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Coronavirus Pandemic

Knowledge and behavior towards COVID-19 in the northern region of the state of Rio de Janeiro – Brazil

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Abstract

Introduction: Despite efforts by health organizations to share evidence-based information, fake news hindered the promotion of social distancing and vaccination during the coronavirus disease 2019 (COVID-19) pandemic. This study analyzed COVID-19 knowledge and practices in a vulnerable area in northern Rio de Janeiro, acknowledging the influence of the complex social and economic landscape on public health perceptions.

Methodology: This cross-sectional study was conducted in Novo Eldorado – a low-income, conflict-affected neighborhood in Campos dos Goytacazes – using a structured questionnaire, following the peak of COVID-19 deaths in Brazil (July–December 2021). Statistical tests were used to delineate profiles and evaluate knowledge and preventive behaviors associated with COVID-19.

Results: This study involved a cohort of 156 participants, predominantly women (74%), with an average age of 53 years. Almost half of the participants were identified as single (48%), and more than half had not completed elementary school. Notably, 68% believed they were well-informed about COVID-19. The answers to the questionnaire revealed that the majority correctly identified severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as a virus (65%); 72% recognized fever or cough as the main symptoms; and 71% recognized the importance of wearing masks. The overall mean score of the study was 7.628 (SD 1.583047). Social networks, especially 'WhatsApp' (65%), were the primary information sources. Those using social media or WhatsApp had higher knowledge scores (8.000 vs. 7.000, $p = 0.0064$).

Conclusions: Involving marginalized communities and using social media to disseminate accurate information and trust in science is necessary to tackle COVID-19 challenges.

Key words: attitude; COVID-19; Brazil; knowledge; prevention; public health.

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Introduction

Severe pneumonia cases in Wuhan (Hubei, China), led to numerous deaths in December 2019 [1]. The pathogen was identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the disease was named coronavirus disease 2019 (COVID-19) [2]. In Brazil, the first case of COVID-19 was diagnosed in the city of São Paulo on February 26, 2020, and the first death from the disease was diagnosed the following month [3]. Subsequently, COVID-19 had infected more than 34.368,909 Brazilians, resulting in more than 683,390 deaths in the country in 30 months [3,4]. Brazil experienced its second wave of COVID-19 in March 2021, driven by the Manaus Gamma variant, with a daily average of 72,000 cases and over 2,000 deaths per day for weeks [4].

Since the pandemic's onset, Pan American Health Organization (PAHO), the regional office for the World Health Organization (WHO) in the Americas; and Oswaldo Cruz Foundation (FIOCRUZ) [5]; have consistently provided evidence-based information on their websites to combat rumors and misinformation. Meanwhile, online research, which allows researchers to collect data conveniently through the internet, found that Brazilians had a fundamental understanding of COVID-19 [6,7]. However, the population of this country is significantly heterogeneous; cities in the Rio de Janeiro state harbor communities are characterized by low-income socio-demographics, residents enduring armed conflicts, and limited access to educational resources. These communities were more vulnerable to misinformation and had a less proactive response to COVID-19, despite access to information [8,9]. Furthermore, the vulnerability of respondents to COVID-19 encompasses both financial and social dimensions. A high Gini index, indicating inequality

(0.524 in 2020), coupled with a lower human development index (HDI; 0.76, in 2022) were demonstrably associated with higher mortality rates due to SARS-CoV-2 infection [10].

In this study, we aimed to explore COVID-19 awareness and practices in a low-income, conflict-affected area in northern Rio de Janeiro.

Methodology

Study design and experimental setting

This study was conducted in Novo Eldorado, which is a low-income neighborhood with a population of approximately 4,720 inhabitants located in Campos dos Goytacazes, Rio de Janeiro, Brazil. Data was collected from July 14 to December 16, 2021, using convenience sampling and interviewer-administered questionnaires. The research period coincided with the time when Brazil faced the highest number of deaths (April 2021) and a little before the period with the most significant number of cases following the emergence of a new variant that was less lethal but more transmissible; and there was access of vaccination (January 2022) [11,12]. The interviews were conducted on Saturday afternoons, outside business hours, and during workdays to ensure a more representative sample.

The inclusion criteria were age ≥ 18 years, residing in the Novo Eldorado area, and with at least one other person residing in the same household. People who were under the influence of alcohol or those who were mentally incapacitated were excluded from participation in this research.

The questionnaire applied in this study was an adaptation of a previous similar questionnaire survey used in China, which was translated into Portuguese and supplemented with questions covering sociodemographic and epidemiological data [10]. The questionnaire was piloted using two random individuals to ensure its validity and usability. The study data were gathered and managed using the REDCap electronic data capture tool [13] and stored on the Faculdade de Medicina de Campos server.

A scoring system for assessing participants' COVID-19 knowledge and understanding was created after analysis of the questionnaire which included participants' responses to the following statements: "a virus causes COVID-19"; "COVID-19 can be transmitted by air"; "I can protect myself by wearing a mask"; "which mask should I use (cloth, two masks, surgical, or N95)"; "fever or cough are major symptoms of COVID-19"; "social isolation is what we need to do in case of suspected contamination"; "yes, I have recovered from the COVID-19 disease, but I can be infected again"; "I've recovered, but I need to keep wearing a mask"; "I took or I will take the COVID-19 vaccine to protect myself"; "isolation must be done to not infect others.". Each of these questions was scored as a binary (1/0) – correct responses earned one point, while incorrect or unanswered ones received zero point. This method quantitatively assessed participants' COVID-19 knowledge and aided in gauging public awareness.

Ethical considerations

The study received approval from the Regional Committee of Ethics in Research in Humans from the Faculdade de Medicina de Campos (CAAE: 47657421.3.0000.5244). All participants gave written

Table 1. Demographic profile of survey participants (n = 156).

Variable	N (%)
Gender	
Female	111 (74)
Male	40 (26)
Age (years)	
18–29	43 (31)
30–39	28 (20)
40–49	34 (24)
50–59	20 (14)
≥ 60	15 (11)
Marital status	
Single	74 (48)
Married/common-law marriage	64 (41)
Divorced/Separated	10 (6)
Widowed	7 (5)
Education	
No education	3 (2)
Elementary School (incomplete)	82 (54)
Elementary School (complete)	21 (14)
High school (incomplete)	27 (18)
High school (complete)	19 (13)
Work status	
Part time job	8 (5)
Full time job	13 (8)
Unemployed	74 (47)
Self-employed	44 (28)
Student	1 (1)
Retiree	13 (8)
Pensioner	3 (2)
Monthly income ($ US dollars)	
< 50	24 (15)
50–200	76 (49)
200–400	49 (32)
400–600	6 (4)
Religion	
Protestantism	103 (66)
Christianity	25 (16)
Spiritism	1 (1)
Atheist	2 (1)
Others	24 (15)

Some variables do not add up to 100%; this is expected because we rounded to the nearest whole number.

informed consent in compliance with the Declaration of Helsinki.

Data analysis

The variables were presented as median with interquartile range or mean with standard deviation. Nonparametric tests like Wilcoxon and Spearman correlation were used for non-normally distributed continuous variables. Statistical significance was set at 5%. Data analysis was performed using R programming language [14].

Results

This study included 156 participants, the majority (111, 74%) were women, with an age range of 18 to 73 years and an average age of 53 (standard deviation, SD, 2.9) years. Seventy-four (48%) eligible participants were single, and over half of them did not finish elementary school (Table 1). Many participants were unemployed or self-employed and had monthly earnings of up to $ 200. Furthermore, 106 (68%) individuals believed that they were well-informed about COVID-19.

The majority (65%) of participants correctly identified SARS-CoV-2 as a virus (Table 2), and 24% identified as bacteria. Fever or cough were mentioned as the main symptoms of COVID-19 (72%), and 71% said they used up to two cloth masks, surgical masks, or N95 to protect themselves. In response to the question "how should I protect myself?", 142 (91%) participants responded with ‘wearing a mask’, and 140 (90%) of the participants responded affirmatively to "I've recovered, do I need to keep wearing a mask?". However, most participants (74%) did not recognize the importance of social isolation in cases of suspected infection. Overall, the participants demonstrated a commendable level of COVID-19-related knowledge, as reflected by the mean score of 7.628 (SD 1.583047).

The participants in our sample were more concerned about hygiene measures such as ‘washing their hands with soap’ (89%), than with measures of protection such as ‘social isolation’ (n = 89, 57%) or ‘wearing a mask before leaving the house’ (n = 59, 38%). However, there was a significant prevalence of usage of cloth (fabric) masks with one/two layers (n = 133, 78%), which necessitates frequent changing for cleaning. In addition, 89 (57%) followed social isolation at the time of interview (Table 3). We did not find a difference in knowledge score between participants who washed their hands after coming from outside and those who did not (8.000 vs. 7.000, p = 0.7539); or between those who always ‘wore a mask’ when leaving home and those who did not (8.000 vs. 8.000, p = 0.3871).

Access to social networks was reasonably high (85%), with WhatsApp being the most popular (65%), followed by Facebook (43%; Table 4). The median knowledge score was statistically higher in participants who used social media or WhatsApp to get information about COVID-19 than via TV, radio, school, friends, and church (8.000 vs. 7.000, p = 0.0064). However, we did not find any association between knowledge score and age (R = – 0.142, p = 0.093, Spearman correlation), gender (p = 0.2654), or level of education (p = 0.1430)

During the interview, 26 (17%) participants answered "yes" when asked if they had ever had an episode of COVID-19. However, only 17 (65%) of them sought medical attention, and 16 (62%) were tested (Table 5). Twenty-nine (19%) participants had a family member with the disease, three (1.9%) lost a resident of the same household, and three other participants (1.9%) lost a familiar person but not a household member.

Table 2. Assessment of participants' COVID-19 knowledge and understanding.

Statements	Correct answer, n (%)	Wrong answer, n (%)
COVID-19 is caused by virus	101 (65)	55 (35)
COVID-19 can be transmitted by air	118 (76)	38 (24)
I can protect myself by wearing mask	142 (91)	14 (9)
Which mask should I use (cloth, two masks, surgical or N95)	111 (71)	45 (29)
Fever or cough are major symptoms of COVID-19	112 (72)	44 (28)
Social isolation is necessary in case of suspected infection	71 (45)	85 (55)
Yes, I have recovered (from previous infection), but I can be reinfected	126 (82)	28 (18)
I have recovered, but I need to keep wearing a mask	140 (90)	16 (10)
I took or I will take the COVID-19 vaccine to protect myself	145 (93)	11 (7)
Isolation must be done in order not to infect others	115 (74)	41 (26)
Score mean (SD)	7.628 (1.583047)	

COVID-19: coronavirus disease 2019; SD: standard deviation.

Table 3. COVID-19 preventive behaviors and participant responses.

Statements/questions	N	%
In what situation did you wash your hands last month?		
Before dinner	100	22
After going to the bathroom	117	25
After returning home from the street	113	25
After touching objects in the street	47	10
Before and after putting on the mask	36	8
After contact with animals or handling animal feces	30	7
After contact with tears, mucus and sputum	12	3
Do not wash	2	0
How have you washed your hands in the last month?		
With detergent or soap	146	89
Only with water	7	5
With chlorine/bleach	9	5
I don't remember	2	1
How often did you wear a mask when you left your home in the past month?		
Always	59	38
Often	35	23
Rarely	60	38
Never	1	1
What kind of mask have you used in the last month?		
Cloth (fabric) with one/two layers	133	78
Cloth/fabric with three layers	11	6
Two masks (cloth and disposable or two cloth masks or two disposable masks)	0	0
Disposable medical/surgical	24	14
N-95	3	2
How often have you changed or sanitized your mask in the last month?		
2–4 hours	41	26
Everyday	69	45
2 to 5 days	14	9
More than 5 days	10	6
I continue to use it after cleaning	14	9
Others	7	5
What is the correct method for wearing a surgical mask?		
I hold it by the straps and put it behind the ears	130	37
I check the front and back of the mask and always put my nose on the back	87	25
I cover all mouth, chin and nose	104	30
I cover my mouth and chin	7	3
I cover my nose, most important part	12	3
Unknown	0	0
I don't wear a mask	4	1
Others	4	1
Have you practiced or do you practice social isolation?		
Yes	89	57
No	66	43

COVID-19: coronavirus disease 2019.

Table 4. Social network usage: types of apps preferred.

Statements/Questions	N	%
Access to social networks		
Yes	99	85
No	17	15
If yes, which?		
WhatsApp	96	43
Facebook	67	30
Instagram	39	17
Telegram	1	0
Twitter	3	1
TikTok	15	7
Others	2	1

Discussion

This study examined a unique setting where the population faced socio-economic challenges like low education, poverty, and armed conflict. Surprisingly, high internet and social media access correlated positively with knowledge scores, contrary to expectations influenced by extensive open television programming. The main sociodemographic characteristics of our participants were young age, female gender, unemployment, and a low monthly income, which were risk factors for poor knowledge,

Table 5. Personal and family clinical history related to COVID-19.

Statements/questions	N	%
Have you ever had COVID-19?		
Yes	26	17
No	129	83
If so, have you had a test to confirm the diagnosis?		
Yes	16	62
No	10	38
Did you go to the doctor/healthcare unit?		
Yes	17	65
No	9	35
Were you hospitalized for COVID-19?		
Yes	2	8
No	24	92
Has anyone residing in the household had COVID-19?		
Yes	29	19
No	126	81
If yes, how many?		
Mean ± SD	1.21 ± 0.56	
Has any resident in the house died from COVID-19?		
Yes	3	12
No	20	76
Yes, relative but not resident	3	12

COVID-19, coronavirus disease 2019; SD, standard deviation.

attitudes, and behavior profiles for COVID-19 [15]. In this armed conflict environment, many respondents were evangelical Protestants. The biggest problem encountered was dealing with religious congregations because mobilization of face-to-face meetings would constitute a possible vehicle of viral transmission. However, religious beliefs and practices were mediators in the health context here since they encouraged the adoption of healthy behaviors, such as lowering illegal drug usage and violence [16]. At the same time, conflicting findings in COVID-19 scenarios have been reported [17,18].

We observed that participants who utilized social media and WhatsApp as sources of COVID-19 information had a significantly higher median knowledge score (8.000) than those who relied on TV, radio, school, friends, and church (7.000) as information sources. These data were noteworthy, because these two social networks were responsible for disseminating about 51% of the fake news about COVID-19 in the country [19]. Those numbers were even higher in another survey where WhatsApp alone was responsible for 74% of the dissemination of fake news and Facebook for almost 16% of the dissemination of fake news. Thus, together they were responsible for up to 90% of the fake news distributed [20]. Our study aligned with previous research findings, which emphasized the importance of education in combating misinformation. However, no singular factor explained the varying levels of COVID-19 knowledge, as shown in Table 2.

Furthermore, our survey indicated that only 35% of the participants considered social isolation was a required measure of control in case of suspected infection, and this was much lower than the 90% reported in other studies [9,21]. However, the participants in our study had some specific knowledge that could have been considered as a favorable scenario for dissemination of information on COVID-19. The participants in our study were aware that the virus that causes COVID-19 is airborne, and the use of masks was an important measure to protect themselves even after a primary infection.

The high overall score of knowledge (7.628 ± 1.583) in our study can be explained mainly by the information received via social media, church, and television. The score, although higher that that reported in Rohingya refugees [22], was lower than the one reported in other studies in Brazil [6,7]. Our results found no association between knowledge score and age, gender, or level of education. The participants of this study were similar in demographics to previous cross-sectional surveys and community-based research that included a significant percentage of young unemployed women [9,23]. This could be seen as a study limitation, but from a sampling point of view, the explanation could be that a qualitative survey of this nature required face-to-face home interviews, and it was easier to enroll more women, especially mothers, because they spend more time on responsibilities such as childcare and domestic chores than their male counterparts [24].

However, COVID-19 protective measures taken by the participants in our study were lower than usually reported [25], with just 38% of them confirming wearing a mask when leaving home and 25% washing their hands after returning home. However, the median

knowledge scores did not statistically differ between participants who washed their hands after being outside and those who did not; nor between those who always wore masks when leaving home and those who did not.

We did not find an association between the knowledge score and self-reported infection with COVID-19 (p = 0.7452). The prevalence of 17% (26/155) was close to the number that was officially declared by the Ministry of Health in Brazil (15%) at the time. The participants in this research were defined as low-income category and relied on government support, including access to healthcare services. However, our study found that only 62% had themselves tested to confirm the disease, lower than 74% cited by an online survey in Brazil [7] which included a different socioeconomic class. We believe these findings could be due to: a lack of access to COVID-19 tests or a lack of understanding of when was the right time to test. Furthermore, a study in Brazil highlighted that there may be inequalities in public healthcare related to municipality-level deprivation [26].

A strength of this study is that we included a representative sample of the local population with low education and income, and who resided in a conflict region of the country. In a worldwide context, it is not difficult to identify people knowledgeable about the COVID-19 pandemic, even in low-income countries such as the Philippines [27]. This exploratory survey with face-to-face interviews demonstrates the potential positive and negative impacts of social media as the primary source of information for health education. During the study period, many cases in the region may have had challenges in acquiring knowledge about COVID-19. Our data can help us study the communities and understand how they acquire knowledge.

A principal challenge lies in the socioeconomic impact on health-related behaviors, which makes it difficult to prevent diseases. The questionnaire was administered during a period immediately following the second wave of SARS-COV-2 in Brazil caused by the Zeta and Omicron variants [5]. This temporal context may account for the observation that less than half of the participants (43%) reported not adhering to social isolation measures, and this deviated significantly from findings reported in a systematic review [15]. It is worth mentioning that in the months leading up to the administration of the questionnaire, the population had suffered several challenges affecting their psycho-socioeconomic well-being [28]. This could have intensified and broadened acceptance of misleading information, including fake news, and eroded trust in science [29]. This trend was especially prominent within marginalized regions such as the one in this study.

Conclusions

This study focused on a unique situation where various socioeconomic factors overlapped. The study highlighted communities that face challenges like limited access to education, low incomes, and armed conflicts; but also have areas with widespread internet and social media use. It is vital to recognize that marginalized populations in Brazil rely on the internet and social media for information. Therefore, it is crucial for governmental and public health agencies to increase their presence on these platforms to ensure that accurate information reaches the intended audience. Otherwise, misinformation can hinder not only the fight against COVID-19, but also other efforts to help these marginalized populations.

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Authors' contributions

ALV, TLS, IBA: conception, planning, analysis, interpretation, and manuscript writing; LPVS, LMBRP, RPD, TFM: interpretation and manuscript writing. All authors approved the final submitted version.

References

1. Zhou P, Yang X-L, Wang X-G, Hu B, Zhang L, Zhang W , Si HR, Zhu Y , Li B , Huang CL , Chen HD , Chen J, Luo Y, Guo H, Jiang RD, Liu MQ, Chen Y, Shen XR, Wang X, Zheng XS, Zhao K, Chen QJ, Deng F , Liu LL , Yan B, Zhan FX , Wang YY, Xiao GF , Shi ZL (2020) A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature 579: 270–273. doi: 10.1038/s41586-020-2012-7.
2. Vasques MAA, Rodrigues GJ, Mamede MMS, Castro BA, Monteiro OL, Ribeiro AP (2020). Nitazoxanide and Ivermectin COVID-19 prophylaxis approach: evidence summary. Comunicação em Ciências da Saúde 31 Suppl 1: 144–161. [Article in Portuguese].
3. Souza CDF de, Paiva JPS de, Leal TC, Silva LF da, Santos LG (2020) Spatiotemporal evolution of case fatality rates of COVID-19 in Brazil, 2020. J Bras Pneumol 46: e20200208. doi: 10.36416/1806-3756/e20200208.
4. Brasil. Ministério da saúde (nd) Coronavírus Brasil. Available: https://covid.saude.gov.br/. Accessed: 5 February 2024.
5. Francisco Junior R da S, Lamarca AP, de Almeida LGP, Cavalcante L, Machado DT, Martins Y, Brustolini O, Gerber AL, Guimarães APC, Gonçalves RB, Alves C, Mariani D, Cruz TF, de Souza IV, de Carvalho EM, Ribeiro MS, Carvalho S, da

Silva FD, Garcia MHO, de Souza LM, da Silva CG, Ribeiro CLP, Cavalcanti AC, de Mello CMB, Struchiner CJ, Tanuri A, Vasconcelos ATR (2021) Turnover of SARS-CoV-2 lineages shaped the pandemic and enabled the emergence of new variants in the state of Rio de Janeiro, Brazil. Viruses 13: 2013. doi: 10.3390/v13102013.

6. Campolino LM, Bernardes JM, Alonso MS, Gómez-Salgado J, Ruiz-Frutos C, Domínguez-Salas S, Días A (2022) Communication, information, and knowledge in the pandemic by COVID-19 in Brazil. Medicine (Baltimore) 101: e29559. doi: 10.1097/MD.0000000000029559.
7. Rosa DAC, de Sousa SS, da Silva MNR, Gamboge LRR, Deusdará R, Lapa J (2022) Knowledge about COVID-19 and associated factors early in the outbreak among the Brazilian population. Int J Environ Res Public Health 19: 13824. doi: 10.3390/ijerph192113824.
8. Nicholas T, Mandaah FV, Esemu SN, Vanessa ABT, Gilchrist KTD, Vanessa LF, Shey ND (2020) COVID-19 knowledge, attitudes and practices in a conflict affected area of the South West Region of Cameroon. Pan Afr Med J 35: 34. doi: 10.11604/pamj.supp.2020.35.2.22963.
9. Zhong B-L, Luo W, Li H-M, Zhang Q-Q, Liu X-G, Li W-T, Li Y (2020) Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci 16: 1745–1752. doi: 10.7150/ijbs.45221.
10. Sepulveda ER, Brooker A-S (2021) Income inequality and COVID-19 mortality: age-stratified analysis of 22 OECD countries. SSM Popul Health 16: 100904. doi: 10.1016/j.ssmph.2021.100904.
11. Sott MK, Bender MS, da Silva Baum K (2022) COVID-19 outbreak in Brazil: health, social, political, and economic implications. Int J Health Serv 52: 442–454. doi: 10.1177/00207314221122658.
12. Taylor L (2022) COVID-19: Brazil sees Omicron cases soar but data blackout obscures true impact. BMJ 376: o133. doi: 10.1136/bmj.o133.
13. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG (2009) Research electronic data capture (REDCap) — a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 42: 377–381. doi: 10.1016/j.jbi.2008.08.010.
14. R Core Team (2021) R: A language and environment for statistical computing. In: R Foundation for Statistical Computing Vienna Austria. https://www.R-project.org/.
15. Bekele F, Sheleme T, Fekadu G, Bekele K (2020) Patterns and associated factors of COVID-19 knowledge, attitude, and practice among general population and health care workers: a systematic review. SAGE Open Med 8: 2050312120970721. doi: 10.1177/2050312120970721.
16. Gonçalves JP de B, Lucchetti G, Latorre M do RD, Laranjeira R, Vallada H (2022) Religiosity as a potential mediator for violence in childhood and adulthood: results from a Brazilian nationally representative survey. BMJ Open 12: e051225. doi: 10.1136/bmjopen-2021-051225.
17. Gonzalez KE, James R, Bjorklund ET, Hill TD (2021) Conservatism and infrequent mask usage: a study of US counties during the novel coronavirus (COVID-19) pandemic. Soc Sci Q 102: 2368–2382. doi: 10.1111/ssqu.13025.
18. Lee Rogers R, Powe N (2022) COVID-19 information sources and misinformation by faith community. Inquiry 59: 469580221081388. doi: 10.1177/00469580221081388.
19. Barcelos T do N de, Muniz LN, Dantas DM, Cotrim Junior DF, Cavalcante JR (2021) Analysis of fake news disseminated during the COVID-19 pandemic in Brazil. Rev Panam Salud Publica 45: 1. Available: http://dx.doi.org/10.26633/rpsp.2021.65. [Article in Portuguese]. doi: 10.26633/RPSP.2021.65.
20. Galhardi CP, Freire NP, Minayo MC de S, Fagundes MCM (2020). Fact or fake? An analysis of disinformation regarding the COVID-19 pandemic in Brazil. Cien Saude Colet 25: 4201–4210. doi: 10.1590/1413-812320202510.2.28922020.
21. Hezima A, Aljafari A, Aljafari A, Mohammad A, Adel I (2020) Knowledge, attitudes, and practices of Sudanese residents towards COVID-19. East Mediterr Health J 26: 646–651. doi: 10.26719/emhj.20.076.
22. Jubayer MF, Limon MTI, Rana MM, Kayshar MS, Arifin MS, Uddin M, Mazumder AR (2022) COVID-19 knowledge, attitude, and practices among the Rohingya refugees in Cox's Bazar, Bangladesh. Public Health Pract (Oxf) 3: 100227. doi: 10.1016/j.puhip.2022.100227.
23. Al-Hanawi MK, Angawi K, Alshareef N, Qattan AMN, Helmy HZ, Abudawood Y, Alqurashi M, Kattan WM, Kadasah NA, Chirwa GC, Alsharqi O (2020) Knowledge, attitude and practice toward COVID-19 among the public in the kingdom of Saudi Arabia: a cross-sectional study. Front Public Health 8: 217. doi: 10.3389/fpubh.2020.00217.
24. Giurge LM, Whillans AV, Yemiscigil A (2021) A multi-country perspective on gender differences in time use during COVID-19. Proc Natl Acad Sci USA 118: e2018494118. doi: 10.1073/pnas.2018494118.
25. Siddiquea BN, Shetty A, Bhattacharya O, Afroz A, Billah B (2021) Global epidemiology of COVID-19 knowledge, attitude and practice: a systematic review and meta-analysis. BMJ Open 11: e051447. doi: 10.1136/bmjopen-2021-051447.
26. Pereira FAC, Filho FMHS, de Azevedo AR, de Oliveira GL, Flores-Ortiz R, Valencia LIO, Rodrigues MS, Ramos PIP, da Silva NB, de Oliveira JF (2022) Profile of COVID-19 in Brazil-risk factors and socioeconomic vulnerability associated with disease outcome: retrospective analysis of population-based registers. BMJ Glob Health 7: e009489. doi: 10.1136/bmjgh-2022-009489.
27. Lau LL, Hung N, Go DJ, Ferma J, Choi M, Dodd W, Wei X (2020) Knowledge, attitudes and practices of COVID-19 among income-poor households in the Philippines: a cross-sectional study. J Glob Health 10: 011007. doi: 10.7189/jogh.10.011007.
28. Galhardi CP, Freire NP, Fagundes MCM, Minayo MC de S, Cunha ICKO (2022) Fake news and vaccine hesitancy in the COVID-19 pandemic in Brazil. Cien Saude Colet 27: 1849–1858. doi: 10.1590/1413-81232022275.24092021en.
29. Cristo HS de, Santos T de A, Horita FEA, Saba H (2021) Implications of disinformation and infodemic in the context of the COVID-19 pandemic. Res Soc Dev 10: 1–11. [Article in Portuguese]. doi: 10.33448/rsd-v10i2.12998.

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