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COVID-19 *infodemic* and depressive symptoms: The impact of the exposure to news about COVID-19 on the general Paraguayan population

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ABSTRACT

Introduction: : The COVID-19 pandemic has led to an increase of social stressors and mental health issues in the general population as well as among mentally ill patients. A COVID-19- related “*infodemic*”, including too much information in digital and physical environments, has been recognized globally.

Aim: : This study aimed to describe the impact of COVID-19 *infodemic* (exposure to news related to COVID-19) in terms of depressive symptoms in the Paraguayan general population.

Methods: : This was a descriptive and cross-sectional study. An online survey, designed in Google Forms, has been launched nationwide through the most popular social networks (Facebook, Twitter, Instagram) and messaging applications (WhatsApp, Telegram) in April (1st-30th) 2021. The Mental Health Inventory-5 (MHI-5) was employed for detecting depressive symptoms.

Results: : The survey included 1102 responders aged 35.4 ± 12.9 years old, 74.9% were women. MHI-5 mean score was 44.07 ± 14.16 in the general population with 34.4% ($n = 379$) of responders suffering from severe symptoms of depression (>52 , as cut-off point). 53.5% of sample reported to have been exposed between 1 and 3 h to COVID-19 news, daily. An OR 1.933 (95% CI 1.48 - 2.52) was found between the exposure to news and depressive symptoms.

Conclusions: : This study suggests that people exposed to a higher number of hours of COVID-19 news were 93.3% more likely to develop depressive symptoms.

1. Introduction

The COVID-19 (Coronavirus- related Disease) pandemic occurred in the *Information Age* with a global promotion of interconnections and a large availability of communication sources worldwide. In fact, from its outbreak in the Hubei province of China (Cucinotta and Vanelli, 2020), COVID-19 has been rapidly spread across the countries and consequences on population as well as on health systems have been disclosed even anticipating the spread of infections through the globe (Moscadelli et al., 2020). The World Health Organization defines as *Infodemic* “too much information including false or misleading one in digital and physical

environments during a disease outbreak”, including information regarding the COVID-19 (World Health Organization, 2021). *Infodemic* includes useful and necessary information as well as false (*fake*) news (Carrion-Alvarez and Tijerina-Salina, 2020), reporting minute by minute the count of infected people and deaths, warning on the impact of COVID-19 on physical health, mental health (Dubey et al., 2020) and the long- term consequences (long-COVID syndrome) (Chatterjee et al., 2020; Gentile et al., 2020).

Banerjee and Meena (2021) have suggested that repeated and detailed news about the virus, geographic statistics and multiple sources of information may cause chronic stress and confusion in the general

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population. *Infodemic* can contribute to mass hysteria and panic, non-compliance with precautionary measures, and faulty treatments.

Furthermore, false or misleading news may lead to a refusal of precautionary measures in the general population (such as wearing protective masks or practicing social distancing). This type of news has been largely spared through social networks (Carrion-Alvarez and Tijerina-Salina, 2020; Orso et al., 2020). In addition, *infodemic* (mainly originating from misleading information and *fake news*) may also intensify anxiety, concern, insecurity, frustration, discrimination and stigma (Banerjee and Rao, 2020) and can lead to additional psychopathological distress (Lee et al., 2020). Also, *fake news* affect unconscious attitudes with the aim of manipulating behaviors. Bastick has emphasized that unconscious attitudes may affect cognitive, emotional, and moral processes and that short exposure to disinformation may have moderate effects on unconscious individual behavior (Bastick, 2021).

Paraguayan population has coped with the dissemination of misleading information and false news even before the virus entered the country (March 2020), which generated a rapid collective reaction of neurosis with compulsive food-shopping, xenophobia, risky health care practices (Moreno Fleitas, 2020), fear (Barrios et al., 2021), and stress (Torales et al., 2020).

The COVID-19 pandemic has also been associated to an increase of psychosocial pressure among health care providers, leading to levels of exhaustion and stress (García-Fernández et al., 2020). In addition, governments have been adopting public health policies in order to contrast the spreading of virus and have applied measures to restrict mobility and promote social distancing with negative impact on mental health of general population (Hossain et al., 2020; Usher et al., 2020). These consequences were clearly warned in the first stages of the pandemic by different organizations (Kaufman et al., 2020; Torales et al., 2020), and it is agreeable that part of the long term impact of pandemic will be seen in the next months, above all for public mental health.

Specifically, this study aimed to detect the presence of depressive symptoms in the general Paraguayan population and test the association between levels of depression with the impact of the exposure to daily news about COVID-19.

2. Methodology

2.1. Design and sampling

This was a descriptive and cross-sectional study. The sampling was non-probabilistic, of consecutive cases. An online survey, designed in Google Forms, has been launched nationwide through the national social networks (Facebook, Twitter, Instagram) and messaging applications (WhatsApp, Telegram), in the month of April 2021 (from 1st to 30th). All participants received complete information on the purpose of the study, privacy and use of data. Additionally, they were provided with information related to mental health and contact details of the Department of Psychiatry of the Faculty of Medical Sciences of the National University of Asunción for specific consultations. At the start of the online survey, the participants were asked to confirm that they were in a legal age and they voluntarily agreed to join the survey.

From a methodological point of view, recent researches have shown that data collected through online surveys may provide similar results to those obtained through "in-person" sampling (Gosling et al., 2004) and that web-based questionnaires may replace traditional "in-person" questionnaires based on similar response rates (Hohwü et al., 2013). In addition, web-based surveys have been shown to reduce data collection costs, which is useful in a population-based survey (Ebert et al., 2018).

2.2. Exposure to news about the COVID-19 pandemic

Participants were asked to report accurately a) how many hours they had been spending in looking for news about COVID-19 in the last two

weeks (1–3 h, 4–6 h, 7–8 h, more than 8 h); b) their main source of information about COVID-19 (social media, radio, television, magazines / scientific articles) c) view points (opinion leaders, health organizations, friends, co-workers, family members).

2.3. Screening for depression

2.3.1. Mental health inventory-5 (MHI-5)

The MHI-5 is a short version of the 38-items Mental Health Inventory, developed to be used in the general population (Mchorney and Ware, 1995). The MHI-5 comprises five items, measuring mood in the last month. The following questions are proposed: 'During the past month, how much of the time have you: (i) been a very nervous person?; (ii) felt downhearted and blue?; (iii) felt calm and peaceful?; (iv) felt so down in the dumps that nothing could cheer you up?; and (v) been a happy person?' For each question, one of the following responses may be selected: all of the time (1 point), most of the time (2 points), a good bit of the time (3 points), some of the time (4 points), a little of the time (5 points), or none of the time (6 points). Items (iii) and (v) report on positive feelings and their scores are reversed. The total score for the MHI-5 is computed by adding up the scores of each question item and then transforming the raw scores into a 0 to 100-point scale. We used a previously validated Spanish version of the MHI-5 Cronbach's α coefficient = 0.83 (Lara et al., 2002). In our study, the tool reported an adequate internal consistency (McDonald's ω coefficient = 0.78; Cronbach's α coefficient = 0.71). As suggested by the literature, the cut-off score considered for depression was 52 (Yamazaki et al., 2005).

2.4. Covariables

Since the exposure to news about COVID-19 may be influenced by a number of other variables, the following data were also collected:

- Demographic data: participants were asked to provide information on their sex (male, female, I prefer not to tell), age (in complete years), marital status (single, married, civil partnership, widower, divorced), social status (alone, with partner / family, with friends).
- Socioeconomic data: participants were asked to provide information on their educational level (no formal education, primary education, secondary education, tertiary / university education), employment status (whether or not they currently have a job), average monthly income (no fixed income, less, equal or more than the minimum wage).
- Data on health status regarding the COVID-19: participants answered if they had been diagnosed with COVID-19 or if they had been in contact with a person tested positive for COVID-19 (yes, no, I don't know).
- Mental health status: participants answered whether they had previously been diagnosed with depression or not.

2.5. Data analysis

The sample size was calculated to estimate a proportion (expected frequency of depression), using the Epidat epidemiological package (Pan American Health Organization, Galician Health Board and CES University of Colombia). Assuming an expected frequency of depression of 16.8% (Torales et al., 2016), a confidence level of 95% and a precision of 2.21%, the minimum sample was established at 1100 participants (Muñoz Navarro, 2014). Finally, the sample included 1102 participants.

The data were collected into a spreadsheet, processed with the statistical package RStudio, version 1.2.5033. Descriptive statistics were performed for all variables: reporting any categorical variable with frequencies and percentages, and the numerical variables with measures of central tendency and dispersion. Student's *t*-test and ANOVA were used to search for associations between numerical variables, as appropriate.

Pearson correlations were calculated to test for bivariate associations between continuous variables. To further investigate the relationship between exposure to news about COVID-19 and depressive symptoms, an ANOVA was performed between variables with a $p < 0.05$ considered as statistically significant. Odds Ratio (OR) was calculated using a contingency table between hours of exposure to COVID-19-related news (two categories: 1–6 h, and 7 h or more) and depression, using the suggested 52-cutoff point (two categories: yes, no).

2.6. Ethical issues

The study was part of the research project "Epidemiology and psychopathology of mental disorders" (installed by Resolution D. No. 1950/2017 of the Dean of the Faculty of Medical Sciences of the National University of Asunción) and was approved by the Ethics Committee of the School of Medical Sciences of the National University of Caaguazú, Paraguay. The principles of ethics applied to the research were respected and participation was free and voluntary. The principles of autonomy, beneficence and non-maleficence, and justice were respected, in accordance with the Declaration of Helsinki. The anonymity of the participants was respected at all times, since no data were collected that might allow their identification.

3. Results

Study participants ($N = 1102$) reported age ranging from 18 to 84 years with a mean of 35.4 ± 12.9 years. 74.9% of them were women, 55.8% single, 69.9% currently employed, and 91.8% currently living with their partner or family. Table 1 shows the means and standard deviations (SDs) of scored depressive symptoms associated to any characteristic of participants sampled.

Participants reported a mean total score of 44.07 ± 14.16 at MHI-5, which indicates that 34.4% ($n = 379$) of them reported severe symptoms of depression (considering 52 as a cut-off score). Table 2 shows these results in detail.

Table 1
Depressive symptoms associated to participants' characteristics ($N = 1102$).

Characteristics	Participants		MHI-5		p-value
	n	%	Mean	SD	
Sex					
Female	825	74.9	45.04	14.02	<0.001*
Male	270	24.5	41.23	14.09	<0.001*
I prefer not to tell	7	0.6	39.43	20.84	0.130*
Marital status	337	30.6	39.70	13.11	0.003*
Married	50	4.5	41.20	12.83	<0.001**
Divorced	615	55.8	46.67	14.34	<0.001*
Single	85	7.7	43.72	12.34	
Civil partnership	15	1.4	47.47	18.81	
Widower	14	1.3	48.86	11.97	
Whom do you live with?	1012	91.8	43.83	14.02	
With friends	76	6.9	46.47	16.19	
With partner / family	9	0.8	28.89	12.29	
Alone	104	9.4	43.15	15.44	
Educational level	987	89.6	44.34	13.97	
Primary School	2	0.2	28.00	11.31	
Highschool	332	30.1	48.43	14.39	
Tertiary education	770	69.9	42.19	13.66	
No formal education	568	51.5	41.61	13.68	
Occupational status	97	8.8	45.53	14.53	
Not Working	316	28.7	47.58	14.31	
Working	121	11.0	45.29	13.65	
Monthly income					
Higher than the minimum wage					
Lower than the minimum wage					
No fixed income					
Minimum wage					

*ANOVA
**Student's t-test
MHI-5: Mental Health Inventory-5

Table 2
Levels of depressive symptoms of participants ($N = 1102$).

Levels of depression	n	%
Severe*	379	34.4
Moderate or severe**	480	43.56
Mild, moderate or severe***	689	62.52

*cut-off: 52 points
**cut-off: 60 points
***cut-off: 68 points

Of the participants, 12.52% ($n = 138$) indicated that they had previously received a diagnosis of depression.

Regarding the length of daily exposure to news about COVID-19, 53.5% had been exposed between 1 and 3 h, 16.2% between 4 and 6 h, 10% between 7 and 8 h and 20.2% more than 8 h. Age was negatively associated with depression symptoms ($r = -0.273, p < 0.01$), indicating a weak and inverse relationship.

Participants' main source of information about COVID-19 was social media (56.4%), while the main view-point came from health organizations (88.5%). Table 3 shows the MHI-5 means and standard deviations (SD) obtained by participants, associated with the source of information and view-point. In a post hoc analysis, we found higher MHI-5 means associated with social media than radio/television ($p = 0.001$), and lower means associated with scientific articles compared to social media ($p = 0.001$).

Multivariate regression was structured in order to confirm the relevance of longer daily exposure to COVID-19-related news according to the sociodemographic data. The only significant variable has been "if participants had been in contact with a person tested positive for COVID-19", with a $OR=1.12 (p = 0.006)$.

Of the participants, 69.8% ($n = 769$) reported they had not been diagnosed with COVID-19, 21.4% ($n = 236$) did not know and 8.8% ($n = 97$) tested positive. 42.5% ($n = 468$) had not been in contact with someone who tested positive for COVID-19, 22.7% ($n = 250$) did not know and 34.8% ($n = 384$) had been in contact.

When testing the association between the exposure to news related to COVID-19 (1–6 h and 7 h or more) and the presence of depression, an $OR 1.933 (95\% CI 1.48 - 2.52)$ was found, which may suggest that 93.3% of those exposed to COVID-19 related news for more hours may have prevalent symptoms of depression. Table 4 shows the ANOVA analysis comparing the scores of MHI-5 and hours of exposure. In a post hoc analysis all the associations were significant ($p < 0.001$).

4. Discussion and conclusion

The percentage of participants reporting depression during this specific phase of pandemic (April 2021) was similar to the prevalence reported in other studies. In fact, in a systematic review of studies from eight different countries, depression frequencies rated from 14.6% to

Table 3
Depressive symptoms associated to the exposure to news about the COVID-19 pandemic ($N = 1102$).

Characteristics	Participants		MHI-5		p-value
	n	%	Mean	SD	
Main source of information					
Social media	622	56.4	45.74	13.75	<0.001*
Radio / Television	329	29.9	42.08	14.45	0.932
Scientific articles	77	7	39.48	14.29	
Magazines	74	6.7	43.67	14.26	
View points	975	88.5	44.01	14.05	
Health organizations	58	5.3	45.10	15.02	
Family members	44	4	44.55	15.49	
Friends	25	2.3	43.36	14.95	
Co-workers					

*ANOVA
MHI-5: Mental Health Inventory-5

Table 4

MHI-5 scores (Mean±SD) and hours of exposure to news regarding the COVID-19 (N = 1102).

Time exposed to news about COVID-19	Participants		MHI-5		p-value
	n	%	Mean	SD	
1 to 3 h	153	13.89	41.77	13.60	<0.001*
4 to 6 h	76	6.89	45.65	13.96	
7 to 8 h	53	4.81	47.78	13.53	
More than 8 h	97	8.80	47.07	15.05	

*ANOVA
MHI-5: Mental Health Inventory-5

48.3% during the pandemic (Xiong et al., 2020). In a Saudi study, symptoms of depression were found in 13.51% of Saudis and 50.74% of non-Saudis living in Saudi Arabia during the pandemic (Mohamed-Azzam Zakout et al., 2020). In our study it is reported that female sex and unemployment are associated with higher levels of depressive symptoms. Similarly, some other studies reported that sex, employment, income, marital status and educational level were identified as risk factors for the development of mental health problems in the course of COVID-19 pandemic (Dubey et al., 2020; Hossain et al., 2020).

Regarding the association between the exposure to COVID-19-related news and depressive symptoms, it has been found that the exposure was significantly associated with prevalent symptoms of anxiety and depression in a sample of university students (Huckins et al., 2020). In China, the prevalence of anxiety and depressive symptoms in the general population was 19.21% and people spending more than two hours/day in looking for COVID-19 related news reported higher morbidity (OR = 3.08) (Ni et al., 2020). In a study measuring depressive symptoms during two different phases of COVID-19 quarantine in Spain, it was found that age, the amount of information about COVID-19 and physical activity seem to show an important impact on the prevalence of depressive symptoms (Planchuelo-Gómez et al., 2020). In a study from United States, reporting on a similar sample in terms of percentage of females and mean age to our sample, a positive and significant association was also found between the exposure to news about COVID-19 and depressive symptoms (Olagoke et al., 2020). In a study reporting on health workers in Egypt and Saudi Arabia, an association was found between the exposure to COVID-19 news for at least two hours/day with depression, anxiety, stress, and sleep disturbance (Arafa et al., 2021). In Greece, depressive symptoms were found to be higher in younger individuals, students, those in isolation due to the viral infection, and those overexposed to news about the pandemic (Skapinakis et al., 2020). In addition, patients with previous mental disorders presented psychopathological exacerbations during the pandemic, even leading to changes in their treatment (Gentile et al., 2020; Heitzman, 2020; Jepsen et al., 2020).

In Paraguay, *hoaxes* and *fake news* have been spread exponentially since the outbreak of the SARS-CoV-2 virus in the country, which has contributed to a large state of neurosis with compulsive food-shopping, discrimination against people from other countries, xenophobia, acts of vandalism, inadequate consumption of medicines, and unusual and not very recommendable health care practices, among others (Moreno Fleitas, 2020).

Part of the impact of the news regarding COVID-19 might be due to the false news spread around the pandemic. Different strategies have been employed to address this issue, as improving the quality and sources of information provided by health professionals and government spokespersons (Cuan-Baltazar et al., 2020; Song and Karako, 2020), or considering penalties for those sharing false news (Alvarez-Risco et al., 2020). However, at this phase of pandemic individual liberty of expression must be considered and the control of information by the governments must be weighed, especially in the democratic countries (Gostin and Javitt, 2001; Lu et al., 2020).

According to Moreno Fleitas (2020), we confirm the need for a general social education in Paraguay and a specific training about

aspects related to source of information and the effective detection of hoaxes, among others. Although government have advised the general population to be cautious with information on COVID-19, a more comprehensive approach and public policy is needed.

The strength of this study lies in the fact that, to the best of our knowledge, it is one of the first surveys exploring the impact of COVID-19-related *infodemic* in terms of depressive symptoms in the general population. Findings encourage future research and may support government and health agencies in developing strategies to contrast false news and their consequences in terms of mental health.

Limitations of this study may include that the subjects were predominantly female, employed, with a university education, with an income greater than the minimum wage, and with a partner. These characteristics do not exactly match the general standard of the Paraguayan population.

There may be a self-selection bias among those who were informed about the survey and decided to join it. One more limitation includes this is a cross-sectional study and, therefore, cause and effect relationship cannot be elucidated. In addition, we had no baseline measures before the start of COVID pandemic and could not perform any comparison. Also, the impact that isolation and other restrictive measures reported on depressive symptoms was not adequately considered in the analysis. Finally, measuring the exposure to COVID-19 related news for two weeks only, while measuring the outcome (depressive symptoms) over a month, may limit the interpretation of results.

We may conclude that the *infodemic* about the COVID-19 pandemic, as warned, has been playing a role in affecting the mental health of general Paraguayan population, leading, among other factors, to an increase of neurotic and depressive symptoms (OR: 1.9).

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JT, IB, MO, JA-S: conception and design of the study, analysis and interpretation of the results and conclusions, critical review of the manuscript, final approval of the manuscript. IG, OG, CR-G, JMC.M, AV: conception and design of the study, data collection / obtaining / results, drafting of the draft, final approval of the manuscript.

Conflict of Interest

The authors declare that there are no conflicts of interest.

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