Knowledge, attitudes, and perceptions regarding COVID-19 outbreak in Greece in September 2020: a cross-sectional web-based survey

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Abstract

Background: Decreasing the transmission rate of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is related to people's knowledge, attitudes, and perceptions towards the novel coronavirus. Our study investigated the above factors aiming at pandemic's successful management.

Methods: A web-based survey was conducted among the general Greek population from 11th September to 7th October 2020 after institutional ethics approval, using a non-probability, convenience sampling method. The survey consisted of socio-demographic, knowledge, attitude, and perception questions towards coronavirus disease 2019 (COVID-19). Statistical analyses conducted were appropriate according to the type of variable and the research question.

Results: We collected a total of 9,309 questionnaires with a completeness rate estimated at 98.3 %. The median knowledge score regarding COVID-19 was 72.7 %, exhibiting variation depending on socio-demographic subgroups. Individuals were better informed about coronavirus modes of transmission (86.4 %). The acceptance of the COVID-19 vaccine among the general population was 25.9 %, while 43 % of participants remained undecided about being vaccinated. A significant part of the respondents experienced a health issue for which they had to visit a hospital, but they did not do so due to the fear of possible infection by SARS-CoV-2.

Conclusions: Our findings suggest a moderately high level of knowledge in the Greek population towards COVID-19 at the study time. Educational programs, health actions, and vaccination campaigns are essential for filling knowledge gaps in particular demographic groups, such as the low educated and over 65 years old people. Interventions may be needed for the National Healthcare System to recover citizens' confidence. Measures strengthening individual wellbeing and social solidarity during the pandemic should also be of high priority. HIPPOKRATIA 2021, 25 (1):15-21.

Keywords: Coronavirus disease 2019, COVID-19, knowledge, attitudes, perceptions, survey, Greece

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Introduction

In Greece, the first coronavirus disease 2019 (COVID-19) case was reported on the 26th of February, 2020[1]. In late March, the prime minister announced a nationwide lockdown to prevent and control the spread of the novel virus in the country[2]. According to the World Health Organization (WHO) recommendations[3], movement restrictions, social distancing, the obligatory use of facemasks, and the closure of gathering places, such as schools and malls, were among the measures imposed. The lifting of the restriction measures started on the 4th of May, after efficient management of the first wave of the pandemic[4]. A significant increasing trend regarding the number of confirmed COVID-19 cases and deaths was observed in early September 2020. The Greek authorities aimed to protect public health and control the upcoming second wave of COVID-19, imposing region-based restriction measures. Concurrently, a series of nationwide measures were also introduced, including the obligatory use of facemasks in closed public spaces, the operation of schools and universities with precautionary measures, and the prohibition of gatherings of more than 50 people[5]. As shown in cases of previous viral diseases outbreaks, apart from the preventive measures, the public's awareness/knowledge with regards to the transmission modes of the virus seem to be vital in eliminating its spread in the community[6,7]. In Greece, a few knowledge and attitudes assessment studies were conducted during the first wave of the pandemic, showing moderate-high levels of knowledge about COVID-19 both in the general population and health care professionals[8-10]. These high knowledge scores were associated with positive attitudes and practices toward the implemented prevention measures. Good knowledge was probably an important factor for the successful management of the pandemic in Greece.

Frequent monitoring of a population's awareness, attitude, and perception patterns regarding COVID-19 is considered necessary for effective planning prevention

strategies for the most vulnerable community members. In this perspective, the present study aimed to assess how the Greek public's knowledge, attitudes, and perceptions towards the pandemic changed between the end of the first and the onset of the second wave. This is the first study, to our knowledge, depicting the public's COVID-19 knowledge and perception in Greece at this particular time. It is also the first study considering parameters not addressed in previous works, such as Greeks' perception of the responsibilities of particular groups of people for transmitting the virus or their trust in the national healthcare system. Our purpose was to identify knowledge gaps and misconceptions to provide useful insights for developing and applying interventions targeting particular demographic groups.

Materials and methods

Study design and sampling method

A pilot study was carried out among 270 randomly selected individuals before the questionnaire was administered to estimate the response rate for the full-scale study. A total of 94 fully completed questionnaires were returned to us, indicating a response rate close to 35 %. The sample size was calculated considering the above response rate, 95 % confidence level, 1 % margin of error, and the Greek population's size (10,400,824 individuals)[11]. The estimated sample size was 8,732 participants[12]. Our full-scale analysis did not contain the findings of the pilot study.

Due to the implemented prevention measures against the spread of COVID-19, an online structured questionnaire was developed in Greek using Google forms (Google, Mountain View, CA, USA) instead of a paper-based one. According to recent data from the Hellenic Statistical Authority, a significant percentage of the Greek population has access to the internet[13]. Non-probability convenience sampling was considered an appropriate sampling method for the present study. The survey link was sent via email to schools, universities, municipalities, hospitals, administration, and other public services, and it was also shared with public groups on social networking sites.

This study was approved by the Ethical Committee of the School of Medicine of the Aristotle University of Thessaloniki (Reference No 6265, date: 06/2020).

Questionnaire design

The guidance for behavioral insights studies provided by the WHO's regional office for Europe was used as a primary source for our survey instrument[14]. The items selected were adjusted to Greece's situation regarding the pandemic at the time of the study. Moreover, the researchers added additional questions related to some controversial issues, such as the responsibility of particular demographic groups for the spread of the virus or people's trust in the national healthcare system during the pandemic. The final version of the questionnaire consisted of closed, multiple-choice questions with single- or multi-select answer options. The full form of the questionnaire is provided in the supplemental material. It included six socio-demographic questions, 11 questions regarding people's knowledge about the COVID-19, 14 questions about their attitudes (six regarding their behavior and eight regarding their psychology and wellbeing), and 16 questions about their perceptions of issues related to the pandemic. A total score of correct answers (converted to the percentage scale) was estimated for the knowledge questions, assigning one point for each correct and zero for incorrect answers. Informed consent was included in the initial section of the survey. Only participants having read the consent and accepted to participate in the survey could proceed. Participants were permitted to withdraw from the survey at any time by not submitting their form. During data collection, storage, and analysis, anonymity, privacy, and confidentiality were protected.

Statistical analysis

Statistical analysis was performed using Jamovi (The Jamovi project, Sydney, Australia). The frequencies, percentages, medians, and interquartile range were used to describe the data. Non-parametric tests (Mann-Whitney U and Kruskal-Wallis H) were applied to compare the mean of knowledge score among participants' socio-demographic groups. Univariate linear regression analysis was performed, selecting variables related to attitudes and perceptions towards COVID-19 pandemic as predictors and knowledge score as the dependent variable to identify factors associated with knowledge. Multivariate analysis was also developed using socio-demographic characteristics as predictors and knowledge score as the dependent factor to examine whether the above characteristics were related to the level of awareness. Collinearity checks of possible interactions between the independent variables were also conducted. Binomial logistic regression was used to determine the relationship between socio-demographic and binary variables (usual agreement versus disagreement). A p-value of less than 0.05 was considered statistically significant.

Results

Sample size and questionnaire reliability

A total of 9,309 questionnaires were collected between the 11th of September and 7th of October 2020. Among the respondents, 153 individuals did not consent to participate in the study, and six participants did not fill appropriately the survey form indicating a completeness rate equal to 98.3 %. On account of this, they were excluded, and 9,150 completed questionnaires were finally used for the analysis. Cronbach's alpha values were calculated to assess the instrument's internal consistency. The values for knowledge, attitudes, and perceptions were 0.86, 0.70, and 0.81, respectively. The overall Cronbach's alpha coefficient for the survey was 0.92, indicating an acceptable internal consistency.

Socio-demographic data

The gender ratio in the study population was approxi-

mately one male to two females. Most respondents had a bachelor's degree (41 %) and belonged to the age group of 40-65 years (66.4 %), while people aged over 65 had the smallest participation among the age classes (3.6 %). Less than 40 % of the participants lived in one of the two largest Greek cities, namely Athens and Thessaloniki, and an almost equal proportion (37.6 %) reported having an underlying medical condition. The minority of the participants were healthcare professionals (5 %), whilst the majority worked in other sectors (70.9 %).

Knowledge regarding COVID-19

Moderate-high total knowledge scores (median: 72.7 %) were found in the study population. Higher knowledge levels were observed concerning the modes of COVID-19 transmission (86.4 % of participants' answers were correct). Knowledge score values differed signifi-

cantly (p <0.001) among the socio-demographic groups (Table 1). The univariate linear regression analysis findings showed that the knowledge scores of people willing to get vaccinated were higher than those of the unwilling and undecided (p <0.001). Similarly, higher knowledge scores were associated with a more considerable trust in scientists (p <0.001) and attitude toward the operation of schools with preventive measures (p <0.001) (Table 2). Being female, between 40-65 years old, having an underlying health condition, residing in Thessaloniki, being a university student, or having a doctorate were significantly linked to higher knowledge scores (p <0.001). Conversely, being male, above 65 years old, and undereducated was strongly associated with poor knowledge (p <0.001) (Table 2). Collinearity checks confirmed the lack of interaction between the predictor variables.

Table 1: Univariate analysis of population characteristics (n: 9,150) and knowledge score regarding COVID-19.

Characteristics	Size of subgroups		Knowledge score		p-values
	n	%	Median	IQR	
Gender					<0.001
Male	3,046	33.5	72.4	18.2, 81.8	
Female	6,057	66.5	72.7	54.5, 81.8	
Age group (years)					<0.001
Under 18	632	6.9	36.4	9.09, 72.7	
18-39	2,111	23.1	72.7	54.5, 90.9	
40-65	6,067	66.4	72.7	54.5, 81.8	
Over 65	325	3.6	41.3	9.09, 72.7	
Geographical Region					<0.001
Athens	1,986	21.9	72.7	54.5, 90.9	
Thessaloniki	1,559	17.2	72.7	54.5, 90.9	
Other	5,518	60.9	72.7	45.5, 81.8	
Education					<0.001
Elementary school diploma	50	0.5	45.5	18.2, 72.7	
Junior high school diploma	672	7.4	18.2	9.09, 63.6	
High school diploma	1,761	27.2	54.5	9.09, 81.8	
Bachelor's degree	3,745	41.0	72.7	63.6, 81.8	
Master's degree	2,449	26.8	81.8	63.6, 90.9	
Doctorate	309	3.4	81.8	72.7, 90.9	
Other	149	1.6	63.6	45.5, 81.8	
Job Status					<0.001
Primary/secondary school student	636	7.0	45.5	9.09, 72.7	
University Student	662	7.2	81.8	63.6, 90.9	
Health Professional	458	5.0	81.8	63.6, 90.9	
Working in another sector	6,478	70.9	72.7	54.5, 81.8	
Other	898	9.8	63.6	9.09, 72.7	
Underlying medical conditions					<0.001
Yes	3,444	37.6	72.7	54.5, 81.8	
No	5,706	62.4	72.7	45.5, 81.8	

Knowledge score represents the number of participants' correct answers to the survey's knowledge questions regarding COVID-19 expressed on a percentage scale (range: 0-100). Knowledge score is not normally distributed. Complying with the General Data Protection Regulation, the completion of all demographic characteristics was not requested as mandatory for the participants in the questionnaire. Any completed questionnaire with more than three blanks (missing data) in demographic characteristics was excluded from the analysis. n: number of answers, %: percentage of each answer, IQR: interquartile range, p-values refer to the comparison of knowledge scores between subgroups of each socio-demographic factor using Mann-Whitney U and Kruskal-Wallis H tests.

Table 2: Linear regression using participants' attitudinal/perceptual characteristics (univariate analysis) and socio-demographic factors (multivariate analysis) as predictors of COVID-19 knowledge scores.

Predictors	Diff	95 % Cl	p-values
Univariate linear regression			
Do you want to get vaccinated for the novel coronavirus? (undecided vs. yes)	-10.4	(-11.5, -9.3)	<0.001
Do you want to get vaccinated for the novel coronavirus? (no vs. yes)	-43.9	(-45.1, -42.7)	<0.001
To what extent do you trust scientists to create a safe and effective vaccine for the novel coronavirus? (to a great extent vs. not at all)	61.4	(60.2, 62.5)	<0.001
School units should operate without any preventive measures against novel coronavirus (agree vs. disagree)	-60.6	(-61.7, -59.5)	<0.001
Multivariate linear regression			
Gender (male vs. female)	-3.17	(-4.23, -2.10)	<0.001
Age group (under 18 vs. over 65 years old)	9.04	(3.86, 14.22)	<0.001
Age group (18-39 vs. over 65 years old)	8.57	(5.51, 11.64)	<0.001
Age group (40-65 vs. over 65 years old)	9.57	(6.74, 12.41)	<0.001
Geographical Region (Athens vs. other)	2.16	(0.95, 3.36)	<0.001
Geographical Region (Thessaloniki vs. other)	4.70	(3.37, 6.04)	<0.001
Education (elementary school diploma vs. bachelor's degree)	-28.91	(-35.66, -22.16)	<0.001
Education (junior high school diploma vs. bachelor's degree)	-43.21	(-46.31, -40.11)	<0.001
Education (high school diploma vs. bachelor's degree)	-28.37	(-29.84, -26.89)	<0.001
Education (other vs. bachelor's degree)	-14.84	(-18.68, -11.00)	<0.001
Education (master's degree vs. bachelor's degree)	4.98	(3.77, 6.19)	<0.001
Education (doctorate vs. bachelor's degree)	9.10	(6.38, 11.82)	<0.001
Job status (primary/secondary school student vs. university student)	-14.76	(-19.25, -10.27)	<0.001
Job status (health professional vs. university student)	-24.04	(-27.15, -20.93)	<0.001
Job status (working in other sector vs. university student)	-31.30	(-33.68, -28.92)	<0.001
Job status (other vs. university student)	-34.53	(-37.31, -31.76)	<0.001
Underlying medical conditions (no vs. yes)	-4.61	(3.58, 5.64)	<0.001

Diff depicts the difference in knowledge scores. Knowledge score is the number of participants' correct answers to the survey's knowledge questions regarding COVID-19 expressed on a percentage scale (range: 0-100). Cl: confidence interval, vs.: versus.

Attitudes towards COVID-19

In total, 63.3 % of participants answered that they were willing to self-isolate for a while if they had a fever or cough, and 77.5 % of them reported a correct use of the facemask. Only one in four participants (25.9 %) was willing to get vaccinated against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), while a more significant proportion (43 %) remained undecided. Healthcare professionals were more positive regarding vaccination against SARS-CoV-2 than those working in other sectors (data not shown). During the pandemic, 5.5 % of respondents experienced a health problem requiring them to attend a hospital/health center; however, one out of four never attended due to fear of possible SARS-CoV-2 infection. Most of them referred that their health problem eventually proved to be severe. Also, one in three discussed issues related to the novel coronavirus with their family and friends very often. Almost 27.8 % of respondents mentioned a reduced need for socializing.

Perceptions of COVID-19

Our study showed that 67.3 % of participants trusted scientists for the production of a safe and effective vaccine against the novel coronavirus, 73 % of them agreed with the imposed restriction measures for the elimination of the SARS-CoV-2 spread, and almost half of them thought measures had been implemented mainly to prepare the National Healthcare System for the impending health crisis. In contrast, almost 9.2 % of the respondents considered measures as restrictions of people's freedom or unnecessary. According to the binomial logistic regression results (Table 3), this perception was significantly associated with lower education (p <0.001). A total of 46.9 % of participants mentioned that school units should operate with mandatory protective facemasks for students, teachers, and other school staff members, while only 14.3 % of them believed these measures were unnecessary. People of younger ages tended to consider the elderly as responsible for the spread of COVID-19 (p =0.006), while older people thought youngsters were

responsible for the increase in the reported COVID-19 cases (p =0.008) in Greece at the time the study was performed (Table 3).

Discussion

Here we report the largest web-based survey regarding the knowledge, attitudes, and perceptions towards COVID-19 after the first phase of the pandemic in Greece. The overall knowledge score demonstrated that most of the participants were knowledgeable about CO-VID-19 (overall median score: 72.7 %) at the time of the study (September 2020). This is in agreement with the results from other studies conducted during the first wave of the pandemic, in May, in Greece or elsewhere[8,9,15]. The general Greek population's overall knowledge levels regarding the COVID-19 pandemic did not change significantly in the time between May and September 2020. Despite the good level of knowledge regarding CO-VID-19, notable differences in the scores related to the participants' educational level, age, and occupation were observed. The association of high knowledge scores with higher education levels is consistent with the findings in a corresponding study[15]. Nevertheless, a gap of knowledge regarding the COVID-19 pandemic was observed in males and older people. Lower knowledge scores for these demographic groups have also been reported elsewhere, probably indicating a lack of access to reliable sources of information[16-18].

We estimated the acceptance rate for the COVID-19 vaccine among the general Greek population at 25.9 %. However, a higher acceptance rate (49.3 %) was reported, and a moderate-low perception towards the general practice of vaccination was found during the first national lockdown (April 2020)[8,9]. According to Kourlaba et al[19], more than 40 % of the Greek adult population was hesitant to be vaccinated against the COVID-19 over the same period. Health professionals were more willing to get vaccinated against COVID-19 in comparison with the general population. Another nationwide survey study confirmed these levels of willingness for vaccination among healthcare workers[10]. Considerable variation in vaccination acceptance both over time and across countries has been reported in similar studies. In European countries, a broad range of willingness for vaccination against COVID-19 from 62 to 80 % was found in the general population[20]. A significant variation across countries was also reported for the acceptance of the H1N1 influenza pandemic vaccine in 2009. The acceptance rate varied from 8 % to 67 %, with Greeks showing a lower range, from 9.1 % to 22.9 %, depending on the time of the survey[21,22]. This negative attitude towards vaccination was associated with the gender and age group, while a strong correlation with the low educational level was observed in our study. Considering the above data, Greek people might be more hesitant towards the COVID-19 vaccine than most other populations in Europe. When the study was performed, no vaccinations were approved from health authorities so that the vaccination willingness could be changed according to the authorities' statement. Given the significance of immunization for protecting the community against viral spread, a vital point of the public awareness campaigns should focus on the importance of a large percentage of the population being vaccinated to achieve herd immunity.

During the first six months of the pandemic, a large percentage of participants had a health problem that required them to attend a hospital or health center, which they never did due to fear of a possible SARS-CoV-2 infection. As a result, it is anticipated that for many individuals, their health problems might be exacerbated due to this delay. Greece is ranked among the European countries with the highest rate of hospital-acquired infections (HAIs) occurrence[23]. The COVID-19 pandemic might further induce the sense of insecurity and exposure to health risks related to the National Healthcare System in the population, often preventing people from visiting a public health services unit during the pandemic. In general, weakened motivation to socialize during the pandemic was reported by a proportion of the study population. Besides that, the psychological status might be affected. Indeed, a study performed in Greece five months earlier than ours (April 2020) found that almost one of ten individuals developed signs of depression[24]. Healthcare providers, women, young people, and people with underlying medical conditions were considered more likely to develop a psychological disorder during the lockdown period[25-28]. These facts show the effects of the COVID-19 pandemic on raising people's psychologi-

Table 3: Binomial logistic regression analysis on the association of population characteristics with perceptions towards COVID-19.

Predictors	OR	95% CI	p-values
The government's measures against novel coronavirus were unnecessary (agree vs. disagree)			
Education (junior high school diploma vs. bachelor's degree)	14.53	(10.51, 20.09)	<0.001
Education (doctorate vs. bachelor's degree)	1.05	(0.42, 2.63)	0.924
Young people are responsible for the spread of COVID-19 (agree vs. disagree)			
Age group (under 18 vs. over 65 years old)	0.31	(0.22, 0.43)	<0.001
Age group (18-39 vs. over 65 years old)	0.29	(0.22, 0.38)	<0.001
Older people (over 65 years old) are responsible for the spread of COVID-19 (agree vs. disagree)			
Age group (under 18 vs. over 65 years old)	2.76	(1.33, 5.7)	0.006
Age group (18-39 vs. over 65 years old)	2.53	(1.28, 5.02)	0.008

OR: odds ratio, CI: confidence interval, vs.: versus.

cal distress. More steps targeting the safety of the population's mental health and wellbeing should be included in COVID-19 prevention and control strategies.

Interestingly, our analysis revealed differences in social responsibility for viral transmission in the community. According to our knowledge, the present study is the first to show a trend for shifting the burden between individuals of different ages. In particular, younger participants tended to consider elderly individuals responsible for spreading the disease. Conversely, older people shifted the blame for the SARS-COV-2 transmission onto the youngsters, among which the number of confirmed COVID-19 cases in mid-September 2020 was significantly higher compared to other age groups[29]. A solid social trust, indicating the confidence that others are honest and exhibit behaviors promoting the common benefit, is necessary for achieving joint objectives, such as the effective control and prevention of the pandemic[30]. The state authorities should consider this during the development of strategies for the management of the pandemic. In this context, policies that foster social cohesion and eradicate social stigma tend to be of high priority.

Our study was limited to participants who had specific technology devices to respond to, such as smartphones, computers, tablets, and internet access. This particular sample employed due to social distancing measures may not be representative of the general population, despite its large size, especially regarding older age groups. Collecting qualitative data from non-participants would have helped elucidate the demographic characteristics and why they chose not to participate. A researcher-made questionnaire was used instead of an existing validated one. However, the data from the pilot study confirmed an acceptable validity and reliability. Another limitation is that the results of this study might change during the pandemic.

To conclude, our findings suggest a moderate-high level of knowledge regarding COVID-19 in the general Greek population after the end of the first wave of the pandemic. Nevertheless, there is still an awareness gap among the elderly, men, and those less educated. Understanding these people's misconceptions and strengthening their awareness would positively affect their attitude and actions to prevent the spread of SARS-COV-2. Health education initiatives and information campaigns focused on the mass media and the internet, especially emphasizing the role of vaccination as a preventive measure, should be considered critical components of the state strategy for raising public awareness about the pandemic. Significant interventions are needed for the National Healthcare System to recover citizens' confidence and protect and strengthen individual wellbeing and social cohesion through beneficial and socially responsible actions.

Conflict of interest
The authors declare no conflict of interest.

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