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## ■ Original Article

# Perceptions about the COVID-19 disease and the vaccination of those arriving at a vaccination center are correlated with medical public health services management

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## ABSTRACT

**Background:** Perceptions of COVID-19 and vaccination depend on personal beliefs, experiences, and trust in health authorities' information. Cultural and social factors also influence perceptions. Effective government messaging can minimize barriers to vaccination.

**Methodology:** This cross-sectional research examines socio-demographic parameters related to risk factors, conducted using questionnaires at the vaccination center of Hippokrateio General Hospital of Athens, Greece (n=167), in the last quarter of 2022. Participants were asked to answer questions regarding the impact of the COVID-19 pandemic, a measurement tool for assessing good health status developed by the World Health Organization. The data were analyzed using IBM SPSS v26.

**Results:** The study found that women perceive vaccines to cause more harm than men, with younger individuals viewing the infection as harmless. Educational level also influences vaccine side effects and long-term harm. Perceptions of COVID-19 differ based on vaccination status.

**Conclusions:** This research confirms the link between socio-demographic variables and pandemic severity perception, emphasizing the importance of correlated with medical public health services management in enhancing communication strategies and creating effective vaccination campaigns.

**Keywords:** COVID-19 disease, public health, management, services, vaccination center, perceptions, medical

## INTRODUCTION

The coronavirus pandemic has been an unprecedented crisis for all people, as the last such situation can be traced back to the Spanish flu season almost a century ago [1]. Due to the relative state of complacency, preparation for the scenario of a pandemic was almost zero [2]. Already from the early phase of the pandemic it was widely accepted that mass vaccination of the general population would be the only way to bring the pandemic under control [1]. Therefore, the main “bet” concerned and continues to concern the effective implementation of a mass vaccination coverage worldwide, something that is significantly hindered by vaccine hesitancy [3].

The pandemic has been a factor that has led to a much greater degree to the digitalization of human communication. It is a fact that the digitization of human communication has been taking place for decades, with the prevalence of social networks now complete and affecting almost the entire population in developed Western countries. However, the pandemic was a catalytic factor in the expansion of the use of social networks and digital media, as during the lockdown period people’s communication began to take place to a much greater extent than in the past through them [1]. Clearly, the speed of this change does not mean that there was readiness for a smooth transition to the new digital era. A characteristic feature of digital communication during the pandemic is that it increasingly concerns issues related to human health, including vaccination. Therefore, greater importance began to be given to digital health literacy, i.e., the existence of these necessary digital skills that allow the acquisition of information on vaccination-related issues via the internet [4].

Vaccine hesitancy became clear already before the development of the COVID-19 vaccines that it would be one of the most key factors determining the success of the vaccination campaign and consequently determining the time horizon until the end of the pandemic [1]. It is a fact that the spread of fake news through the internet greatly hindered the success of the vaccination campaign [4, 5]. Therefore, addressing vaccine hesitancy and the factors that lead to strong online hesitancy is imperative to address the pandemic. This research examines vaccine hesitancy, the perceived impact of the pandemic, quality of life and digital health literacy in relation to all the above parameters. In particular, the research questions that were attempted to be answered in this study were the following:

1. Factors are related to the perceived impact of the pandemic, vaccination center correlated with medical public health management services, perceived health, and attitudes and perceptions about infection and vaccination.
2. The relationship between, perceived health, attitudes and perceptions about infection and vaccination and the perceived impact of the COVID-19 pandemic.

## COVID-19 PANDEMIC & VACCINATION

It is undeniable that during the 20<sup>th</sup> century there was an unprecedented change in the level of public health. Traditionally, the central challenge of public health has been communicable diseases. However, in the 20<sup>th</sup> century this situation changed, with non-communicable diseases becoming the focus of public health, as the incidence of diseases such as cancer and cardiovascular increased [6]. Since the beginning of the 21<sup>st</sup> century, there have been some signs of a relative risk of humanity returning to this previous situation, i.e., at a time when communicable diseases will once again pose a significant threat. In November 2002, the crisis of the SARS virus began in the countries of Southwest Asia, a virus that was initially detected in China and then spread to 37 countries, leading to more than 800 deaths and 8,000 cases [7]. The next decade saw three similar health crises, but they were also local in nature. The first related crisis concerns the MERS coronavirus, which was detected in the Arabian Peninsula and South Korea but did not lead to a larger crisis being not highly contagious [8]. The second crisis concerns the Ebola virus, which experienced a significant outbreak in sub-Saharan African countries in the mid-2010s [9]. The third related crisis concerns the Zika virus, which also in the middle of the previous decade led to major public health crises in South America [10]. All the above crises were characterized by local character and never led to a pandemic. However, the case of H1N1 should also be mentioned, the spread of which took place globally, because of which the World Health Organization (WHO) put the planet in a state of pandemic on June 11, 2009, which ended after 10 months [11]. Against this background, the COVID-19 pandemic developed following several crises that were already early signs of a return to the risk of communicable diseases. However, it is a fact that humanity’s preparedness against the scenario of a pandemic was particularly low [1]. The onset of the COVID-19 pandemic is dated to early December 2019 in Wuhan, Hubei Province, China. The following months saw a significant spread of the virus globally, forcing WHO to declare a pandemic [12]. In our country, the rapid adoption of measures at the level of

public health led to effective control of the relevant crisis during its first phase of development, which can also be attributed to the high level of compliance of the Greek population with the measures decided by the government [13]. However, since the second wave of the pandemic, dating back to August 2020, the health system has been put under significant pressure, with a corresponding increase in coronavirus deaths [14]. Now, the pandemic has entered a new phase, as from the end of 2020 onwards the administration of vaccines against COVID-19 began worldwide. In our country, the significant increase in vaccination coverage led to a more effective response to the Pandemic, although there was quite a high hesitancy towards vaccination by the general population [15]. Even before the development of vaccines, it became clear that mass vaccination of the general population is the only way to end the pandemic [1]. The use of supercomputers and artificial intelligence has led to the rapid development of the COVID-19 vaccines in a way that would have been unfeasible in the past [16]. The vaccines developed to tackle the coronavirus fall into four main categories [17]:

1. Vaccines for inactivated or attenuated viruses, which utilize a form of the virus that has been inactivated or weakened to an extent that does not cause disease but nevertheless leads to a strong immune response.
2. Protein-based vaccines, which safely exploit protein fragments or protein shells that mimic the virus to lead to significant immune responses.
3. Vaccines that have a viral load but harness a safe virus that cannot lead to infection, serving as a platform to produce proteins to develop a robust immune response.
4. Vaccines based on DNA and RNA technologies, i.e., utilizing modified DNA and RNA to produce proteins that safely trigger relevant immune responses.

Perceptions of lockdown were also examined through a recent study in France in March 2020. In this survey, it was found that there was generally an agreement of the general population with the lockdown policy. However, this is not the case for the whole sample, as people with a particularly low socioeconomic level had a negative assessment of the relevant policy. This may be because people with a particularly low socio-economic level have been affected to a much greater extent by the policy. For example, as some people with low socioeconomic status were working in the informal economy, they could not receive compensation when they were suspended [18]. The ability of governments to deal with the relevant crises is a third type of perception that were studied during the early phase of the pandemic.

Another level of perception in this period has to do with participants' optimism about how the coronavirus problem will be tackled in the future. In a related study in central China, a sample of 508 people was examined between February and March 2020. This survey included students, health professionals and people in the general population. It was found that in all three groups more than 90.0% of respondents expressed confidence that the coronavirus crisis will become manageable in the future [19]. Another level of perceptions examined in this period of the pandemic concerns participants' attitudes towards a potential vaccine to tackle the coronavirus.

In Greece, vaccine hesitancy was examined through a relevant study conducted between November 2020 and May 2021. In this study, an attempt was made to examine whether vaccination intent varied over time. It was found that in the participants included in the survey in November 2020, the vaccination intention was 67.6%. However, among participants included in May 2021, vaccination intent was 84.8%. In addition, participants who were aged 65 or older had a higher intention to vaccinate. This research also found a strong effect of factors traditionally associated with vaccine hesitancy, such as female gender, low educational attainment, and young age [20]. In this research study, various perceptions were studied and not as much emphasis was placed on traditional sociodemographic factors associated with vaccine hesitancy. It was found that greater perceived severity of COVID-19, more knowledge on the part of participants, trust in vaccines and in the scientific community were associated with greater vaccination intent.

## METHODOLOGY

The purpose of this research was to investigate citizens' attitudes and opinions towards the COVID-19 disease and vaccination. The specific objectives include understanding how the population perceives this disease and vaccination, and investigating how they are adequately informed about vaccines, their attitudes towards general vaccination and vaccination against COVID-19 and the impact on society of the opinion of those who are negative towards vaccination in general.

## Research Aims

1. The attitudes and perceptions of the population regarding COVID-19.
2. The attitudes and perceptions of the population about vaccination.
3. The role of medical public health management services in vaccination center.

This study was quantitative and cross-sectional. Quantitative surveys are those in which measurements are made using numerically analyzed data, such as the reference questionnaire, cross-sectional surveys refer to those in which measurements are made at a single time. Therefore, this survey was quantitative and cross-sectional, since all measurements were carried out using questionnaires at a single point in time. The survey participants were N=167 participants in the general population. The criterion for inclusion in the survey was that the participating adults should be present for vaccination against COVID-19 in a Public General Hospital of Hippokrateio, Greece. The data collection of survey data was carried out using a self-report questionnaire. The relevant measuring tool is set out in the Annex. Initially, participants were asked questions related to the impact of the COVID-19 pandemic. There were 15 questions, and the answers were given on a five-interval Likert-like scale. The Cronbach index for this leg was 0.85. The second part of the questionnaire that participants were asked to complete concerned digital health literacy and included 10 questions with answers on a 5-space Likert scale. The Cronbach index for this leg was 0.76. The third part of the questionnaire consisted of questions assessing attitudes and perceptions about coronavirus infection and vaccination. This part consisted of 11 sub-questions.

These questions were either answered "Yes and No" or scored on a 7-span Likert scale. In addition, the measurement tool for assessing good health status developed by WHO was administered. This measurement tool consists of five sub-questions, scored on a Likert-like scale with values from 0 to 5. For this leg the Cronbach index was 0.83. The last part of the questionnaire included sociodemographic data related to the gender of the participants, their age, their educational level, the vaccine doses they have completed and the formulation with which they have been vaccinated.

The questionnaires of this survey were administered to people who came to the vaccination center of the "Hippokrateio" hospital. Participants were approached at their vaccination appointments and explained the nature and purpose of the study. In case they wished to participate, then they were given the questionnaires that were

completed at the same time. Participants stressed the anonymity and confidentiality of their participation, and that the data would be used for research purposes only. Before the start of the study, permission was obtained from the scientific council of the hospital, where the study was carried out.

The data analysis of this survey was performed using the program SPSS (IBM), version 26 for Windows. More specifically, descriptive statistical analysis was initially performed on the examined variables, using mean values and standard deviations for quantitative variables and absolute values and percentages for categorical variables. Subsequently, the regularity of the distribution of quantitative variables of the survey was studied to decide on the use of parametric or non-parametric analyses. In the case, where the regularity of the distribution was not violated, the analyses were performed using independent sample control, variance analysis, and Pearson correlation coefficient, while in the case, where the regularity of the distribution was violated, the analyses were performed using Mann-Whitney U test, Kruskal Wallis, and Spearman's correlation coefficient, and one-way ANOVA test. In addition, relationships between categorical variables were examined using Chi-square. The significance index was set at 0.05 for all analyses.

## RESULTS

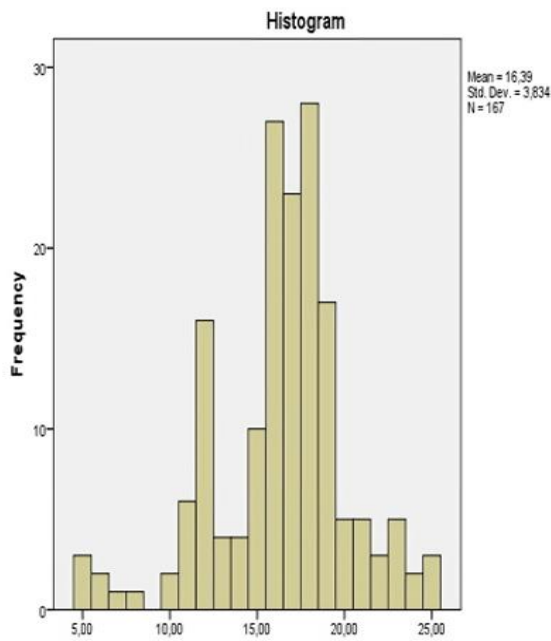
Equal distribution of the individual age groups in the examined sample, without any proportionally much higher or much lower value compared to the rest. The lowest frequency was for participants under 30 years of age (10.2%) and the highest of all participants aged 41-45 years (19.2%). Also, the distribution of participants according to their educational level is presented.

The frequency of vaccination doses received by participants is presented. As can be seen from **Table 1**, 77.8% of the examined course had completed all three doses.

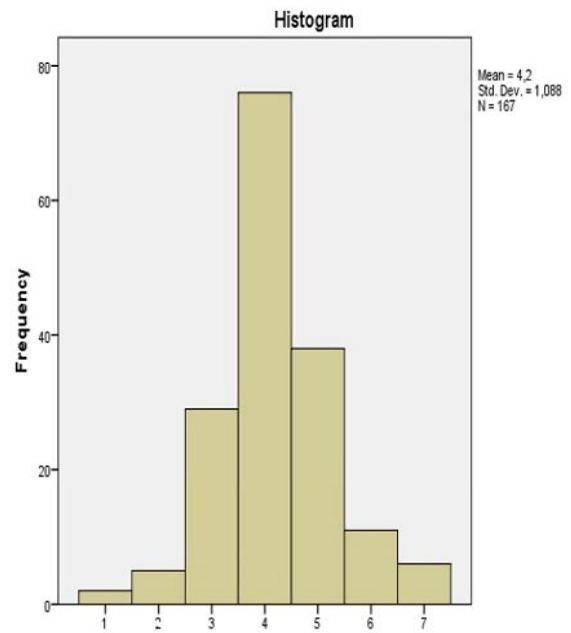
The distribution of participants according to the formulation with which participants were vaccinated is presented. As can be seen from **Table 1**, many participants had been vaccinated with the Pfizer formulation (70.1%).

**Table 1.** Preparation with which have been vaccinated

Name	Frequency (n)	Percentage (%)	Valid percentage (%)	Cumulative percentage (%)
AstraZeneca	7	4.2	4.2	4.2
Johnson & Johnson	21	12.6	12.6	16.8
Modern	22	13.2	13.2	29.9
Pfizer	117	70.1	70.1	100
Total	167	100	100	



**Figure 1.** Histogram with total score of participants, mean & standard deviation score=3.834 (Source: Authors’ own elaboration, using IBM SPSS v26)



**Figure 2.** Histogram with total score of participants, mean & standard deviation score=1.089 (Source: Authors’ own elaboration, using IBM SPSS v26)

**Figure 1** and **Figure 2** show histogram with total score of participants, mean, and standard deviation scores.

**Table 2** shows the check for the regularity of the distribution of quantitative variables in the survey. As can be seen from **Table 2**, in all the relevant cases the regularity of the allocation was breached, presents the descriptive analysis

for the quantitative variables of the study, based on mean values and standard deviations.

**Table 3** shows the gender differences of study participants, based on the Mann-Whitney U test. As can be seen from **Table 3**, the perception that vaccines cause long-term considered it useless or dangerous. Further details are presented in **Table 3**.

**Table 2.** Perceptions of COVID-19 impact, perceived tests of normality, & significance correction

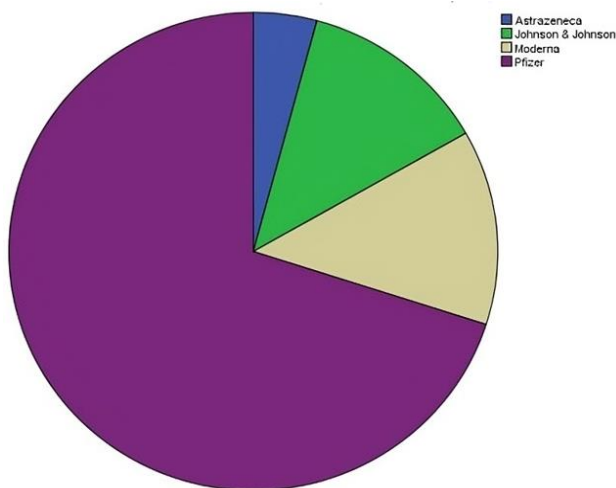
	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
COVID-19 infection is just a flu-like illness & generally harmless	0.260	167	0.000	0.888	167	0.000
People should not be afraid of COVID-19 infection	0.232	167	0.000	0.895	167	0.000
Vaccines have side effects	0.185	167	0.000	0.940	167	0.000
Vaccines cause long-term damage	0.243	167	0.000	0.906	167	0.000
Perceived impact of pandemic	0.081	167	0.009	0.963	167	0.000

**Table 3.** Preparation with which have been vaccinated

Variations in quantitative variables related to vaccine safety, vaccination intention, digital health literacy, & participants’ gender-specific perceived health status	Sex	n	Mean	Standard deviation	p-value
COVID-19 infection is just a flu-like illness & generally harmless.	Man	84	2.600	1.019	0.065
	Woman	83	2.930	.947	
People should not be afraid of COVID-19 infection.	Man	84	2.900	.926	0.352
	Woman	83	3.040	.890	
Vaccines have side effects.	Man	84	3.570	1.562	0.083
	Woman	83	3.980	1.269	
Vaccines cause long-term damage.	Man	84	4.040	1.156	0.038
	Woman	83	4.360	.995	
Have you ever refused a vaccine for yourself or a child because you considered it useless or dangerous?	Man	84	2.290	1.082	0.009
	Woman	83	1.880	.861	
Have you ever postponed a vaccine recommended by a doctor?	Man	84	1.940	.923	0.289
	Woman	83	1.710	.553	

**Table 3 (Continued).** Preparation with which have been vaccinated

Variations in quantitative variables related to vaccine safety, vaccination intention, digital health literacy, & participants' gender-specific perceived health status	Sex	n	Mean	Standard deviation	p-value
Have you ever given a vaccine to a child or yourself despite doubts about its effectiveness?	Man	84	1.790	1.042	0.057
	Woman	83	1.480	.651	
Perceived impact of pandemic	Man	84	46.523	8.612	0.138
	Woman	83	48.530	7.482	
Perceived health status	Man	84	16.523	3.558	0.937
	Woman	83	16.253	4.110	



**Figure 3.** Vaccinations percentage with which type of vaccine (Source: Authors' own elaboration, using IBM SPSS v26)

The corresponding analysis regarding the perception and percentage of vaccination of long-term harm of vaccines is presented in **Figure 3**.

1. Pfizer/BioNtech's Comiranty vaccine was granted emergency use authorization in December 2020.
2. AstraZeneca/AZD1222 was licensed in February 2021.
3. Johnson & Johnson's Janssen/Ad26.COV 2.S.
4. Moderna and Sinopharm vaccines also received authorization in March 2021.

This results in increased population immunity in the first months of 2021. The relationship between the formulation with which participants have been vaccinated and their studies or work in a crowded space, an analysis carried out through a Chi-square test.

**DISCUSSION**

Several studies, articles, and papers presented at international conferences have been published in recent years on the organizational characteristics and sociopsychological hazards in the workplace of public health services in Greece and how these influence employees [21-27].

Authorities oversee overseeing public health audit services [28-33]. Employee discontent with their occupations, as well as the need for training and higher education among public health personnel, are other factors influencing performance and the delivery of high-quality services to society. Political and administrative pressures, paired with metropolitan and semi-urban surroundings, have a negative impact on public health service delivery. The operation of public health services suffers as a result, as was especially evident during the COVID-19 pandemic [21-23, 27, 28, 33, 34].

Political initiatives impact and increase employee burnout. Leadership in the service sector is crucial for guaranteeing the efficient operation, transparency, and government control of Greece's administrative apparatus, as well as the consequences of climate change [35, 36]. The current pandemic has brought about structural changes in a multitude of parameters for modern societies [1]. In this context, this research focused on examining the perceived impact of the pandemic, digital health literacy and perceived health status on a sample of the general population. Based on the analyses carried out, several key findings can be drawn. First, women think vaccines cause harm to a greater extent than men in the study. However, men are more likely to have refused any of the recommended vaccines for themselves and their children. The finding of more intense hesitancy on the part of women is consistent with the previous literature. For example, a related study in France found that women were more vaccine hesitant than men [37]. However, this study also highlights a broader vaccine hesitancy among men, which generally concerns vaccines rather than those developed to treat COVID-19. Therefore, this study highlights vaccine hesitancy as an issue that affects men and women differently. A fourth finding of the research has to do with the differentiation of perceptions about COVID-19 based on the vaccination status of participants. In general, it appears that participants who have received only one dose of vaccine are more likely to consider vaccines to have side effects and cause long-term harm. In addition, these perceptions are found to a greater extent in those who have

been vaccinated with the AstraZeneca preparation. It is a fact that this vaccine was associated with particularly intense side effects, which eventually led to the restriction of its use by European countries [38]. Another finding of the study has to do with the relationships between the perceived impact of the pandemic and digital health literacy. The correlation between these two variables is positive and statistically significant. Therefore, it can be assumed that people who possess skills that allow them to reliably obtain online information about the coronavirus perceive the coronavirus pandemic and infection as something more serious than others. It could be considered that the information time these people spend searching for relevant information, as well as the reliability of the information they find, lead to a realization of the importance of the pandemic problem. Access to reliable sources of information to understand the importance of the situation emerged already in the early phase of the pandemic [1, 37, 38]. Therefore, the findings of this research are consistent with previous literature. In any case, this study encounters certain limitations that prevent any findings from being reached through this research. A first relative limitation has to do with the size of the sample tested. From a methodological point of view, the calculation of the necessary sample size of a survey should be carried out using sample size calculation formulas to eliminate the risk of type 1 and type 2 error, concerning the incorrect rejection and acceptance of the null hypothesis, respectively [39]. Therefore, the risk of statistical error cannot be excluded in this study.

Finally, there is a need to further examine gender vaccine hesitancy. Although it is widely accepted that women are distinguished by greater hesitancy to vaccinate, this study also recorded some relative differences on the part of men. Therefore, it is imperative to further investigate individual parameters of vaccine hesitancy in both sexes. In addition to proposals for future research, some proposals should be made regarding the promotion of the vaccination campaign in our country. As can be seen from the above, those who had been vaccinated with the AstraZeneca formulation seem to constitute a distinct group compared to all others, distinguished by greater fear of possible side effects and long-term negative effects of vaccines [38]. This is therefore a group that requires a completely different approach, placing greater emphasis on addressing fears about vaccination and highlighting the safety and efficacy of other vaccines. A second relevant proposal has to do with focusing the vaccination campaign on younger age groups. It is found that people in younger age groups are more hesitant towards vaccination compared to the rest. Therefore, it may

be considered necessary to adopt a different rhetoric to promote the vaccination campaign in this age group.

Finally, a third relevant proposal concerns the targeted reversal of fears that may concern vaccine hesitancy among women. Women have greater fears about the side effects of vaccines. This fear may be linked to related distortions about the effects of coronavirus vaccines on pregnancy, as a relative phobia of negative effects of this nature prevails [40, 41]. Therefore, the vaccination campaign towards women may need to focus on addressing any relevant distortions. Important role plays the fast diagnosis of COVID -19, the importance of machine learning in diagnostic methods [42]. Job satisfaction levels are critical in managing the pandemic because they have a negative impact on the medical working environment [43]. Finally the key significance of digital health literacy in determining the severity of the situation during the pandemic's impact on quality of life [44, 45, 46].

## CONCLUSIONS

This research examined parameters in relation to the perceived impact of the pandemic, perceptions about the disease of COVID-19, and correlated with medical public health services management. As shown by the analysis carried out, people who perceive the threat of the relevant pandemic more strongly are also distinguished by higher health education. But perceived health status is not related to the perceived impact of the pandemic. This research also confirms previously known relationships between sociodemographic variables and vaccine hesitancy, in terms of age, educational level, and gender. This study improves the population's facts-based attitudes and perceptions of COVID-19 and vaccinations. The very important role of medical public health management services and policies is imperative that all necessary actions be taken to avoid a negative impact on the medical working environment as well as the promotion of health of the population.

**Author contributions: IPA, ANB, & MMM:** conceptualization, data curation, investigation, methodology, resources, software, writing—original draft, writing—editing, validation, visualization, conception/design, data collection, data interpretation, drafting the article, & critical future revision of the article & **IPA:** supervision, project administration. All authors approved the final version of the article.

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**Ethical statement:** The authors stated that ethical approval of this study was carried out in accordance with the rules and current bioethics legislation, all the conditions and specifications of the National and European Union Legislation for the protection of personal data as well as in accordance with the instructions of quality assurance and the study was carried out according to the Declaration of Helsinki. The authors uphold high ethical standards in this study. The authors further stated that a positive recommendation and approval for the

conduct of the above-mentioned research has been granted by the Scientific Committee of the Ethics Board and Research and Protocols Committee of the Hellenic Republic Public General Hospital of Athens Hippokrateio (E.S. 3/28-12-2021). Statements that the participants consented to participation and publication were given to all participants, where they signed the statement mentioned in the questionnaire of the relevant survey.

**Declaration of interest:** Authors declare no competing interest.

**Data sharing statement:** Data supporting the findings and conclusions are available upon request from the corresponding author.

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