

THE COVID-19 PANDEMIC AND ARTIFICIAL INTELLIGENCE (AI) APPLICATIONS IN HEALTH: HOW MUCH ARE WE INTERESTED IN?

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ABSTRACT

Purpose: New viruses have emerged, causing global damage and mass deaths that can spread to international borders, the latest of which is the new coronavirus (COVID-19). After the Second International Congress on Artificial Intelligence in Health, themed "Artificial Intelligence in Health During COVID-19 Pandemic Process" organized online by İzmir Bakırçay University and İzmir Provincial Health Directorate with the contributions of the International Association of Artificial Intelligence in Health, a questionnaire was conducted to evaluate the knowledge of the participants about artificial intelligence applications.

Material and Methods: This study aimed to evaluate the interest of the congress participants in this field with the questions which form the questionnaire such as the duration of the interest of the participants in the field of artificial intelligence in health, their publication status, the development of studies on artificial intelligence with the COVID-19 pandemic, demographic structures such as age and gender, and educational level. 130 participants answered the questionnaire consisting of 23 questions. Questionnaire responses were analyzed in a statistical setting.

Results: We found that 130 people filled out the questionnaire and the majority of the participants were female, with participation from many organizations, but university staff showed more interest. We have seen that the 30-39 age group is more interested in artificial intelligence than the other age groups, but the majority of the participants do not have academic studies in this field. We found that the technical terms related to artificial intelligence were not well known by the participants, and that the number of participants who tended to this field, especially in the recent year, was high. Another important point was that people working in this field stated that they would definitely follow up if scientific activities continued.

Conclusion: We know how important congresses, symposiums, courses and other meetings are, especially for scientist candidates, which will be held to raise awareness about the usage areas of artificial intelligence-based health technologies, to develop new communication and work networks by bringing together different disciplines, to create an agenda and to lay the groundwork for new studies, and we think that there is a need for many repetitive activities in this field and that these activities should be continued.

Keywords: artificial intelligence, COVID-19, health, questionnaire

INTRODUCTION

While an epidemic is defined as the transformation of a contagious disease into an epidemic within a certain region, a pandemic is expressed as an epidemic that begins to affect a large population and humanity outside of a certain region (1,2). When we look at the history of humanity, it is seen that there are many pandemics that cause great sociodemographic and economic destructions (3,4).

Epidemics that emerged in the first 20 years of the 21st century have once again shown how vulnerable people are to infectious diseases, and infectious diseases have deeply affected the whole world, despite all the possibilities of today's modern medicine. This situation continues to pose a threat to human health day by day (5). In the last decade, new viruses have emerged that cause global damage and mass deaths that can spread to international borders, the latest of which is the new coronavirus (COVID-19). Inadequate production of vaccines and, more importantly, the lack of strong health systems in countries where the disease persists cause the spread of the pandemic (6). Artificial intelligence applications in healthcare have aroused strong interest both because machines create the illusion of making life and death decisions and because they enter the decision-making domains of the experts (7). In recent years, with the development of deep neural networks and robotics, great progress has been made in artificial intelligence and since these techniques have been actively applied in health services, it is predicted that many of the healthcare activities of the clinicians and administrators will be replaced by artificial intelligence in the forthcoming years (8). By developing tools based on machine learning in healthcare, new ways are sought to combat global pandemics (9). Early detection of cases, quarantine and prevention of community impact are very important pillars in managing a pandemic like COVID-19.

The Canadian Blue Dot Company has successfully applied machine learning algorithms to detect the spread of COVID-19 in the Chinese city of Wuhan at the end of December 2019. The most common of these algorithms is the Susceptible-Exposed-Infectious Recovered (SEIR) modeling method, which is used to predict the areas and extent of COVID-19 spread.

In our country, interest in artificial intelligence in health is increasing day by day. With the COVID-19 pandemic, the need for health policy makers to give

increasing importance to artificial intelligence applications in both the management and the field has emerged and it has been inevitable for the studies to accelerate.

After the second International Congress on Artificial Intelligence in Health with the theme of "Artificial Intelligence in Health during COVID-19 Pandemic" applications organized online by İzmir Bakırçay University and İzmir Provincial Health Directorate with the contributions of the International Association of Artificial Intelligence in Health, a questionnaire study was conducted to evaluate the knowledge of the participants about artificial intelligence applications. During the congress, attention was drawn to the concepts behind artificial intelligence in health and the application areas it can have in the world of healthcare with today's technology, while current issues such as the origin of artificial intelligence, developing deep learning algorithms, smart diagnosis and treatment systems for COVID-19, vaccine and drug development studies, as well as the topics such as artificial intelligence and ethics, artificial intelligence in food and agriculture, artificial intelligence from the clinician's point of view, how artificial intelligence can be a tool to support and enhance human cognitive functions are discussed. (10,11)

This study aimed to evaluate the interest of the congress participants in this field with the questions which form the questionnaire such as the duration of the interest of the participants in the field of artificial intelligence in health, their publication status, the development of studies on artificial intelligence with the COVID-19 pandemic, demographic structures such as age and gender, and educational level. In accordance with our application to the scientific research platform, this study was approved by our Ministry of Health and non-interventional ethics committee approval was received from İzmir Bakırçay University Ethics Committee (Decision no: 211, Research number: 193).

MATERIAL AND METHODS

This study was approved by the İzmir Bakırçay University Non-Interventional Clinical Research Ethics Committee (Decision No: 211, Date: 04.03.2021). Congress participants were asked to fill in a 23-question questionnaire form created by the members of the organizing committee on the congress website. The distribution of the questions aimed to evaluate the demographic characteristics of

Table 1. Yes answers to the questionnaire

Question	N (%)
Have you ever attend in a scientific project?	18 (13,8)
Have you ever write an article?	36 (27,7)
Have you ever write a book chapter?	4 (3,1)
Have you ever attend in a congress, panel or etc?	18 (13,8)
Do you know machine learning?	24 (18,5)
Do you know deep learning?	25 (19,2)
Do you think optimization is a tool in AI?	3 (2,3)
Do you think computer vision is a tool in AI?	7 (5,4)
Do you think robotic Technologies is a tool in AI?	7 (5,4)
Do you think statistics is a tool in AI?	11 (8,5)
Do you think neuroscience is a tool in AI?	5 (3,8)
Do you think the COVID-19 pandemic reveal the importance of AI studies in the health?	128 (98,5)
Would you like to take part in AI based project?	130 (100)
Do you think congresses will help individuals working in this field to establish communication and cooperation?	129 (99,2)

the participants, the developments and awareness in the field of artificial intelligence related to the processes developed by COVID-19 pandemic, the opinions of the participants about the future of artificial intelligence and congress satisfaction, and 130 participants answered the questionnaire.

Statistical Analysis

Data were evaluated in the statistical program IBM SPSS Statistics 25.0 (IBM Corp. Released 2017 IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Descriptive statistics of participant questionnaire form information were given as number of units (n), percentage (%). Categorical data analysis was performed for intergroup comparisons between question categories and Pearson Exact Chi-Squared Test was used. The value of $p < 0.05$ was considered statistically significant.

RESULTS

The demographic characteristics of the participants who filled out the questionnaires during participation in the congress were analyzed, it was determined that the participants were 36.9% (n:48) between the ages of 18-29, 40.8% (n:53) between the ages of 30-39,

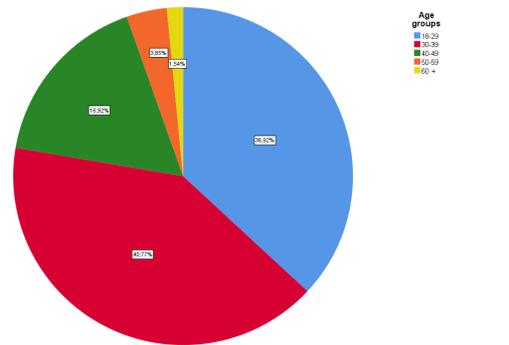


Figure 1. Age groups and percentages

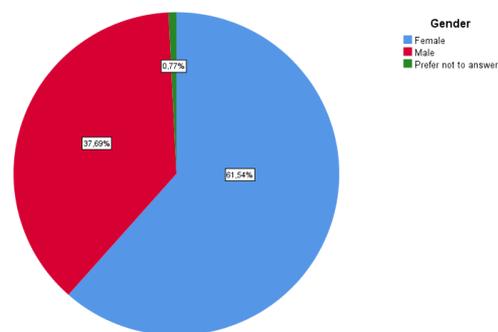


Figure 2. Gender distribution and percentages

and 16.9% (n) between the ages of 40-49 (n) :22), 3.8% (n:5) between the ages of 50-59 and 1.5% (n:2) aged 60 and over (Figure 1). When the age groups were examined, it was seen that it was not homogeneously distributed and it was found that the 30-39 age group was more interested in artificial intelligence in health compared to other age groups ($p < 0.001$). Of 130 people, 49 were male and 80 were female, and one person did not specify gender. Male participants made up 37.7% (n:49) and female participants made up 61.5% (n:80) (Figure 2). No difference was found in terms of interest in artificial intelligence according to gender ($p > 0.05$). When the educational levels of the participants are examined, it is seen that 1 person is primary school graduate (0.8%), 23 people are at bachelor's level (17.7%), 47 people are at master's level (36.2%) and 59 (45.4%) are at doctoral level (Figure 3). It was determined that the interest in artificial intelligence was higher in people with postgraduate education, and the interest of doctoral graduates was statistically significantly different from the others ($p < 0.001$). When the academic titles of the participants are evaluated, it is seen that 60 (46.2%) of those who participated in the questionnaire did not have an

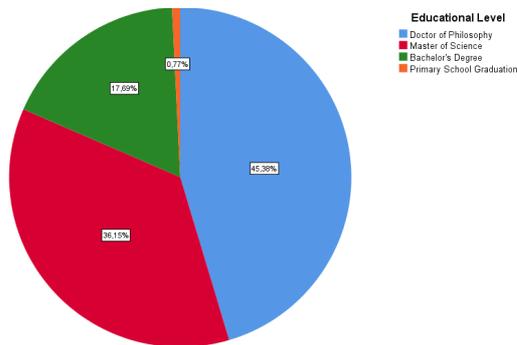


Figure 3. Educational level and percentages

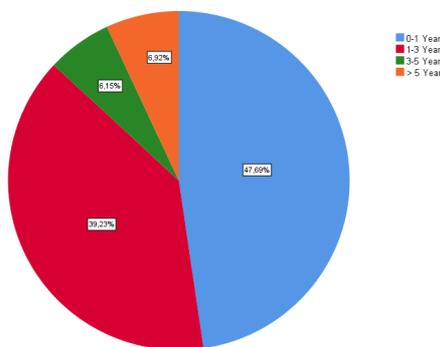


Figure 4. Year of experience on AI and percentages

academic title, 49 people (37.7%) who had the title of teaching staff (research assistant, lecturer, specialist, etc.). It was seen that 12 people with the title of faculty member (9.2%), 3 people with the title of associate professor (2.3%) and 6 people with the title of professor (4.6%) participated in the questionnaire. When the institutions of the congress participants who participated in the questionnaire were questioned, 20 people (15.4%) were in the ministries (Ministry of Health and Ministry of Agriculture and Forestry ,7 people (5.4%) were in the state hospital, 72 people (55.4%) were in the university, 16 people (12.3%) were in the private sector and 15 people (11.5) were in other working institutions. It was statistically determined that university members were more interested in artificial intelligence in health compared to the staff of other institutions ($p < 0.001$). When the participants' working time in the field of artificial intelligence was questioned, 47.7% (n:62) worked for 0-1 years, 39.2% (n:51) worked for 1-3 years, 6.2% (n:8) worked for 3-5 years. and 6.9% (n:9) worked in this field for more than 5 years (Figure 4). Since the participants were new to the field of artificial intelligence in health, and if we set the threshold of 3 years between 0-1 and 1-3 years, those who worked in this field for less than 3 years were

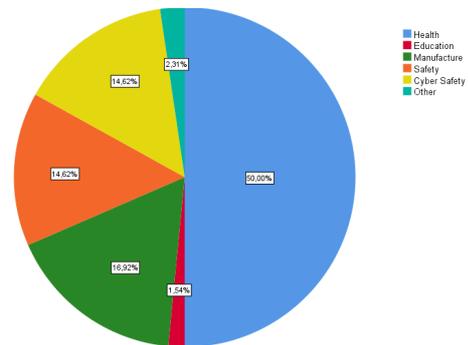


Figure 5. AI applications according to the areas

statistically significantly higher than the other group ($p < 0.05$).

In the field of artificial intelligence, 30% of the participants had academic studies on the subject (n: 39), while 70% did not have any studies in this field. A statistical difference was found between the groups with and without studies on artificial intelligence in health ($p < 0.001$). When the participants were questioned on their participation status in case the congress was repeated next year, it was seen that all (100%) wanted to participate. When the participants were asked whether they trust human intelligence or artificial intelligence more, it was determined that 55.4% of the participants preferred human intelligence. It was determined that access to information about the congress was mostly through social media and mentor recommendation (40%, 41%, respectively).

When it was asked to rank the areas where artificial intelligence is most used, half of the participants (50%) pointed to the health sector, while the manufacturing industry sector took the second place with 16.9%, and defense and cyber security took the third place with 14.6% (Figure 5). When people's knowledge of artificial intelligence-related terms and fields is questioned, it was seen that the use of artificial intelligence in machine learning, deep learning, optimization, computer vision, robotic artificial intelligence, statistical artificial intelligence and neuroscience was not known by a significant part of the participants (Table 1).

When the difficulties they experienced during scientific studies were questioned, the most important problem stated by the participants was the participation fee to the congresses (41.5%), and the difficulty of accessing the academicians who would work together in the field (29.2%) was found in the second place (Figure 6). When we asked, "How does the increasing impact of artificial intelligence on our

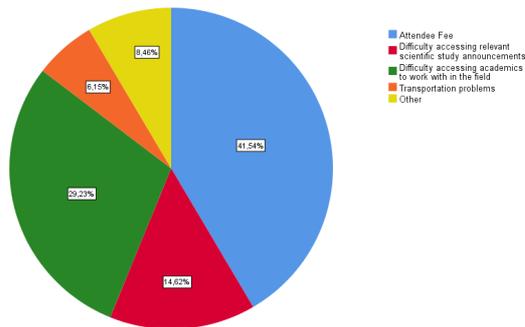


Figure 6. Challenges Encountered in Scientific Study

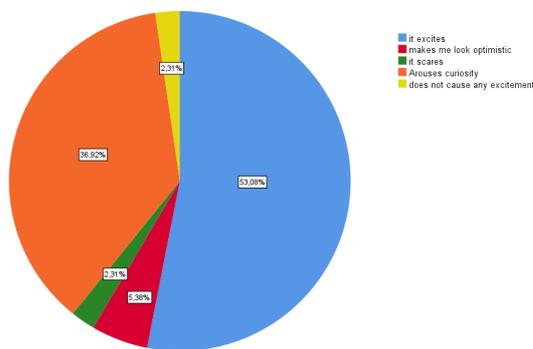


Figure 7. How does the increasing impact of artificial intelligence on our lives make you feel for the future?

lives make you feel about the future?" 53.1% of the participants stated that they were very excited, 36.9% of them stated that it aroused their curiosity, but 2.3% of them said it caused fear. (Figure 7). When we asked about their expectations for the next congress, 29.2% of the participants asked us to deal with the situation of the difficulty of accessing the academicians who will work together in the field. 26.2% stated that they wanted to learn more about machine learning and big data analysis, and 12.3% stated that personalized medicine should be mentioned more (Figure 8).

98.5% of congress participants think that the COVID-19 pandemic reveals the importance of artificial intelligence studies in the field of health, and all of the participants stated that they want to take part in an artificial intelligence-based project and want to take an active role in collaborations (Table 1).

Although there was a significant difference in terms of working time according to gender in the group participating in the congress ($p < 0.05$), there was no statistically significant difference in terms of having publications in the field of artificial intelligence according to gender ($p > 0.05$). (Table 2). There was no significant difference in the group participating in the congress in terms of working in the field of artificial intelligence according to the institutions ($p > 0.05$).

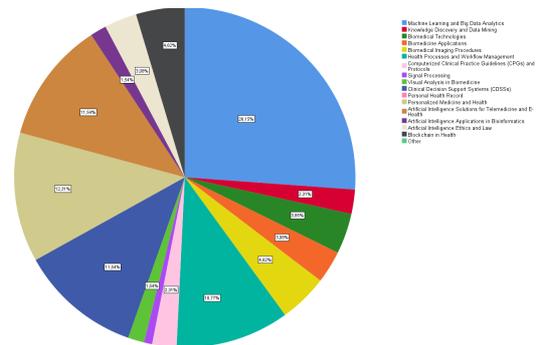


Figure 8. Is there any topic you wish to be in the next congress?

DISCUSSION

Health is of great importance, both personally and socially. Socially, health is at the center of welfare and prosperity. From an economic point of view, healthcare is one of the largest industries in the world. (12). Thanks to new technologies such as broadband internet and mobile communication technologies, wearable electronics, internet of things, cloud computing and robots, a great transformation is taking place in health. Thanks to the capabilities offered by these technologies, artificial intelligence and learning machines, they can become indispensable assistants of healthcare professionals in disease prevention, diagnosis, treatment and post-treatment services. For this reason, artificial intelligence is at the center of health technology research and development activities. Universities, health institutions and health technology companies, the number of which is increasing day by day, are investing billions of dollars in the field of artificial intelligence. The number of artificial intelligence applications in health is also increasing day by day (13).

The World Health Organization China Country Office reported cases of pneumonia of unexplained cause in Wuhan, Hubei Province, China, on December 31, 2019, and on January 5, 2020, a new coronavirus, which had not been detected in humans before, was identified. This disease, which was initially expressed as 2019-nCoV, was later named COVID-19, and after it emerged in China, it affected the whole world in such a short period like three months. The COVID-19 outbreak, which was declared a pandemic by the World Health Organization as of March 12, 2020 continues to threaten humanity physically, spiritually and socially (14).

It can be said that there are "special" measures for the health system that countries plan to protect and develop the capacity of their health systems. The fact of the future of digitalization in health is at the forefront of the areas that will experience the most radical change in health policies after the pandemic. Information systems, which have been widely and intensively used in the provision, financing, management and decision support systems of health services, will make significant progress in becoming a health service provider, decision maker and practitioner in the new era (15).

In our country, in order to benefit more from artificial intelligence and digital applications in epidemic management, Hayat Eve Sığar (HES) mobile application, developed by the Ministry of Health, has been downloaded to more than 18 million devices as of June 30, 2020. In addition to providing person-based tracking in the prevention of the epidemic, it has been constantly updated, enabling people to follow their families, demand for masks, and see the risk status in their regions (16). By developing tools based on machine learning in healthcare, new ways are sought in the fight against global epidemics (17). Canadian Blue Dot Company has successfully applied machine learning algorithms to detect outbreaks of COVID-19 in the Chinese city of Wuhan at the end of December 2019. Unlike traditional epidemiological forecasting methods, models based on big data have additional advantages such as adaptive learning, recalibration, flexibility, and estimation of the extent of improvement and effects based on a newer understanding of the disease process (18). Cellphone-based systems can be particularly useful in early detection of individuals to be quarantined. Artificial Neural Networks (ANNs) are used to predict antigenic regions with high-density binders (antigenic hotspots) in the viral membrane protein of acute respiratory syndrome of severe coronavirus. This information is crucial to the development of vaccines. To this end, the use of machine learning may allow rapid screening of the entire viral proteome, allowing for faster and cheaper vaccine development (19). The rapid development of technology is of great importance in humanity's fight against COVID-19.

While solving the world's complex health problems, we ask the question: "How can it be possible to provide personalized, reliable and sensitive health services that are easily accessible to everyone at low cost?" The number of those who answered this

question by "Giving more space to artificial intelligence applications in health" is increasing day by day. We organized the "II. International Congress of Artificial Intelligence in Health" themed "Artificial Intelligence Applications in Health in the Process of COVID-19 Pandemic" under the leadership of İzmir Bakırçay University and İzmir Provincial Health Directorate, with the contributions of the International Association of Artificial Intelligence in Health, via videoconference, on 16-18 April 2021 in order to include studies in this context and to shed light on the points that the future can reach regarding artificial intelligence in health. Within the scope of the congress, we wished to reveal the awareness of the participants about artificial intelligence applications in the field of health during COVID-19 Pandemic. During the congress, a scientific platform was provided for the concepts behind artificial intelligence in health to develop perspectives to propose common solutions to the global problems experienced in health services with today's technology. In this congress, where the application areas of artificial intelligence in health services were highlighted, the participants had the chance to listen to pioneering projects, new technologies and promising young researchers for the future thanks to the international and national scientists from different disciplines.

In the light of the data obtained from the questionnaire forms filled by the participants, we found that the age groups of the congress participants were not homogeneously distributed, and the 30-39 age group was more interested in the subject. We determined that the majority of the participants were women, with the highest participation in universities. It would also be appropriate to say that university staff turned the pandemic process into an advantage in terms of academic studies. When it was questioned whether the participants had academic studies on artificial intelligence, we found that the number of academicians who had academic studies on this subject was low, but all participants wanted to take part in activities in this field. Although the female gender was more in the group participating in the congress, we observed a significant difference in terms of working time in the field of artificial intelligence in favor of the male gender. We can say that the participants do not know much about the terminology in the field of artificial intelligence, and their interest in this field has increased especially in the last 1-3 years. For the scientific activities in the future, the participants stated that they would like to

be given more space on machine learning and the creation of a big data network, which we can perhaps call the basis of artificial intelligence in health, which was also included in this year's congress.

The pandemic has once again revealed the fact that digitalization in health will be one of the areas that will experience the most radical change in the policies of countries (20). The potential of artificial intelligence in health is huge, and therefore it is of great importance that it is in the focus of technology organizations as well as states, and especially the creation of large data networks and processing them in a way that will serve humanity.

CONCLUSION

We think that congresses, symposiums, courses and other meetings which will be organized in order to create awareness about the usage areas of developing artificial intelligence-based health technologies, to bring the disciplines together, to increase new communication and work networks, and to lay the groundwork for new studies in this field are especially necessary for scientists, and also, there are many volunteer participants from all walks of life, and there is a need for many activities in this field.

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Conflict of interests: The authors have no conflicts of interest to declare.

Ethical approval: This study was approved by the Izmir Bakircay University Non-Interventional Clinical Research Ethics Committee (Decision No: 211, Date: 04.03.2021).

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