The use of social networks and their implication for health communication. A bibliographic review on the use of Twitter and cancer

El uso de redes sociales y su implicación para la comunicación en salud. Revisión bibliográfica sobre el uso de Twitter y la enfermedad del cáncer

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Abstract:

Cancer is one of the diseases that most circulates on social networks due to its high incidence. Twitter is one of the most effective networks for disseminating information on this topic. This review aims to compile the main findings of articles that analyse cancer communication on Twitter. For this purpose, we examined WoS and PubMed databases (2009-2019), and we carried out a content analysis of 20 articles found. 64.3% of the articles conclude that Twitter is an effective tool for health education and 58.3% consider that more significant

Resumen:

El cáncer es una de las enfermedades que más circula en las redes sociales debido a su alta incidencia, siendo Twitter una de las más efectivas para difundir información sobre este tema. Esta revisión tiene por objetivo compilar los principales hallazgos de los artículos que analizan la comunicación sobre cáncer en Twitter. Para ello se examinan las bases de datos de WoS y PubMed (2009-2019) y se realiza un análisis de contenido de los 20 artículos encontrados. El 64,3% de los artículos concluyen afirmando que Twitter es una herramienta efectiva para edu-

intervention by health professionals is still needed. Therefore, it is a useful complementary tool for disease awareness and prevention, which must still go hand in hand with other educational and media literacy actions.

Keywords:

Social networks; Twitter; cancer; health communication; bibliometric analysis.

car en salud y un 58,3% considera que todavía es necesaria una mayor intervención por parte de los profesionales sanitarios. Es por tanto una herramienta complementaria útil para la sensibilización y prevención de enfermedades, que todavía debe ir de la mano de otras acciones educativas y de alfabetización mediática.

Palabras clave:

Redes sociales; Twitter; cáncer; comunicación en salud; análisis bibliométrico.

1. Introduction

Digital social networks such as Twitter, Facebook, and Instagram are essential communication vehicles in citizens' lives. They currently reach billions of users worldwide and are continually growing. The number of users will reach 4.2 billion people in 2021, i.e., 53.6% of the world's population, which is an increase of 13.2% active users compared to 2020 and a total of 490 million more users (Galeano, 2021). These networks are used for several reasons such as agility, immediacy, information searches and allow users to generate and share content. People spend an average of two hours a day on them.

Although Twitter is positioned behind Facebook (2.7 billion users), YouTube (2.2 billion users), Instagram (1.2 billion users), or TikTok (689 000 users) in the digital social network rankings, the number of users has remained steady over time, as loyal users have not left it (We are social, 2021). For Crua (2020), Twitter is the microblogging platform par excellence characterized by instantaneousness and live connection between users, mainly males between 25 and 49 years old.

Twitter is not only a platform for users, but it is also a work channel for professionals. In the United States, the police and fire departments across the country use it to disseminate information. The former communicate arrests, homicides, riots, traffic accidents, road closures, robberies, and advances in criminal investigations. Regarding firefighters, they post to inform about their work and receive information from citizens, who warn them, for example, of wind changes in a fire zone that may be key to preventing the fire from spreading.

Twitter's fundamental characteristic is that users can easily stay informed about new events or the latest news (We are social, 2021). Some examples of it being used in this way were during the organization of protests or social upheavals in Egypt and Iran (Castells, 2012), the minute-by-minute broadcasting of the earthquake and subsequent nuclear threat in Fukushima, or during the start of the COVID-19 pandemic, whereby it was a powerful tool for disseminating information from the public health sphere. World leaders and representatives from health institutions worldwide use it to transmit information to citizens more quickly and directly than through traditional media such as the press, radio, or television (Rufai and Bunce, 2020).

1.1. Media literacy and health communication via Twitter

Health authorities use Twitter precisely because this social network is one of the most used networks for sharing and searching for information about health (Matarin, 2015). Thousands of people in different parts of the world search for general information (Schapira, 2019) through hashtags, such as healthy lifestyle habits or disease prevention, or specific information related to a

particular disease's symptomology or the implications of a medical diagnosis. Moreover, it has been used in health research for surveillance, education, and as a tool for promoting, preventing, and supporting the treatment of various conditions. It also can promote research, given the growing number of publications and various organisations' experience, which seek to boost research using this channel (Curioso and Carnero, 2011). Twitter users, the media, and civil servants have become spokespeople amassing millions of followers during the COVID-19 pandemic (Sued and Cebral, 2020).

Moreover, Twitter may be an essential support network for patients and their families by allowing those affected to recount their personal experiences and also find out about others' experiences, opinions, and personal experiences regarding health issues since users can interact with each other, thus preventing the so-called sick person's loneliness (Gage-Bouchard et al., 2018). It also fosters user-to-user counselling and encourages them to share advice (Keckley and Hoffmann, 2010). In other words, they go from being mere information consumers to having a much more active and empowered role in health issues, making them "prosumers" and allowing them to generate information based on their knowledge (Martin and Tyner, 2012).

However, this new way of generating participative knowledge does not come without its risks, and we should reflect on the implications of being exposed to information on health issues with data that may sometimes be untrue, biased or based on beliefs, values, and prejudices (Martin and Tyner, 2012).

The COVID-19 infodemia showed that poor health literacy is an underestimated public health problem worldwide (Paakkari and Okan, 2020). International organisations such as UNESCO consider media and information literacy essential for strengthening citizens' critical capacity when exposed to fake news and disinformation through hoaxes, which are common on social networks (Calvo and Aruguete, 2020). This digital health literacy is essential for empowering the population, limiting the reinforcement of existing social differences, and preventing new inequalities from forming as citizens learn to master health information (Sanders et al., 2015).

Mateos, Vicepresident of the Association of Health Researchers (AIES) and coordinator of #Health without hoaxes, highlights that fake news is causing a great deal of harm to patients in a study by EHON (García, 2018) since some stop taking medication and even hide the use of complementary treatments from their doctor, therefore it is necessary to contrast information with a health professional. According to González (2019), there are three types of reasons for spreading fake news: to harm a third party (the creators of this hoax intend to take advantage of discrediting others); to hide the genuine interest of the person who started the hoax (selling products); and/or to cause social alarm.

Sector professionals are aware of this reality and express the need to intervene on the same channels to provide the user with helpful information and play one of their most essential roles, giving the patient reliable information and educating the community (Fernández et al., 2014). Thus, many healthcare professionals use Twitter to present studies, opinions, recommendations, and guidelines on different health issues, strengthening their followers' health literacy (Piqueiras et al., 2020).

Health care centres and public health organizations have started to show an interest in literacy and use Twitter to promote health education actions, which complement measures carried out through other channels and reach more people (Xu et al., 2016). Moreover, one of the social network's greatest advantages is the ability to measure action's effectiveness, for example, by quantifying user interaction with different publications (likes, retweets, shares, comments).

1.2. Communication on cancer

Cancer is one of the diseases among health issues, which is disseminated the most on social networks (de Oliveira, 2020) since it is a disease that affects more than 19 million people worldwide. Breast, lung, and colon cancer were the three most diagnosed cancers in 2020, according to the National Institutes of Health (NIH, 2020). Due to the high incidence, we must consider it an important theme from a public health perspective, whose main objectives are to promote health through information, education, and empowering people when it comes to health issues.

According to the National Cancer Institute (2020), treating cancer with a solid and correct communicative perspective is essential. They state the following indications in this regard: good communication between cancer patients, family caregivers, and the health care team; cancer patients have special communication needs; communication is important at different points in cancer care, i.e., when the patient receives their first diagnosis, any point at which treatment decisions must be made, after treatment, when treatment efficacy is discussed, any time that treatment goals change, when the patient makes their wishes known regarding their advance directives such as a living will.

Therefore, since communication is essential throughout the entire process (especially when important decisions must be made), Twitter can help to promote, boost, and streamline information, opinions, and ultimately the entire communicative process between the different agents involved, as recent studies have highlighted the effective communication on cancer compared to other social networks (Vraga et al., 2018).

Several studies highlight the wealth of information about this disease published on the web: patients who have survived the disease (Chou, 2011); information about cancer and the Internet (García-Mirón and Torres-Romay, 2020); the emotional processes (Schmidt and Andrykowski, 2004); cancer-doctor patient relationships and communication (Forguione-Pérez, 2015); benefits and adverse effects of treatments (Jiménez-León, 2015); breast cancer (Kern and Moro, 2012); cancer and therapies in adolescents (Haase, 2020); prevention (Plackett et al., 2020) and risk factors (Vandertempel, 2015).

The interest of this article lies in the fact that there has not yet been any review that attempts to compile the results of the empirical study that analyses Twitter as a means of cancer communication. For this reason, the specific objectives of the study are the following:

– To identify the type of information (promotion/treatment) disseminated through Twitter in the articles studied.

– To identify the main themes and approaches studied in the scientific literature about using Twitter regarding cancer.

– To analyse the conclusions about the use of Twitter as a tool for surveilling health in the selected articles.

– To examine the articles' findings to evaluate Twitter usage as an effective source of health information.

2. Methodology

For this research, a literature review was conducted on scientific literature published over ten years (from 2009 to 2019) about health communication issues on Twitter. The search was carried out in July 2020 on the Web of Science Core Collection and PubMed database.

The search was limited by one of the keywords: "Health communication and Twitter" and its appearance in the title, abstract, the author's keywords and/or in the Keywords Plus," by language (English and Spanish) and by the type of article (Classical article). These terms were chosen following the same structure outlined in Segado and Fernández (2015), combining global tags such as "Health Communication" and other specific ones with the name of the social network "Twitter."

A total of 107 articles were retrieved using the search terms initially established. Their abstracts were manually reviewed, and articles that did not meet the previously established inclusion/exclusion criteria, i.e., empirical articles that specifically refer to health communication published on Twitter, were eliminated. This left 87 articles out of the sample 1) mentioned the concept of health communication on Twitter tangentially, without being a specific subject of study; 2) articles that were restricted to medical or specialised communication; 3) articles that were duplicated on different databases.

Finally, a content analysis was carried out on 20 articles focused on disseminating information about cancer on Twitter. For this purpose, we included articles that contained the keyword "cancer" in the title and articles centred on risk factors for developing this disease (see Figure 1).

Figure 1. Inclusion and exclusion criteria applied in the review (2009/2019)
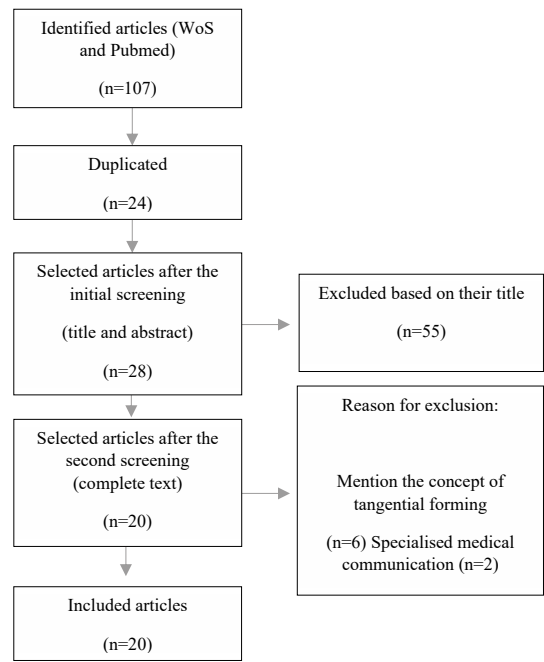
Source: created by the authors

A data collection protocol was elaborated containing the following variables for the content analysis:

1. The article's year of publication

2. Number of researchers

3. Principal investigator's sex

4. Social networks studied

5. Topic being studied

6. The article's analysis methodology

7. Item sample size

8. Country/countries that constitute the article's study universe

9. Audience to whom the communication actions are addressed.

10. The focus of the article: Information/education/empowerment

11. Pharmacological information (trade names, side effects, efficacy, and effectiveness)

Finally, the articles were classified according to the focus (information, education, and empowerment) and the valence of their conclusions (positive or negative) following the definitions set out in Table 1.

Table 1. Focus and valence of the reviewed articles' conclusions

Twitter Usage	Positive valence	Negative valence
	Description	Description
Information	It is a reliable source of health information and contributes effectively to promoting healthy behaviours through information.	More intervention by health care professionals is needed to improve the quality of the information disseminated and promote healthy behaviours.
Education	Enables sensitising or raising awareness about health issues and evaluating the impact of the actions for raising awareness.	It continues to underrepresent or make specific health problems or prevalences invisible.
Empowerment	Foster communication, support networks, and the debates between different actors and allow communication in emergencies.	Unidirectional communication does not foster dialogue or improve communication between different actors or in critical health situations.

Source: created by the authors

A concordance analysis was performed on a sample of 20% of the total universe studied, obtaining 81.3% agreement (BG and BC) to avoid inter-observer variation when coding the information.

The information is recorded on the SPSS database, version 15, used later to analyse results.

3. Results

We found a total of 20 articles analysing cancer communication on Twitter between 2009 and 2019 (Table 2).

Table 2. Reviewed articles focused on disseminating cancer information via Twitter (2009/2019)

SURNAME, YEAR[1]	TITLE OF THE ARTICLE
VILLA, 2012	Redes sociales de internet en difusión antitabáquica: la experiencia de la Clínica Contra el Tabaquismo del Hospital General de México «Eduardo Liceaga»
MAHONEY, 2015	The Digital Distribution of Public Health News Surrounding the Human Papillomavirus Vaccination: A Longitudinal Infodemiology Study
BRAVO, 2015	Tweeting About Prostate and Testicular Cancers: What Are Individuals Saying in Their Discussions About the 2013 Movember Canada Campaign?
VANDERTEMPEL, 2015	Vape, quit, tweet? Electronic cigarettes and smoking cessation on Twitter
MYRICK, 2016	#Stupidcancer: Exploring a Typology of Social Support and the Role of Emotional Expression in a Social Media Community
BRAVO, 2016	Tweeting About Prostate and Testicular Cancers: Do Twitter Conversations and the 2013 Movember Canada Campaign Objectives Align?
CHUNG, 2016	A Smoking Cessation Campaign on Twitter: Understanding the Use of Twitter and Identifying Major Players in a Health Campaign
MASSEY, 2016	Applying Multiple Data Collection Tools to Quantify Human Papillomavirus Vaccine Communication on Twitter
SURIAN, 2016	Characterizing Twitter Discussions About HPV Vaccines Using Topic Modeling and Community Detection
BRAVO, 2017	Social Media and Men's Health: A Content Analysis of Twitter Conversations During the 2013 Movember Campaigns in the United States, Canada, and the United Kingdom.
LAZARD, 2017	Public reactions to e-cigarette regulations on Twitter: a text mining analysis
GLOWACKI, 2017	E-Cigarette Topics Shared by Medical Professionals: A Comparison of Tweets from the United States and United Kingdom

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1   First author's surname and the reviewed article's year of publication.

MALPASS, 2017	Using Twitter to Understand Public Perceptions Regarding the #HPV Vaccine: Opportunities for Public Health Nurses to Engage in Social Marketing
TEOH, 2018	A Cross-Sectional Review of Cervical Cancer Messages on Twitter during Cervical Cancer Awareness Month
LAMA, 2018	Discordance Between Human Papillomavirus Twitter Images and Disparities in Human Papillomavirus Risk and Disease in the United States: Mixed-Methods Analysis
MARTINEZ, 2018	"Okey, we get it. You vape" An analysis of Geocoded Content, Context, and Sentiment regarding e-cigarettes on Twitter
VRAGA, 2018	Cancer and Social Media: A Comparison of Traffic about Breast Cancer, Prostate Cancer, and Other Reproductive Cancers on Twitter and Instagram
YOO, 2018	The Effect of Health Beliefs, Media Perceptions, and Communicative Behaviors on Health Behavioral Intention: An Integrated Health Campaign Model on Social Media
KELLEY, 2019	Prevalence and Characteristics of Twitter Posts About Court-Ordered, Tobacco-Related Corrective Statements: Descriptive Content Analysis.
SEDRAK, 2019	Examining Public Communication About Kidney Cancer on Twitter

Source: created by the authors

Seventy percent of the articles reviewed were published from 2016 to 2018, while the beginning of the analysis period most often studied was between 2013 and 2015 (20% each year). Sixty percent of the selected articles focused on the U.S.A, 10% on Canada, 5% on Mexico, 5% on Switzerland, and 5% did not contain this information. Finally, 15% of the articles did not specify a country but were focused on English-speaking countries (see Table 3).

Table 3. Frequency and percentage of the articles reviewed by subject and country of study (2009/2019)

Country where the article is studied	Electronic cigarettes n (%)	HPV vaccine n (%)	Anti-smoking campaigns n (%)	Risk of tobacco use n (%)	Reproductive cancer n (%)	Kidney cancer n (%)	Cancer n (%)	Total n (%)
U.S.A.	3 (75)	4 (57.1)	1 (50)	1 (100)	1 (25)	1 (100)	1 (100)	12(60)
Canada	0	0	0	0	2 (50)	0	0	2 (10)
Mexico	0	0	1 (50)	0	0	0	0	1 (5)

Switzerland	1(25)	0	0	0	0	0	0	1 (5)
English speaking countries	0	2 (28.6)	0	0	1 (25)	0	0	3 (15)
Not identified	0	1 (14.3)	0	0	0	0	0	1 (5)
Total	**4 (20)**	**7 (35)**	**2 (10)**	**1 (5)**	**4 (20)**	**1 (5)**	**1 (5)**	**20 (100)**

Source: created by the authors

45% of the articles had four (25%) or six signatories (20%), and in 80% of the total sample, the principal investigator was a woman. Men appear as first signatories concerning the HPV vaccine (42.9%) and electronic cigarettes (25%). In comparison, women appear as first signatories in the rest of the subjects in 100% of the cases.

The vast majority of the articles included in the review study only twitter (85%), and the remaining 15% combine the study of Twitter with other social networks such as Instagram (5%), Facebook (5%), and Google News (5%).

In 70% of the articles, the central theme of the analysis was the risk factors associated with cancer; the HPV vaccine was the most studied topic out of the 20 analysed articles (35.7%), followed by electronic cigarettes (28.6%). On the other hand, when the articles focus on the disease itself, reproductive cancers (breast, prostate, testicles) appear most frequently, accounting for 66.7% of the six articles focused on the theme of cancer (see Table 4).

Table 4. Articles focused on disseminating cancer information on Twitter

	Thematic	Specific topic	N (%)
Risk factors for developing cancer	**Tabacco**	Electronic cigarettes	4 (20)
		Anti-smoking campaigns	2 (10)
		Risks of tobacco consumption	1 (5)
	HPV	HPV vaccine	7 (35)
Disease	**Cancer**	Reproductive cancer (breast, prostate, testicles, cervical cancer)	4 (20)
		Kidney cancer	1 (5)
		No type specified	1 (5)

Source: created by the authors

Medicine trade names do not appear often; it is only mentioned in one article on the HPV vaccine. However, 25% of the articles reviewed note cancer prevention products or medicine's adverse effects, 35% mention their efficacy, and 5% mention their effectiveness. When differentiating by specific topic, we see how this information mainly appears concerning the HPV vaccine, where 57.1% of the articles mention the adverse effects and 85.7% mention efficacy. Also, in the case of electronic cigarettes, 25% of the articles reviewed on this topic mention both adverse effects and efficacy (see Table 5).

Table 5. Information on pharmacological treatments or products for cancer prevention

	Trade names		Adverse effects		Efficacy		Effectiveness	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Electronic cigarettes	0	4 (100)	1 (25)	3 (75)	1 (25)	3 (75)	0	4(100)
Anti-smoking campaign	0	2 (100)	0	2 (100)	0	2(100)	0	2(100)
Smoking risks	0	1 (100)	0	1 (100)	0	1(100)	0	1(100)
HPV vaccine	1 (14.3)	6 (85.7)	4 (57.1)	3 (42.9)	6 (85.7)	1 (14.3)	1 (14.3)	6 (85.7)
Reproductive cancer	0	4 (100)	0	4 (100)	0	4(100)	0	4(100)
Kidney cancer	0	1 (100)	0	1 (100)	0	1(100)	0	1(100)
Cancer	0	1 (100)	0	1 (100)	0	1(100)	0	1(100)

Source: created by the authors

Regarding the articles' conclusions, a total of 26 approaches were found. The classification of approaches is non-exclusive. Of these, 64.3% concluded that Twitter was an effective tool for health education. However, 58.3% of the articles also concluded that the quality of the information is insufficient and more intervention by health professionals is needed to improve the quality of the information disseminated. Regarding the nine articles that focus on empowerment, opinions are quite polarised, with 44.4% of the articles concluding that it contributes to empowering the user and 55.6% of the articles stating the opposite (see Table 6).

Table 6. Twitter's uses and valences in Health Communication are identified in reviewed articles' conclusions

Twitter Usage	Positive valence		Negative valence		Total	
	No	%	No	%	Nº	(%)
Information	1	7.1	7	58.3	8	30.8
Education	9	64.3	0	0	9	34.6
Empowerment	4	28.6	5	41.7	9	34.6
Total	14	100	12	100	26	100

Source: created by the authors

4. Discussion

According to the results obtained, we affirm that we found a small number of empirical articles focused on analysing cancer communication via Twitter in the databases consulted. This result coincides with the previous literature reviews on the analysis of health communication through this digital social network, where we can comparatively observe that cancer has had less of a presence than other health problems such as infectious, psychiatric, or neurological diseases, which have been the focus of study most frequently (Sinnenberg et al., 2017).

On the other hand, it is also worth noting that most of the analyses carried out in the articles that make up our study universe have focused on English-speaking countries or analyses of communication in English. Communication in other countries or languages has had little representation. Spanish shows a language bias in communication and health research, which was previously identified in communication (De la Torre-Espinosa et al., 2019).

Moreover, it is also observed that the study of disseminating cancer information on Twitter is a theme of work mainly conducted by women, as it is primarily women who lead the research on this topic, regardless of the article focus or type of cancer. These results may also correspond with the higher number of female healthcare professionals (Witter et al., 2017), resulting in more female researchers in this area. However, despite the differences by sex among the first signatories of the reviewed articles, health issues that affect men and women have been studied equally since both breast cancer and prostate cancer communication have been the most studied types of cancer.

Most of the articles have focused on analysing communication regarding the risk factors such as tobacco or HPV and do not often focus on cancer as a disease. Therefore, when analysing health communication through Twitter, the focus is more on prevention than its effectiveness in creating support networks or assessing its use as a tool for searching for information about the disease.

In this sense, we highlight that although few articles underline the presence of pharmacological treatments' trade names, there are arguments centred on the adverse effects that products such as vaccines or electronic cigarettes can cause. This may indicate that much of the research has studied Twitter as a health surveillance tool by monitoring communication to identify needs on health issues that can be sensitive or controversial.

Concerning the selection of themes, we must highlight the high volume of articles that focus on tobacco consumption as a risk factor for developing respiratory cancer (bronchial, tracheal, or lung) is warranted by its high incidence and mortality worldwide, according to the World Health Organization (WHO, 2020), as is the case for breast and prostrate cancer, both have a high incidence. However, this same criterion could not be applied to HPV, a risk factor for developing cervical cancer, since this type of cancer is not found among the most diagnosed nor those with the highest mortality rate (American Cancer Society, 2020).

Regarding the articles' conclusions, many authors highlight that Twitter is a valuable tool for educating about health issues, specifically cancer, raising awareness or making the risk factors affecting the development of the disease visible, and evaluating the impact of such actions. However, the information on health issues is often incorrect, and health professionals need to intervene more. Therefore, social networks are a support tool that must go hand in hand with other actions, i.e., it serves to reinforce information but must not be considered the only means. Still, it is a tool to measure the impact of communication actions carried out by other means.

Moreover, according to the results obtained, there is also no consensus on the usefulness of Twitter for empowering citizens on health issues. Although one of the main advantages of social networks is the bidirectionality of communication, many articles conclude that this is still mainly unidirectional. Most of the users also limit themselves to expressing opinions and personal experiences, not neglecting the cancer patient's loneliness, who needs, among other things, to preserve hope and be emotionally recognised for communication to be effective (Cunill and Serdà, 2011). However, for true empowerment, media literacy needs to be reinforced to evaluate information critically so that users are not confused when exposed to opinions that may be biased or based on isolated experiences.

One of the main limitations of this literature review is the small sample size that does not make it possible to generalise the quality of cancer information on Twitter. Nevertheless, this work opens up an initial avenue of research that allows us to compile the analyses carried out so far and draw some initial conclusions in this regard. Furthermore, only those studies focused on Twitter have been analysed, so the results cannot be extrapolated to other social networks with more users, such as Facebook or Instagram.

5. Conclusions

Most of the articles reviewed related to cancer communication through Twitter have centred on analysing communication about risk factors for developing the disease, mainly tobacco and HPV, rather than on cancer as a disease in itself, so this may indicate from an academic perspective that the focus has centred on preventive themes.

It points to the need for greater media literacy to enable cancer patients to evaluate information critically as they are often exposed to partial or biased opinions. At the same time, we must also highlight the effectiveness of its use as a support tool for raising awareness or visibility actions and measuring the impact of communication actions carried out by other media. Finally, there is no consensus in the articles analysed regarding its effectiveness as a tool for empowerment by creating support networks that prevent the cancer patient's loneliness. Since some authors highlight that communication is often unidirectional.

As future lines of research, we consider that it would be of interest to carry out a literature review on the most frequently addressed health issues on other social networks so as to compare them. Likewise, the literature review could also be extended to other health problems to determine whether the weight of the diseases corresponds with the highest incidence and/or prevalence and their presence in the debates about health on Twitter.

6. Acknowledgments

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