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# Health Literacy of the Inland Population in Mitigation Phase 3.2 of the COVID-19 Pandemic in Portugal: A Descriptive Cross-Sectional Study

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**Keywords**
COVID-19 · Pandemic · SARS-CoV2 · Health literacy · Portugal

**Abstract**
***Background:*** COVID-19 is a respiratory disease transmitted through respiratory droplets and has a high transmission rate. There is still no effective and approved antiretroviral treatment or vaccine, so preventative measures remain the key to contain this pandemic. Portugal is now in phase 3.2 of the mitigation of COVID-19, with it being imperative to understand the health literacy of our country and prevent a lack of information through community empowerment. ***Material and Methods:*** A cross-sectional study with a sample from a primary care facility was conducted. We collected demographic and epidemiological data and carried out a questionnaire by phone call. Descriptive statistics and nonparametric tests were used to assess associations between the independent variables and the level of health literacy. The level of significance was set at $p < 0.05$. ***Results:*** Our sample included 222 subjects (median age 62 years), mostly females ($n = 131$), undergraduates ($n = 193$), and with at least 1 risk factor for COVID-19 ($n = 144$). Overall, younger individuals, females, graduates and the nonrisk group appeared to have higher levels of health literacy, with some exceptions. ***Conclusions:*** We observed a well-informed population. However, it being a pandemic situation, our intention was to identify and correct outliers/misconceptions. This work allowed a perspective of the current state/pattern of health literacy as well as its possible predictors. Furthermore, it raised awareness of the relevance of specific communication approaches. Further studies to understand the predictors of health literacy are necessary.



**Literacia em Saúde da população do interior na fase de mitigação 3.2 da pandemia COVID-19 em Portugal: um estudo transversal descritivo**

**Palavras Chave**
COVID-19 · Pandemia · SARS-CoV2 · Literacia em saúde · Portugal

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**Resumo**

***Introdução:*** A COVID-19 é uma doença respiratória transmitida por gotículas respiratórias, com uma elevada taxa de transmissão Não existindo um tratamento antirretroviral ou vacina aprovados, as medidas preventivas são a chave para conter esta pandemia. Atualmente Portugal encontra-se na fase 3.2 da mitigação da pandemia COVID-19, sendo imperativo perceber a literacia em saúde do nosso país e como prevenir possíveis falhas, através da capacitação comunitária. ***Materiais e Métodos:*** Foi realizado um estudo transversal com uma amostra de cuidados de saúde primários. Os dados demográficos, epidemiológicos e a realização de um questionário foi realizada através de telefonemas. A estatística descritiva e testes não-paramétricos permitiram compreender associações entre as variáveis independentes e o nível de literacia em saúde. Considerou-se estatisticamente significativo para $p < 0.05$. ***Resultados:*** A amostra incluiu 222 indivíduos (idade mediana: 62 anos), maioritariamente mulheres (131), com um nível de escolaridade baixo (193) e com pelo menos um fator de risco para COVID-19 (144). Globalmente, indivíduos jovens, mulheres, nível de escolaridade mais elevado e ausência de fatores de risco parecem ser sinónimo de maior literacia. ***Conclusões:*** Observamos uma população relativamente bem informada. Contudo, sendo uma situação de pandemia, pretendemos identificar e corrigir conceitos errados. Este estudo permite uma perspetiva do atual estado/padrão da literacia em saúde, assim como seus possíveis preditores. Adicionalmente, este estudo consciencializa para o quão relevantes são as abordagens de comunicação específicas. São necessários estudos futuros para compreender quais os preditores de literacia em saúde.



## Introduction

In December 2019, there was an outbreak of pneumonia with unknown etiology in the city of Wuhan, China, and the diagnosis of influenza and other *Coronaviruses* (MERS and SARS) were considered but later excluded by laboratory tests [1, 2]. On 7 January 2020, China announced that the cause was a new *Coronavirus* strain, later designated SARS-CoV-2 and proved to occur in wild bats [2–4].

The transmission mode of SARS-nCoV-2 is through respiratory droplets, which are either a source of direct or indirect contamination [5, 6]. This virus strain presented a basic reproduction number (R0) within a range of 1.4–6.5, with the highest infection rates in the elderly and people with underlying pathologies [2, 7]. This means that this virus has a high rate of human-to-human transmission and a person is more contagious the more symptomatic they are [6, 8]. The median age of patients with symptoms seems to be around 47–59 years, but it can affect individuals of all ages [2].

The clinical presentation of COVID-19 has a wide spectrum that ranges from asymptomatic to a slightly upper respiratory infection to septic shock [5, 9, 10]. The cardinal symptoms described by the World Health Organization and later integrated in the flowcharts issued by the Direção Geral de Saúde (DGS) are "cough," "fever," and "dyspnea." However, other studies report myalgia, fatigue, headache, and gastrointestinal symptoms as other symptoms to be taken into account [11–13]. In a study involving 1,099 laboratory-confirmed cases, Zhong et al. [14] described the most common clinical manifestations as: fever (88.7%), cough (67.8%), and fatigue (38.1%); sputum, dyspnea, sore throat, and headache are also highly reported by patients. They also reported a small percentage of patients with gastrointestinal symptoms such as vomiting and diarrhea. Guo et al. [2] and Huang et al. [10] reported that the elderly or those with underlying pathologies such as hypertension, chronic obstructive pulmonary disease, diabetes mellitus, and cardiovascular diseases experience faster progression of the disease, with a higher rate of acute respiratory distress syndrome, consequent multiorgan failure, and higher mortality. These pathologies, considered as risk factors for COVID-19, were later included in *Normas de Orientação Clínica 004/2020* compiled by the DGS regarding patients with a particular risk of infection and with greater care needs.

At present, there is no effective and approved antiretroviral treatment or vaccine targeting SARS-CoV-2, so treatment consists mainly of symptom relief and organ support [6, 10]. In the absence of an effective specific treatment, there is a range of preventative measures to be taken, such as a correct handwashing, respiratory etiquette, disinfection of surfaces, and social isolation and/or social distancing (>2 m) [2, 3, 6, 14]. These measures are assumed to be vital for the control and mitigation of the pandemic [3, 14].

To raise public awareness of these measures and health promotion, community empowerment is necessary and is the main key to this public health problem. This empowerment through health literacy programs and official campaigns, using television, radio, and other media, has

**Table 1.** Demographic characterization of the cohort

| | | *n* | % | Median age, years |
|---|---|---|---|---|
| Sex | female | 131 | 59.01 | 62 |
| | male | 91 | 40.99 | 61 |
| Education | undergraduate group | 193 | 86.94 | |
| | graduate group | 29 | 13.06 | |
| Risk factor(s) for COVID-19 codified by ICP-2 | non-risk group | 78 | 35.14 | 49 |
| | risk group | 144 | 64.86 | 66 |

had a positive impact, especially in the context of outbreaks and/or pandemics [15–17].

On 18 March 2020, a state of emergency was decreed in Portugal, with a decree regulating preventative measures to contain the pandemic. On 26 March 2020, phase 3.2 of the mitigation of the COVID-19 pandemic in Portugal was declared for chains of community transmission of the virus in the national territory. Thereupon, it arose the need for tighter control and application of preventative measures.

Regarding the positive impact of official campaigns and community empowerment for strong health literacy, we considered it extremely important to study the health literacy of the population in this mitigation phase, so as to understand flaws that may still exist as well as identify possible predictors of health literacy concerning this matter. To our knowledge, this is the first study to focus on this topic, and we hope the findings help in rectifying false notions by implementing specific intervention strategies aimed at different populations. We hope the study helps to identify possible errors/flaws regarding health literacy in a pandemic situation, so that these can be avoided at the beginning of pandemics in the future.

## Materials and Methods

*Subjects and Data Collection*

We conducted this cross-sectional study on a sample of 222 subjects aged ≥15 years, to avoid a misunderstanding bias of our questionnaire, the COVID-19 Questionnaire. We excluded subjects codified with the International Classification of Primary Care v2 (ICPC-2) codes for "dementia," "mental retardation," or "presbycusis," to exclude the inherent misunderstanding bias. We semi-randomly selected a sample from among individuals with a scheduled medical appointment at a primary care facility of the Unidade Local de Saúde de Nordeste between 1 and 8 April 2020. We collected the demographic and epidemiological data (age, gender, education level, and risk factor(s) for COVID-19 codified by ICPC-2) and conducted the COVID-19 Questionnaire by phone call, with simultaneous registration of the data between 30 March and 3 April 2020.

*Elaboration of the COVID-19 Questionnaire*

The questions included in the questionnaire were decided on by the authors of this article. J.G.S. selected an extensive list of important topics to cover, and B.A., C.S.S., and P.M. independently selected the topics to be included. A consensus meeting was held (online) to make the final decisions. The pilot questionnaire was applied to a group of 10 patients to verify its comprehension and adequacy as well as the average time required to answer the questions.

*Statistical Analysis*

For statistical analysis, we regarded age as a continuous variable. Concerning the other variables, we categorized subjects according to gender (female or male), education (an undergraduate group with <4 years of schooling; 4, 6, 9, or 12 years of schooling; and a graduate group with a Bachelor's, Master's, or Doctorate), and risk factor(s) for COVID-19 as codified by the ICPC-2 (a risk group and a non-risk group) and listed by the DGS in *Normas de Orientação Clínica 004/2020* (chronic obstructive pulmonary disease, asthma, cardiac insufficiency, diabetes mellitus, chronic liver disease, chronic renal disease, active malignant neoplasm, or a state of immunosuppression).

We performed statistical analysis of the collected data using Microsoft Office Excel 2019® (Microsoft, Redmond, WA, USA) and SPSS v22.0 (SPSS, Chicago, IL, USA). Exploratory analysis was conducted to demographically characterize our sample as well as for the answers to each question on our questionnaire. We used nonparametric tests (Kruskal-Wallis H and Fisher exact test) to test whether significant associations between variables and answers given were observed or not, except for the last question. The level of significance for all statistical tests was set at $p < 0.05$, with a 95% confidence interval. The confidentiality of the data and the content of the phone calls was guaranteed, being accessible only to the main investigator and the respective authors.

## Results

*Sample Characterization*

This study involved a sample of 222 subjects, with an age in the range 15–94 years (median 62 years). The ma-

**Table 2.** Relative frequencies for each question in the COVID-19 questionnaire

| Variable | | Gender | | Education | | Risk factors | |
|---|---|---|---|---|---|---|---|
| | | female | male | undergraduate | graduate | non-risk group | risk group |
| Question 1 | No | 3.82 | 2.20 | 3.11 | 3.45 | 0.00 | 4.86 |
| | Yes | 96.18 | 97.80 | 96.89 | 96.55 | 100.00 | 95.14 |
| Question 2 | Other | 36.64 | 32.97 | 31.60 | 58.62 | 43.59 | 32.12 |
| | Fever | 65.65 | 72.53 | 66.84 | 79.31 | 75.64 | 67.88 |
| | Cough | 77.10 | 69.23 | 73.06 | 79.31 | 85.9 | 70.80 |
| | Dyspnea | 67.95 | 68.13 | 69.95 | 55.17 | 64.10 | 73.72 |
| Question 3 | No | 33.58 | 32.96 | 30.05 | 55.17 | 51.47 | 27.08 |
| | I don't know | 26.72 | 23.08 | 27.46 | 10.34 | 16.67 | 29.86 |
| | Yes | 39.69 | 43.96 | 42.48 | 34.48 | 38.46 | 43.06 |
| Question 4 | Other | 52.67 | 47.25 | 50.78 | 51.72 | 62.82 | 43.75 |
| | Respiratory etiquette | 5.34 | 1.10 | 3.63 | 3.45 | 5.13 | 2.78 |
| | Handwashing | 48.85 | 41.76 | 43.52 | 58.62 | 52.56 | 41.67 |
| | Social isolation | 80.15 | 74.73 | 75.13 | 96.55 | 76.92 | 77.78 |
| Question 5 | No/I don't know | 17.56 | 17.95 | 22.80 | 20.69 | 14.10 | 27.08 |
| | Stay at home and call SNS24 | 82.44 | 82.05 | 77.20 | 79.31 | 85.90 | 72.92 |
| Question 6 | No/I don't know | 29.77 | 17.58 | 76.17 | 68.97 | 66.67 | 79.86 |
| | Correct answer | 70.23 | 82.42 | 23.83 | 31.03 | 33.33 | 20.14 |
| Question 7 | No | 84.93 | 81.31 | 82.90 | 86.21 | 91.03 | 79.17 |
| | I don't know | 6.11 | 2.20 | 4.66 | 3.45 | 2.56 | 5.56 |
| | Yes | 9.16 | 16.48 | 12.43 | 10.34 | 6.41 | 15.28 |
| Question 8 | No | 94.66 | 85.71 | 90.16 | 96.55 | 94.87 | 88.89 |
| | I don't know | 0.76 | 2.20 | 1.55 | 0.00 | 0.00 | 2.08 |
| | Yes | 0.46 | 12.09 | 8.29 | 3.45 | 5.13 | 9.03 |
| Question 9 | No | 62.59 | 47.25 | 53.37 | 75.86 | 80.77 | 43.05 |
| | I don't know | 14.5 | 12.09 | 14.51 | 6.90 | 11.54 | 14.58 |
| | Yes | 22.9 | 40.66 | 32.64 | 17.24 | 7.69 | 42.36 |
| Question 10 | No | 61.07 | 58.24 | 58.03 | 72.41 | 74.36 | 52.08 |
| | I don't know | 16.03 | 14.29 | 16.06 | 10.34 | 7.69 | 19.44 |
| | Yes | 22.90 | 27.47 | 25.91 | 17.24 | 17.95 | 28.47 |
| Question 11 | No | 6.87 | 3.30 | 6.22 | 0.00 | 3.85 | 6.25 |
| | I don't know | 4.58 | 7.69 | 6.74 | 0.00 | 2.56 | 7.64 |
| | Yes | 88.55 | 89.01 | 87.05 | 100.00 | 93.59 | 86.11 |
| Question 12 | No | 3.05 | 3.30 | 3.63 | 0.00 | 1.28 | 4.17 |
| | I don't know | 16.03 | 8.79 | 14.51 | 3.45 | 11.54 | 13.89 |
| | Yes | 80.92 | 87.91 | 81.87 | 96.55 | 87.18 | 81.94 |

jority registered an undergraduate level of education and had at least 1 risk factor for COVID-19 as codified by the ICPC-2 (Table 1).

*COVID-19 Questionnaire*

Overall, younger individuals, females, graduates, and the non-risk group presented a higher number of correct answers on the COVID-19 Questionnaire. However, 3 exceptions were observed. Compared to the graduate and non-risk groups, more subjects in the undergraduate and risk groups, respectively, stated that COVID-19 has a cure and that "Social Isolation" is an important preventative measure to adopt. More males than females knew the telephone number of SNS24 (the current hotline of the Portuguese National Health Service [SNS] for questions about COVID-19) and stated that children can get sick

**Table 3.** Nonparametric tests applied for the correct answers throughout the COVID-19 questionnaire

| Variables: | Age | | Gender | Education | Risk factor |
|---|---|---|---|---|---|
| Correlation coefficient/association test: | Point-biserial correlation coefficient | Kruskal-Wallis H test | Fisher exact test | | |
| | | *p* value | *p* value | *p* value | *p* value |
| Question 1: answer "Yes" | −0.20 | 0.26 | 0.70 | 1.00 | 0.09 |
| Question 2: answer "Other" | −0.22 | 0.10 | 0.67 | <0.01* | 0.06 |
| Question 2: answer "Fever" | −0.23 | 0.28 | 0.31 | 0.20 | 0.09 |
| Question 2: answer "Cough" | −0.1 | 0.06 | 0.22 | 0.65 | <0.01* |
| Question 2: answer "Dyspnea" | 0.03 | 0.52 | 1.00 | 0.14 | 0.37 |
| Question 3: answer "Cure" | – | 0.53 | 0.78 | 0.02* | 0.01* |
| Question 4: answer "Other" | −0.14 | 0.20 | 0.59 | 1.00 | 0.01* |
| Question 4: answer "Respiratory Etiquette" | −0.02 | 0.84 | 0.15 | 1.00 | 0.46 |
| Question 4: answer "Handwashing" | −0.10 | 0.85 | 0.27 | 0.16 | 0.12 |
| Question 4: answer "Social Isolation" | 0.04 | 0.61 | 0.41 | <0.01* | <0.01* |
| Question 5: answer "Stay home and call SNS24" | −0.26 | 0.02* | 0.04* | 1.00 | 0.03* |
| Question 6: answer "808242424" | −0.18 | 0.54 | 0.04* | 0.49 | 0.03* |
| Question 7: answer "No" | – | 0.84 | 0.13 | 1.00 | 0.09 |
| Question 8: answer "No" | – | 0.70 | 0.04* | 0.81 | 0.34 |
| Question 9: answer "No" | – | 0.25 | 0.01* | 0.09 | <0.01* |
| Question 1: answer "No" | – | 0.48 | 0.74 | 0.40 | <0.01* |
| Question 11: answer "Yes" | – | 0.88 | 0.35 | 0.19 | 0.22 |
| Question 12: answer "Yes" | – | 0.92 | 0.32 | 0.16 | 0.53 |

* $p = 0.05$, statistically significant differences.

and transmit the infection by SARS-CoV-2 (Table 2; online suppl. information). The use of nonparametric tests (the Kruskal-Wallis H test and Fisher exact test) demonstrated several statistically significant associations between our variables and the answers given in the COVID-19 Questionnaire (Table 3).

Questions Regarding the Course of COVID-19

When questioned about the symptomatology of COVID-19, 96.85% of the subjects stated that they knew the symptoms of COVID-19. Indeed, analyzing only the 215 individuals who answered "Yes" to the first question, we observed that most (>70%) stated the cardinal symptoms of COVID-19 described in *Normas de Orientação Clínica 004/2020* (fever, cough, and dyspnea), and 36.28% stated other symptoms such as myalgia, headache, and loss of smell and taste ("Other"). Nonparametric tests denoted statistically significant associations "Other" revealed a significant association with "Education," with the graduate group more often stating other symptoms of the disease. "Cough" revealed a significant association with "Risk Factor," with the non-risk group stating this symptom more often.

When questioned whether COVID-19 only affects the elderly or not, 90.99% of individuals answered the correct answer. Nonparametric tests reveal a statistically significant association regarding variable "Gender," with females more often answering correctly.

Regarding the 2 questions about children, there was a good level of health literacy in our sample. When questioned if children can get sick, "Yes" was the predominant answer (88.74%). Nonparametric tests revealed a statistically significant association regarding the variable "Risk Factor," with the non-risk group stating the correct answer more often. When we questioned about the possibility of children transmitting the disease, 83.78% answered "Yes." No statistically significant associations were observed.

Regarding the question about a cure for COVID-19, we found a wide range of answers; 41.44% stated that there is a cure, 33.33% denied it, and 25.23% stated that they didn't know if there is a cure or not. Nonparametric

tests revealed a statistically significant association regarding the variables "Education" and "Risk Factor," with individuals from the undergraduate and risk groups stating the correct answer more often.

Procedure in Cases of Suspected COVID-19 and Preventative Measures

When questioned about the correct procedure in the case of symptoms compatible with COVID-19, 77.48% stated they should "Stay home and call SNS24." Nonparametric tests revealed a statistically significant association regarding the variables "Age," "Gender" and "Risk Factor," with younger individuals, females, and the risk group stating the correct answer more often. Regarding the telephone number for SNS24, only 24.77% of the subjects knew the correct number. Nonparametric tests revealed a statistically significant association regarding the variables "Gender" and "Risk Factor," with males and the non-risk group knowing the correct number for SNS24.

When questioned about the preventative measures to adopt, 77.93% stated "Social Isolation," 50.90% stated "Other" (e.g. the use of gloves or a mask, keeping a distance >2 m from other people, leaving one's shoes at the front door, etc.), 45.50% stated "Handwashing," and only 3.60% (8 subjects) overall mentioned "Respiratory Etiquette" as an important measure to adopt. Nonparametric tests demonstrated several statistically significant associations. "Other" had a statistically significant association with "Risk Factor," with the non-risk group stating this symptom more often; "Social Isolation" had a statistically significant association with "Education" and "Risk Factor," with the graduate and risk groups stating this preventative measure more often.

Regarding the use of gloves, a wide range of answers was observed, with 56.31% stating that the use of gloves does not always prevent COVID-19 infection, 13.51% affirming "I don't know," and 30.18% answering "Yes." Nonparametric tests demonstrated that the variables "Gender" and "Risk Factor" had a statistically significant association with the answers given, with females and the non-risk group answering correctly more often.

Regarding the use of masks, a wide range of answers was observed, with 59.91% stating that the use of gloves does not always prevent COVID-19 infection, 15.32% affirming "I don't know," and 24.77% answering "Yes." Nonparametric tests showed a statistically significant association with the variable "Risk Factors" for this question, with individuals from the non-risk group answering correctly more often.

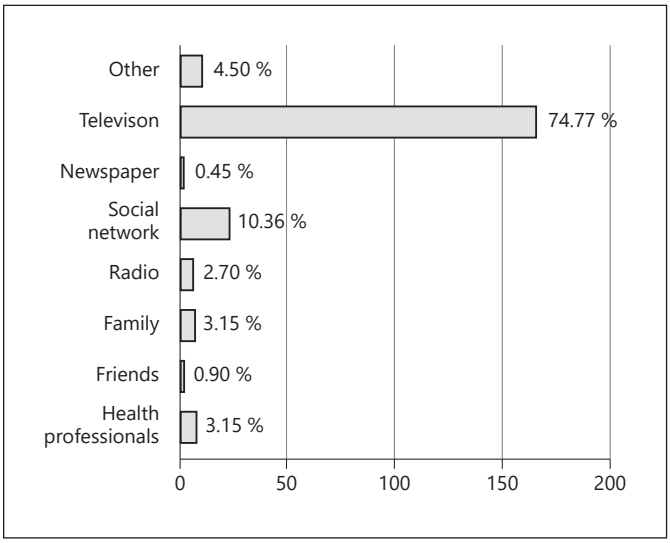


**Fig. 1.** Answers to question 14 given as percentages of the study population.

When we questioned our subjects about the possibility of visits by/to friends and/or family during social isolation, 83.33% stated "No," 12.16% stated "Yes," and 4.5% affirmed "I don't know." Nonparametric tests showed no statistically significant associations.

Source of Information

Regarding the final question, and despite the range of answers, it is obvious that the major source of information about COVID-19 is the television, with 74.77% reporting this. After television, social networks (10.36%) and "Other" (4.50%), e.g., official websites (of the WHO, DGS, and CDC), employers, the Town Hall, and Guarda Nacional Republicana, play an important role in informing the population about the current public health problem (Fig. 1).

## Discussion

According to Portugal's last census, the population of our sample comprised 23,850 citizens, with a proportion of >1 female per male, and an undergraduate and older population when compared to the national median age [18, 19]. The characterization of our sample is compatible with these data.

Our results revealed a relatively well-informed population. Furthermore, females, younger individuals, grad-

uates, and the non-risk group more often gave the correct answer throughout our questionnaire. There were exceptions, which are discussed below.

In the literature, several studies support our results, reporting age, gender, and education as predictors of health literacy. Indeed, Sørensen et al. [20], in their comparative study of the results of the European Health Literacy Survey (HLS-EU) reported education, age, and gender as predictors of low health literacy, along with social status and financial privation. We understand health literacy as the ability to obtain, understand, and use information to develop the skills to make free and informed decisions about one's own health as well as playing an important role in preventative medicine and in advocating effectively to political leaders and policy-makers. According to the HLS-EU findings, males and the aging population tend to have slightly poorer health literacy, while a higher level of education is a strong positive predictor of health literacy. Several other studies have reported significant gender, age, and education differences, i.e., that older age, male gender, and having a lower level of education usually imply a decrease in health literacy [21–27].

Regarding the presence/absence of risk factors for COVID-19, as far as we can gauge, there is no literature available to support the results found in our study. However, we do know that the median age of the risk group is older than that of the non-risk group. Such differences, confirmed by the nonparametric tests run in this study, may be a consequence of an age bias.

Concerning the symptomatology, most of the population (>70%) knew the cardinal symptoms of COVID-19 as listed by the DGS. Curiously, even though not being reported by DGS, a significant percentage of subjects reported other symptoms such as myalgia, headache, and loss of taste and smell, also described in several other articles [10, 12–14, 28]. This may suggest that people do not obtain their information from a single source and that they try to search for relevant information.

The third question was thus constructed to capture the discord underlying the definition of a cure. According to the Portuguese dictionary, "cure" is defined as the "act or effect of self-healing or healing somebody" or "health recovery," and "healing" is "to restore health." However, the answers given highlighted the uncertainty of this definition and emphasized the insecurity experienced when answering this question. Indeed, throughout the study, most people who answered "No," justified this with sentences such as "there's no vaccine" or "there's not a medication targeting the virus." These findings underline some incongruence and some misconceptions. A vaccine is a tertiary preventative measure administered to confer immunity to a certain infectious disease by enabling an asymptomatic/mild clinical manifestation of it, useful for controlling epidemics [29–31]. Therefore, it is necessary to demystify the idea that a vaccine is a cure for an infectious disease. Even though no specific antiretroviral targeting of SARS-CoV-2 has been efficiently approved, there are several reported cases of healed patients, i.e., that match the Portuguese definition of a cure [6, 10, 28, 32]. Even in clinical medicine, there are several meanings and definitions of the word "cure," regarding clinical manifestation, clinical evolution, and available clinical treatments for a certain disease [33–37]. From our perspective, the divergent results obtained might have been influenced by these differences regarding different diseases as well as the linguistic terms used in data collection and the anthropological, cultural, and/or sociological contexts.

Interestingly, the undergraduate group answered "Yes," more often, although it wasn't actually possible to find any information in the literature to substantiate this finding.

Regarding preventative measures to adopt in the face of COVID-19, overall, the subjects in our study were able to report them, with the exception of "Respiratory Etiquette." In the literature, there are several studies that state the importance of handwashing, respiratory etiquette, and social isolation in containing epidemics and in controlling SARS-CoV-2 transmission [28, 38]. Indeed, even though Yang [39] reported no proven efficacy of handwashing in controlling SARS-CoV-2 transmission, there are several findings that report the opposite. Ma et al. [40], in a study involving 7 countries, highlighted the fact that handwashing significantly slows the exponential spread of SARS-CoV-2, and several other studies have shown that correct handwashing is useful in controlling epidemics as well as SARS transmission [21, 40, 41]. Handwashing is an important preventative measure to adopt during the COVID-19 pandemic, but unfortunately findings show that the correct procedure (as recommended by the WHO) is not always applied and mistakes are observed such as not washing hands often enough or for long enough each time [42, 43]. Zhang et al. [14] conducted a study on the population of Beijing as a postpandemic assessment and verified that even though people knew the importance of handwashing, they did not apply it. Fung and Cairncross [21] observed a decline in the practice of this preventative measure. To avoid such a decline and other errors, it is imperative to implement

methods that successfully achieve correct preventative handwashing [44].

Respiratory etiquette plays an important role in controlling the transmission of all infectious respiratory diseases [45–47]. In our study, the number of subjects who mentioned this as a necessary preventative measure was disappointingly low. We found no explanation for this, except to state that data were collected at an early stage in the COVID-19 pandemic which could account for the lack of sensitivity for this preventative measure. The low number of subjects aware of the importance of this measure underlines the huge necessity of improving communication, which is an issue to be incorporated in future health literacy strategies.

As SARS-CoV-2 is highly contagious, an effective and important preventative measure to adopt to contain the pandemic is social isolation [6, 48]. Interestingly, and in contrast to the other questions, it was found that the risk group reported "Social Isolation" more often than the non-risk group did. This may be explained by the fact that the non-risk group was a younger group. Younger people have to leave home for work more than the elderly do; this might explain this finding. Regarding the answers to question 7, there were still people who believed it possible to receive or visit family and/or friends at home. Since this promotes new transmission chains, it is necessary to demystify this issue across every single outlier.

Regarding the right procedure to follow when symptoms are present, most of the subjects stated that they must stay at home and call SNS24, as recommended by the DGS. Concerning the telephone number of SNS24, interestingly, males gave the correct number more often than females. This may be explained by the fact that, in the Portuguese population, males generally have higher levels of education and more educational opportunities [19]. Recalling that the graduate group stated correct answers more often, this difference between females and males could indeed be explained by this bias. As for knowing the SNS24 phone number, the risk group which largely consisted of the aging population, stated that they didn't know the number by heart because their caregivers knew it or else it was noted down. Besides suggesting the lower capacity of the elderly to memorize numbers, this draws attention to the important role that caregivers can play in conveying relevant information to seniors in their care.

Regarding the questions about the epidemiology of COVID-19, there was a major consensus that the disease affects the elderly and that children can transmit it and can get sick. The literature states that SARS-CoV-2 may infect individuals in all age ranges, with a more severe clinical manifestation in the elderly and/or people with underlying pathologies [6, 10, 49]. Concerning the clinical manifestation and transmission in children, some subjects stated: "children can transmit the virus, that's why grandchildren and grandparents cannot be together." Indeed, children can get sick and are an important vector of transmission of SARS-CoV-2 [6, 10]. When infected, they are usually asymptomatic and have more difficulty applying the correct procedures and hygiene measures [50]. Interestingly, males stated more often than females that children can get sick and transmit SARS-CoV-2. There is no other literature confirming this finding.

Regarding the use of gloves and masks, a certain hesitation was observed and there were some myths associated with this, possibly to be explained by the huge quantity of contradictory information available about this equipment [51]. The use of gloves is recommended during procedures associated with aerosol production in a clinical context [51, 52]. The general use of gloves is not recommended by the WHO, CDC, or DGS, and may even constitute false security if people do not dispose of the gloves correctly [47]. The use of masks has been under constant study since the beginning of this pandemic, to determine whether it prevents infection by SARS-CoV-2 or not, and the literature regarding this matter is very controversial. In a recent study, Greenhalgh and Howard [53] advocated the general use of masks (regardless of their material), stating that even a simple cotton mask will reduce virus transmission by 36 times. Indeed, masks are gaining a major role as a community preventative measure and not as an individual preventative measure [40, 49, 53–55].

Even though we observed a relatively well-informed population, this is a pandemic of a virus with an elevated transmission rate. Thus, biological characteristics as well as individual and community behaviors have an impact in its course [10, 14, 20]. A single error may have a negative impact, e.g., creating a new chain of transmission that could have been prevented [32, 38, 48, 49, 56]. Following this thought, we are looking for the outliers of wrong answers/unfamiliarity of a concept, and to promote a fruitful health literacy in an informed population, while avoiding an overwhelming unjustified panic which can lead to more mistakes being made [56–58].

To pursue this objective, we must take into account the major sources of information and adapt communications by creating programs/methods to reach each specific sector of the population [59]. This adjustment to different realities has a positive impact on the population and their

behavior, by promoting community empowerment [15]. According to the WHO, this can be attained by empowering citizens and engaging them in community actions for health as well as promoting governance to fulfil their duties and responsibilities, in the pursuit of individual and community health [60]. Nevertheless, this community empowerment can be a problem if information is always changing, as this requires a constant effort to be made by the individual to keep up-to-date. Moreover, on a final note, we would like to include the observation that health literacy does not always equate to correct behavior and that mistakes can still prevail [58, 59].

## Conclusion

Health literacy is a critical issue nowadays and has an impact in controlling epidemics and pandemics [61–63]. In Portugal, we are now in phase 3.2 of mitigation of the COVID-19 pandemic, and, even though we have a relatively well-informed population, there seems to be some misconception about the guidelines [62]. As the current public health situation is a pandemic caused by a highly infectious virus, every single deviation from compliance matters and must be prevented. Our goal was to characterize the population regarding their COVID-19 health literacy, to help create specific intervention strategies aimed at populations with different levels of health literacy.

Although our sample was relatively small, it highlighted some aspects that can bridge gaps that still prevail. We believe it also provides support for future studies and alerts us to the necessity for new communication approaches to be able to control not only this pandemic, but also pandemics with human-to-human transmission in the future.

The main limitation of this work was the size of the database. Besides comparisons between groups, other tests or applying metrics could also have been deployed, e.g., Spearman's rank and Pearson's correlation coefficients. A multinomial regression could also have been carried out to predict the health literacy of an individual. The variable "resident status" of each patient could also have been collected, to avoid a potential bias regarding local interventions. Likewise, a new index variable representing health literacy could have been created that would determine the level of health literacy of an individual. In further studies, this new variable can be created based on data from the WHO and DGS, thereby enabling a comparative study of various coefficients, taking criteria and quality adjustment metrics into consideration.

## Statement of Ethics

This study was submitted for approval and approved by the Department of Primary Health Care of Unidade Local de Saúde do Nordeste (an ethics committee was informed about the study, but it did not have an opportunity to assemble and adjudge this study and so transferred this responsibility to the Department), according to the Declaration of Helsinki of the World Medical Association. The confidentiality of the data and phone calls was guaranteed, with access granted only to the main investigator and the respective authors. All subjects provided their written informed consent.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.
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## Author Contributions

J.G.S.: Conception and design of the study, acquisition, analysis and interpretation of data for the work; drafting the work; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

C.S.S.: Analysis and interpretation of data for the work; critically revision for important intellectual content of the manuscript; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

B.A.: Design of the study, acquisition, analysis and interpretation of data for the work; drafting the work; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

P.M.: Interpretation of data for the work; critically revision for important intellectual content of the manuscript; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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