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How is communication of vaccines in traditional media: a systematic review. Perspectives in

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Journalism and vaccines: characteristics and outcomes of media research

Abstract

Objective: Identify communication research of media coverage in relation to vaccines and describe the characteristics and outcomes.

Methods: A systematic review was performed. Three electronic databases were searched. Inclusion criteria were: studies about vaccines, applying media content analyses methods, and publication from 2007 to 2017. The characteristics and outcomes were systematically identified and described.

Results: twenty-one studies were identified. 62% (n = 13) of studies analysed the HPV vaccine, 86% (n = 18) examined newspapers, and 62% (n = 13) examined North-American media. 83% contained negative messages on vaccines, and 86% presented lack of accurate information.

Conclusion: Media coverage of vaccines has been largely studied during the last decade. We have identified gaps in the literature and an agenda for further research. There is a strong need to analyse other types of media such as television, radio and social digital networks, in more different types of vaccine, and in some geographical areas such as in low-income countries.

Practice implications: Findings will be of interest to those in the health field, researchers and policy makers who are trying to communicate their messages about

vaccines. Public health officials implementing vaccination programs should develop a close collaboration with the journalists and the media.

Keywords: vaccines; immunization; journalism; communication; systematic review.

1. Introduction

In the last decades, the incidence of polio, measles, mumps, rubella, Haemophilus influenzae type b, hepatitis, and varicella (chickenpox) have been very much declined thanks to vaccination programs. Today, vaccines represent one of the greatest achievements of science in the battle against serious infectious diseases improving quality of life and life expectancy worldwide. Countries have made tremendous progress in vaccination programs and the public is aware of the important role of vaccines in preventing diseases. Nevertheless, despite the impact of vaccines on health and well-being, they have had a long history of arousing anxiety. Concerns raised by anti-vaccination groups and supported by policy makers, the media and parents about issues as vaccines' safety and the increasing complexity of immunization schedules have fostered doubts about the necessity of vaccinations [1]. A clear example can be found in measles which is one of the leading causes of death among young children even though a safe and cost-effective vaccine is available. According to the WHO [2], in 2015 there were 134200 measles deaths globally – about 367 deaths every day or 15 deaths every hour. Lack of confidence in vaccines is now considered a threat to the success of vaccination programs and it is believed to be responsible for decreasing vaccine coverage and an increasing risk of vaccine-preventable disease outbreaks and epidemics [3].

The media has been considered as an important tool communicating information about vaccines, increasing awareness [4] and motivating the public to make important

decisions about their health care [5]. In parallel, the traditional media coverage and the rapid growth of the Internet and social media such as Twitter and Facebook have made it easier to find and disseminate immunization-related concerns and misperceptions [1]. This has also been raised by the World Health Organization, the former Director-General Margaret Chan expressed concerns over what she called a "worrisome" public mistrust of vaccines [6]. There has been widespread uncertainty regarding the exact science – particularly when the media try to provide a 'balanced' view, giving at least equal space/time to anti-vaccinationists, even though i.e. more than 99% of informed medical and health-related professionals fully support the MMR vaccination [7]. When media cover information on vaccines, journalists usually cover multiple sides of an issue and provide insight into where the strength of evidence lies by focusing on "evidentiary balance" [8].

The vaccine media debate has been raging for many years, immunizations have a long and complicated history of both saving our lives and hurting us. Parental acceptance of routine childhood immunization is essential to protecting children's health and the foundation for high vaccination rates. But maintaining that acceptance can be difficult- especially because the success of the immunization program in the United States has resulted in new generations of parents who have little or no firsthand experience with most of the diseases that are preventable by vaccination [1]. Therefore, vaccine adherence is becoming an increasing public health challenge. For example, in 1998 a scientist claimed there might be a link between the measles, mumps and rubella (MMR) vaccine and autism. His claims received significant media attention and vaccination rates fell across many countries [9], although many scientific experts raised that there is no scientific evidence that the MMR vaccine plays any part in the etiology or triggering of autism. Another relevant example is the Swine Flu vaccine. Since the Swine Flu scare hit the airwaves around 2008, reports of people being sick because of

that kind of flu have doubled. Even though this particular flu was a major health concern, it had a lot of people scared of needles in their arms with anti-virus vaccines.

Media contents published by journalist may impact public perception on health preventive measures and influence decisions on public's own health. It is well-known that the experience of society dynamics, including the introduction of new medical practices is partly mediated by mass media [10]. Given that communication via media is a common practice, it is important to explore media representations of vaccines. This review focuses on traditional media including television, radio, print press, etc.

Although the growth of digital media, traditional media are not dead and still play an important role in the communication landscape [11]. In fact, traditional media have been in existence for long and are still a main medium of communication in many regions of the World. For example, in India traditional media yet occupy an important role in the delivery of messages to a large number of people [12].

To our knowledge, beyond the original studies, only one systematic review has been conducted investigating the media coverage of vaccines [13]. However, this study was limited to news media on the human papillomavirus (HPV) vaccine uptake in the United States (US), and included only 13 content-analysis articles published from 2006 to 2011. In contrast, our systematic review intends to expand the review towards all types of vaccines, world regions, and we also intend to update the publication period.

Therefore, this article presents a systematic review to identify communication research of media coverage in relation to vaccines and describes the characteristics and outcomes.

2. Methods

This systematic review was registered with PROSPERO: CRD42017072849. The development of this systematic review was guided by the PRISMA statement [14,15]. A

protocol for the systematic review was developed through consensus among the co-authors.

2.1. Search strategy

Literature search strategies were developed using medical subject heading (MESH) and text words related to mass media. Search strategies combined two types of terms: vaccine terms (e.g., vaccine, vaccination, immunization) AND media terms (e.g., television, radio, newspaper); see search strategy in table 1. We searched databases PubMed (including MEDLINE), Scopus and the International Bibliography of Social Sciences (IBSS). Papers that were written in English and published between January 1 2007 and January 1 2017 were included. We chose the time period from 2007 to only analyse publications made after the publication of the World Health Organization guidelines on the safety of medicines, in which the mass media were recognized as a key element [16].

Please insert Table 1 about here

2.2. Selection of articles

Regardless of their methodological quality, the studies had to meet the following inclusion criteria: (1) conduct a content analysis of publications made in a traditional mass media such as radio, television, newspapers or any other such as movies; (2) address vaccines or immunization; (3) report original qualitative or quantitative data examining the media coverage of vaccines. Reference lists of key articles were manually searched to identify further relevant studies. Systematic reviews, abstracts, dissertations, single case reports, editorials, commentaries, conference abstracts, non-research articles and studies focused on digital mass media, such as websites or social networks, were excluded. Articles analysing advertisements on vaccines in the media were also excluded.

The PRISMA flow diagram in Figure 1 outlines the screening processes applied to the articles identified by the literature searches, which were subsequently screened for duplication and relevance using title and abstracts. Of those, articles that were considered relevant, were assessed for eligibility by reviewing full texts.

Please insert Figure 1 about here

2.3. Study records

Literature search results were uploaded to Zotero that facilitates bibliographic source management. Following the removal of duplicates, two independent reviewers (DC, CS) screened the titles and abstracts according to eligibility criteria. A third team member (CP) was consulted when necessary. All discrepancies between reviewers were resolved through discussion and 100% of agreement was reached. We obtained full articles for all titles that appeared to meet the inclusion criteria or where there was an uncertainty. The appropriateness of the full text papers was verified to check that they met the eligibility criteria. We contacted the study authors to obtain additional information about eligibility.

2.4. Data extraction, synthesis and analysis

The review team developed a coding form designed to capture descriptive information on the included studies. The variables analysed were: country, media type, major theme, vaccine type, objectives, outcome measures, sample size, main outcomes, and conclusions. We synthesized data qualitatively, dividing studies into major themes and vaccine types. We did not have a sufficient number of studies with similar topics or methodologies to consider meta-analysis, and we did not conduct quality assessment of studies since all met the inclusion criteria of following the same research

methodology, content analysis. Overall, the aims, data collection methods, samples and outcomes were sufficiently well described in the studies.

3. Results

The screening processes identified 182 articles by the literature searches, which were subsequently screened for duplication and relevance. Therefore 131 articles were titles and abstracts reviewed. Of those, 49 full-text articles were considered relevant and were assessed for eligibility. A total of 28 full-text articles were excluded after careful review. The specific reasons for exclusion can be found in Figure 1. This ultimately led to the inclusion of 21 studies for further analysis.

3.1. Study characteristics

For a summary of characteristics of the 21 studies see table 2. Dr. Casciotti's team published the highest amount of articles during the period of analysis (n = 3). Dr. Casciotti's affiliation was Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, USA. This finding is consistent with USA as the leading country investigating media coverage about vaccines. In fact, among the 21 studies, 13 studies analysed North America media, 9 from US and 4 from Canada. 2 studies analysed UK, and other 2 the media of New Zealand. The media of the following countries were also analysed (n = 1): Australia, Japan, Nigeria, Romania and United Arab Emirates. Print media, especially Newspapers, were the most frequent media type reported among the included studies. In total, 95% (n = 20) of all studies reported print media, and of those, 86% (n = 18) analysed coverage by newspapers. Other studies analysing print media were on magazines (n = 1), and a combination of media including newspapers, magazine and videos (n = 1). Only one study (n = 1) analysed coverage made by TV.

The twenty-one studies comprised 7781 units of content analyses: 7560 newspaper articles, 59 TV and video broadcasts and 40 magazine articles. The average study sample size was 140 units of analysis (SD= 511.56; range 15 - 2113).

Major themes were identified for each of the analysed studies. The most frequent theme was “media coverage” in general, specifically 38% (n = 8) [17–24]. These studies mostly provided a general description of the characteristics of the contents published by the media without any especial focus. The remaining studies, 62% (n = 13), described specific characteristics of media coverage. From these, two articles analysed the arguments provided for immunisation [25,26], three studies analysed risk messages [27–29], and two studies [30,31] analysed safety information on vaccines. The other themes with low frequencies (n = 1) can be found in table 2.

The most common vaccine that was analysed in the selected studies is ‘HPV – Human Papillomavirus Vaccine’ (62%, n=13). Two studies analysed the influenza vaccine (one the seasonal and one the A/H1N1). One article analysed the Polio vaccine and another the ‘MMR – Mumps, Measles, Rubella vaccine’. Three articles did not analyse one specific vaccine and one article focused on the relation of Autism and vaccination.

Please insert Table 2 about here

3.2. Measures and outcomes

For a summary of measures, outcomes and conclusions please see table 3. In relation to the measures, all articles described the characteristics of the media coverage quantitatively such as the frequency of target contents, number of pages, word count, dates of publication, length, etc. After this quantitative description of the sample, the outcome measures varied according to the aims of each study. Some common measures were the types of sources that were used by the journalist to prepare the content, headlines and message characteristics (i.e. tone, controversy, risks, barriers,

concerns, support to vaccination, health outcomes), themes, completeness and use of evidence concerning vaccination.

According to the outcomes found in each of the studies, they have been grouped as: 'messages', 'accuracy and evidence-based information', 'frames and themes' and 'other outcomes'.

Please insert Table 3 about here

3.2.1. Message analysis

57% of the studies (n = 12) analysed the messages in relation to vaccines. Of these, 83% (n = 10) found negative messages which mostly focused on vaccines being negative, ineffective, poorly understood by science and the vaccine causing harm [4,19,21,23,25,27,29,31–33]. 17% (n = 2) of articles found positive messages in relation to vaccines and vaccination. Of these, one study found more messages supporting vaccination of the A/H1N1 than reasons against getting vaccinated [28]. The other study found that most articles were positive in tone, prompted by research/scientific advancement or legislative activities [18].

3.2.2. Accuracy and evidence-based information

33% of the studies (n = 7) analysed the accuracy and completeness of the information provided, and if journalists provided evidence-based information. Of these, 86% (n = 6) found lack of accuracy. More specifically, an article found that evidence-based information to support claims for or against getting vaccinated appeared in only 27.8% and 6.8% of the articles, respectively [28]. Other studies found a lack of comprehensive information, inaccuracies and detailed coverage of HPV and the HPV vaccine [17,19,21,22]. Other study identified numerous mistakes of both fact and logic, predominately used by anti-immunisation proponents, but occasionally by health

authorities [26]. One article found positive messages prompted by research/scientific advancement [18].

3.2.3. Frames and themes

29% (n = 6) of the studies identified frames or themes among the media coverage of vaccines. Of these, most of the studies (n = 5) analysed the themes of the HPV vaccine [20–22,24,34]. The themes that were identified are: ‘aetiology, epidemiology of cervical cancer, prevention and vaccine efficacy’ (n = 5), ‘screening or vaccination programmes’ (n = 2), ‘issues about decision making for acceptance of HPV vaccine’ (n = 2), ‘cultural sensitivity and misconceptions surrounding HPV in school-aged females (e.g., promoting promiscuity)’ (n = 1), ‘cost-effectiveness, efficacy, and safety (n = 1)’, ‘pride in vaccine development’ (n = 1), ‘HPV vaccination’s future’ (n = 1), ‘whether or not males could and/or should get the vaccine’ (n = 1), ‘issues related to sexual activity and the vaccine’ (n = 1), ‘controversy regarding HPV vaccination’ (n = 1), ‘side effects and insufficient testing’ (n = 1).

One study identified and described themes on vaccine safety in US newspaper articles [31]. In this study, six (not mutually exclusive) themes were identified: vaccine-safety concerns (46%); vaccine policy (44%); vaccines are safe (20%); immunizations are required (10%); immunizations are not required (8%); and state/school exemption (8%).

3.2.4. Other outcomes

Two studies identified the sources that were used by the journalist to prepare the media content on vaccines [22,30]. They found that the content and format of articles between different information sources varied widely being government/political sources, medical doctors, and the Centers for Disease Control and Prevention (CDC) the most commonly cited sources. Only 16% of all the articles featured personal accounts.

Other two recent studies looked at the lack of vaccine information on the HPV vaccine targeting boys and men [17,35]. The studies described that the majority of articles (93%) mentioned that girls are eligible for the HPV vaccine, whereas only half (49%) mentioned male eligibility. While most articles associated HPV with cervical cancer (85%), fewer indicated its relation to other HPV-associated cancers (59%) or genital warts (52%). One study stated that key political events might have functioned to overshadow the recommendation of the HPV vaccine for boys and men.

Another study analysed the relation of vaccination rates and media coverage of the flu vaccine [29]. Vaccination rates were positively and significantly related to the frequency of risk messages in newspaper coverage ($r = .691$, $p < .05$). Finally, a study (Clarke, 2011) found that the educational level of readability of the media content was higher than recommended for the general public.

4. Discussion and conclusion

4.1. Discussion

The present systematic review provides an overview of the communication research of media coverage about vaccines. The objective of this study was to identify communication research of media coverage in relation to vaccines and describe the characteristics and outcomes. To our knowledge, this is the largest systematic review of media content analysis on vaccines which has included 21 studies published during the last ten years (since 2007), all types of vaccines and traditional media coverage from any geographical region. There are some main findings that can be drawn from this systematic review.

First, the 21 studies reviewed describe the media coverage of vaccines during the last ten years (1 January 2007 – 1 January 2017). This includes studies from any country

around the world, and tackles a broad array of vaccines. The majority of the studies included in this review originated from North America (9 from US and 4 from Canada), and in clearly lower proportions, from other high-income countries such as UK, New Zealand, Australia, Japan, and United Arab Emirates. Only two countries, that are actually not classified as high-income countries according to the World Bank [36], have been analysed. These were Nigeria and Romania. There could be several reasons for the lack of publications in low-income countries. According to [37] these include limited technical competency in scientific writing, lack of research, high teaching burden at universities which does not allow time for research and writing; and biases against low-income countries' authors by journals editors, editorial boards, and publishers from high-income countries. In addition, there is also a lack of funding from international funding agencies, which are largely from the developed nations, and many journals from low-income nations are not indexed in global databases [38] thus they can't be found through our systematic review. Another reason for the dominance of research in the US might be because of the established regulatory system for direct-to-consumer prescription drug advertising (DCTA). In fact, DTCA of prescription drugs is illegal in some countries as a health protection measure, but is permitted in the US and New Zealand [39]. In contrast, the advertising of over-the-counter (OTC) products and dietary supplements to consumers is allowed in these countries and in others.

Therefore there is an increasing need for analyses of public communication of vaccines in other geographical groups such as low-income countries, because laws regarding public communication on medicines are rarely implemented in these countries due to lack of commitment and resources on the part of the law enforcement departments [40]. In conclusion, according to our systematic review, the characteristics and outcomes of media coverage of vaccines in low-income countries is almost currently unknown from a research perspective.

Regarding the methodological approach of the selected studies, this systematic review showed a preference for conducting media coverage analyses in print media.

Newspapers were the most frequent, and a few number of studies analysed magazines. Only one study examined TV coverage. This is consistent with a previous review [13] where newspapers were the most analysed media. Therefore, this homogeneous analysis does not reflect the real mass media consumption by the public, instead it reflects the preferences in media research, where newspapers are most frequently sampled by social scientists, rather than other media [41]. As a conclusion, further research should focus on other potential traditional media beyond newspapers, such as radio and television.

Regarding the vaccines analysed by the studies included following our search criteria, HPV vaccine was the most frequent. There is a sizeable literature on HPV vaccines portrayal in the media. HPV infection is highly prevalent and sexually transmitted, with a peak incidence in adolescents and young adults. Chronic HPV infections are the leading cause of cervical dysplasia and cervical cancer. Gardasil, a vaccine directed against HPV, generated both positive and negative media and public attention. Gardasil was implemented amongst unease about timing and rushed approvals, and questions about its long-term safety and efficacy voiced by the public and health officials [27]. Other types of vaccines but in a clearly lower proportion were influenza vaccine both seasonal and A/H1N1, the polio vaccine and the MMR vaccine. However, according to the World Health Organization's global immunization coverage program [42], there are other important vaccines with either very low media attention or not analysed by social scientists. These are hepatitis B, meningitis A, pneumococcal diseases, rotaviruses, tetanus and yellow fever. Further content analyses would be needed to explore media coverage of these other important vaccines.

Regarding the outcomes of the media coverage on vaccines, it has been possible to draw attention and address important questions raised in previous content analyses. In

relation to the messages, it was the most common outcome analysed by the selected studies. Most of them found negative messages about vaccines in the media such as the vaccine is poorly understood by science, it is not effective, and that the vaccine may cause harm [29]. In fact, this is not too surprising. According to Taylor [7], journalists and editors want a good story and they often do not care about the public health, only bad news is good news, and good news is no news. From our view, this might be alarming given that the media remain an important source of health information [43], and even health officials often view journalists as valuable channels through which to promote the benefits of immunization and communicate risk information [44]. However, the journalistic goal of ensuring an informed citizenry inevitably clashes with the goals of other actors such as health officials, but also including owners of media companies, information sources, and advertisers. These journalistic goals include entertainment (reporting news that is interesting or exciting), profitability (reporting stories that generate revenue and maximize viewership), and favorability (reporting stories that reflect positively on owners) [32]. We would suggest that it's critical to provide comprehensive and transparent information in the media for the public to make informed decisions about how to use the information presented. Information about efficacy, details about the accrual of evidence regarding vaccine safety and efficacy, as well as subsequent implementation into vaccination policies may mitigate perceptions of risk by the public [29]. Although we should take into account media space constraints pose challenges to extensive explanations. Level of accuracy and evidence-based information provided are other key outcomes. According to the selected studies, there is a lack of comprehensive information, inaccuracies, errors of both fact and logic, concluding that journalists misrepresent the state of clinical evidence. It is particularly important to avoid the transmission of inaccurate information to avoid misinterpretation and wrong decisions with regards to getting vaccinated. To prevent this, it has been considered a useful strategy [21,29] to improve communication between health officials and journalists. Finally, only one study

looked at behavior change through analysing the relation of vaccination rates and media coverage [29], therefore our systematic review did not draw conclusions among the effects of media among the citizens due to the lack of studies analysing the relation of media coverage with public behavior. Should in the future there are more studies, we would recommend to conduct pooled analyses of the effects of media coverage about vaccines.

4.1.2. Limitations

Although our review followed systematic review methods, some limitations need to be noted and any interpretation of the results must take into account the restrictions of the study. First, the findings of the review can only present the distributions as they appear in the journals that were included in our search strategy. Any process of selecting journals has unavoidable limits. The inclusion of additional publications in the future is most likely to gradually change the image that has emerged here.

Second, our analysis focused only on original scientific studies that have been published, so it is not a comprehensive assessment of media coverage in general. Our study only focuses on what samples and approaches researchers have followed in their studies. For example, we are limited in our synthesis to vaccine coverage in other media types. We found that television ($n = 1$) and radio ($n = 0$) were infrequently or not analysed, compared to newspapers ($n = 18$). Moreover, we are concerned that media consumption today is not the same as before when people waited for their morning papers or sat down at an appointed time for the evening television news. More and more readers, viewers and listeners are going online for their news. Television, newspapers and radio are still here but there is a growing competition [45]. In our systematic review, we have not included studies analysing social digital networks, i.e., YouTube, Facebook or Twitter. Since 88% of millennials also get their news from social media [13], this is a limitation in the current study especially for this age group.

Third, we only searched for content analyses studies as research method. Here we can only speculate on the importance of the themes, messages covered and information quality, but we cannot claim that the patterns and themes have actually shaped public views or vaccination behaviors. RCTs examining media effects are required to make these causal assertions. In fact, according to Boyce [9], there is a paucity of research examining journalistic materials and their impact on audience understandings.

In spite of these limitations, to our knowledge, this is the largest systematic review to date analysing the media coverage on vaccines. Given the explosion of scientific literature, and the fact that time is always scarce, review articles play a vital role in decision making in evidence-based practice. Given that most decision makers do not have the time to track down all the original articles, critically read them, and obtain the evidence they need for their questions, systematic reviews may be their best source [46].

4.2. Conclusion

This systematic review shows that media coverage of vaccines is a topic that has been largely studied during the last decade. Most of the studies conducted content analyses in newspapers, HPV vaccine was the most frequent selected vaccine for the studies, and the North American national media were the most frequent among the selected by the researchers. The studies revealed the following categories of outcomes including issues to be considered in future media coverage of vaccines: 'message analysis', 'accuracy and evidence-based information', 'frames and themes' and 'other outcomes'. We have identified gaps in the current literature and an agenda for further research. There is a strong need to conduct research in other types of media such as television and radio, in a more variety of vaccine types, and in other geographical areas such as in low-income countries.

4.3. Practice implications

In agreement with other authors [29,32], our systematic review does not suggest that journalists should become public health practitioners tasked with persuading people to be vaccinated. Rather, media can serve as a resource through which people become aware of an issue, aware of strategies to address this issue, and potentially motivated to take action, depending on pre-existing attitudes and predispositions. To achieve this, our systematic review provides a useful basis and will be of interest to those in the health field, researchers and policy makers who are trying to communicate their messages about vaccines to the public. Since the results of the literature are consensual on the fact that media coverage of medicines comprises mostly negative messages and inaccurate information, which could negatively impact public health initiatives, public health officials implementing vaccination programs should develop a close collaboration with the journalists and the media.

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