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# EARLY COVID-19 PANDEMIC IMPACTS ON SOCIETY AND ENVIRONMENT IN ROMANIA. PERCEPTION AMONG POPULATION WITH HIGHER EDUCATION

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## Abstract

This study aimed to explore the impact of the COVID-19 pandemic crisis on the society and environment in Romania. It is based on the results of a survey conducted in May 2020 to emphasise the perception and reactions of the higher educated population to unprecedented measures taken by public and health authorities during the lockdown. The analysis of the population perception addressed four significant aspects: the awareness of the risks of infection; the adaptation to pandemic issues; behavioural changes due to the disease outbreak; and the prioritisation of social and environmental measures, aimed at minimising the spread of the virus and diffusion of COVID-19 disease it causes. A reliable cross-sectional online questionnaire was performed on a final sample of 719 Romanian adults aged 18-75 years. Both quantitative and qualitative methods were applied, using SPSS analysis and procedure, and respectively Application Programming Interface (API). Findings pointed out that in Romania, the higher educated population considered the risk of infection as being moderate. Although, they initially questioned the restrictions, they subsequently followed social distancing measures, initiated resilience actions by adopting new sanitary habits, healthy behaviours and reconsidering the importance of an inclusive living environment. In their views, the management of the crisis at the national and local level is satisfactory, thus outlining the directions for actions and placing health and the environment along with social issues as top priorities and needs for the Romanian communities.

## 1. Introduction

Infectious diseases shaped human history. The current COVID-19, the largest pandemic the World is facing in more than a century, is considered one of the most significant threats since World War II. Presently, the safety and protection of the society facing the COVID-19 pandemic represent critical priorities on the agendas of various stakeholders worldwide.

Coronaviruses infections, out of which seven can affect humans, are not uncommon and were identified in the 1960s (Pettit Bruns et al., 2020). The Coronaviruses are major pathogens of emerging respiratory disease outbreaks (Abdelhafiz et al., 2020).

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The new coronavirus responsible for Coronavirus Disease 2019 (COVID-19) or the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) broke out firstly in Wuhan, China, in December 2019 (McFadden et al., 2020). From a local outbreak, the new disease evolved rapidly beyond China leading World Health Organization to issue the first global alert a month later, (Abdelhafiz et al., 2020; del Carmen Pérez-Fuentes et al., 2020), and to declare SARS-CoV-2 a global pandemic, on 11 March 2020 (WHO, 2020). The pandemic crisis emerged in the early 2020 and produced significant changes on at all levels of the world society, being perceived as a major destabilising shock. It It extensively altered habits and lifestyles, according to the following three stages: (i) adults' perceptions of health risks and life, (ii) building representations of the disease, and (iii) setting up strategies to cope with the risk and changes (del Carmen Pérez-Fuentes et al., 2020). All these raised the interest of scientists, from the medical field to social sciences and humanities. Many studies focusing on the new disease were published shortly afterwards, because research could better inform and advise people about protection against the Coronavirus (Geldsetzer, 2020), at different geographical scales (Khader et al., 2020), and new findings significantly contributed to reducing the on-going global threat of COVID-19 pandemic (Goddard et al., 2006; James et al., 2006; Huynh, 2020, Requia et al., 2020; Saez et al., 2020;).

Studies regarding public awareness, perceptions, knowledge, or attitudes concerning COVID-19 were subsequently published (Abdelhafiz et al., 2020; McFadden et al., 2020). Some authors have pointed out that science often fails to make the right decisions for the disease COVID-19, which continues to be subject of large uncertainties (Kapecki, 2020; Krause et al., 2020). The perception and representation of the adult population on the threat of COVID-19 are relevant for the psychological adaptation of individuals to the crisis and to the state of social alert (Blasco-Belled et al., 2020; del Carmen Pérez-Fuentes et al., 2020).

Public responses to COVID-19 have been the subject of research in many countries (del Carmen Pérez-Fuentes et al., 2020; de León-Martínez et al., 2020; Ling and Ho, 2020; Paital et al., 2020; Requia et al., 2020; Saez et al., 2020; Shigemura et al., 2020; Zhong et al., 2020). Public awareness is highly significant in limiting the spreading of infection, especially in the case of middle and low-income countries, considering that their health systems have a moderate capacity to cope with outbreaks of infection disease (Abdelhafiz et al., 2020; Pettit Bruns et al., 2020). At the same time, population compliance with the recommended prevention measures facilitated the management of the crisis.

Analysing the news environment associated to COVID-19, Krause et al. (2020) explained that misinformation represents a meta-risk which obstruct public perception on the initial risk of the disease, several factors being responsible: early research findings shared with policymakers, different policies adopted by different countries and epidemiological models brought to fore (Adam, 2020; Krause et al., 2020). Assessing and understanding how people behave and enact changes in response to COVID-19 is also of great importance (Geldsetzer, 2020; Huynh, 2020; Khader et al., 2020; Lauer et al., 2020; Li et al., 2020), facilitating the response to the pandemic (Betsch, 2020), and the adoption of appropriate community safety management. Changes in risk perception and people's attitude towards risk, stress and the probability of infection or death are shaping human behaviour (Poletti et al., 2012). Therefore, the public's perception of risk, along with its attitudes towards COVID-19, and infection control (Khader et al., 2020) are relevant for the risk assessment and local management of the COVID-19 pandemic crisis by public authorities. Several studies also focused on control measures to be taken against COVID-19 (Wang and Zhang, 2020) or suggest the lack of interest and reduced interventions of authorities in COVID-19 prevention (Geldsetzer, 2020; Lohiniva et al., 2020).

Acknowledging that uncertainty and risk are part of the social, environmental and economic related phenomena, drives prudence and learning as processes of adaptive management within emerging public policies that support societal resilience (Aven and Bouder, 2020). Timely and appropriate public health interventions entailing adjustments in several areas are needed to improve the present situation (Krause et al., 2020; Pettit Bruns et al., 2020). However, social distancing remains the most important prevention action (Park, 2020; Park et al., 2020). Both actions generate a strong impact on the individual freedom and on the social and economic life of the communities (Lewnard and Lo, 2020).

All countries, from low-income to high-income ones, faced multiple challenges during outbreaks of infectious diseases (Pettit Bruns et al., 2020). While prevention (primary) is considered the best way in all cases, the general level education of the population is essential, particularly for commitment to avoidance behaviours (Pettit Bruns et al., 2020). Within this framework, by analysing the perception of the higher-educated population, the present paper aims to assess the COVID-19 pandemic impacts on the society and environment, during the lockdown in Romania.

Therefore, the study adds a new perspective by considering the environment domain, together with other ones addressed in this research namely society, economy and health, analysing the views of higher educated population. The research objectives relied on a four-dimensional approach: the health risk concern, the adaptation patterns, the effects on individual behaviour during next period, and identification of decisive measures to reduce the impact on society and environment, for a rapid response to such crises in the community management.

## 2. Case study and study area

Romania was directly exposed to the Romanian Diaspora returned home from hotspot states, such as Italy, Spain, Germany, France and the United Kingdom, some of the most affected by COVID-19 pandemic at that time (Crețan and Light, 2020; Statistics COVID-19, 2020). These circumstances furthered the community transmission of SARS-CoV-2 in Romania. The first COVID-19 confirmed case was reported in Romania on the 26th of February 2020, and the number of infections increased steadily afterwards.

Therefore, at this stage, the Romanian government has implemented several preventive measures at the state borders, in the transport system and closed schools and universities. On the 16th of March 2020, after the WHO declared the disease a pandemic, Romania established the emergency state (nationwide lockdown) for 60 days, an exceptional measure taken by the President of Romania, with the approval of the Parliament (Law no. 453/2004). It consisted of a series of special regulations for entire country, concerning health, justice, work and social protection, politics, foreign affairs, economy, and public order, unusual social restrictions for a democratic society. To increase the lockdown effectiveness and, thus, to reduce coronavirus communitarian infection (Lohiniva et al,, 2020), the authorities introduced restrictive measures targeting social life and mobility, the population being advised "stay at home" and "wash hands" as worldwide institutions recommendation (Atalan, 2020).

Despite all these measures and intense media campaigns, between the 26th of February and 15th of May, the last reference point of this study, when the emergency period ended, the number of infections was 16,437 (0.83‰), out of which 1,089 (0.054‰) deaths (RMH, 2020, Geospatial.org). Thus, according to official statistics, Romania ranked on the third position in Eastern Europe, after Poland (18,016) and Ukraine (17,730), but with the highest number of deaths in the region (EU, 2020, WHO, 2020).

The Macro-Region (MR) 2 was the most affected (43.5% of the total number of infections and deaths) (Fig.1a), with the largest focus of COVID-19 and quarantine at Suceava county (20.8% of the infected and 20.5% of the death) (Fig. 1b), along with MR 4, where the death rate out of the infected ones was 9.4%).

## 3. Materials and methods

### 3.1. Study procedures and tools

To investigate the population's perception on the COVID-19 crisis in Romanian communities, both quantitative and qualitative research was used, as mixed-method research is largely considered in various recent studies on the pandemic. The survey is a key research tool in such analyses, either directly administered or applied online and social media channels (Huynh, 2020; Lohiniva et al., 2020;). During the period declared as a COVID-19 pandemic emergency in Romania, we applied a cross-sectional online questionnaire (precisely between 5 and 10 of May 2020) (Fig. 2), on a cohort of higher educated adults, able to respond by Google Forms application, and accustomed to accessing the Internet, since Romania has one of fastest speeds in the world and the cheapest cost per Mbps (0.05 $) (Economica.net, 2020). The degree of saturation regarding the absorption of the respondents emerged when the rate of answers dropped off in frequency and determined the closing of the survey after six days. Hence, the sample size almost corresponds to the demographic structures of the macro-regions, being in line with questionnaire surveys thoroughly administered and suggested in the literature (Geldsetzer, 2020).

The questionnaire was disseminated by snowball sampling and online networking, at the same time from four different university centres, large cities, poles of each development macro-region (MR) in Romania: Cluj-Napoca-MR1, Iași-MR2, Bucharest-MR3, and Timișoara-MR4. The questionnaire was carried out following the ethics of academic research.
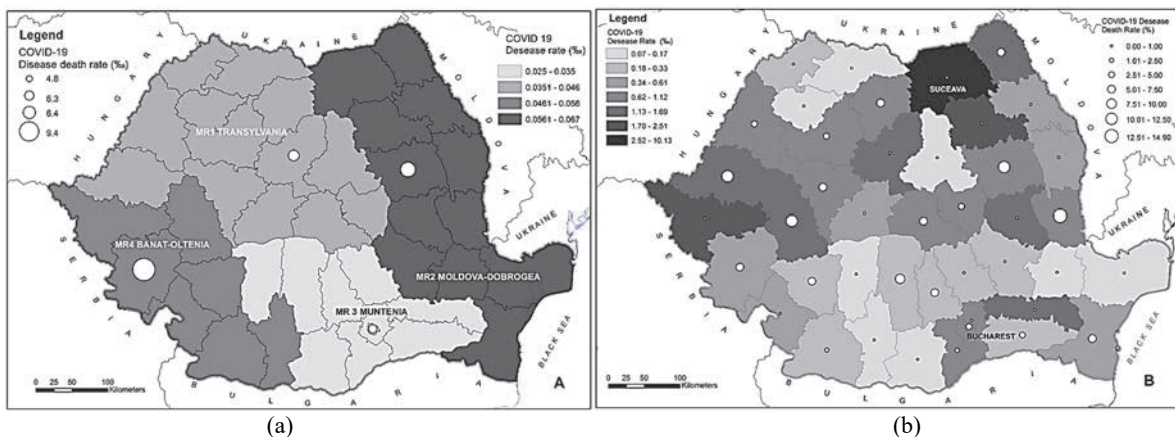


**Fig. 1.** The incidence and death rate due to COVID-19 in Romania on the 15th of May 2020 Macro-Regions (a) and counties (b). Processed in ArcGIS 10.3.1 by authors. (Sources: RMH, 2020 and COVID-19, 2020)
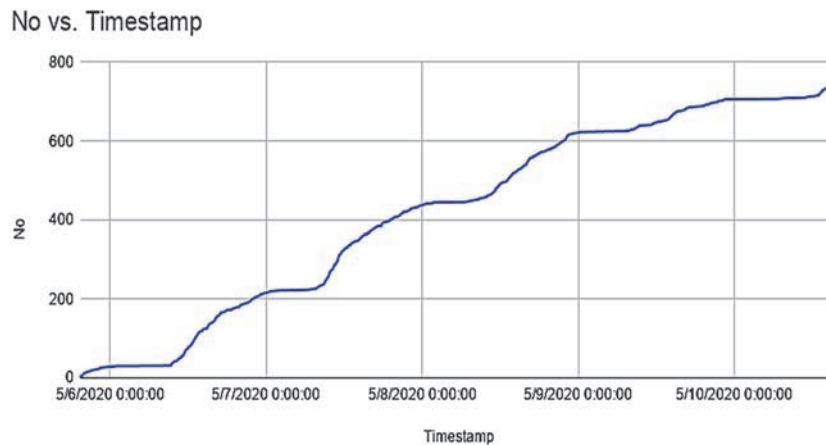
No vs. Timestamp



**Fig. 2.** Timestamp and sample count

It started with an introductory paragraph outlining the purpose of the study, the institutional affiliation of authors, and compliance with anonymity and confidentiality. Completion of the questionnaire was considered as voluntary acceptance of the respondents to be part of the study.

The research team designed the questionnaire, its structure and content being subject of debate and some questions were rephrased after being submitted to a group of experts in specific fields. Finally, it included 30 issues grouped in five sections (S): S1 - demographic characteristics (Table 1) S2 - perceptions of COVID-19 health risks; S3 - people's attitude during COVID-19 lockdown; S4 - short term impacts of the pandemic on individual behaviour, and S5 - social and environmental issues and measures for the pandemic. For S2, S4, and S5 the items used 10 points linear scale questions, whose internal consistency coefficient was good (Cronbach's Alpha of 0.780). In S3 and S4, we applied multiple-choice of categorical items, while for S5 open-ended questions.

### 3.2. Data analysis

The data processing was performed with the IBM SPSS 22.0 for Windows. Thus, to examine the mean scores of the perceptions of COVID-19 effects by to the social and demographic characteristics, the Student test within the Independent Samples and Fisher test within the ANOVA procedures have been applied. The significance level of these two tests allowed identifying the significant differences among various groups of respondents regarding their perception on COVID-19. We used the association analysis and the Chi-Square test to investigate the relationship between respondents' behaviour related to the pandemic and the main social and demographic groups of respondents. For the graphical illustration of the associations between the core issues related to the pandemic and the respondents' socio-demographic profile, we applied the correspondence analysis and multiple correspondence analyses.

In qualitative research, useful insights can be obtained by carrying out sentiment analysis and discourse analysis of textual opinions (Anoop and Asharaf, 2020; Dittmer, 2010; Qazi et al., 2020). A range of APIs (Application Programming Interface) provided by Meaning Cloud through an add-in to Microsoft Office Excel was used to gain a wide application in research (Perriam et al., 2020). For each question, a series of analyses were performed using the following range of APIs: Text Classification (TC); Global Sentiment Analysis (GSA), Deep Categorization and Summarization. TC used three linguistic taxonomies from open sources, while GSA is based on a predefined algorithm that identifies the level of positivism or negativity of the response. Polarity offers values on six scales: P + (very positive), P (positive), NEU (neutral), NONE (not identified), N (negative), and N + (very negative), depending on the degree of confidence associated with the values for polarity (expressed as a percentage).

## 4. Results and discussions

### 4.1. Characteristics of the study sample

The sample initially included 742 respondents, higher educated Romanian adults, of which only 719 entered in the research, after the elimination of respondents that lived outside Romania during pandemic. It is composed of 70.7% females and 29.3% males. The age ranged from 18 to 75 years old; the mean age is 37.32 (standard deviation – SD=13.3), with a small difference between genders. Over 90% graduated university and post university studies, while10% were students in the last year of graduation, recorded by their last level of graduation (Table 1).

Therefore, 50% of respondents declared earning good income, and more than a third they had average incomes. Three-quarters live in urban areas, out of which half dwell within blocks of flats and a quarter resided in individual houses; 25% of respondents declared living in rural areas, with a majority dwelled in individual houses. Within a population that has not graduated from a medical school but with excellent health literacy, we measured the perception of pandemic health risks using four

questions graded on a scale of 1 (extremely low) to 10 (extremely high).

### 4.2. Perception of the health risk during early COVID-19 pandemic

The general perception (Pg) on the COVID 19 risk expressed by the negative emotion (fear, anxiety) for the pandemic period marked by lockdown had an average intensity, while the perception of personal health (Pp) was slightly lower. A higher distress was registered in perception for family members (Pf) and very high for the elderly (Pe) (Table 2).

The respondents' perceptions of health risk during the COVID-19 pandemic vary according to social and demographic characteristics. The average score of the answers for the four questions (Q1, Q2, Q3, and Q4) corresponding to the four types of perceptions of health risk (Pg, Pp, Pf, and Pe) have been considered for testing the differences among socio-demographic groups. If the statistical test (Student test or Fisher test) is significant, the probability value of the test is highlighted (Table 2).

The perception is more intensely negative to women. Moreover, there are significant differences in the negative perception of the pandemic risk according to the respondents' age. Thus, the highest negative impact was registered in groups aged over 55.

The living environments, the population in the rural areas seemed to be more concerned than the population from urban ones, showing, also, a significant worry for the elderly ($p<0.05$). According to income financial and material conditions, the cohort of the low-income respondents, expressed an increased concern for the family (Pf) and the elderly (Pe) ($p <0.05$). When considering the level of education, it can be seen that the average scores of general and personal health risk perception (Pg and Pp) are higher in the group of high school graduates, while the average score of perception for family and elderly health risk (Pf and Pe) are higher in the faculty group. However, the differences in perception by education level are not statistically significant, showing that education does not affect the perception of COVID-19. The geographic distribution of the general pandemic health risk perception (Pg) pointed out the lowest value in MR2 (Moldova), considered a hot spot in terms of the number of infections, while the lowest Ps score registered in MR4 (Western Romania), ranked first due to the death rate caused by COVID-19 infections. By region, similarly to the place of residence, there is no statistical correlation with the perceptions risks of COVID-19. *Pf* differs spatially, highlighting the most significant concern in MR3 (Muntenia), comparing with Pe, which showed a slightly similar pattern for all regions (Table 3).

**Table 1.** The demographic characteristics of respondents enrolled in the study (S1)

| Variables | Group | %(Total) | Age (years) Mean | Age (years) SD. |
|---|---|---|---|---|
| Age | Overall sample | 100 | 37.32 | 13.3 |
| Age groups | 18-24 | 27.5 | 21.21 | 1.51 |
|  | 25-34 | 16.3 | 30.05 | 2.99 |
|  | 35-44 | 24.3 | 39.86 | 2.77 |
|  | 45-54 | 21.0 | 48.99 | 2.79 |
|  | 55-64 | 8.5 | 59.02 | 2.69 |
|  | 65+ | 2.4 | 67.47 | 2.72 |
| Gender | Male | 29.3 | 37.9 | 14.2 |
|  | Female | 70.7 | 37.1 | 12.9 |
| Education | High school | 6.9 | 31.3 | 14.9 |
|  | Graduates | 52.3 | 34.7 | 13.4 |
|  | Postgraduates | 40.9 | 42.7 | 10.9 |
| Income | Very low | 0.2 | 23.5 | 2.1 |
|  | Low | 2.7 | 33.27 | 13.3 |
|  | Average | 39.5 | 37.42 | 14.0 |
|  | Good | 51.5 | 37.85 | 12.9 |
|  | Very good | 6.1 | 35.11 | 13,3 |
| Types of housing | Urban BF | 49.5 | 38.69 | 13.1 |
|  | Urban H | 23.5 | 40.65 | 12.9 |
|  | Rural BF[1] | 2.8 | 35.9 | 11.5 |
|  | Rural H[2] | 24.2 | 32.55 | 12,8 |
| Place of residence | Urban | 75.5 | 37.17 | 13.4 |
|  | Rural | 24.5 | 37.82 | 13.3 |
| Residence during pandemic | Urban | 73.8 | 38.68 | 13.3 |
|  | Rural | 26.2 | 33.96 | 13.1 |
| MR1 | Transylvania | 49.1 | 38.03 | 13.1 |
| MR2 | Moldova | 22.7 | 36.60 | 13.3 |
| MR3 | Muntenia | 17.5 | 37.67 | 13.9 |
| MR4 | Banat-Oltenia | 10.7 | 34.70 | 13.3 |

*Note: 1.BF Block of flats, 2.H-house. (Source: Authors' own calculations in IBM SPSS 22.0)*

**Table 2.** The results of testing the differences in the respondents' scoring COVID-19 risk perception in relation to their socio-demographic characteristics

| Variables | | Q1 (Pg(1...10)) | | Q2 (Pp(1...10)) | | Q3 (Pf(1...10)) | | Q4 (Pe(1...10)) | | Statistical test |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean score | Test value (p value) | Mean score | Test value (p value) | Mean score | Test value (p value) | Mean score | Test value (p value) | |
| *Overall sample* | | *5.92* | | *5.80* | | *7.74* | | *8.17* | | |
| Gender | M | 5.32 | *-4.169* | 5.24 | *-3.708* | 7.43 | *-2.312* | 7.88 | *-2.158* | Student's' t Test |
| | F | 6.16 | ***(0.000)*** | 6,04 | ***(0.000)*** | 7.87 | ***(0.021)*** | 8.29 | ***(0.031)*** | |
| Place of residence | Urban | 5.82 | *1.508* | 5.71 | *1.480* | 7.66 | *1,376* | 8.05 | *2.090* | Student's' t Test |
| | Rural | 6.13 | *(2.090)* | 6.02 | *(0.139)* | 7.92 | *(0.139)* | 8.43 | ***(0.037)*** | |
| Education | High school | 6.22 | *0.503 (0.605)* | 6.26 | *1.276 (0.280)* | 7.84 | *2.268 (0.104)* | 8.02 | *0.225 (0.798)* | Fisher test (ANOVA) |
| | Faculty | 5.91 | | 5.83 | | 7.88 | | 8.21 | | |
| | Post gr. | 5.86 | | 5.66 | | 7.49 | | 8.13 | | |
| Income | Very low | 5.0 | *783.163 **(0.000)*** | 4.50 | *84.213 **(0.000)*** | 10.00 | *974.171 **(0.000)*** | 10.00 | *110.777 **(0.000)*** | Fisher test (ANOVA) |
| | Low | 5.82 | | 5.73 | | 8.00 | | 8.09 | | |
| | Av. | 6.04 | | 5.76 | | 7.67 | | 8.26 | | |
| | High | 5.96 | | 5.95 | | 7.85 | | 8.19 | | |
| | Very high | 4.91 | | 5.00 | | 7.02 | | 7.40 | | |
| Age groups | 18-24 | 6.17 | *2.961 **(0.012)*** | 5.81 | *2.834 **(0.015)*** | 7.99 | *2,000 (0.077)* | 8.23 | *1,473 (0.196)* | Fisher test (ANOVA) |
| | 25-34 | 5.52 | | 5.32 | | 7.80 | | 8.14 | | |
| | 35-44 | 5.62 | | 5.62 | | 7.38 | | 8.07 | | |
| | 45-54 | 5.86 | | 5.95 | | 7.68 | | 8.35 | | |
| | 55-64 | 6.75 | | 6.80 | | 8.15 | | 8.23 | | |
| | 65+ | 6.18 | | 6.06 | | 7.06 | | 6.82 | | |
| Macro-Regions | MR1 | 5.71 | *2.200 (0.087)* | 5.74 | *1.037 (0.375)* | 7.65 | *0.777 (0.507)* | 8.20 | *0.603 (0.980)* | Fisher test (ANOVA) |
| | MR2 | 6.27 | | 6.11 | | 7.78 | | 8.16 | | |
| | MR3 | 6.08 | | 5.66 | | 8.04 | | 8.13 | | |
| | MR4 | 5.99 | | 5.63 | | 7.69 | | 8.08 | | |

*(Note: P-perception, Q-question)Source: Authors' own calculations in IBM SPSS 22.0.Considered p<0.05 in bold italic*

**Table 3.** The spatial distribution of pandemic health risk perception

| Variables | | Q1(Pg(1...10)) | | Q2(Pp(1...10)) | | Q3(Pf(1...10)) | | Q4(Pe(1...10)) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean score | Test value (p value) | Mean score | Test value (p value) | Mean score | Test value (p value) | Mean score | Test value (p value) |
| Macro-Regions | MR1 | 5.71 | *2.200 (0.087)* | 5.74 | *1.037 (0.375)* | 7.65 | *0.777 (0.507)* | 8.20 | *0.603 (0.980)* |
| | MR2 | 6.27 | | 6.11 | | 7.78 | | 8.16 | |
| | MR3 | 6.08 | | 5.66 | | 8.04 | | 8.13 | |
| | MR4 | 5.99 | | 5.63 | | 7.69 | | 8.08 | |

*(Source: Authors' own calculations in IBM SPSS 22.0. Considered p<0.05)*

The risk of COVID-19 for human health was perceived as being moderate to high, similarly to values in the U.S. or Spain population's perception (Dryhurst et al., 2020). This was felt more in vulnerable groups (elderly, low income) and particularly in Muntenia Macro-Region, with the largest concentration of population in the capital of the country.

*4.3. People's attitude during early COVID-19 pandemic period*

The interest for (the up-to-date) knowledge about the virus was also tested, starting from the circumstances of novelty, appearance, impact, effects of COVID-19. The time when respondents found out about COVID-19 was between January 1 and March 14, although some of them associated the New Coronavirus with the Corona family and asserted it before its identification in China, December 2019 (Fig. 3). Consistent to this, 51.3% were interested in getting as correct as possible knowledge about COVID-19, using medical literature and statistic reports (22.3%) as primary information sources.

The respondents' orientation regarding the types of information on COVID-19 was closely linked to their age. The persons aged less than 35 years were more interested in statistical information compared to the older respondents. A large percentage of young persons (18-24 years) looked mostly for information on regulations than other age groups of respondents, while those aged 65+ searched for any kind of information without filtering it.
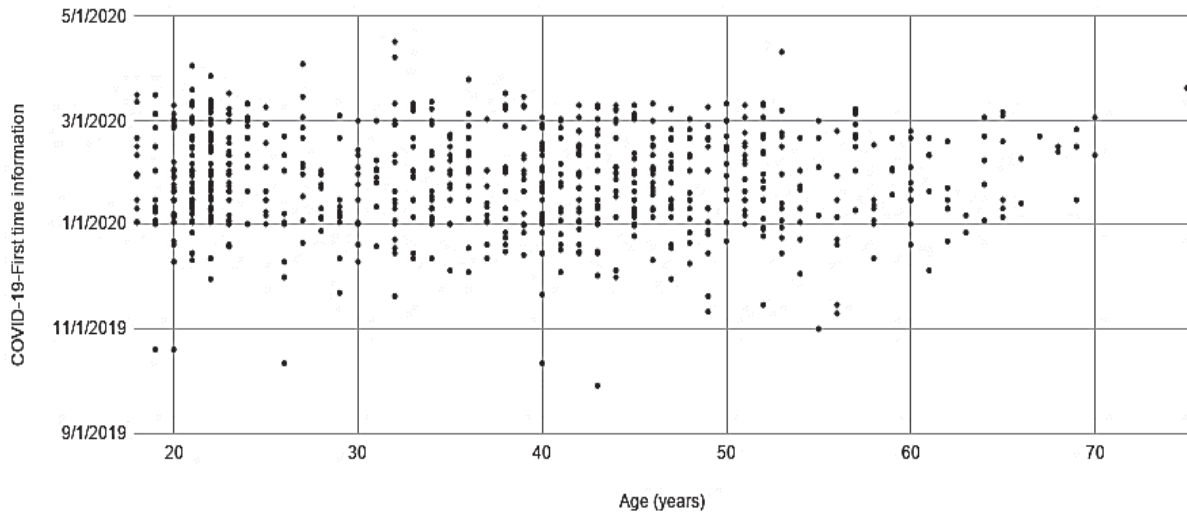
**Fig. 3.** First time information about COVID-19 by age

The connection between age and types of information on COVID-19 is statistically significant (the value of the Chi Square test equals 75.02 with a significance level less than 0.1%), (Fig. 4a). The population's perception regarding the occurrence of the Coronavirus outbreak highlighted equally structured responses among admitting that they did not know (23.3%) or that was a human error (20.2%) to presuming the incident naturally emerged (18.9%).

The results of the association analysis between the socio-demographic profile and the sources of the pandemic graphically showed that people aged 25-34 years were more predisposed to believe in a natural factor compared with either respondents under 25 years old or low income, followers of a globalist scenario. Post-graduate respondents and people with very high income suggested human error or by a natural process as determinants of the pandemic Fig. 4b).

Uncommon gender discrepancies among the respondents' opinions could be noticed. Male respondents supported mostly the natural process or human error as causes of the pandemic, while female admitted other causes. Additionally, there were higher percentages of non-responses and do not know answers among the females (Fig. 4c). The attitude of the population during the restriction period in Romania generally revealed compliance with regulations. Thus, almost 90% of respondents followed the lockdown regulations, going out shortly (65.8%) and moderate (25.0%). According to the statistical data, those who had not complied with restrictive pandemic mobility rules were male, under 44 years old, living in urban areas of MR2 and MR4. Moreover, the lockdown appeared as the most upsetting restriction (50.3%) together with the perpetual hygienic care and working online from home (15%). The results show a significant connection among the shortages related to the pandemic and the respondents' age and income (p<0.5%). The relationship between the socio-demographic profile and the shortages due to the pandemic that were considered the most important in their opinion are illustrated on the correspondence map (Fig. 4d). The most devastating effect of the pandemic crisis for the low- and very low-income groups was the deterioration of their financial situation (50%), and for the elderly (65+) the susceptibility to the disease (35.3%) and the food purchasing. The young persons (18-24 years old) were mainly affected to a higher extent (21.2%) by the online activity for study/work.

The Romanian higher educated population's attitude was almost entirely compliant with the official and sanitary rules imposed by the Government, although the worst measure was mobility restrictions. An intense need to understand the issue of SARS-CoV-2 is also noticed, explaining the constant concern for complex information.

*4.4. Expected behavioural changes due to the early COVID-19 pandemic*

Since the rules imposed during pandemic time aimed primarily at protecting the population health, we investigated the changes they produced in the people's lives.

Therefore, aspects related to health security as housing, diet, leisure, the environment-mobility relationship, and hygiene practices were tested (Table 4). More than half of the respondents considered the pandemic to be less threatening if living in the rural area, and individual houses safer than collective ones (41.7%). This explains the stated intention of more than a third of respondents to adjust their way of living, opting for safer houses (33.1%) and, at the same time, to move in less polluted areas, shifting to ecological and healthy mobility.
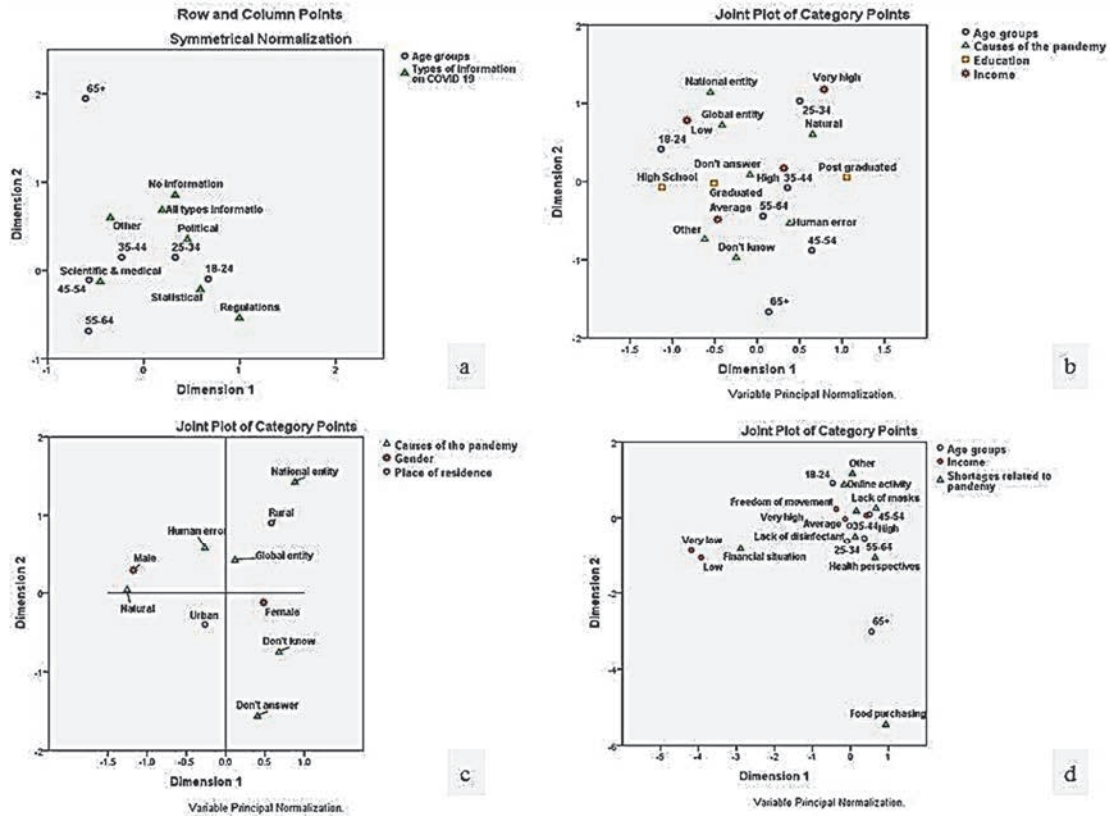
**Fig. 4.** (a) The correspondence map (CM) between age and information types on COVID-19; (b) The CM between age, education, income and causes of the pandemic; (c) The CM between gender, place of residence and causes of the pandemic; (d) The CM between age, income and shortages related to the pandemic (Source: Authors' own calculations in IBM SPSS 22.0)

**Table 4.** Chi-square test significant values of individual perception of respondents on possible changes according to socio-demographic characteristics

| *Items* | $\chi^2$ *(df) p value* | | | | | |
|---|---|---|---|---|---|---|
| | *Age groups* | *Education* | *Income* | *Gender* | *Type of house* | *Regions* |
| *Safety of living* | 45.800(20) ***0.001*** | 10.337(4) ***0.035*** | 17.274(16) *0.368* | 2.439(4) *0.656* | 42.542(12) ***0.001*** | 17.621(12) *0.128* |
| *Improve housing* | 9.142 (10) *0.519* | 10.377(4) ***0.035*** | 18.189(8) ***0.020*** | 0.994(2) *0.608* | 55.423(6) ***0.001*** | 7.112(6) *0.311* |
| *Diet* | 39.191 25) ***0.035*** | 19.605(10) ***0.033*** | 20.611(20) *0.420* | 9.577 (5) *0.088* | 10.891(5) *0.054* | 15.110(15) *0.444* |
| *Eco-friendly mobility* | 85.332(25) ***0.000*** | 18.914(10) ***0. 041*** | 29.537(20) *0.078* | 20.298(5) ***0.001*** | 15.317(15) *0.429* | 16.396(15) *0.356* |
| *Leisure* | 48.443(35) *0.065* | 23.235(14) *0.057* | 41.516(28) ***0.048*** | 9.578(7) *0.214* | 39.916(21) ***0.008*** | 27.181(21) *0.165* |

*(Source: Authors' own calculations in IBM SPSS 22.0. Considered p<0.05 in bold italic)*

Also, 122 respondents (18.5%) out of 719 mentioned they planned to switch to an ecological diet, to improve their health, while the others will their mixed eating style (Table 4).

Leisure was analysed from the perspective of environmental safety. Thus, the mountainous areas of Romania (32.8%) or the Black Sea coast (10%) are perceived as the safest. Also, the family environment is favoured, 17.9% of respondents considering that spending time with relatives and friends is safer. Women over 55 years old living in rural areas plan to stay at home. This structure revealed the residual anxiety on possible infections and adaptation to travel restrictions, reinforced by the moderate to higher fear

perceived for possible contamination in the accommodation structures, (M: 6.20; SD: 2.475) on the 10 points scale and especially in restaurants (M: 6.64; SD: 2.364).

The analysis of changes in hygiene habits was based on the responses of 712 people, representing a share of (99%), as 1% declared no changes. The answers grouped into five categories, of which three were almost equal in rate (approximately 22.7%) included people who adopted routine preventive habits, raised by germ-prone hypochondriac tendencies, and recommend the adoption of strict hygiene practices by the entire population; those who mentioned only minor changes in their hygiene habits

(rhythmicity, duration of hand washing) and people confirming moderate changes (additional facial hygiene and a strong disinfectant).

Almost a third of respondents confirmed the adoption of significant changes in hygiene habits: 18.9% fulfilled major changes (individual hygiene, external protection by masks and gloves, as recommended), and 12.9% % introduced severe changes in their sanitary behaviour (actions mentioned above, social distancing in public, household disinfection at the return from public spaces, excessive use of disinfectants "despite skin lesions").

Various experiences during the pandemic will probably not alter the behaviour of the population, mainly the eating habits; however, a change in the attitude of the population towards possible health hazards can be observed, through a pro-environmental orientation, asserted by one-third of respondents. Also, the current trend to spend free time in open spaces, where social distancing could be ensured, continues in the next period.

*4.5. Environmental and society priorities in community management for pandemic crisis*

The analysis of these aspects highlights both, the degree of satisfaction of the respondents towards pandemic management at the local and national level, as well as suggestions of priorities for the environment and community management, during pandemic situations or future health crises. The respondents' satisfaction with pandemic management, expressed as a score (1-10), was moderate, slightly higher at the local level (M: 6.84; SD: 2.099) (p=0.045) compared to the national one (M: 6.38; SD: 1.954) (p=0.005).

The responses rate regarding suggestions on priorities for a better environment and community management was 78.4%. Consistent with the applied instruments of API, eight priorities clusters were found, the environment being on first positions (Fig.5a). The need to protect the environment has been promoted in tandem with the sanitation and health, to point out the connection between environmental

hygiene and disease risk. The correlation with the results of the open-ended question (Fig.5b) highlighted that correct air management represents a priority (56.3%). The arguments presented are both positive, suggesting the importance of clean air, and negative, expressing the concern about its carrying capacity role ("most diseases are transmitted by air", "excessive air pollution intensifies respiratory diseases", "it seems that airborne particles favour the spread of SARS Covid 2") (Fig. 5b). In this context, the positive effects of the pandemic on reducing the exhaust emissions, industrial pollutants and their impacts on global climate change were highlighted. They also were mentioned as priorities for national and local management.

The second priority underlined equally both positively and negatively by respondents, relies on the crucial role of water in hygiene, as a potential vector for COVID-19 transmission. Hence the need to address the relationship between increased water consumption and rainfall deficit during the pandemic in Romania, the lack of services for water supply or sanitation in some rural areas and the preservation of water quality. Although vegetation was positively perceived through its ecological and economic services, people have drawn attention to the acceleration of illegal logging during pandemic and also the neglect of crops ("neglecting them can lead to insufficient food, resulting in high food prices"). Soil and fauna were perceived as well positive and negative.

Few respondents are aware of the systemic nature of the environment, about the interconnection between its components and on the need for inclusive management. Within the Social cluster (Fig. 5a), two topics prevailed: rethinking the socio-spatial relations running in the social distancing paradigm, and the protection of vulnerable groups. Law and Justice included many aspects in relation with Labour label, starting with law enforcement and compliance of civil servants with the rules, with emphasis on rigour, transparency, and fairness in the management of funds and environment, and concern for citizens.
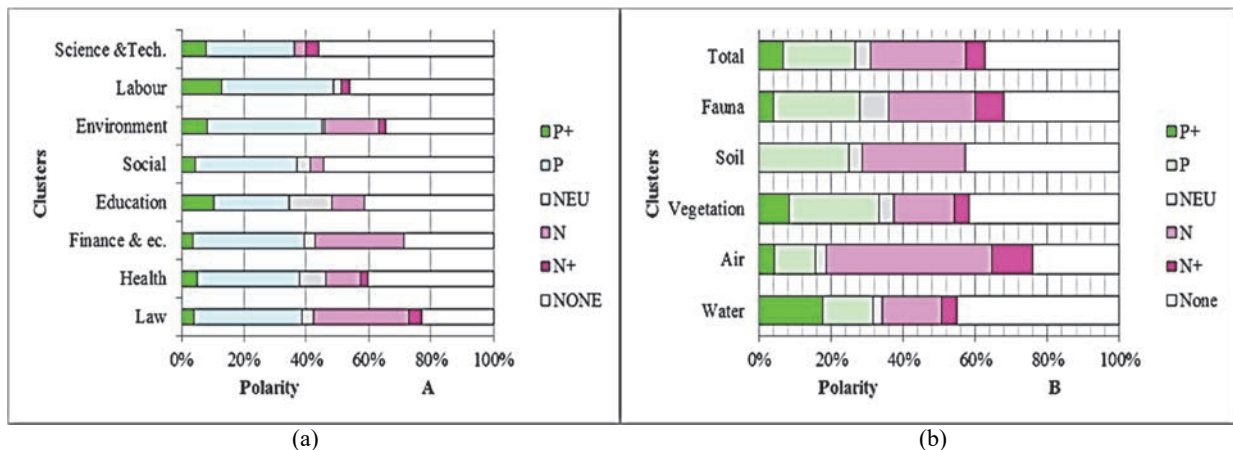


(a)                                                    (b)

**Fig. 5.** Clusters' polarity by GPA analysis: (a) Society clusters; (b) Environmental clusters

The needs to eradicate corruption, corruption-induced incompetence were closely linked to the moral values of people working in public administration, at various levels. Financial, economic and business cluster revealed a need to streamline the services provided by public administrations the top priority being the complete digitalisation, the reduction of bureaucracy, and a better coordination and engagement, especially during the crisis caused by COVID-19.

Education was tied to general and specific information about COVID-19, better communication through civil servants, curricular and community health education on risk and/or protection methods. Science and Technology needs for more funds correctly and transparently managed. Furthermore, environment sanity relies on different actions and level from individual, to community, state or global between those who believe they can manage themselves the components of the environment and those who consider that only decision-makers could do or have that goal.

Thus, more complex and rhythmic sanitation of localities, institutions and/or multiple dwellings were requested, upgrading the management of health services, environment quality, during and after pandemic time.

**Limitations.** The study has several limitations due to specific causes. The present paper considered and analysed the opinions of the adults with a university degree as well as as well as a small percentage of peoples enrolled in higher education, at a month distance to graduate. That's why we included all in the same group with higher education. We started from the assumption that this population is more informed from appropriate sources, often more aware of threats, they are the first to adjust their behaviour and habits, as a result, they are more likely to follow the rules and their example is often followed by the rest of the population. A limitation is the sample resulting from the online dissemination on various social media platforms, having in the first line the authors' networks.

This could explain the overrepresentation of women especially in MR 1. The research revealed the women sensitivity about environmental issues (Momsen, 2007), same we found too, we consider, hence this not affected the results. Added to this, our findings may suffer of possible selection bias due to participants' need of internet connection and skills to use information and communication technology (i.e. smartphone/computer) in order to participate. As well, some answers may be altered by the respondents' desire to demonstrate their lack of fear or erudition. In this regard; post/pandemic perception studies will continue the present study.

## 5. Conclusions

The Romanian population with higher education is concerned about the threat of COVID-19 and perceives the risk of infection as moderate to high. This segment of the population also thoroughly complied with the socio-medical rules imposed during the pandemic and manifested a greater concern for the vulnerable groups in each family. There is a concordance between the higher level of education, awareness and compliance with the restrictive rules.

Nevertheless, lockdown stressed the population. The threat of infection, perceived as moderate, can lead, in case of relaxation of restrictions, to a non-compliance with the rules, increasing the number of cases. Therefore we strongly recommend rigorous management in case of future lockdown and during the pandemic. Significant changes in individual behaviours to maintain good health, as mentioned by a third of the surveyed population, represents also gains for society and public health.

There is also an urgent need to consider environmental issues, in terms of reducing pollution, especially air pollution; integrated management of environmental problems, from sanitation to others services, especially in urban areas, is a priority. Education, science and technologies, modernisation of administration represents tools to increase resilience out of or during the pandemic. Thus, national or/and global guidelines should be updated and applied simultaneously during the crisis and after the COVID-19 pandemic.

Cultural factors or the level of development could influence the society response to a severely restricted situation. The response of each country and society is highly informative and relevant for the management of the present and future waves of COVID-19, as well as for other health crises situations.

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