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MISINFORMATION AND HEALTH IN THE PRECOVID ERA: A SYSTEMATIC REVIEW

Desinformación y salud en la era PRECOVID: una revisión sistemática

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Abstract

The coronavirus pandemic has been a turning point in health and communication research. Scientific work in this field has been rushed since the beginning of 2020, so it is important to know the previous situation in which the research was. This paper focuses on existing studies up to 2019 that relate health and any of its fields to misinformation.

We carried out a systematised bibliographic review of 171 articles collected in various scientific databases, the central theme of which was misinformation and health up to the end of 2019. Through the exhaustive analysis of different variables, this article aims to establish the starting point of research on hoaxes and health before the start of the COVID-19 pandemic.

Research on health and misinformation maintained a clear upward trend between 2014 and 2019. Different epidemic diseases such as Ebola or the Zika virus are the most frequent in the articles analysed. However, the most relevant result of our analysis is the attention devoted to vaccine related misinformation.

Despite the interdisciplinary nature of the subject, it has been the field of Health the mainly responsible for researching it, so, it is clear that there is a need for greater attention from the area of

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Communication to research this phenomenon.

Keywords:
Disinformation, Health, Review, Hoax, Vaccine, Internet, Fake.

Resumen

La pandemia del coronavirus ha supuesto un punto de inflexión en la investigación sobre salud y comunicación. Los trabajos científicos en este campo se han precipitado desde principio de 2020, por lo que es importante conocer la situación previa en la que se encontraba la investigación. El presente trabajo se enfoca en los estudios existentes hasta el año 2019 que relacionen la salud y cualquiera de sus ámbitos con la desinformación.

Llevamos a cabo una revisión bibliográfica sistematizada de 171 artículos recogidos en diversas bases de datos científicas, cuyo tema central fuese desinformación y salud hasta finales del año 2019. Mediante el análisis exhaustivo de diferentes variables, el presente artículo tiene como objetivo establecer el punto de partida en el que se encontraba la investigación sobre bulos y salud antes del inicio de la pandemia del COVID-19.

La investigación sobre salud y desinformación mantuvo entre los años 2014 y 2019 una clara tendencia al alta. Diferentes enfermedades epidémicas como el Ébola o el virus del Zika son las más frecuentes en los artículos analizados. No obstante, el resultado más relevante de nuestro análisis es la atención dedicada a la desinformación relacionada con las vacunas.

A pesar de la naturaleza interdisciplinar del tema, ha sido el ámbito de la Salud el que se ha encargado mayoritariamente de investigar sobre el mismo, por lo que, en definitiva, resulta evidente la necesidad de mayor atención por parte del área de la Comunicación a la investigación de este fenómeno.

Palabras clave:
Desinformación, Salud, Revisión, Bulo, Vacunas, Internet, Falso.

1. INTRODUCTION

Misinformation is not a new phenomenon. Possetti and Matthews (2018) place the first documented examples of disinformation in Octavian's propaganda against Mark Antony, where messages were engraved on coins in order to discredit the Roman consul (ca. 44 BC). Thereafter, the invention of the printing press is also considered a key moment for the dissemination of invented facts, and in more recent history, the world wars with the role played in them by propaganda. Since the early 20th century the implications of this phenomenon have been widely studied in the academic literature (Giglietto et al., 2019). However, the digital society has given this phenomenon a new dimension (García-Marín, 2020), with new implications. It is a social, cultural and political problem, which can influence human reasoning (Matamoros, 2020). All this makes the phenomenon a relevant object of study (Ceron et al., 2020).

The term disinformation can encompass multiple issues, from the dissemination of false content on social networks, to the use of mechanisms such as bots for the dissemination of hate speech, to clickbait content (Magallón, 2019). However, the term fake news is often used to refer to the phenomenon. This may be due to confusion within the terminology of this field and the popularisation of the term since 2016 (Cunha et al., 2018). Fake news has been defined as "news articles that are intentionally and verifiably false, and could mislead readers" (Allcott and Gentzkow,

2017, p. 213). However, the meaning of fake news has changed over time (Brummette et al., 2018; Toma and Scripcariu, 2020). Rodriguez (2019) advocates using the term disinformation as opposed to fake news to cover the multiple facets in which malicious, misleading, hoaxes, etc. are spread.

Confusion with this term can arise because there are two English words that are usually translated as 'disinformation'. They are 'disinformation' and 'misinformation'. The nuance of the aforementioned words lies in the intentionality of the sender when disseminating information (or non-information), according to some authors (Shu, et al., 2020). Disinformation is understood as information that is intentionally false on the part of the issuing source, and which is likely to cause the public to believe falsely (Fallis, 2014). Misinformation, on the other hand, could be translated, simplistically, as "misinformation" disseminated by its issuer with no intention to harm or cause false beliefs. Swire-Thompson and Lazer (2019) state that 'disinformation' is a deliberate intention to circulate 'misinformation' with the aim of gaining money, power or reputation.

Several authors try to explain in their publications either the causes of the emergence of misinformation or its origins. The coronavirus pandemic has motivated several of the aforementioned investigations, as authors such as Ceron et al. (2020) consider the political agenda to be responsible for the diversion of the focus of attention from the health crisis. In this context, Pozo and León (2020) agree that institutions have been the most damaged in terms of hoaxes, followed by political groups.

Based on research carried out during the coronavirus pandemic, we find some classifications of factors that can produce hoaxes. According to García-Marín (2020, p. 3):

- Politicisation of the media.
- Citizens' distrust of institutions.
- Psychological biases and social gratifications that drive individuals to share fake news.
- Failure of platforms to recognise and leverage their role in solving the problem.

Another classification of factors at the origin of misinformation in research that also arose in the context of the coronavirus pandemic is that of López-Borrull, 2020 in Alonso González (2021):

- Economic return: they seek to attract visits to a website.
- Ideological profit: they aim to stigmatise a social group and feed xenophobic discourse.
- Conspiracy theorists: global scientific hoaxes that aim to impose another way of seeing the world while expanding their ideas.
- Hooligans 2.0: they aspire to achieve a viral impact and take the dissemination or creation of the hoax as a challenge.

2. OBJETIVES

The main objective of this review is to find out the situation of research on misinformation and health before the COVID-19 pandemic by analysing, among other questions, the areas of knowledge that were responsible for its investigation, as well as the subtopics they dealt with and the number of articles published over the years. In this way, the aim is to establish the basis for future research to check whether or not such a global and transcendental phenomenon as the coronavirus pandemic has changed health disinformation strategies.

3. METHODOLOGY

In order to carry out this research, a systematic bibliographic review was carried out. The search began by defining the databases and/or search engines to be used to compile the units of analysis. The searches were carried out in the most academically recognised databases such as Scopus and Web of Science, as well as Google Scholar and Dialnet.

The results have been limited in time to the years 2000 and 2019. Once a preliminary search had been carried out, it was found that the results prior to 2000 were not significant. Taking into account that the disease was detected in China in November 2019 and the WHO declared the pandemic in March 2020, for practical reasons (some search engines do not offer the option of filtering by days or months), the end of 2019 has been set as the cut-off date.

A bank of keywords related to the topic has been chosen, and the keywords used by Wang et al. (2019) have been adapted for searches in Scopus and Web of Science: a first group refers to false information, the second group refers to the way in which false information is disseminated, and the third group refers to health.

The following search was carried out in English:

misinformation OR fake news OR disinformation OR rumor* OR hoax* (título)
AND online OR social media OR news OR twitter OR Facebook OR google (te-ma WOS) (título, abstract, keywords SCOPUS) AND health OR disease OR infec-tious OR virus OR vaccin* OR measles (tema)

In Spanish, the following search has been carried out:

desinformaci* OR fake news OR rumor* (título) AND online OR redes sociales OR no-tici* OR twitter OR Facebook OR google (tema WOS) (título, abstract, keywords SCO-PUS) AND salud OR enfermeda* OR infecci* OR virus OR vacun* (tema WOS) (título, abstract, keywords SCOPUS)

The Google Scholar search does not allow the formula explained above, so a search has been carried out until 2019 for the following words:

- In English: health "fake news" misinformation (6,650 results)
- In Spanish: desinformación salud información falsa (9,560 results)

The results dealing with misinformation and health were selected from the first 30 pages of each search. Once the units of analysis had been compiled (we will call each article that forms part of the corpus), we proceeded to evaluation, a phase in which we selected the articles. We have discarded all those that:

- They were duplicated because they appeared in more than one database.
- Their main topic did not include both topics: hoaxes and health.

After two sifts to check that all the units of analysis correspond to the characteristics sought, the total corpus amounts to 171 units. The analysis was then carried out. For this purpose, a database has been designed, in which each of the articles occupies one record unit and which includes the following variables:

- Authorship.
- Number of authors.
- Title.
- Journal: Publication in which it is included if it is a journal.
- Book: Publication in which it is included if it is a book.
- Area/discipline: several areas of knowledge are differentiated according to the publication in which the article is included. It is checked in which categories it is indexed and distributed according to the 2011 UNESCO International Standard Classification of Education.
- Year of publication.
- Type of article:
    - Scientific article: including method, results, conclusions...
    - Non-scientific article: any other non-scientific publication (editorial, letters to the editor...).
    - Preprint.
    - Doctoral thesis.
    - Final degree/master's thesis.
    - Manual.
- Keywords: The keywords included in the articles are copied as they are. Not all articles include them.
- Abstract: the summary of the article as it is included in the article. Not all publications have an abstract.
- Topic: the subtopics of the articles. It can be about diseases, treatments, disciplines within medicine...
- Language.
- Methodology: what scientific method the scientific articles use.
- Type of study: empirical, theoretical or literature review.
- Number of citations in Google Scholar as of 1 February 2022.
- URL.
- Type of access: open, institutional or fee-paying.
- Remarks: for any annotations to be taken into account.

During the development of the analysis it was not possible to access three of the articles collected for different reasons. Therefore, the final analysis was carried out on 168 units.

4. RESULTS

4.1. Type of article

The results of the classification according to the type of article reveal that the majority of the units of analysis correspond to the category of scientific articles, with a wide difference with respect to the rest of the types registered. However, the fact that the majority of results appearing in scientific databases correspond to scientific articles is not considered a relevant result. Despite this, it is noteworthy that, given the magnitude of this type of work, there are five doctoral theses on misinformation and health prior to 2020.

Table 1. *Classification according to article type*

Type of article	Number
Scientific article	96
Communication in congress	13
Doctoral thesis	5
Book chapter	3
Preprint	2

Source: *Own elaboration.*

4.2. Sub-themes

Within the general theme of misinformation and health covered by all the units of analysis, there was an interest in finding out the most common sub-themes shared by the works in the corpus. In principle, the interest was focused on finding out which health-related topics were the most researched, but it was found that not all of them dealt with one of these topics in particular. A sub-theme was assigned to each of the units of analysis, prioritising health-related topics. In cases where this did not apply, a sub-theme on information processing was assigned. Thus, table 2 shows that, among the most common sub-themes, the majority of sub-themes had to do with communication. This could lead to the interpretation that most of them dealt with misinformation and health in general, with the difference being the way of approaching it from a communication point of view.

Table 2. *Classification according to sub-themes*

Sub-themes	Number
Communication management	30
Vaccines	25
Disinformation factors	24
Literacy	23
Health research and misinformation	10
Cancer	8
Zika	6
Ebola	3
Media	3
Autism	2
Pharmacy	2
Nutrition	2
Reproduction	2
Respiratory Syndrome OM	2
Tobacco	2
Stroke	1
Antibiotics	1
Primary care	1
Beauty	1
Biotechnology	1
Oral and Dental	1
Stem Cells	1
Drugs	1

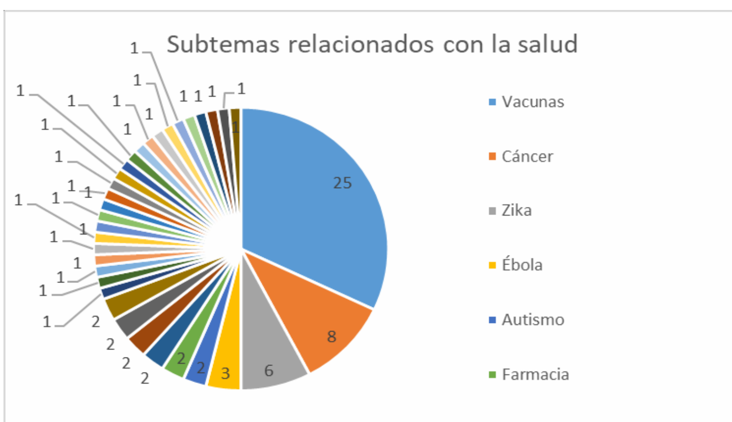
Skin diseases	1
Ideopathic pulmonary fibrosis	1
Yellow fever	1
Crimean-Congo haemorrhagic fever	1
Influenza A	1
Wounds	1
Neurology	1
Infection prevention	1
Psoriasis	1
Measles	1
Tuberculosis	1
Urology	1
Old age	1
HIV	1
Monkeypox	1
Human Papilloma Virus	1

Source: *Own elaboration*

To see this more clearly, we eliminated articles whose subtopics were not related to health and found that, without a doubt, vaccines were, until 2019, the most common element in relation to health in the works analysed. Most of the publications on vaccines follow the trend of the entire corpus and have a clear predominance of content analysis in terms of method, with Health as the area that has published the most on the subject.

After vaccines, cancer or infectious diseases such as Zika or Ebola are the ones that accumulate more papers, although clearly with a lower prominence. The presence of these may be related to high rates of cases or specific epidemic episodes.

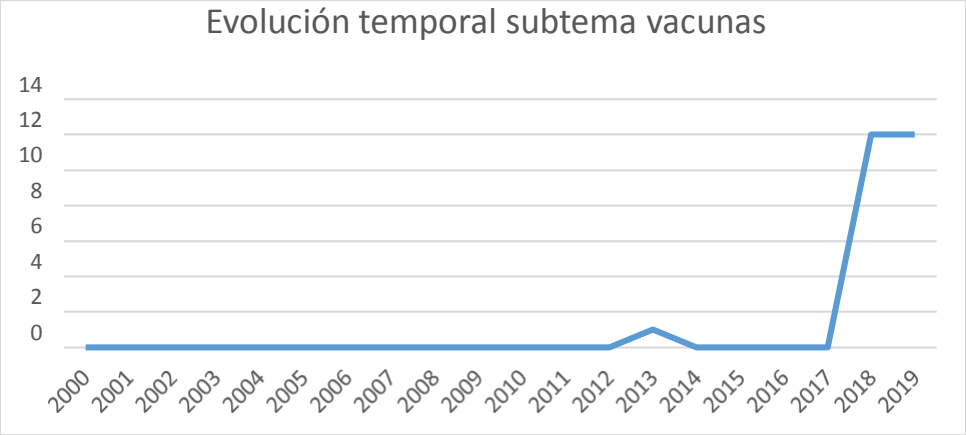
Figure 1. *Graphical representation of health sub-themes*



Source: *Own elaboration.*

With regard to vaccines, since they have been presented as the most frequent health-related subtopic among those analysed, we found that, of the 25 units of analysis, only one of them dates from 2013 and the rest from 2018 and 2019, 12 in each of them. Therefore, it is possible to affirm that interest in vaccine misinformation suffered a sudden interest in the two years prior to the pandemic, and that in the previous years it had been practically nil.

Figure 2. *Graphical representation of the evolution over time of the units of analysis collected on vaccines.*



Source: *Own elaboration*

4.3. Method

The methods used in the articles were classified into scientific articles, conference papers, doctoral theses and final degree or Master's theses. In terms of the results, the difference between the use of content analysis and the other methods is notable. This could mean that research on misinformation and health is oriented towards collecting what has been published (media or networks) rather than the perception of the recipients of the information. Moreover, considering that vaccines were presented as the most frequent health topic, and that it is inevitably associated with anti-vaccine movements, it is curious that only three units using discourse analysis were found. While we cannot claim that denialist discourses are necessarily disinformation, it is curious that the message and how it is constructed is not explored in depth. We may be running the risk of remaining on the surface.

Table 3. *Classification according to method used*

Método	Número
Content analysis	52
Survey	19
Experiment	15
Literature review	7
Theoretical	7
Case studies	6
Interviews	4
Not specified	4
Discourse analysis	3

Source: *Own elaboration.*

4.4. Most frequent keywords

In the keyword count carried out, we used the keywords included by the authors themselves in their works, if they were included. Each of the words included in this field was separated individually and the number of times each keyword appeared was analysed. However, the need has been detected to group some of them together, since the interest lies in finding out which concepts appear most frequently and not the specific words. Some of these examples would be: vaccine, vacuna, vaccination or health and salud. As a result, the most frequent word by far is 'health'. We found certain similarities between this section and that of the sub-themes, since among the ten most

frequently used keywords, those related to information and communication predominate (table 4).

Table 4. *Most frequent keywords*

Keywords	Number
Health(care)	53
Social(s)	35
Fake news	22
Information	18
Vaccination	17
Rumor Communication	15

Source: *Own elaboration*

The process has been repeated with the list from the previous step, but this time searching for the same words in the titles. The results do not vary too much, although the term 'misinformation' is more frequent.

Table 5. *Most frequent keywords in titles*

Keywords	Number
Health(care)	79
Misinformation Social(es)	72
Media Fake news	43
Vaccination	26
Rumor	19
Information	15

Source: *Own elaboration*

4.5. Areas of study

The publications that had disseminated the articles in our corpus were identified and classified according to the UNESCO (2013) categories depending on the areas in which they were indexed. Occasionally, some publications belonged to more than one area. It is striking that there is such a notable difference between the publications in Medicine and the rest, even more so when the difference between Medicine and Journalism and Information is so notable, and not between Journalism and Information and HSS and Behavioural Sciences, or Computer Science, for example. In this case, one would have expected a greater involvement by the area of communication in researching the phenomenon that is the subject of this work, which could be interpreted as a lesser perception of it as a threat than in the case of the area of health.

Table 6. *Classification according to study area*

Keywords	Number

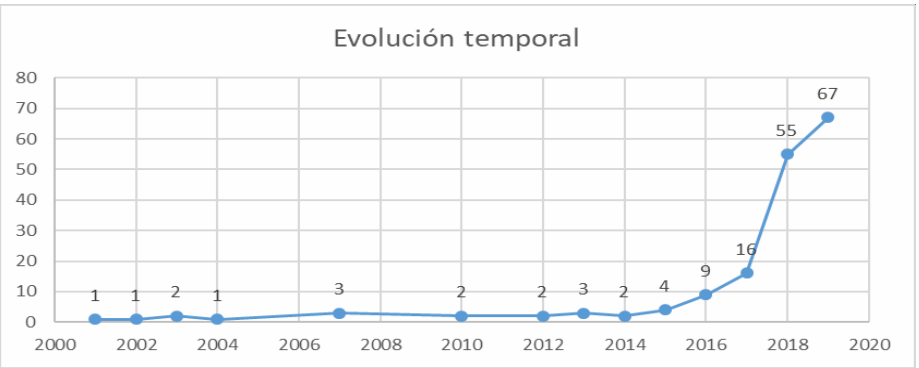
Medicine	78
Journalism and Information	14
SSC and Behavioural Sciences	11
Computing	11
Humanities	10
Engineering and allied professions	5
Law	3
Business Education and Administration	1
Education Sciences	1
Mathematics and Statistics	1

Source: *Own elaboration*

4.6. Time evolution

The years of publication of the units of analysis of the corpus have been recorded to check which have been the moments of greatest interest in the scientific community around misinformation and health. Figure 3 clearly shows that the number of articles published remained at similar numbers until 2015, when an upward trend began and continued until the end of the period analysed. However, the year with the most notable increase is 2018. The trend largely corresponds to the temporal evolution of interest in misinformation and vaccines analysed above. This seems to demonstrate a growing interest of the scientific community in the years immediately preceding the pandemic, which may have been positive in terms of preparation for the analysis of the phenomenon at the crucial moments of Covid-19.

Figure 3. *Graphical representation of the evolution by years of the number of articles published on misinformation and health.*



Source: *Own elaboration*

4.7. Language

The result of our research confirms what is already known about English being the most widely used language in academic research.

Table 7. *Classification according to language*

Language	Number
English	143
Spanish	18
Portuguese	6
French	1

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Source: *Own elaboration*

4.8. Access

The vast majority of units in the corpus are open access. The articles that are presented with one of the other types of access, either institutional or paid, sometimes offer both options. This is the reason why the total of the table exceeds the number of units in the corpus. However, it should be noted that this can sometimes change over time.

Table 8. *Classification according to type of access.*

Access	Number
Open	117
No access	19
Payment	16

Source: *Own elaboration*

5. DISCUSSION

We found that our results about vaccines as the main subtopic among the articles analysed largely coincide with those of other authors (Wang et al., 2019) (Suárez-Lledo and Álvarez-Gálvez 2021), since in their research, not only vaccines were profiled as protagonists, but infectious diseases such as Zika and Ebola, or cancer, were also present. This is not the case with other works that place cancer as the main focus (Waszak et al., 2018), although this may be due to the date of writing, since, as we have seen, the most notable increase in articles on misinformation and health, and that of vaccines more specifically, occurs in 2018 (Wang et al., 2019). In terms of communication- related subtopics, we find some similarities with Li et al. (2019), especially in the characteristics and strategy for dealing with hoaxes.

The fact that in recent years before the pandemic, interest in this topic was growing may have resulted from the awareness that misinformation was until a few years ago underestimated as a danger to public health (Southwell et al., 2019). By the time the pandemic broke out, scientific interest in misinformation and health had increased dramatically and was at an all-time high. Although publications from 2020 onwards are likely to have skyrocketed, the present work already predicted an increase in research on it, even in the absence of a pandemic.

The phenomenon studied is clearly multidisciplinary (Suárez-Lledo and Alvárez-Gálvez, 2021). Although some research (Li et al., 2019) claims Medicine and Information as the only two fields concerned with the issue, our results do not allow us to draw such a conclusion. In our study, even if Information ranked second, it is not comparable to the extensive research in the field of Medicine. The reason may lie in the proximity of the Health area to the problems caused by misinformation; it is the professionals, experts and scientists in this area who most directly perceive the negative consequences of misinformation, who identify it as a problem that needs to be solved. On the contrary, the area of Communication may have been perceiving disinformation as a general threat, a problem yes, but without serious and direct consequences for their professional work.

As we explained in the results section, in relation to the methods used by the units analysed, priority is given to the analysis of the content of disinformation before the attitudes of the recipients, in agreement with Li et al. (2019). Methodological diversity is identified by authors such as Suárez-Lledo and Álvarez-Gálvez (2021) as a factor that makes it difficult to identify solutions to the problem of health misinformation.

6. CONCLUSIONS

As explained in previous sections, the increase in research on misinformation and health in the years immediately prior to the pandemic can be seen as a positive development, as it may have provided a more solid basis for researching and dealing with the phenomenon. Although publications from 2020 onwards are likely to have soared, this work already predicted an increase in research on the phenomenon, even in the absence of a pandemic.

However, it has been shown that not all areas of knowledge had the same level of involvement with the subject. Ultimately, these results underline the need for the field of Communication to pay more attention to research on the phenomenon in question. The revelation of vaccines as a major theme in research on misinformation and health before the coronavirus pandemic leads to the conclusion that vaccines are one of the main sources of false information, and that, moreover, this is how they are perceived by the scientific community. The fact that one of the main measures against COVID-19 was the worldwide vaccination campaign may have confirmed this trend.

In the light of the results of our analysis, it is worth asking whether the trend in research on misinformation and health has been maintained or whether it has changed, especially with regard to two factors. On the one hand, it would be interesting to know how the subject of vaccines has evolved and how it has developed during the pandemic. On the other hand, and as has already been mentioned, it will be essential to check whether the area of Communication has had a greater impact on research into this phenomenon than it had done up to 2019.

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8. RELATED ARTICLES

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