of infection. Recommended protection measures can work well in controlled clear spaces in the community. Sharing a space with several members of

the immediate or extended family increases the risk of transmission in all three ways. Intrafamilial transmission of SARS-CoV-2 virus one of the most important causes of pandemic spread of COVID-19 disease (5, 8).

Knowing how intrafamilial spread can enable more effective protection measures and adequate prehospital treatment at home. Approximately 75% of secondary infection occurs within 5 days of the first clinical manifestation of COVID-19, so prompt intervention of protective measures is required (8, 20).

In our study with 25 families, the secondary transmission of infection from the index case to other members was 61.8%. In studies from China, the results indicate a much lower degree of transmission, but it is stated that there are large differences between individual regions. In Wuhan, where the pandemic began, a secondary intrafamilial transmission of 30% was established. In 85 households there were 240 family members. There were 132 (55%) members that tested positive for COVID-19 infection (20).

Secondary intrafamily transmission with a high percentage (over 50%) was found in a US study. Swiss based study shows that secondary transmission is much lower. Families had higher socioeconomic status with an average number of 2 members (8, 17).

Average number of family members in Bosnian households is higher (5 members). With an increased number of family members, the risk of secondary transmission is reduced, however risk significantly increases with gathering more family members in one common area. The characteristics of the patient index in our study correspond to data from papers from China where the index patients are mostly middle-aged men that work in places with a high risk of infection (21). Secondary transmission of infection depends on both the habits and behavior of the index case. If the index patient is not aware of his state and does not apply protective measures, the transmission of the disease increases. The occurrence of diarrhea is also a significant risk factor for secondary transmission (5).

In the initial phase of the pandemic, hospital isolation of patients could prevent a significant intrafamilial transmission. Hospital systems were rapidly collapsing in many countries, including BiH, due to the large number of patients arriving at the same time without adequate treatment. The rapid collapse of the hospital healthcare system led patients to search for help from their family doctor. However, at the time, family doctors did not have sufficient knowledge and resources for adequate treatment. A family doctor according to his / her scope of work (community and family oriented, oriented towards prevention and health promotion, has coordination, education and rational approach skills) can play a key role in disease prevention, early diagnosis and treatment.

The prolonged time of the pandemic and the general crisis has put family medicine at the center of the health system. Patients returned to primary health care for all their health problems, but also information about COVID-19, prevention and treatment advice. Family doctor also decide when it's necessary to go for the consultation at the secondary and tertiary level. (9, 10, 11). During the treatment of an entire family, the doctor is informed about

the living conditions of the family and has the opportunity to recommend additional protective measures. Preventative measures in the household are especially important since children and adolescents are mostly asymptomatic but highly contagious (5, 8, 12).

Education about a healthy lifestyle with strengthening the natural defenses and immune system with a healthy diet and other non-medical methods (stress control, maintaining healthy sleep and walking in the woods) can play an important role in controlling the spread of the disease in the family but also in the community. Family members with excessive visceral fat tissue are especially at risk and should follow special nutritional advice to help boost the immune system and fight off the virus (13, 14, 22). Our practice operates on the principles of family medicine. Majority of patients were treated in their household and only 9 patients were hospitalized.

Limitation of the study

Study has a few limitations, but one of the most important limitations of the study was the size of sample included in investigation – small numbers of families included in our investigations. That was reason we couldn't make any statistical analysis which can prove more scientifically our hypothesis about importance of much and more better organization of the Family practice model of healthcare protection in all parts of our country. Healthcare decision makers didn't follow concepts, rules and statements of Declarations from Alma Ata concept to Global Health Strategy, adopted by World Health Organization and its public health experts, as it was described as Determinants of health and Targets of Health for All (23-29). Unfortunately, almost all countries in the world, including, also, Bosnia and Herzegovina, which has very specialized (unique in the world) organization of Health Care System, didn't react professionally and scientifically against Corona pandemic and decision makers (in almost all countries) didn't listen carefully expert's opinions regarding appropriate measures in fighting for prevention of the COVID-19 infection, especially with more and better involved family medicine teams to provide health care protection, following recommendations and postulates like Andrija Stampar proclaimed it in WHO Statute and Declarations. Consequences of that behavior are much more intensive and nobody knows how will be resulted in the future.

6. CONCLUSION

Intrafamilial transmission of Covid-19 in households of Bosnia and Herzegovina is high. The secondary attack rate of SARS-CoV-2 in households is 61,8%. In the surveyed households, family members use common rooms with an infected patient, and the customs of family gatherings are maintained, without the application of protective measures. The family medicine team has the opportunity to apply appropriate preventive measures, education and early prehospital treatment and adequate selection for hospital admission.

• **Patients Consent Form:** All patients included in this study were officially informed about it.

• **Author's contribution:** All authors were involved in all steps of the preparation of this article. Final proofreading was made by the first author.

• **Conflict of interest:** None declared.

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REFERENCES

- Masic I, Naser N, Zildzic M. Public Health Aspects of COVID-19 Infection with Focus on Cardiovascular Diseases. *Mater Sociomed.* 2020 Mar; 32(1): 71-76. doi: 10.5455/msm.2020.32.71-76.
- WHO. Emergency situational updates. Weekly epidemiological update (2021, 27 January). Accessed 13 Feb 2021. Available on: <https://www.who.int/publications/m/item/weekly-epidemiological-update-on-27-january-2021>
- WHO. Transmission of SARS-CoV-2: implications for infection prevention precautions. Published July 9, 2020. Accessed February 1, 2021. Available on: <https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions>
- Priesemann V, Balling R, Brinkmann MM, Ciesek S, Czypionka T, Eckerle I, et al. An action plan for pan-European defence against new SARS-CoV-2 variants. *Lancet.* 2021 Feb 6; 397(10273): 469-470. doi: 10.1016/S0140-6736(21)00150-1.
- Wang Y, Tian H, Zhang L, Zhang M, Guo D, Wu W, et al. Reduction of secondary transmission of SARS-CoV-2 in households by face mask use, disinfection and social distancing: a cohort study in Beijing, China. *BMJ Glob Health.* 2020; 5(5): e002794. doi:10.1136/bmjgh-2020-002794.
- The Lancet Respiratory Medicine. COVID-19 transmission up in the air. *Lancet Respir Med.* 2020 Dec; 8(12): 1159. doi: 10.1016/S2213-2600(20)30514-2.
- Pollock Allyson M, Lancaster James. Asymptomatic transmission of covid-19 *BMJ* 2020; 371. doi:10.1136/bmj.m4851.
- Grijalva CG, Rolfes MA, Zhu Y, McLean HQ, Hanson KE, Belongia EA, et al. Transmission of SARS-COV-2 Infections in Households—Tennessee and Wisconsin, April–September 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1631–1634. doi: 10.15585/mmwr.mm6944e1
- de Sutter A, Llor C, Maier M, Mallen C, Tatsioni A, van Weert H et al. Family medicine in times of 'COVID-19': A generalists' voice. *Eur J Gen Pract.* 2020; 26(1): 58-60. doi:10.1080/13814788.2020.1757312.
- Jenkins LS, Von Pressentin KB, Naidoo K, Schaefer R. The evolving role of family physicians during the coronavirus disease 2019 crisis: An appreciative reflection. *Afr J Prim Health Care Fam Med.* 2020;12(1): e1-e4. doi:10.4102/phcfm.v12i1.2478.
- Lee JQ, Loke W, Ng QX. The Role of Family Physicians in a Pandemic: A Blueprint. *Healthcare (Basel).* 2020 Jul 5; 8(3): 198. doi: 10.3390/healthcare8030198.
- WHO. Coronavirus disease (COVID-19) advice for the public: Protect yourself and others from COVID-19. Updated on 3 March 2021. Accessed January 22, 2021. Available on: <https://www.who.int/westernpacific/emergencies/covid-19/information/transmission-protective-measures>.
- Zildzic M, Masic I, Salihefendic Nizama, Jasic M, Hajdarevic B. The Importance of Nutrition in Boosting Immunity for Prevention and Treatment COVID-19. *Med. Arch.* 2020; 8(1): 73-79. doi: 10.5455/ijbh.2020.73-79.
- Salihefendić N, Zildžić M, Jašić M. Prirodna odbrana od

- bolesti COVID-19. Planjaks komerc, 2020.
15. COVID-19 patients infect half of household: CDC study (2020, October 30). Published 30 October 2020. Accessed 29 December 2020. Available on: <https://medicalxpress.com/news/2020-10-faster-wider-covid-households.html>.
 16. Deeks JJ, Dinnes J, Takwoingi Y, Davenport C, Spijker R, Taylor-Phillips S, et al. Antibody tests for identification of current and past infection with SARS-CoV-2. *Cochrane Database Syst Rev* 2020; 6(1). doi: 10.1002/14651858.CD013652.
 17. Bi Q, Lessler J, Eckerle I, Lauer SA, Kaiser L, Vuilleumier N, et al. Household transmission of SARS-CoV-2: Insights from a Population-based Serological Survey. *medRx* .2020. <https://doi.org/10.1101/2020.11.04.20225573>.
 18. WHO. Coronavirus disease (COVID-19) technical guidance: The Unity Studies: Early Investigation Protocols. Published on 23 March 2020. Accessed December 3. Available on : <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/early-investigations>.
 19. Salihefendic N, Zildzic M, Ahmetagic S. Acute Respiratory Distress Syndrome (ARDS) from Endemic Influenza A/H1N1: Prehospital Management. *Med Arch*. 2015; 69(1): 62-63. doi:10.5455/medarh.2015.69.62-63.
 20. Wang Z, Ma W, Zheng X, Wu G, Zhang R. Household transmission of SARS-CoV-2. *J Infect*. 2020; 81(1): 179-182. doi:10.1016/j.jinf.2020.03.040.
 21. Li W, Zhang B, Lu J, et al. Characteristics of Household Transmission of COVID-19. *Clin Infect Dis*. 2020; 71(8): 1943-1946. doi:10.1093/cid/ciaa450.
 22. Salihefendic D, Zildzic M, Masic I. The Importance of the Quantity and the Distribution Assessment of Fat Tissue in a Diagnosis of Insulin Resistance. *Med Arch*. 2020 Dec; 74(6): 439-443. doi: 10.5455/medarh.2020.74.439-446.
 23. Masic I. Public Health Aspects of Global Population Health and Well-being in the 21st Century Regarding Determinants of Health. *Int J Prev Med*. 2018 Jan 15; 9:4. doi: 10.4103/ijpvm.IJPVM_476_17.
 24. Masic I. Determinants of Health and Health Concepts According to WHO Targets. *Int J Biomed Healthc*. 2015; 3(2): 16-21.
 25. Masić I. Javnozdravstveni aspekti porodične/obiteljske medicine u Bosni i Hercegovini [Public health aspects of family in Bosnia and Herzegovina]. *Med Arh*. 2003; 57(5-6): 311-316. (in Bosnian)
 26. Niksić D, Masić I. Procjena kvaliteta u primarnoj zdravstvenoj zaštiti [Quality assessment in primary health care]. *Med Arh*. 1998; 52(3): 147-151. (in Bosnian).
 27. Toromanović S, Masić I, Novo A, Kudumović M, Zunić L. Kriteriji za izbor adekvatne metodologije i relevantnih varijabli za procjenu kvaliteta primarne zdravstvene zaštite [Criteria how to choose adequate methodology and relevant variables for assessment of quality of primary healthcare]. *Med Arh*. 2005; 59(1): 23-26. (in Bosnian).
 28. Salihović H, Puvacić S, Masić I. Procjena broja potencijalnih korisnika usluga porodične medicine—vaznost registracije korisnika [Determination of the potential number of users of family medicine services—importance of user registration]. *Med Arh*. 2004; 58(1 Suppl 1): 33-35. (in Bosnian).
 29. Masić I. Edukacija iz Obiteljske medicine na Medicinskom fakultetu u Sarajevu [Education in family medicine at the Medical School in Sarajevo]. *Med Arh*. 2004; 58(1 Suppl 1): 27-31. (in Bosnian).