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# Factors related to the perception of the risk of getting sick from COVID-19 in adults in the Southeast Region

## *Fatores relacionados à percepção do risco de adoecer por COVID-19 em adultos da Região Sudeste*

***Marcela de Abreu Moniz[1], Cleber Nascimento do Carmo[2], Lidia Santos Soares[3], Carolina de Alcantara Campos[4], Beatriz Cristina de Oliveira Rocha[4], Emellen Frez Muniz[4]***

[1] Nursing Department of Rio das Ostras, Institute of Humanities and Health, Fluminense Federal University, Rio das Ostras (RJ), Brazil. [2] Department of Epidemiology and Quantitative Methods in Health, Postgraduate Program in Epidemiology in Public Health, National School of Public Health, Oswaldo Cruz Foundation, Rio de Janeiro (RJ), Brasil. [3] Nursing Department of Rio das Ostras, Institute of Humanities and Health, Fluminense Federal University, Rio das Ostras (RJ), Brazil. [4] Undergraduate Course in Nursing, Fluminense Federal University, Rio das Ostras (RJ), Brasil.

**Corresponding author:** Marcela de Abreu Moniz. *E-mail*: marcelamoniz@id.uff.br

**RESUMO**
O objetivo do presente estudo foi identificar fatores relacionados à percepção do risco de adoecer por COVID-19 emadultos da Região Sudeste. Estudo transversal, *websurvey*, realizado com amostra de 2.477 residentes da Região Sudeste. Foi empregada a análise de correspondência múltipla para ilustrar graficamente as relações entre os padrões de respostas; e o teste *t* de student para comparação entre médias. Homens, com ensino médio e 40 anos ou mais de idade demonstraram percepção de risco baixo de adoecer pela COVID-19. A média mais elevada (2,08) da percepção de risco de adoecer foi a dos participantes que tiveram contato próximo com caso suspeito de COVID-19 (p<0,001). Conclui-se que as diferentes técnicas de análise utilizando medidas quantitativas permitiram evidenciar que a percepção de risco elevado de adoecer por COVID-19 relacionou-se com a experiência de contato próximo com caso suspeito da doença.

**Palavras-chave:** Risco. Percepção. COVID-19.

**ABSTRACT**
The objective of this study was to identify factors related to the perception of risk of getting sick from COVID-19 in adults in the Southeast Region. This is a cross-sectional, websurvey study, conducted with a sample of 2,477 residents of the Southeast Region. Multiple correspondence analyses were employed to graphically illustrate relationships among response patterns; and Student's t test for comparison of means. It was observed that, men, with high school education, and 40 years of age or older showed low risk perception of getting sick by COVID-19. The highest mean (2.08) perceived risk of becoming ill was among participants who had close contact with a suspected case of COVID-19 (p<0.001). It is concluded that the different techniques of analysis using quantitative measures allowed evidence that the perception of high risk of becoming ill with COVID-19 was related to the experience of close contact with a suspected case of the disease.

**Keywords:** Risk. Perception. COVID-19.

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## INTRODUCTION

Coronavirus Disease 19 (COVID-19) is characterized as an extremely challenging and complex global health risk. This is due to its pandemic character and the uncertainties inherent to its transmissibility, severity, treatment, as well as the mutability, infectivity, and pathogenicity of its etiologic agent, SARS-CoV-2, which generates new strains and variants[1].

The oscillation of the epidemiological situation in relation to the number of cases and deaths from COVID-19 in Brazil indicates the importance of understanding the aspects related to public perception of risks arising from this health threat. This is because this perception can affect both the compliance of non-pharmacological preventive measures by the population and the strategies for coping and control of this pandemic[1–2].

The assessment of human perception of risk must consider aspects already grounded in scientific literature, as well as personal, social and cultural factors, knowledge and experience of the populations exposed to risk, in addition to the inherent characteristics of the risk itself[3].

In this context, the perceptions of populations affected by risks are indispensable components of the risk management process. They can be used as indicators of vulnerability and resilience in health, supporting effective actions and responses, decision making and formulation of public policies for the management of public health emergencies[3].

However, there are still gaps in knowledge about aspects that may interfere with risk perception and communication of COVID-19 and other possible respiratory epidemic diseases among different population groups[1].Considering this context in Brazil, the objective of the present study was to identify factors related to the perceived risk of becoming ill with COVID-19 in adults in the Southeast Region.

## METHODOLOGY

### STUDY DESIGN, PERIOD AND LOCATION

Cross-sectional, web survey, observational study, conducted based on the application of a form disseminated through its link generated in Google Forms, via applications (WhatsApp and Messenger) and social networks (Instagram and Facebook). The online form contained: a text explaining the research and the invitation to participate; and the Free and Informed Consent Term. After acceptance, the participant had access to the online form.

Data collection was conducted between July 7 and August 28, 2020. The study was guided by the items of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) tool: cross-sectional studies.

## POPULATION, SAMPLE, INCLUSION AND EXCLUSION CRITERIA

In Brazil, the first cases and deaths registered by COVID-19 occurred in the states of São Paulo and Rio de Janeiro; and it is precisely the Southeast that has been showing a tendency to remain as the Brazilian region with the highest number of notified cases and deaths[4]. Based on this scenario, the population of this region was selected for the present study, covering all of its states: Rio de Janeiro, São Paulo, Espírito Santo, and Minas Gerais.

To calculate the size of the representative sample (n = 2,401), we adopted procedures recommended for finite populations of simple random sampling, without replacement. A confidence level of 95% was used, a sampling error of 2%, an expected proportion of 50%, a total population of 69,085,000 people, according to the estimate of people over 18 years of age in the four states of the Southeast Region of Brazil by the Brazilian Institute of Geography and Statistics (IBGE)[5], referring to the third quarter of 2020.

A sample size of 2,477 participants was reached. The inclusion criteria for the study participants were: being 18 years old or older; using some digital equipment with Internet access; being a resident of the Southeast Region of Brazil.

## STUDY VARIABLES

The outcome variable (dependent) was "perceived risk of becoming ill with COVID-19", however, for the purpose of comparison of means, the dependent variable "perceived risk of developing severe form of COVID-19" was also used. The independent variables were: gender, age group, level of education, monthly family income, profession, close contact with a suspect case, perceived risk of a family member getting sick from COVID-19, and perceived risk of developing the severe form of COVID-19.

To assess their experience with such a disease, participants were asked, "Do you have or have you ever had close contact with a person who was with suspected COVID-19? No; yes." To assess the perceived risk of getting sick from COVID-19, participants were asked, "What is the chance of you getting sick from COVID-19? High, moderate, low, none"; "What is the chance of a family member residing in your household getting sick from COVID-19? High, moderate, low, none." To assess the perceived risk of severity of COVID-19, we asked, "What is the chance that a person who has COVID-19 will develop a severe form of the disease? High, moderate, low, none."

## STATISTICAL ANALYSIS

Data was analyzed using IBM Statistical Package for the Social Sciences (SPSS) software, version 24.0. Initially, descriptive statistical analysis was performed with presentation of absolute and relative frequencies and 95% confidence intervals of categorical variables. To

investigate disagreements between respondents, the Student's t-test was conducted to compare differences between the averages of risk perception (Table 2), considering as statistical significance a p-value less than 0.05. To calculate the means, the valuation levels corresponding to the categorical answers of the variables "perceived risk of getting sick from COVID-19", "perceived risk of developing severe form of COVID-19" and "positive perception of risk of family member getting sick from COVID-19" were:0 - none; 1 - low; 2 - moderate; and 3 - high The answers "moderate" and "high" were considered to calculate the mean and the proportion of participants with positive perception about the risk of family member getting sick by COVID-19.

Finally, Multiple Correspondence Analysis (MCA) was used to graphically illustrate the relationships between participants' different response patterns. This multivariate analysis technique aims to explore relationships between categorical variables by structuring a data matrix, in which one can observe the location of response categories on the same axis/dimension system in a graph and measure the degree of association of these variables arranged in contingency tables[6].

The two axes generated, called Dimensions 1 and 2, are made up of estimates of eigenvalues and inertia (variance) of each variable. In the generated graph, called "perceptual map", when the participants have similar characteristics or their answers are similar, one notices a greater geometric proximity between the study categories and, therefore, the formation of groups[6].

ETHICAL ASPECTS

This study was approved by the Ethics Committee for Research in the Humanities at the Federal Fluminense University on July 3, 2020, in accordance with the national norms for ethics in research involving human beings.

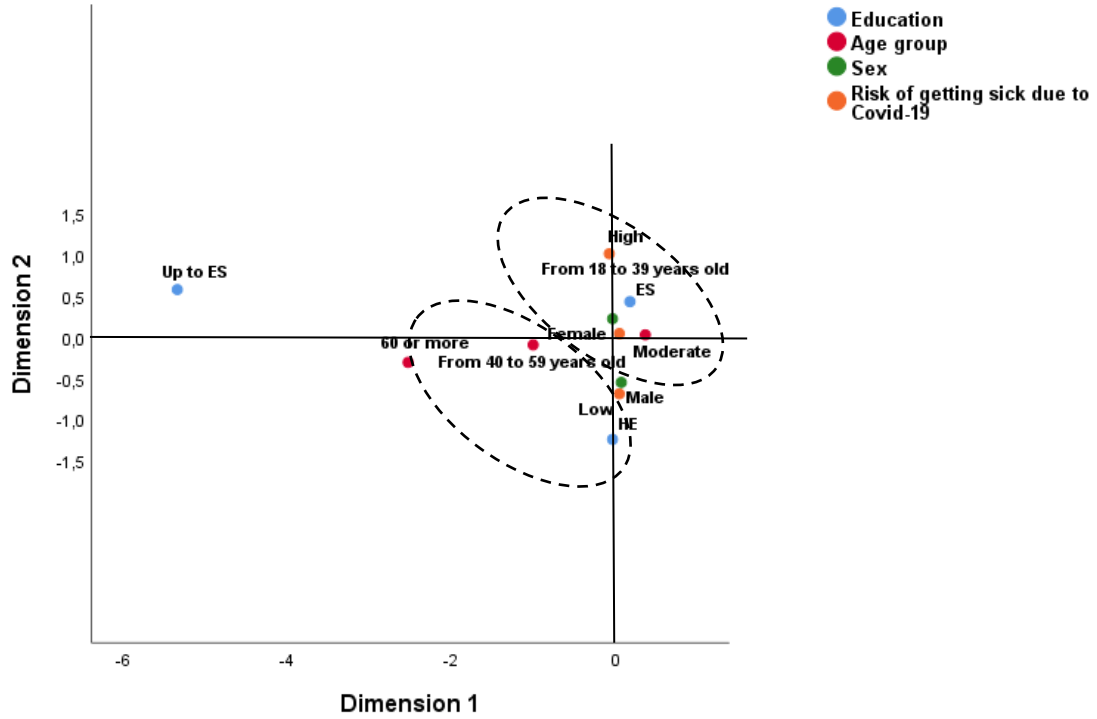
**RESULTS**

A total of 2,477 participants were evaluated. The mean age was 31.2 years (SD = 12), with a minimum of 18 and a maximum of 80 years. As can be seen in Table 1, most were women (70.2%), had higher education (71.4%), monthly income of up to 2 minimum wages (37.7%), type of occupation not specified (50.8%). The majority, 53.2%, reported having had close contact with a suspected case of COVID 19. The mean number of people living in the same house was 3.3 (SD = 1.3), with a minimum of 1 and a maximum of 12 people.

**Table 1.** Characterization of the study sample, according to socioeconomic factors, close contact with a suspected case of COVID-19, perceived risk of becoming ill with COVID-19, and perceived risk of developing the severe form of COVID-19 - Southeastern Region of Brazil, 2020, (n = 2,477)

| Sociodemographiccharacteristics | N (%) | 95%CI |
|---|---|---|
| **Sex** | | |
| Female | 1740 (70.2) | 68.8-72.1 |
| Male | 737 (29.8) | 27.9-31.6 |
| **Age group** | | |
| 18-39 yearsold | 1893 (76.4) | 74.8-78.0 |
| 40-59 yearsold | 510 (20.6) | 19.0-22.2 |
| 60 or more | 74 (3.0) | 2.3-3.7 |
| **Levelofeducation** | | |
| Uptoelementaryschool | 56 (2.3) | 1.7-2.9 |
| Highschool | 653 (26.4) | 24.6-28.1 |
| Highereducation | 1768 (71.4) | 69.6-73.2 |
| **Monthly income range** | | |
| Upto 2 minimumwages | 935 (37.7) | 35.7-39.8 |
| Between 2 and 4 minimumwages | 762 (30.8) | 28.9-32.7 |
| Between 4 and 8 minimumwages | 508 (20.5) | 19.0-22.0 |
| More than 8 minimumwages | 272 (11.0) | 9.8-12.3 |
| **Profession** | | |
| Student | 643 (26.0) | 27.3-31.2 |
| Health professional | 279 (11.3) | 11.3-14.1 |
| Autonomous Professional | 115 (4.6) | 4.3-6.2 |
| Retired | 46 (1.9) | 1.5-2.7 |
| Other | 1118 (50.8) | 48.8-52.7 |
| **Close contact with suspected case of COVID-19** | | |
| Yes | 1318 (53.2) | 51.4-55.2 |
| No | 1159 (46.8) | |
| **COVID-19 Perception of risk of getting sick** | | |
| None | 80 (3.2) | 2.5-4.0 |
| Low | 890 (35.9) | 34.0-37.8 |
| Moderate | 907 (36.6) | 34.7-38.4 |
| Elevated | 600 (24.2) | 22.6-26.1 |
| **Perceived risk of developing severe form of COVID-19** | | |
| None | 18 (0.7) | 0.4-1.0 |
| Low | 265 (10.7) | 9.5-11.9 |
| Moderate | 672 (27.1) | 25.4-29.0 |
| Elevated | 1522 (61.4) | 59.4-63.4 |

Figure 1 refers to the relationship between perceived risk of becoming ill by COVID-19 and socio-demographic variables (gender, education level, and age group). In this multiple correspondence analysis, the two dimensions explain 56.9% of the variation present in the data. It is noted that those who presented low risk perception tended to be men, with high school education (HS), and 40 years of age or older. Another group identified is that formed by women, aged between 18 and 39 years, with moderate or high risk perception of illness by COVID-19 and with higher education (HE). There is no evidence of association of the participants who have education "up to elementary school (up to ES)" with the other variables, probably because of its low occurrence among the respondents.




**Note**: The variables were categorized as follows: sex - male and female; level of education - up to ES (elementary school), HS (high school) and HE (higher education); age group - from 18 to 39 years, from 40 to 59 years and 60 years or more; perceived risk of getting sick from COVID-19 (low, moderate and high). * The category "none" was grouped with the category "low" for a consistent visualization of the result, as it showed a low frequency among the groups.

**Figure 1.** Perceptual map of the risk of getting sick from COVID-19 and selected sociodemographic variables.

Figure 2 shows the relationship between perceived risk of getting sick from COVID-19, perceived risk of intra-domiciliary family member getting sick from COVID-19, and perceived risk of severity from COVID-19. In this correspondence analysis, the two dimensions explain 84.3% of the variation present in the data. Initially, it is noteworthy that those participants who perceived no risk of getting sick from the disease are also those who tend to believe that there is no risk of a family member from the same household getting sick from COVID-19 and do not see risk of severity in the disease.

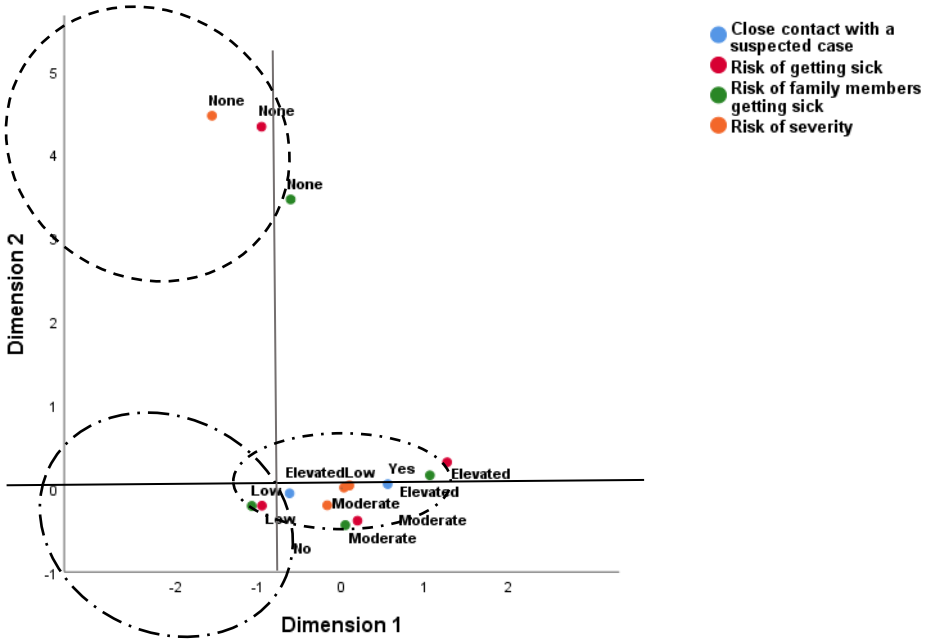



**Figure 2.** Perceptual map of risk of becoming ill with COVID-19, risk of household member becoming ill, risk of disease severity, and close contact with suspected case.

Two other groups were identified, but with greater geometric proximity. The participants who reported no close contact with a suspected case of this disease tended to be those who perceived as low or moderate the risk of getting sick for themselves and their close family members and the risk of worsening the disease.

Finally, in a third group, those whose statement was close contact with a suspected case of COVID-19 tended to be the same ones who perceived as high the risk of getting sick for themselves and their family members and the risk of progressing to a severe form of the disease.

Table 2 below shows differences in risk perceptions between the groups. There was evidence of significant differences in the means of the perceptions of risk of getting sick from COVID-19 among respondents who had close contact with a suspected case of the disease; had an education level up to elementary school; and with a positive perception of risk of a family member living in the same household getting sick from COVID-19.

**Table 2.** Differences in perceived risk of getting sick and severity of COVID-19 among respondents according to sex, age group, education level, close contact with a suspected case of COVID-19, and positive perception of risk of an intra-domiciliary family member getting sick from COVID-19 - Southeastern Region of Brazil, 2020 (n = 2,477)

| Variables | N (%) | Mean and standard deviation of perception of risk | |
|---|---|---|---|
| | | GettingSickfrom COVID-19 | Develop severe form of COVID-19 |
| **Sex** | | | |
| Female | 1740 (70.2) | 1.84 (0.83) | 2.56 (0.67)*** |
| Male | 737 (29.8) | 1.77 (0.86) | 2.34 (0.79) |
| **Age group** | | | |
| 18-39 yearsold | 1893 (76.4) | 1.81 (0.83) | 2.49 (0.70)* |
| 40-59 yearsold | 510 (20.6) | 1.84 (0.86) | 2.46 (0.76) |
| 60 or more | 74 (3.0) | 1.74 (0.81) | 2.68 (0.58) |
| **Levelofeducation** | | | |
| Uptoelementaryschool | 56 (2.3) | 1.66 (1.01)*** | 2.54 (0.87)*** |
| Highschool | 653 (26.4) | 1.65 (0.85) | 2.63 (0.64) |
| Highereducation | 1768 (71.4) | 1.88 (0.82) | 2.44 (0.73) |
| **Close contact with suspected case of COVID-19** | 1318 (53.2) | 2.08 (0.83)*** | 2.49 (0.71) |
| **Positive perception of risk of family member getting sick by COVID-19** | 2353 (95.0) | 1.86 (0.80)*** | 2.50 (0.70)* |

Note: t test for difference of means *** $p < 0.001$; * $p < 0.05$. To calculate the means, the rating scale corresponding to the categorical responses of the variables "perceived risk of getting sick from COVID-19," "perceived risk of developing severe form of COVID-19," and "positive perception of risk of family member getting sick from COVID-19" was: 0 - none; 1 - low; 2 - moderate; and 3 - high. The "moderate" and "high" answers were considered to calculate the mean and the proportion of participants with positive perception of risk of family member getting sick from COVID-19.

The highest mean (2.08) that corresponded to the perception of risk of getting sick by COVID-19 was that of the participants with affirmative response of close contact with a suspected case of the disease, with a p value less than 0.001. The lowest mean (1.74) was represented by the group of participants aged 60 years or older, however, there was no significant difference between the groups.

Regarding the perception of risk of developing the severe form of COVID-19, significant differences were observed in the means of the female participants, who had up to elementary school, age range of 18 to 39 years, and those who had a positive perception of risk of a family member becoming ill with COVID-19. The highest mean (2.68) of perceived risk of developing a severe form of the disease corresponded to participants who were 60 years of age or older, while the lowest mean (2.34) was in the male group - however both without statistically significant differences.

It is noted that the statistically significant differences in the means of the perceptions of the risk of getting sick and of the risk of developing the severe form of COVID-19 showed similarity between the groups with the factors: having an

education level up to elementary school and positive perception of the risk of a family member getting sick with COVID-19.

## DISCUSSION

The group of respondents with a low perceived risk of becoming ill with COVID 19 was characterized as male, with a high school education, and 40 years of age or older. A Chinese study[7] observed that the elderly were less worried about getting sick with COVID-19 than adults; and, furthermore, a Brazilian study showed that the elderly were less afraid of getting infected with the coronavirus[8]. In general, the elderly tend to deny the health risks of hazardous environmental situations, even if they have experiences of contact with people close to them with suspected or confirmed health problems resulting from these hazards[3].

Elderly people make up a high lethality risk group for COVID 19, particularly those with clinical comorbidities such as hypertension, diabetes, heart and respiratory diseases, and those living in poor communities[9].

Adult women with higher educational level demonstrated perceptions of high or moderate risk of becoming ill by COVID-19. The female gender, adult age group and higher education level are factors that have been related to a more adequate perception of health risks arising from environmental problems[3]. Adults may be more anxious about becoming infected and ill with COVID-19 because they understand that it can drastically affect their physical and mental health and/or their social life[7].

Regarding the level of education, it is assumed that a higher level of education may determine a more adequate knowledge about COVID-19, and this may interfere in the adoption of individual protective health measures. A study[7] showed that adult women aged 45 to 64 years were more concerned about developing COVID-19, but the level of education was not a determining factor in this perception.

The level of education may be associated with access through digital resources and media to official COVID-19 information provided by government agencies and scientific institutions[10]. In this logic, it should be noted that risk perception can also be substantially affected by personal experiences of accessing information about risk disseminated by health authority sources and other alternative sources, as well as close friends and family[3].

In this sense, it is recognized that differences in risk perception, knowledge, and acceptability of COVID-19 prevention and control measures may be related to the sources of information used by the individual[11].

In current times of social distancing imposed by the pandemic, social media and instant messaging applications (WhatsApp, Messenger) have served as sources of direct

dialogue between authorities, experts, and the population to amplify the dissemination of information about COVID-19. However, they can also be used as resources for public misinformation about the risks brought by the disease[10].

However, traditional media (television, newspaper) remain some of the main resources for the general population to access up-to-date information about COVID-19[10]. These channels tend to maintain sensationalism, valuing risks, which remain essential objects of journalism and of the different political and scientific scenarios[12]. The way content about this disease is conveyed on social media can affect emotions and risk perception[11]. From this perspective, there are social, cultural, historical, personal (including emotional) determinants that can influence the meanings and interpretations of individuals and collectivities about risk[3].

Thus, it can be seen that there is a pattern in the answers: the participants who perceived a high risk of getting sick, of a relative getting sick, and of developing a severe form of COVID-19 were those who had experience of close contact with other people with a suspicion of the disease.

The perception of the chance of a family member getting sick from COVID-19 was shown to be a factor related to the perception of risk of getting sick and the perception of severity of the disease. This result may have occurred as a result of the participant's own experience of becoming ill, contact with someone who is ill, or concern for the health of the family member because he or she presents a risk condition for COVID-19. In fact, familiarity with danger has been widely explored as a preponderant factor in the perception of health risks from exposure to chemical, physical or biological agents, especially with regard to hazards arising from the use of nuclear and chemical technology[13].

In this sense, close contact with a suspected case of COVID-19 was investigated as a possible factor related to risk perception. The prevalence of close contact with a suspected case of the disease was moderate (53.2%) in the population of this study. The current literature indicates that many people become ill with COVID-19, presenting clinical signs and symptoms suggestive of this disease, but cannot confirm it, either due to the presence of symptoms similar to other influenza syndromes, or because of the low coverage of confirmatory tests of infection for most of the population, or not performing tests at the opportune time of acute infection[14-15].

The difficulty in recognizing infected people and potential transmitters of SARS-CoV-2 may have been one of the aspects that favored the denial, by a portion of the participants, of the risk of getting sick from COVID-19 and of the worsening of the disease. The underestimation of health risks may contribute to the adoption of behaviors that increase the individual's vulnerability to risks[3];and particularly on

COVID-19, this may diminish the acceptability of prevention recommendations issued by health authorities[11].

Regarding the perceived high risk of developing the severe form of COVID-19, the results of the present study indicated that such perception was a factor related to the perceived high risk of becoming ill with COVID-19. Other studies[1,7] showed that the perception of severity and/or lethality risk of the disease did not affect the concern to develop it. The perception that the disease is not characterized as a serious health risk may be another factor influencing noncompliance with public health measures by the individual[1].

Furthermore, it was noted that young women with a low level of education and perceived risk of family members getting sick from COVID-19 showed different mean scores for perceived risk of progression to the severe form of the disease. These findings follow other studies in which it was reported that elderly people and men tend to minimize the risk of severity of COVID-19[8,16].

This disease is characterized by a risk of clinical severity and lethality, especially in vulnerable groups, such as the elderly, hypertensive individuals, diabetics, cardiac patients, those with neoplasms and respiratory diseases[17].

The coronavirus has affinity for the lung parenchyma, causing the risk of developing severe acute respiratory syndrome (SARS), the main acute complication that can lead to death[17]. Other serious clinical complications of COVID-19 may occur due to the mechanism of systemic hypoxia, exacerbated immune system response, and deregulation of inflammatory control mechanisms in various tissues and organs[18].

It is noteworthy that, in Brazil, there are social, cultural, political and economic barriers that make it impossible to know the real magnitude of the pandemic in the country, since it is suspected that the number of infected individuals is much higher than the number of reported cases and also that the data on deaths is not consistent with the reality of the Brazilian scenario[4].

The perception of the severity and lethality of a threat (virus, disease) may be associated with triggering negative emotions of anxiety, worry, and fear. Notably, such a situation can impact human perception and produce an overestimation or underestimation of health risk. These feelings of fear and stress caused by coronavirus and other respiratory epidemic viruses tend to cause overestimation of risk and contribute to feelings of panic and the onset of mental problems[11].

In this line of thought, the risks of illness and death from complications as a result of COVID-19 add up to increased risks of mental disorders as psychological responses that exceed the transient stress level to adversity. Such responses are

caused by extreme fear, acute suffering, bereavement, unemployment, reduced monthly family income, social isolation, and quarantine[17].

The fear of becoming infected with coronavirus may be an element present especially in people who perceive themselves to be in a higher risk condition[8]. In order to reduce these mental disorders and the abuse of psychoactive substances caused by the coronavirus pandemic, health professionals and services need to structure mental health care and support interventions[19].

Conversely, some groups may have psychological responses that translate into denial of the risks and their uncertainties and risk exposure behavior, i.e., in this case, non-adherence to preventive measures and control of COVID 19 by the population. Such individuals may be hesitant to use vaccines against the disease, and may also be involved in denialist movements that generate rumors and fake news about the vaccines and the disease[20].

Self-reported fear of becoming ill and of a family member becoming seriously ill with COVID-19 was associated with high likelihood of intending to be vaccinated against this disease and fear of its adverse reactions among participants in a recent study conducted in Latin America and the Caribbean[21].

Thus, it is reiterated that the perception of serious risks involving one's own health and that of a close relative are factors that can strongly influence individual decision making about whether or not to adopt preventive measures against COVID-19[1].

Therefore, it is necessary to make collective efforts of social and political actors to conduct strategic actions of popular health education and mass communication about the risks of COVID-19 and the benefits of individual and collective protection measures[20].The goal is to particularly target both the groups with inadequate risk perception for this disease and the others identified in this study.

The limitations of this study refer to the inherent difficulties: data collection by online form among residents of the four states of the Southeast Region who had digital resources; the fact that it is unfeasible to generalize the findings to other populations; and the scarcity of similar studies for purposes of interpretation and comparison with results in other Brazilian settings. The survey took place at a time when there was an increasing trend in the number of new cases and deaths from COVID 19 in the Southeast Region and when vaccination had not been initiated in the country.

## CONCLUSION

It is concluded that the different analysis techniques using quantitative measures allowed evidencing that the perception of high risk of getting sick from

COVID-19 was related to the experience of close contact with a suspected case of the disease. On the other hand, this study identified that, men, with high school education and 40 years of age or older showed low perceived risk of becoming ill with COVID-19.

The advantage of this quantitative study on risk perception related to the pandemic of COVID-19 is the possibility, in a quick and direct way, of identifying: the profiles of groups that do not perceive or have inadequate perception of the risk to which they are exposed; and the factors related to this collective perception.

Thus, these results may produce practical implications for the direction of political, scientific, and social proposals aimed at health promotion, prevention, and control of this disease in the studied territory.

The perception of health risks out of sync with scientific information may be the result of ineffective practices of risk communication and reveals the need to search for and evaluate communicative and socio-political strategies in health. Such strategies must be mediated by information and communication technologies that take into consideration the social, cultural, political aspects and the familiarity with risk in order to face, by the Brazilian society, the pandemic of COVID-19 and other emerging diseases.

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