General Knowledge and Perception of Portuguese Children About COVID-19

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Abstract. The Coronavirus pandemic (COVID-19) has not only posed a number of challenges to health systems around the world, but its effects have been devastating on economic, social and political levels. Along with the epidemiological danger of COVID-19, the expansion of disinformation about the pandemic has been a major concern of the World Health Organization (WHO 2019), including among children. Therefore, it is important to ask: what is the knowledge and perception of Portuguese children about COVID-19? Our study's main objective is to answer this question by assessing how they perceived the epidemiological phenomenon. In order to fulfill our goal, we applied a single questionnaire to a sample of 960 children between three and 11 years old, collected between March 20 and April 21, 2020. The online survey with open-ended questions was disseminated by email through Primary and Preschools from all regions of Portugal, and through Facebook. Subsequently, we carried out a qualitative analysis of the results for which we rely on the IRAMUTEQ software. The study concluded that Portuguese children were, in general, able to identify and define the disease, assess its risk of contagion and the severity it represents for humanity; and that the majority are afraid of the consequences of COVID-19.

Keywords: COVID-19 · Children · Portugal · Knowledge · Perception · Digital social media

1 Introduction

Since March 2, 2020, when the first infection by COVID-19 was registered in Portugal, the country has joined the list of nations affected by the pandemic. On the 12th of the same month, the Portuguese government ordered the closure of schools and universities as a containment measure. Confirmed the first death by COVID-19 on March 16, President Marcelo Rebelo de Sousa announced the State of Emergency, whose decree

B. P. Toniolo and J. P. Baptista—Both authors contributed in the same way to the article.

Á. Rocha et al. (Eds.): ICITS 2021, AISC 1331, pp. 179–197, 2021.
https://doi.org/10.1007/978-3-030-68418-1_19

was signed on the 18th of that month and renewed twice. Due to the rapid action of the authorities, Portugal was considered an example in the European Union, given the high number of infections and deaths in neighbouring countries like Spain, France and Italy (Table 1).

At the beginning of May, commercial activities began to resume in a gradual process of transition to normality. But the same did not happen with the schools. Still in April, the government decided to keep them closed with students in distance education until the end of the school year. With their routines drastically altered by the pandemic, anxiety and fear among children became a concern. To help parents and teachers address COVID-19, the United Nations Children's Fund (UNICEF 2020) has published a guide on how to talk about the pandemic with children. Among UNICEF's recommendations were to talk openly about the issue; reinforce the importance of hygiene habits; avoid exposure to alarming news and images or listen to them and convey safety.

Despite the difficulty in distinguishing when childhood ends and adolescence begins (Carrilho 2015), our research chose to study the knowledge and opinion of Portuguese children between the ages of three and 11, which includes those attending pre-school to the sixth year of the basic cycle of the Portuguese education system. Theoretically, these children would be prevented from creating profiles on digital social networks, and are expected to be subject to greater parental control over the consumption of information on television and the Internet (Rodríguez-Rossell and Melgarejo-Moreno 2019). Thus, we come to our research question: what is the opinion and perception of Portuguese children about COVID-19? The main objective of the study is to evaluate the opinion and the way Portuguese children perceived the epidemiological phenomenon. We applied a single questionnaire to a sample of 960 children between March 20 and April 21, 2020. The online survey with open-ended questions was disclosed by e-mail, through the several schools of all regions of the country and Facebook. The data collection period includes the first phase of crisis mitigation.

2 Theoretical Framework

Studies on children's use of the Internet have, in EU Kids Online, an important milestone. In 2010, the survey was applied to children aged 9–16 from 25 countries. In the 2019 edition, the survey was carried out in 19 countries, keeping the same age range and, in some countries, until 17 years old. According to the survey report, its main goal is "to map the online access, practices, skills and current risks and opportunities of internet use among European children" (Smahel et al. 2020, p. 9).

Portugal's report highlights "the replication of gendered stereotypes in digital spaces" (Smahel et al. 2020, p. 150). For this country, the results indicated differences in online experience between the genders. While 27% of girls reported uncomfortable experiences in the digital environment, among boys this percentage is only 18%. Another gender difference is noted in relation to family support. Girls seek more guidance from family, teachers and colleagues than boys. These, in turn, consider

Table 1. COVID-19 case numbers in Portugal and neighbouring countries on April 30

Country	Confirmed cases	Deaths
Portugal	183	25
Germany	1.478	173
Spain	2.144	206
France	1.602	427
Italy	2.086	323

Source: Adapted WHO Coronavirus Disease Dashboard (See: https://covid19.who.int/)

themselves more self-sufficient and seek to clarify their doubts about experiences and online content on the web itself.

In a comparison between the countries, Portugal was among those were children had more access to the Internet and carried out more online activities alongside Romania, the Czech Republic, Estonia, Lithuania, Serbia and Poland. And although the study showed that Portugal was in the group of countries where the online risk for children is highest, this risk was not associated with greater harm. It is worth noting that in the 2010 report Portugal was framed in the cluster called "protected by restrictions", i.e., "children concentrate on practical and fairly basic online activities associated with relatively low risk because parents are cautious, and thus restrictive, of wider online exploration" (Livingstone et al. 2018, p. 1113).

In addition to mapping how children interpreted the Internet mediated world in the different countries surveyed, the EU Kids Survey 2010 aimed to unmask some myths about children's use of the Internet. One of the myths evaluated in that survey is that children under 13 would not have access to social networking sites. The study found that 38% of children between the ages of 9 and 12 had profiles on social networks and that they were registered with a false age in order to mislead the privacy and security settings of the provider (Livingstone et al. 2018). Again found in the 2019 survey, in relation to Portugal the study confirmed the overthrow of this myth: 27% of children aged 9–10 years admitted accessing a social networking site on a daily basis; 65% in the 11–12 year old age group; and 81% with 13–14 years old (Ponte and Batista 2019).

A study conducted with 765 families from the Community of Madrid (Valle et al. 2019) showed that the family has a great influence on the development of critical Internet skills in children. But it is the educational level of the children and the style of parental control that are the most important factors in the formation of critical citizens. The investigation concluded that the less restrictive the parents are, the more children are able to use the Internet independently and responsibly. According to the study, the level of education and age of parents are factors that not directly influence the acquisition of critical skills on the Internet.

Regarding the general perception of the population about COVID-19, Dryhurst et al. (2020) concluded, in an applied survey to 10 countries, that the perception of risk was uniform and high. The perception of risk of the disease was slightly higher in the United Kingdom, Spain and Germany. According to the authors, "people's perception

of the risk is higher in those with direct personal experience of the virus, and in those who hold more prosocial worldviews" (Dryhurst et al. 2020, p. 10).

In Germany, Glöckner et al. (2020) investigated the evolution of individual risk perception in three different stages of the Coronavirus outbreak. The authors concluded that, at the beginning of the pandemic, this perception was not different from the experts' assessment. However, with the advancement of COVID-19 and the proximity of the virus, risk perception was overestimated. After the flattening of the curve, in the third stage of the research, the Germans showed to have reached a better balance between confidence and estimation of the potential of the disease.

Based on the premise that people's knowledge and perception of Coronavirus influences whether or not they adhere to preventive behaviour, Geldsetzer (2020) conducted a survey in an adult sample from the United States and the United Kingdom to assess their understanding of the pandemic, as well as to check their belief in myths circulating on the Internet at the time. In Nigeria, Iorfa et al. (2020) identified a more positive relationship between risk perception and adoption of preventive behavior among women than among and men. Also the study of Huang and Yang (2020), developed in the United States, confirmed the existence of an useful association between risk perception and the search for information on COVID-19. This relationship, on the other hand, assumes a negative bias when associated with high uncertainty. The evaluation of hope depends on the balance between these two factors.

Although the Geldsetzer's study (2020) identified good general knowledge about the disease, main symptoms, forms of prevention and transmission, the influence of misinformation on the formation of public perception became evident. In respect of misinformation, Kim et al. (2020) conducted a comparative study on its effects in the United States, South Korea, and Singapore during the early stages of the epidemic. The results obtained confirmed the negative consequences of misinformation. According to the authors, exposure to misinformation led individuals to feel sufficiently informed and with a satisfactory perceived level of knowledge, which directly and indirectly impacted the seek and processing of accurate information. The study also found cultural differences in the processing of disinformation, as North Koreans and Singaporeans are more likely to question the messages to which they are exposed than Americans.

In Asia, 85% of the Bengali surveyed, according to the study by Islam et al. (2020), reported feeling stress and fear towards COVID-19. Fear is a functional feeling among adults in a pandemic context, capable of generating preventive behavioral patterns (Harper et al. 2020), among children it can trigger emotional disorders, as demonstrated by the study conducted by Jiao et al. (2020). Attachment, inattention and irritability were the main reactions identified in all age groups studied (3 to 18 years) in China. In emergency and disaster situations, which include epidemics, children and adolescents are expected to have their perception of events disproportionately affected (Danese et al. 2019).

3 Methods

The main objective of our investigation focused on analyzing the knowledge and opinion of Portuguese children regarding COVID-19. To achieve our goals, a questionnaire was applied to children aged 3 to 11 years old. The universe (or total population) of Portuguese children between 3 and 11 years old is $N = 1{,}047{,}218$[1]. The study sample was $n = 960$, which refers to a margin of error of $\sim 3{,}2\%$ for a 95% confidence level, data that refers to a representative sample. Data collection started with the dissemination of the online questionnaire through a letter addressed to the direction of each public-School Group, which integrated the study cycle corresponding to each age group of the participants. In addition, a printed version of the questionnaire was sent to 375 School Groups in all 18 districts of mainland Portugal. Likewise, the questionnaire was available on a specific Facebook page,[2] which also contains information about the investigation. Through Facebook, the online questionnaire was disseminated to the entire Portuguese territory, through sharing it on several pages and groups related to national locations, cities and regions. Online dissemination was important since in the period of data collection most classes *in praesentia* had been suspended.

We chose to use a questionnaire consisting mostly of open responses, with the aim of simplifying and facilitating the respondent's task, considering their young age. The open response allowed us to obtain unique and more accurate answers regarding the children's knowledge about this epidemiological phenomenon. Participants were exposed to questions related to the Coronavirus, prompted to provide information about the disease, such as its main symptoms and what prevention practices should be taken. The questionnaire allowed us to collect very useful information for the qualitative analysis of the results. We divided the questionnaire into two categories (see Table 2): Identification and General knowledge and opinion.

Table 2. Questionnaire categorization

Questions	Categories
Q.1. How old is the child who is responding? Q.2. What is her/his country of residence? Q.3. Within the following options, indicate the one that suits the school year she/he is attending	Identification
Q.4. What is coronavirus? Q.5. How is the coronavirus transmitted? Q.6. What are the main symptoms of the disease? Q.7. What should be done to avoid contamination? Q.8. Are you afraid of the coronavirus? Q.8.1. If so, what are your main fears about coronavirus? Q.8.2. If not, why are you not afraid of the coronavirus?	General knowledge and opinion

[1] Source: Pordata 2018. Retrieved from: https://www.pordata.pt/Home.

[2] See: https://www.facebook.com/ascriancaseocoronavirus/.

Data collection took place between March 20 and April 21. During this period, Portugal was in a state of emergency (March 19–May 2) due to the alarming situation of COVID-19. The State of Emergency was enacted for the first time since Portugal is a democratic regime. The decree implied that a set of restrictive measures were taken to the operation of commercial, sports or cultural activities. Educational spaces, such as schools and libraries, had also been closed[3].

3.1 Participants

Our sample consisted of 960 participants/children. Participants are of the following ages: three participants aged 3 (0.3%); 20 participants aged 4 (2%); 20 participants aged 5 (2%); 92 participants aged 6 (10%); 126 participants aged 7 (13%); 187 participants aged 8 (20%); 209 participants aged 9 (22%); 174 participants aged 10 (18%); 129 participants aged 11 (13%). Respondents have an average age of 8.5 years.

3.2 Statistical Treatment of Data

In order to carry out the qualitative analysis of the questionnaire, a *corpora* of texts was created based on the set of responses to each question, in order to analyze the results with text mining techniques. For the textual analysis, our study used a set of tools of the software IRAMUTEQ. Based on our objective, we resorted to a basic lexicographic analysis with software, in order to be able to identify the words present in the text and to calculate the frequency of words and hapax (words that appear only once). In addition, lexicographic analysis allowed us to extract segments of text that make up the different text corpora, based on a set of specifics of the words and their grammatical classes (Camargo and Justo 2013; Justo and Camargo 2014).

We also proceed to the processing of data through the graphic representation of the similarity analysis of the program. This operation allows us to identify the various relationships and relations between the words identified in a given text *corpus*. Thus, we were able to assess children's knowledge and opinion about a general aspect (coronavirus), but also about specific aspects (treatment, precautions, fears…). The general corpus consists of questions (Q) 4, 5, 6, 7, 8.1, 8.2; The text corpus of Q.4 consists of 7482 occurrences (words and forms), Q.5 for 7961 occurrences, Q.6 for 5844 occurrences, Q.7 for 10467 occurrences, Q.8.1 for 2352 occurrences and Q.8.2 for 4217 occurrences.

4 Results

The results of our study suggest that children have, for the most part, a good knowledge of the epidemiological disease of COVID-19 with regard to their risks and problems, and also how to prevent themselves from being infected by the virus. If we consider the most frequent words used by children in their responses, we can prove this perception.

[3] See: https://bit.ly/3kgCiNo.

Taking into account Fig. 1, we found that in response to the question: "what is the coronavirus?", The words 'virus' (n = 542), 'disease' (n = 267), 'very' (n = 234) and 'dangerous' (n = 110) are the most frequent in the text corpus of question 4. Regarding question 5: "How is the coronavirus transmitted?", we show in Table 2 that the words associated with contact or physical proximity and the spread of droplets from the breath are the most frequent. 'Contact' (n = 224), 'hand' (n = 200), 'cough' (n = 176), 'sneeze' (N = 159), 'transmit' (n = 138) and 'mouth' (n = 115) are the most frequent terms. With regard to the clinical symptoms caused by the virus, 'fever' (n = 829) and 'cough' (n = 738) stand out for the most indicated symptoms. Also noteworthy are the words related to the respiratory 'difficulties' caused by the virus, demonstrated using terms such as 'lack' (n = 219), 'air' (n = 201), 'difficulty' (n = 194), 'breathe' (n = 134) and 'respiratory' (n = 122). On the other hand, respondents suggest hand washing and social distancing as one of the main ways to avoid contagion by COVID-19, with 'hand' (n = 714) and 'washing' (n = 496), such as most frequent words, followed by 'house' (n = 496) and 'stay' (n = 371).

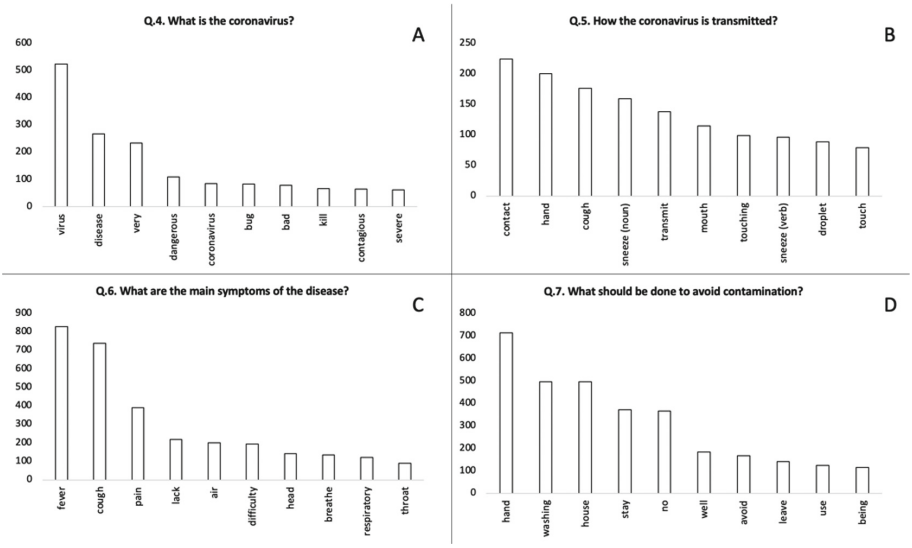

Fig. 1. The top 10 of the most frequent words in the corpora

Given the Top 10 most frequent words in each answer (see Fig. 1), we were able to detect words that identify the disease ('virus', 'disease', 'coronavirus', 'sick', 'health', 'pandemic'), words which point out the risk of transmission ('bug', 'contagious', 'infect', 'transmit', 'provoke', 'spread', 'transmissible') and to its severity ('very', 'dangerous', 'bad', 'kill', 'strong', 'problem', 'highly', 'mortal', 'affect', 'quickly', 'invisible'). Analyzing Fig. 1, we were able to confirm this trend, with 52.91% considering the coronavirus as a virus, 27.19% using the term 'disease', 19.16%

considering it as ‘dangerous or bad’, 16.14% as being a ‘contagious, transmissible or infectious’ disease and 14.79% to be referred to as something ‘deadly or mortal’, which can kill. On the other hand, Fig. 1 also shows us that the respondents consider the disease to be more dangerous for the elderly (1.77%) and is related to ‘flu’ (3.10%). Still, a reduced rate of participants considered the coronavirus to be ‘bacteria’ (0.73%) and ‘microbe or germ’ (0.63%). Our results seem to suggest the exposure of some children to conspiracy tendencies (albeit very low), either because they blame China or the Chinese for the virus or because they say it was created in the laboratory by scientists (see Table 3) (Fig. 2).

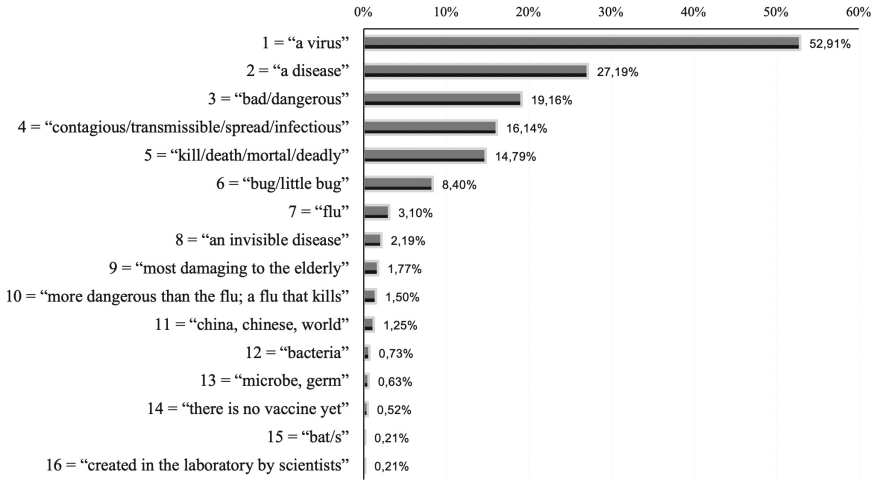

Fig. 2. Answers to the question “what is the coronavirus?”

Regarding a more in-depth interpretation of children’s opinion and knowledge of what the coronavirus is, it is important to analyze the text segments in Table 3. We selected the text segments related to the words ‘virus’, ‘very’, ‘vaccine’, ‘laboratory’, ‘bat’, ‘elderly’, because it may be the words, with the exception of viruses, that seem the most distant from the families of words previously presented.

Table 3. Translation of the text segments (Q.4)

Word	Translation of the text segments (Q.4 - What is Coronavirus?)
Virus	"it is a fatal virus"; "it is the virus that is caused by the covid disease 19"; "it is a virus that infects people and can kill them"; "a new virus"; "it is a virus that is transmitted in our body and that came from an animal that is the bat"
Very	"it is a very bad virus"; "it is a very dangerous flu"; "it is a very strong disease"; "very small bug"; "it is a very contagious disease"; "very serious respiratory problems"; "very small that can be multiplied"
Vaccine	"scientists are developing a vaccine to protect the population, but I think that [the virus] was created on purpose to kill older people"; "it is a virus that has no vaccine for now"; "a very deadly virus that spreads easily and does not yet have a cure vaccine"; "it's a virus that doesn't have the vaccine yet"
Laboratory	"the virus was created in a laboratory in china (two occurrences)"; "it is a virus created in the laboratory that infects people"; "is a virus that was created in the laboratory by scientists who want to kill the non-rich part of the planet"
Bat	"it is a bat"; "is a virus that is transmitted in our body and that came from an animal that is the bat"
Elderly	"it is a dangerous bad virus that can kill older people"; "it is a very dangerous virus that can kill people, especially those who are already sick and the elderly"; "quite dangerous especially for the elderly and people with health problems"

There is a concern for older people. The children were able to identify that the elderly are part of the risk group, indicating, for example, that "[…] It is a dangerous bad virus that can kill older people" or "[…] quite dangerous especially for the elderly and people with health problems". In addition, the word 'very' actually serves as an intensifier of the problem or its severity: "[…] very bad virus […] very dangerous […] very strong". The word 'laboratory' (n = 4), although used in an insignificant way, appears associated with skepticism and conspiracy around the disease. In order to graphically expose children's knowledge and opinion of COVID-19, we used the IRAMUTEQ similarity analysis of our text corpora (see Fig. 3).

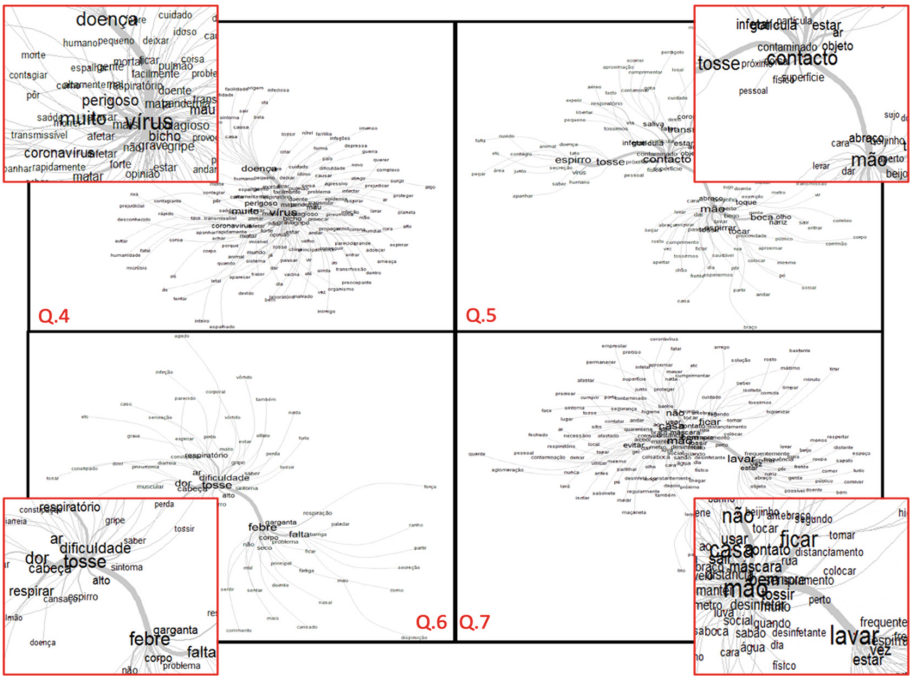

Fig. 3. Similarity test of answers to questions 4, 5, 6, 7

Figure 3 shows the different relations of the most frequent words in the text segments. We can see that in quadrant Q.4 (What is coronavirus?) The words appear interconnected to two nuclei: 'virus' and 'disease'. In the second quadrant (Q.5) of Fig. 3, we verify the existence of two communities or groups of words. The community (1) around the word 'hand', associated with indirect transmission, which involves, for example, touching contaminated surfaces and bringing the hand to the 'mouth' or 'nose'. This is verified through the words 'face', 'greeting', 'squeezing' (shaking hands, that is, greeting), 'approaching', 'handrail', 'dirty', 'socializing', 'moving', 'dirty'. The community (2) around the word 'contact' associated with direct and indirect transmission, as it implies proximity and physical contact and a greater risk of transmission with the word 'liberate', 'saliva', 'droplet', 'perdigote', 'drop', 'particle 'or' 'physical'. Within this community (2), it is important to highlight the words 'cough' and 'sneeze' that are associated with the contagion or direct transmission of the virus. This perception of transmission can also be verified considering the text segments related to the words present in Table 4.

Table 4. Translation of the text segments (Q.5)

Word	Translation of the text segments (Q.5 - How is the coronavirus transmitted?)
Hand	"to hold hands and give kisses"; "by touching, contacting people or infected surfaces through the hands"; "not washing your hands"; "is transmitted by placing the hand on the mouth or on the nose or eyes"
Touch, to	"with other people playing at places that infected people have splashed up"; "touching the surfaces"; "touch things that everyone touches"; "can be transmitted if we touch places and do not wash our hands well"; "touch infected things"
Contact	"contact and proximity to people"; "if you are in contact with an infected person"; "the virus is transmitted by physical contact"; "through contact with infected people"; "the coronavirus is transmitted by objects and personal contact";
Bat	"it is transmitted by bats and Chinese"; "contact with bats"

Regarding Q.6, in the third quadrant of Fig. 3, the text is formed around two nuclei: 'fever' and 'cough', which are indicated as the main clinical symptoms of the disease. Unlike the other quadrants or responses, the variety of frequent words is not as intense. As for Q.7, the fourth quadrant of Fig. 3, there are a number of precautions that must be put in place to avoid being infected. It is important to pay attention to three groups of words: (1) 'hand', (2) 'wash', (3) 'no'. While 'hand' and 'washing' are closely associated and are also related to touching surfaces and cleaning people, the word 'no' is an account of what should not be done, such as: 'no' - 'moving'; 'no'- 'approach'; 'no' – 'talk'; 'no' - 'lend'; 'no' - 'stay' or 'no' - 'greet'. For a better analysis, it is important to examine the text segments present in Table 5.

Table 5. Translation of the text segments (Q.7)

Word	Translation of the text segments (Q.7 - What should be done to avoid contamination?)
Hand	"wash hands"; "washing your hands often"; "wash your hands often"; "use alcohol to disinfect your hands"; "washing hands with soap and not touching the mouth"; "don't touch the face with your hands"
No	"don't leave home"; "don't play with friends"; "not being with many people"; "not having physical contact with other people"; "don't go to the street"; "don't touch the face"; "don't kiss"; "not using other people's things"; "not being with people"; "do not touch the eyes mouth or nose"
Stay, to	"stay at home"; "not being with many people in the same space"; "one must be in isolation"; "we should be quarantined"
Happy birthday	"always wash your hands while singing happy birthday"; "wash your hands with blue and white soap and water in time to sing happy birthday twice"
General Directorate of Health - DGS	"follow DGS rules"; "comply with DGS rules"

4.1 Coronavirus and Fear

The analysis of children's perception of this epidemiological disease also included assessing their fear of COVID-19. Before moving on to more specific cases, we noted that the rates of variation in fear of the virus were not uniform throughout the days when the questionnaire was open online (3/20–4/21). Figure 4 shows the variation in children's fear in accordance with the percentage increase in positive cases by COVID-19, in Portugal, per day. The 'fear of the virus' line concerns the percentage of children who answered 'yes' to Q.8. 'Are you afraid of the coronavirus?'. During this time, approximately one month, the percentage of participants/per day who reported being afraid of the coronavirus (yes or no) was surveyed. In addition, the number of cases of COVID-19 infection in Portugal was verified, calculating its percentage increase. Figure 4 shows only the percentage of participants who answered yes to the question of whether they were afraid of the coronavirus. For example, in 3/20, 43% responded that they were afraid of the coronavirus and, in 3/22, 66%. On 3/20, there were 1020 infected, and on 3/22, 1600, which represents a 57% percentage increase. These variations are those that are represented over the days in Fig. 4.

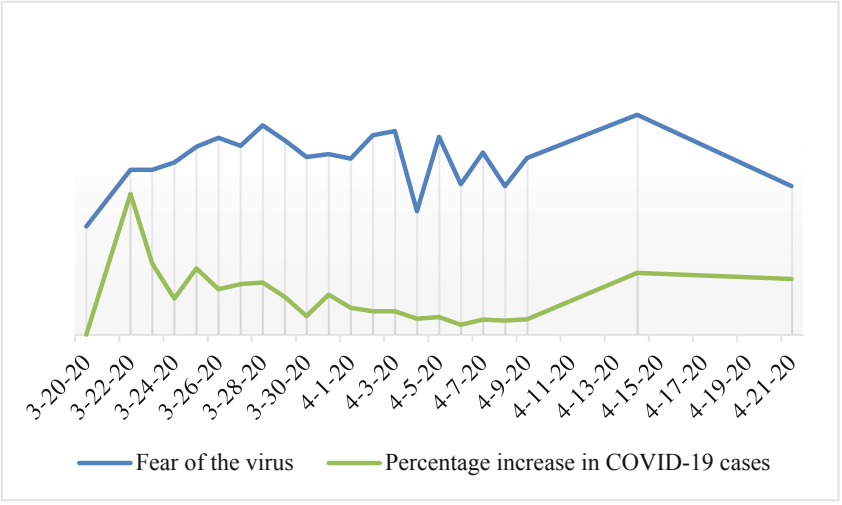

Fig. 4. Timeline with the evolution of fear and percentage increase in positive COVID-19 cases

When analyzing Fig. 4, we found that the lowest percentage of participants to fear the virus (43.75%) was on the first day of the form. It should be noted that the day we received the most responses was March 25, with 75.95% of respondents reporting being afraid of the virus. With the exception of March 20, the percentage of participants 'fearless of the virus' was never higher than the percentage of participants 'fearful of the virus'. It should be noted that Fig. 4 only considered the answers 'yes' or 'no' and

did not consider answers such as 'I don't know' or 'so-so' or 'maybe', among others. Answers of 'yes' or 'no' are 92.29% (N = 886) of the total answers to the question.

The 10-year-old children showed the highest percentage of fear (74.71%) for COVID-19 (see Fig. 5). On the other hand, it is the 3-year-olds who have shown to be 'less afraid' of the disease, with 66.67% reporting 'no'. However, there seems to be no relation between age and fear of the coronavirus. Even so, it is the 11-year-old children who presented a more constructive response.

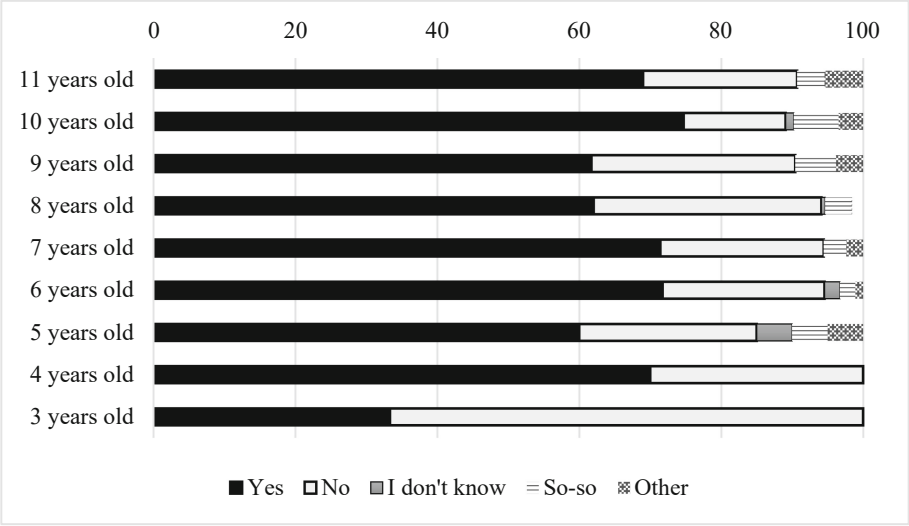

Fig. 5. Percentage of fear of coronavirus by age

But what are the reasons that lead participants to fear or not to fear the coronavirus? In the text corpus of Q.8.2., the most frequent words (in addition to 'why' (n = 214) and 'no' (n = 114), which served as answer connectors to start formulating the child's argument) were 'be' (n = 88), 'home' (n = 86), 'stay' (n = 41), 'fear' (n = 28) and 'protect' (n = 24). Our results suggest that children who are not afraid of the coronavirus feel safe or protected at home. These are the text segments associated with the most frequent words (see Table 6).

Table 6. Translation of the text segments (Q.8.2)

Word	Translation of the text segments (Q.8.2. - If not, why are you not afraid of the coronavirus?)
Home	"because I'm at home"; "because I don't leave the house"; "because I am isolated at home"; "because I'm quarantined"
Protect, to	"because if I protect myself well, I am safe"; "due to being at home, I am well protected"; "I have great parents that protect me"; "because if we disinfect our hands well and use a mask and gloves we are protected"
Very	"it doesn't do children much harm"; "it is not seen and it is very far from home"; "I am very careful"; "because it is too small"
Child	"because it is very rare to infect children"; "it is a virus that in children does not have much impact"; "children are not so infected"; "my parents said that children's bodies can be stronger and more resistant"

On the other hand, the word 'child' (n = 21) also deserves special attention. As can be seen in Table 6, 'child' is associated with the fact that "[…] it is very rare to infect children" or "[…] children are not so infected". We have also seen before that there is an idea that COVID-19 is more dangerous for the elderly.

Regarding the children who said they were afraid of COVID-19, the most frequent words were 'stay' (n = 211), 'die' (n = 177), 'fear' (n = 130), 'sick' (n = 109), 'family' (n = 106), 'get' (getting infected) (n = 53). It is important to highlight that there is a concern with death (1) and with the family (2) The most frequent words associated with each group are: (1) - 'to die' (n = 177), 'death' (n = 30), 'kills' (n = 6); (2) - 'family' (n = 106), 'grandfather' (n = 24), 'family member' (n = 21), 'father' (n = 19), 'friend' (n = 19), 'son' (n = 12), 'brother' (n = 11) and 'mother' (n = 6). In Table 7, we can see the text segments associated with the words 'stay' (this word corresponds to the direct translation from Portuguese), 'Die' and 'Death'.

Table 7. Translation of the text segments (Q.8.1)

Word	Translation of the text segments (Q.8.1. - If so, what are your main fears about Coronavirus?)
Stay, to	"my main fear is that the coronavirus will be transmitted to my family and I will be without it"; "fear of being away from the family"; "get sick"; "from getting infected"; "that my family, friends or me get infected"
Die, to	"fear to die"; "my family may die"; "I'm afraid of dying"; "I'm afraid of contaminating my grandparents and that they will die of the disease"; "I'm afraid someone in my family might die"; "I'm afraid my grandparents will die of the disease"
Death	"I am afraid of death caused by the disease"; "the death of the elderly"

5 Discussion

The SARS-CoV-2 virus, responsible for the emergence of the COVID-19 disease, has already infected more than 27 million people with 899,916 deaths recorded worldwide (data from WHO in September 10, 2020). It is known, due to the severity of the disease and the negative implications that it has caused in society, that it is increasingly urgent to understand the perception of the population regarding the risk of COVID-19, since the behavior of society is closely related to the spread of the virus (Van Bavel et al. 2020). The aim of our study was to assess children's knowledge and perception of COVID-19, since most studies have focused on assessing the behavior of the adult population (see Dryhurst et al. 2020; Geldsetzer 2020). Our results suggest that children's perception of the risk of the disease is high, as was found in investigations with adult people worldwide (Dryhurst et al. 2020).

Children were, in general, able to identify and define the disease, assess its risk of contagion and the severity it represents for humanity. Frequent hand washing, avoiding physical contact and staying at home were the most dominant practices in our study, which children identified to prevent the spread or infection of the disease. Literature has also shown us that these are the most frequent practices identified by adults. Kebede et al. (2020) analyzed the perception of visitors to a hospital in Ethiopia. Hand washing often represents 77.3% and the avoidance of shaking hands, 53.8% of the measures suggested by the participants. In a study conducted with citizens of the United Kingdom and the United States of America, 92.6% of Americans and 86% of British believe that the best way to prevent the disease is to wash their hands, avoid contact with sick people, avoid touching the eyes, nose and mouth (Geldsetzer 2020).

On the other hand, Geldsetzer (2020) also found that some respondents believe in misconceptions due to the way the disease spreads, feeding some prejudices against the Chinese, such as eating at a Chinese restaurant or ordering a package from China. The author believes that these false beliefs may be related to the disinformation and misinformation that circulates on social media. Also, in our study, despite being a very small percentage, there are some signs that may indicate this. A reduced rate of participants blames China or the Chinese for the virus and believe it was created by scientists (Fig. 3). Although theoretically the children in our study (3 to 11 years old) are not allowed to use social media (for example, in Twitter and Facebook, 13 years is the minimum age), we believe that there may be children who access social media or who are influenced by the interpretation of information by their parents.

This will be an investigation that we will carry out in the future. It is known, for example, that the family has an important role in the processing of information that children obtain by watching television (Austin et al. 1990). In addition, parents play an important role in processing their children's general information during their learning process. However, the influence between both (parents and children) is reciprocal. Both influence each other (Knafo and Galansky 2008).

Another way of trying to understand the high capacity of Portuguese children to identify the contagion risks of COVID-19, in addition to the parental influence in information processing, may be related to the child's exposure to television and news. In Portugal, in a partnership between the General Directorate of Health and the

government, since the beginning of the pandemic, a daily press conference was held in which an update of the national panorama was carried out (number of infections and deaths; measures and precautions to be taken; laws and restrictions, among others)[4]. The press conference was broadcast on television in some cases in its entirety, every day. Although children are a kind of 'incidental' viewers, due to the imposition of adults, that intend to watch the news (Lemish 1998), children, especially older ones, understand that the news is real and that it is important for their life (Lemish 1998; Wright et al. 1994).

On the other hand, COVID-19 has psychological effects on children, including anxiety, physical discomfort, nightmares and fear of the pandemic and for the health of their families (Dubey et al. 2020; Jiao et al. 2020). Our study showed that the majority of Portuguese children (3–11 years old) are afraid of the consequences of COVID-19. Children aged 3 years had the lowest rate of fear. These data are in line with the fact that children aged 3 years have little or no understanding of reality and of what goes on beyond the family environment (Flavell 1986; Wright et al. 1994). Children aged 10 are the most afraid of the coronavirus, although there is no relation between fear and age in our results. Some studies show that older children have a greater perception of reality and are more likely to be frightened by the news (De Cock 2012; Smith and Moyer-Gusé 2006; Smith and Wilson 2002).

One of the main fears of Portuguese children is death. The children indicated that they were afraid of dying or that a family member would die from the disease. Children's fear can have a positive effect on their behavior, that is, it can lead them to be more likely to have disease-preventing behaviors (washing hands, social distance, avoiding touching surfaces) (Harper et al. 2020). It may also be the fear that makes children know how to identify the main symptoms and measures to be taken against the spread of the virus. In addition, the fear of children from COVID-19 may also be the result of parental influence. Muris et al. (2010) showed that children's fear can be influenced by the information that parents provide them. Parents' negative information or perceptions about a given reality can be passed on to children. This influence may show in our study, when children identified the coronavirus as a "bug" or "bug that does harm". This language was also used by the youngest, who still do not distinguish reality from fiction and who need a greater parental relationship to process information.

6 Conclusions

When in March 2020, the WHO declared COVID-19 as a pandemic, this generated fear and anxiety in the population, many uncertainties and upset emotions. This particular social alarm situation proved prone to the circulation of rumors, fake news and disinformation, which challenged researchers to gather feedback regarding the global state of knowledge and perception about COVID-19. The concrete focus of our study was children between 3 and 11 years old.

[4] See: https://www.sns.gov.pt/conferencias-de-imprensa-diarias/

Answering our research question - what is the knowledge and perception of Portuguese children about COVID-19? - according to the accurate graphical and textual observation of the responses to the questionnaire, we can say that Portuguese children demonstrated refined knowledge regarding the implications of the COVID-19 epidemic. We conclude that children were able to identify the main means of contagion and its symptoms, as well as the most important measures to prevent the transmission of the disease (washing hands, avoiding physical contact, social distance etc.). Perhaps due to their knowledge and perception of the severity of the disease, most Portuguese children fear the consequences of COVID-19. Children have shown that death is one of their main fears, which demonstrates their awareness of the danger that the disease represents.

However, children are aware that the disease is 'more dangerous' for older people, which leads them to fear the death of their older family members, particularly grandparents. In general, the fear of the consequences of COVID-19 was transversal to the entire age group. We believe that children's behavior and knowledge can also be related to fear. The fear that children have of the disease can contribute to the adoption of preventive behaviors and to seek better knowledge of the disease. This knowledge encourages them to protect themselves and take care of themselves and their families to avoid contamination, get sick and even die.

We can speculate that the fear of death may also be associated with the number of deaths that were reported daily. However, this has not been studied in this investigation, which can serve as an incentive for future research. Regarding its main objective, notably to evaluate the opinion and the way Portuguese children perceived the epidemiological phenomenon, we can affirm that it was achieved.

7 Limitations

One of the limitations of the study was the impossibility of measuring the relationship between media consumption, gender, religion and educational level of parents and the children's perception of coronavirus. In the same way, no data were collected that would allow us to map the existence of differences between children from different regions of Portugal.

8 Future Approaches

As a future approach, it is relevant to indicate a new study with the same methodology in order to compare changes in the opinions and perceptions of children at another time of the pandemic or in the post-pandemic period. Finally, it should be noted that the authors are already working on an investigation of the impact of fake news on coronavirus on children's belief and behavior.

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