

Assessing the Covid-19 infodemic and misinformation among university students in Morocco

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Abstract

The aim of the study was to investigate the implication of university students in Covid-19-related misinformation dissemination in Morocco using an online questionnaire sent out to various faculties and online student groups around the country. A total of 295 university students responded to the questionnaire. The majority of respondents 269/295 (91.2%) claimed to have come across misinformation during the pandemic. The main source of misinformation was online news outlets (77.2%). The most frequent subjects of misinformation had to do with confinement and curfews (24.2%), the politics around the pandemic (17.2%) and the Covid-19 vaccine (16.6%). Some 36.6% of respondents reported having transmitted misinformation at least once. Overall, the difference between medical and non-medical students' implication in misinformation dissemination did not reach statistical significance (Chi-square = 6.37, $p=0.095$). Misinformation, in particular, among university students has potentially been an obstacle to satisfactory Covid-19 response. University students should be a focus of interventions aimed at combatting misinformation.

Keywords: Covid-19, misinformation, social media, university students, Morocco

Introduction

Misinformation has been at an all-time high during the Covid-19 pandemic, and has been responsible for negative outcomes during the crisis. Effective strategies such as vaccination have been hampered by misunderstanding and, at times, by an excess of information. Also, Covid-19-related misinformation is known to have cost lives (Delirrad & Mohammadi, 2020). There has been an exponential increase in content creation and consumption in today's media (Ahmed, 2020; Pan American Health Organization, 2020). In 2012, it was estimated that 90% of all internet data were created only in the 2 years before (International Business Machines Corporation, 2012). With global trends showing increased use of internet and social media in the past years and during the pandemic, it seems the overload has reached unprecedented proportions (Bawden & Robinson, 2009; DataReportal – Global Digital Insights, 2021; Koltay, 2011).

In Morocco, it has been shown that young internet users are not necessarily aware of the fake nature of internet content (Abentak & Moutasser, 2021). Indeed, it has been shown during the pandemic period that decontextualized images have been circulating on social media garnering reactions from more and more users. This has led to large audiences being reached by misinformation as compared to verified and correct content. Unfortunately, misinformation

during the Covid-19 pandemic has a far reaching impact in terms of the wide array of subjects of misinformation, aside from the vast number of internet users reached (Abentak & Mountasser, 2020).

Furthermore, the pervasive impact of the pandemic and its alteration of educational practices have resulted in a blend of traditional education and online education up to levels never before seen. There is a high dependence of student populations on the internet in the present seeing as face-to-face teaching was replaced by distance learning during the pandemic. Importantly, Covid-19-related information is readily available online. The very nature of students as seekers of information earmarks them as very important consumers of online information. An important question that arises is whether all the information they access online pertaining to the pandemic is sound and verified. As students are involved in creation and sharing of content, it is important to address the implication of university students in the dissemination of Covid-19-related misinformation. Little has been published on the contribution of students in the Covid-19 infodemic and misinformation. The purpose of the present study was to investigate the implication of students in the dissemination of misinformation.

Methodology

The present research is a descriptive, transversal study in 295 university students across Morocco conducted from March 8, 2021 to May 9, 2021. The aim of the study was to characterize internet use trends during the pandemic and investigate the prevalence of encounter of misinformation among students. We further inquired about the implication of students in the dissemination of misinformation.

An online questionnaire was sent out to various faculties and online student groups around the country. The questionnaire contained questions on respondent demographics followed by two rubrics, one centered on internet use and the other on misinformation.

The questionnaire was first administered to a group of 10 respondents in order to validate it before the study was conducted.

For internet use, respondents were asked to indicate whether or not they used the internet more during the pandemic as compared to pre-pandemic times. They further had to indicate the internet platforms they visited the most. For misinformation, respondents were asked to indicate whether or not they encountered misinformation during the pandemic, where they came across such information and how often, on a Likert scale from one to five, they found themselves involved in misinformation. Furthermore, respondents were required to give at least an example of misinformation they encountered during the pandemic. After an initial study of examples given by respondents, the examples were categorized into "Political", "Medical", "Academic" and "Social" subjects with further subdivisions for each category. For example, a given example such as "The Covid-19 vaccine has been tainted with man-made HIV," would be categorized under "Medical" and placed under the subject of "Vaccines". Proportions were calculated for each subject category using the total number of respondents who gave examples as denominator.

Questionnaires from non-university respondents, or those that did not indicate the domain, or did not respond to a substantial part of questions in the various rubrics were excluded.

Data were first collected using an online form developed on Google forms®. Upon the end of data collection, data were exported onto Google sheets® and analysed using the Statistical Package for Social Sciences® version 21 for Windows®. Means were calculated with standard deviations, and frequencies were reported as percentages.

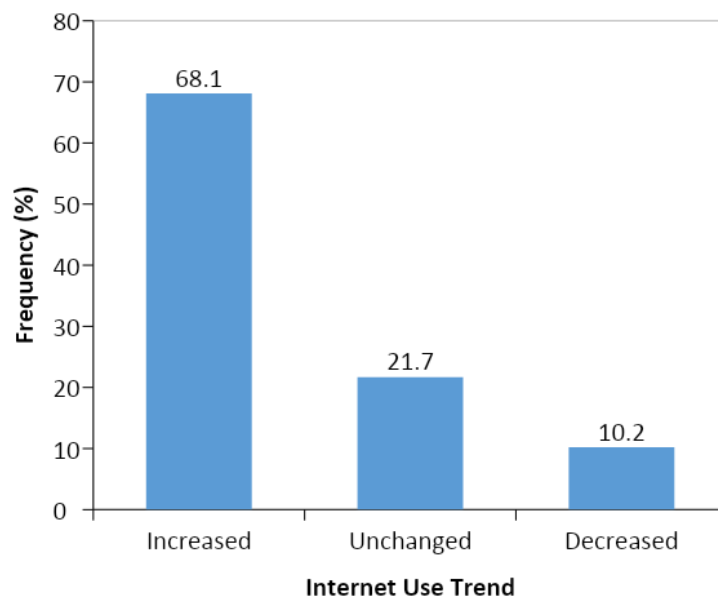
Chi-square test was performed to investigate any differences in proportions between students in the medical domain and those in the nonmedical domain with regards to their implication in the dissemination of misinformation. A p-value less than 0.05 was stipulated as significant.

Results

A total of 303 questionnaires were received and curated. Of these, 8 did not meet criteria of inclusion. A total of 295 questionnaires were retained in this study. The age of respondents ranged from 18 to 38 years, with a mean of 25.0 ± 4.5 years. Respondents in the medical domain accounted for 55.6% of the sample ($n=161$).

In terms of internet use, 68.1% of respondents ($n= 201$) declared spending more time on internet during the Covid-19 pandemic period than before.

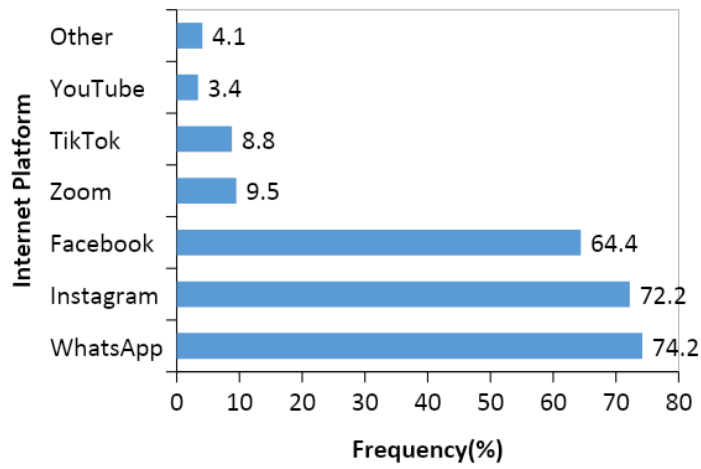
Figure 1: Trends in internet use among 295 university students during the Covid-19 pandemic in Morocco



Source: own elaboration

The most often used social media platforms by respondents were WhatsApp (74.2%), Instagram (72.2%) and Facebook (64.4%).

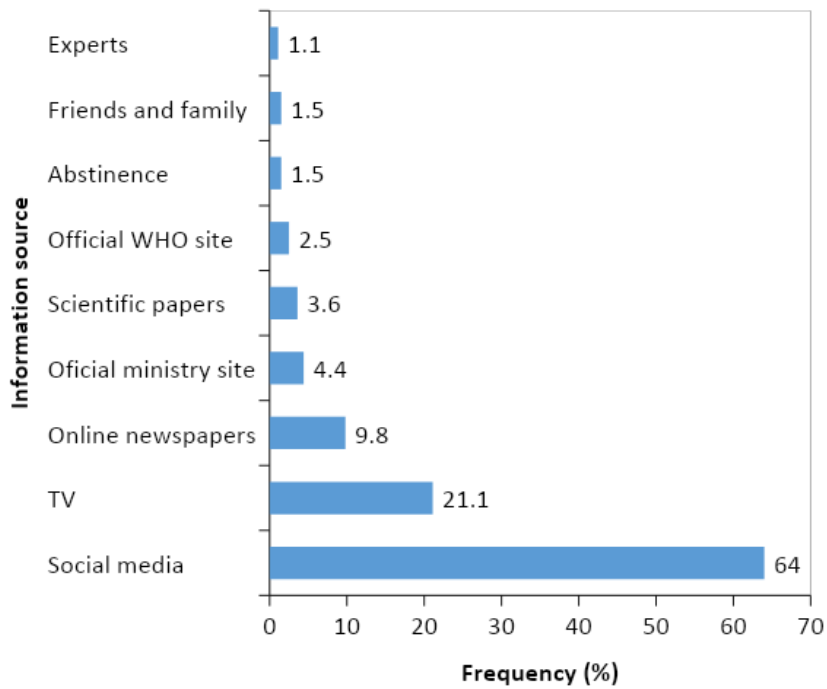
Figure 2: Social media platforms used during the Covid-19 pandemic among 295 university students in Morocco



Source: own elaboration

On the subject of information source, the majority of respondents (64%) reported social media as their main source of information during the pandemic.

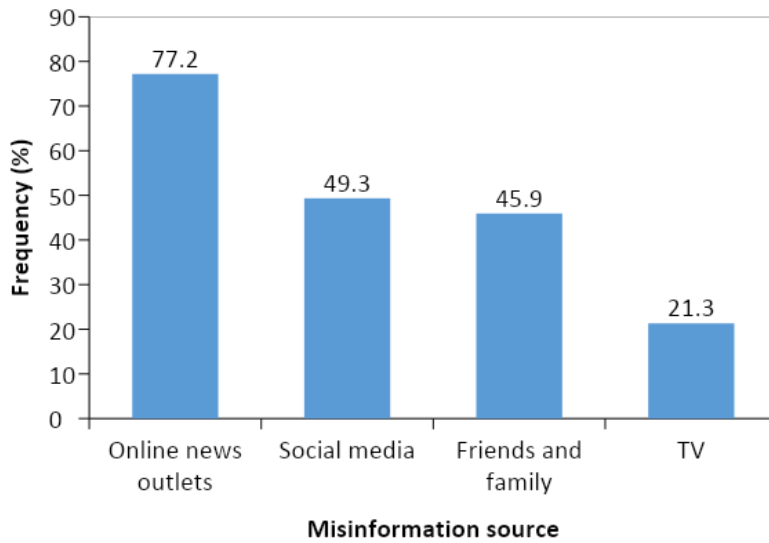
Figure 3: Covid-19-related information source among 295 university students during the Covid-19 pandemic in Morocco



Source: own elaboration

The majority of respondents 269/295 (91.2%) claimed to have come across misinformation during the pandemic. The main source of misinformation was online news outlets.

Figure 4: Sources of misinformation during the Covid-19 pandemic in 295 university students across Morocco



Source: own elaboration

The main examples of misinformation were on the subject of confinement, politics and the vaccine.

Table 1: Misinformation categories, subjects with examples in 157 respondents

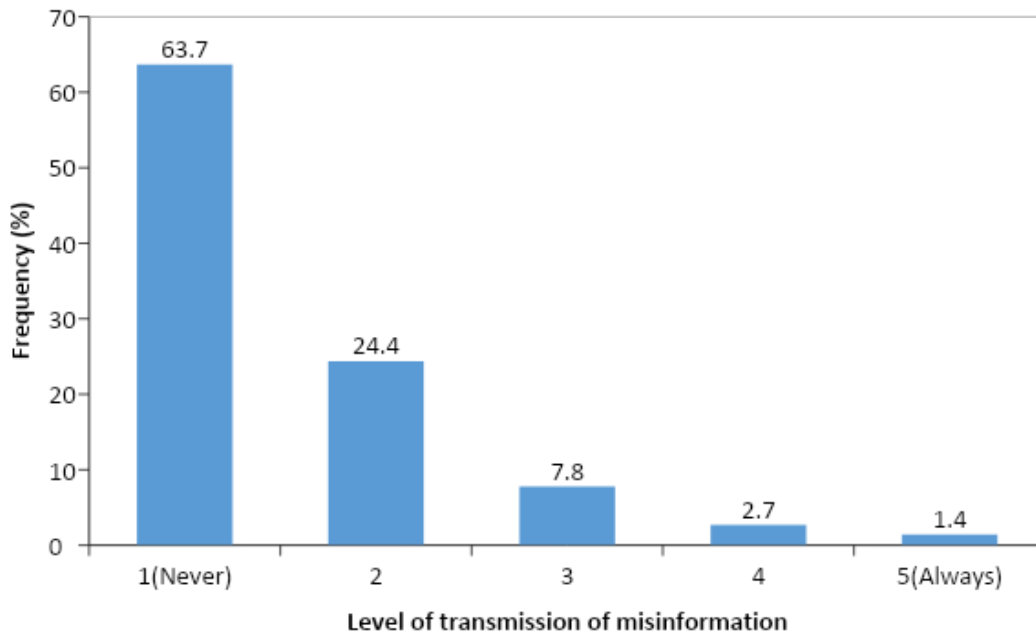
Category	Subject and example	Frequency (%)
Political	Political plot <i>Example: Respondent 003 "Covid-19 is a plot."</i>	17.2
	Statistical manipulation <i>Example: Respondent 270 "The false briefings of the government with regards to case numbers."</i>	5.4
Medical	Vaccine <i>Example: Respondent 275 "The Covid-19 vaccine has been tainted with man-made HIV."</i>	16.6
	Mortality <i>Example: Respondent 106 "People infected by Covid-19 die on the streets."</i>	5.4
	Transmission <i>Example: Respondent 086 "Contamination via food."</i>	8.3
	Clinical manifestations <i>Example: Respondent 254 "Infected people suffer from</i>	3.8

	<i>sexual dysfunction."</i>	
	Reinfection	2.5
	<i>Example: Respondent 125 "Reinfection never occurs."</i>	
	Virus origin	1.9
	<i>Example: Respondent 160 "The disease is due to bats!"</i>	
	Treatment	1.9
	<i>Example: Respondent 101 "Chloroquine is rather harmful in treating Covid-19."</i>	
	Virus nature	1.3
	<i>Example: Respondent 163 "Covid-19 is due to a bacterium rather than a virus."</i>	
	Another pandemic	1.3
	<i>Example: Respondent 167 "Another virus much worse than Covid-19 will hit the world."</i>	
	Staff conduct	0.6
	<i>Example: Respondent 178 "Doctors and nurses abandon patients in hospitals."</i>	
Academic	Schooling	1.9
	<i>Example: Respondent 074 "Lessons will stop due to the pandemic."</i>	
	Confinement and curfew	24.2
	<i>Example: Respondent 249 "There will be a reconfinement during the month of Ramadan."</i>	
	Mask wearing	3.2
	<i>Example: Respondent 068 "It's pointless wearing a mask."</i>	
Social	Celebrity death	0.6
	<i>Example: Respondent 280 "The death of Lhaja Lhamdawiya."</i>	
	Disinfectant use	0.6
	<i>Example: Respondent 064 "The advice to use disinfectants for surfaces is false."</i>	
	Utilities rationing	0.6
	<i>Example: Respondent 187 "Water and electricity cuts between 5 pm and 5 am."</i>	

Source: own elaboration

On the question of having transmitted information that proved to be false, the majority of respondents (63.7%) reported having never transmitting misinformation. In other words, some 36.3% of respondents were involved in transmitting misinformation at some point during the pandemic.

Figure 5: Trends of involvement of 295 university students in Covid-19-related misinformation during the pandemic



Source: own elaboration

As to the relationship between respondents' domain and propensity to transmit false information, the percentage of respondents claiming to have never spread misinformation was comparable: 64.0% in medical domain and 63.4% in nonmedical domain. No respondent in the medical domain claimed the highest frequency of misinformation spread, whereas 3.1% in the nonmedical domain did. Overall, however, the difference did not reach statistical significance (Chi-square = 6.37, $p=0.095$).

Discussion

The aim of our study was to investigate internet use trends and characterize the implication of university students in the transmission of misinformation during the pandemic in Morocco. The main findings in our study are that internet use has spiked, and so has the circulation of misinformation among university students during the period of the pandemic. Furthermore, the vast majority of students are dependent on social media for information on the pandemic. Also, a significant portion of respondents have passed on misinformation at some point during the course of the pandemic. While the social media phenomenon is not particularly unique to university students, this study appears to be the first, to the best of our knowledge, in investigating transmission of misinformation on Covid-19 specifically among university students.

In our study, respondents encountered misinformation on social media, online news outlets, television and through interaction with family and friends. The ubiquity of misinformation is particularly disturbing given the seriousness of the pandemic. Also, there has been an increase in the consumption of traditional sources of news as well as online sources (Nic Newman, 2020). A study conducted across eight countries in Europe found similarly that exposure to digital media was associated with greater misinformation beliefs (De Coninck et al., 2021).

University students in the present study used Instagram, WhatsApp and Facebook more frequently, in line with global trends (Mary Branscombe, 2020). Respondents were more dependent on social media as source of information. This is in line with digital statistics on Morocco which indicate a +9.1% increase in internet users as well as a +22% increase in social media users in 2021 (Simon Kemp, 2021). A study on Covid-19-related knowledge among Jordanian university

students found similarly the preponderance of internet, especially of social media, as source of information (Olaimat et al., 2020). Some university students in a Portuguese study depend exclusively on social media for Covid-19-related information (Silveira & Gancho, 2021). Another study among Portuguese university students found that searches on social media or using internet search engines rather than a direct consultation of public body websites was associated with insufficient digital health literacy (Rosário et al., 2020). In a study in 138 countries across the globe, it was found that internet-based misinformation accounted for 90.5% of misinformation and that social media alone represented 84.9% of misinformation. Facebook was by far the leading social media platform in the dissemination of misinformation, followed by WhatsApp and Twitter (Al-Zaman, 2021).

In the aforementioned study, most Asian and African countries were among the least hit by misinformation. Morocco was among the countries least implicated in Covid-19 misinformation (Al-Zaman, 2021). However, general trends in Africa require cautious exoneration of Morocco. For example, one can hardly forget instances of supposed cures taunted by African leaders and several other pseudoscientific approaches in the African continent ("Coronavirus," 2020). In fact, it must be pointed out that given the very nature of the social media phenomenon, the impact of a false idea in one part of the world could equally be transmitted to users in other parts of the world.

In the present study, the proportion of students subscribing to scientific journals, the Ministry of Health website and the World Health Organization website was particularly small compared to students dependent on other sources of information, especially, social media. Social media and unverified internet platforms do not have the same censoring and critique standards as do scientific journals. Moreover, scientific journals have a certain standard of technicality which might render them not readily comprehensible to persons not versed in the domain. It would therefore be remiss to require that all and sundry go for information from scientific databases.

Even, it is not uncommon for persons affiliated to science to misinterpret data. Papers on conjunctures and potential links are sometimes construed as evidence (Adams et al., 2020). The complexity of scientific information therefore comes with challenges of understanding, and in these pandemic times when information and proof have been in dire demand, it is easy even for the scientist to err in his or her estimations (Favaloro & Thachil, 2020; Garrett, 2020). The case of chloroquine has been a hot debate around the world (Kashour et al., 2020).

Such incidents have led to a great divide, not only in the scientific domain, but also on the plain of politics. This has made transmission of sound information particularly challenging. In fact, the avalanche of information during the pandemic has clogged scientific literature and has, on occasion, led either to insufficient review of material before publication or to wild divergence of perspectives making it difficult to come to any practical clinical consensus (Horbach, 2021; Stamm et al., 2021). While reviewers and editors have been blamed for the slew of misinformation in scientific literature related to Covid-19, it is important to point out the place of author misconduct and reader misinterpretation (Gupta et al., 2020).

Furthermore, the excess of information exacerbated by the pandemic can be overwhelming (Newman, 2019). The particular place of university students makes them constantly eager to seek out information for themselves. This means an increased exposure both to the excess and, consequentially, to large doses of misinformation. This could be rattling even for the well-balanced student (Bawden & Robinson, 2009; Savolainen, 2007). It is not surprising then that a number of respondents completely abstained from searching information on the pandemic. The stress of living through such cataclysmic phenomenon, accentuated by interminable reports of deaths and unending infections has been compounded by conspiratorial theories (Newman, 2019). The confusion then could take a toll on students possibly more than it would on other populations. The fact of the obstruction to their studies and scholarship opportunities could possibly have left many in despair. This could potentially impact health and behaviors of university students (Odriozola-González et al., 2020; Tang et al., 2020).

The question of the implication of university students in Covid-19-related misinformation bears utmost importance. In fact, the place of the internet, its realities, the pros and cons, and the challenges related to its use, are better epitomized by the dynamic between university students and the internet. It is almost impossible for the internet and, more precisely, social media to be dissociated from education today. Despite the setbacks social media could have, it is

equipped with study tools and student-friendly platforms for education. Teachers use these platforms to reach students (Bold & Yadamsuren, 2019). For the university student, therefore, the use of social media cannot be escaped. Indeed, it is not uncommon for institutional departments, governmental ministries, even whole governments, and influential persons to have Facebook pages or Twitter handles. This allows for reaching a large section of the population. However, this could lead to a blurring of authenticity since informal, unverified and even ill-intending sources use the same platforms. This makes sharing of sound information challenging in these times. The medium, it has been said, is the message (McLuhan, 1964). Positive outcomes, however, are possible if these platforms are used effectively by authorities (Li et al., 2020).

Effective use of online platforms could be possible only if we are able to characterize internet use and understand the content of communications to which people are exposed online. Assertions such as "Covid-19 is a plot", "The Covid-19 vaccine has been tainted with man-made HIV", and "It's pointless wearing a mask" have obvious impact on people's behaviors vis-à-vis the pandemic if these utterances are taken seriously. They annul efforts at controlling the spread of the virus. Misinformation has been responsible for loss of lives (Aghagoli et al., 2020; Delirrad & Mohammadi, 2020).

The most frequent subjects of misinformation had to do with confinement and curfews, the politics around the pandemic and the Covid-19 vaccine. The questions of individual liberties and people's rights have surged during these times. It is difficult to have people follow injunctions to socially distance if they are not convinced it is the right approach, or worse, if they think someone else is pulling their strings and has ulterior motives.

An interesting observation in the present study is the fact that some 8.8% of respondents reported coming across no misinformation whatsoever during the pandemic. This could be due to non-recognition of misinformation. This could potentially result in passing on wrong information without being aware of it.

No statistically significant difference was observed in the implication of medical and nonmedical students in misinformation. However, no medical student reported being implicated in misinformation several times over. This might point to a certain consciousness or exposure to better information sources on the part of respondents in the medical domain. In a number of studies on misinformation during the pandemic, it has been shown that a higher level of education, cognitive reflection and scientific knowledge are associated with stronger discernment and lower transmission rates of misinformation (Nielsen et al., 2020). Higher education and trust in information from the government have also been shown to be associated with decreased belief in Covid-19-related misinformation (Melki et al., 2020).

In these times when sound scientific knowledge during the pandemic has become an existential necessity, the role of educational institutions as places for generating, testing and sharing knowledge is indisputable. Knowledge at some point is information. It is the role, therefore, of educational institutions, especially, institutions of higher learning to ensure the generation and transmission of sound information on the subject of the pandemic. This could be achieved by setting the pace in putting on right attitudes toward the pandemic and immersion in well- conducted research on questions of interest. Furthermore, discussion on the subject of the pandemic would allow for critical appraisal of the various facets of the pandemic (UNDP, 2021). A limitation to the study is the limited number of responses. A larger sample size would be more representative. However, given the online nature of the study, this proved to be challenging.

Conclusion

Given the seriousness of the subject, it is not enough for the university student to be critical of information. It is important also to call out misinformation when they come across it. We all must be part of the global effort to stop the spread of wrong information. With the ease of use of social media, university-hosted sites and channels might go a long

way to solving the problem. The paradox, however, is that one becomes a voice among many screaming voices with today's social media phenomenon. It is important then that authorities with the power to track down and curb these other misinforming voices actively partake in the fight. It is evident that there will be ethical ramifications to such takedowns. This subject then cannot be effectively done the justice it deserves until it is discussed in a consortium of various perspectives. Scientific publications must pay more attention to the content of works they consider for publication as well as the evidence presented in them. Review must be stringent. Sound scientific information should be rendered open-access. Importantly, more work should be done to better understand misinformation during the pandemic in terms of the various players, the role various groups of people play, their motivations, content of misinformation, impact and means of combatting this infodemic.

Data availability statement

The data supporting findings in this study are available on request from the corresponding author.

Acknowledgements

The authors are grateful for the insights shared by the staffs of the Department of Epidemiology and the Neuroscience Research Laboratory of the Faculty of Medicine and Pharmacy of Marrakesh.

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