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How Does the Public Receive Information about Vaccines during the COVID-19 Pandemic? A Nationwide Cross-Sectional Study in Spain

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Abstract: Spain has been one of the most severely impacted countries by COVID-19. Vaccination against COVID-19 is one of the most successful preventive strategies. However, some citizens show vaccine resistance, in part due to widespread disinformation that has been disseminated since the pandemic's start. The objective of this study was to explore the characteristics of the Spanish population in terms of their use of traditional and social media for COVID-19 vaccine-related information. A countrywide survey was conducted in June 2022 following a descriptive cross-sectional analysis. Respondents declared that 80.4% had received the full schedule of COVID-19 vaccination, and over 60% would take the booster dosage without hesitation. The major reasons for not having the booster vaccine were possible health risks (37%), and a lack of trust in the COVID-19 vaccines (29%). More than 85% of respondents closely followed the news on this topic, with the journalistic media (27%) and health authorities (26%) considered to be the most important sources for pandemic information, while social media was considered by 9% of respondents. Further collaboration between the media and health professionals, as well as campaigns to enhance vaccination uptake of the COVID-19 booster dose, might be considered in future strategies.

Keywords: vaccination; media; coronavirus; social networks; booster; hesitancy; antivax

1. Introduction

With more than 13,595,504 cases of the SARS-CoV-2 virus reported and more than 115,901 deaths to 29 November 2022 [1], Spain is one of the nations that has been severely impacted. The strongest method for controlling the pandemic and lowering hospital stays and fatalities globally is vaccination against the coronavirus [2,3]. Nevertheless, many European nations have some amount of hesitancy regarding vaccination [4] and/or booster doses against this illness, despite the clinical and scientific proof of their advantages. Although everyone has access to vaccinations, this reality has led to the inability of certain countries to meet their specified immunization objectives [5,6].

The profile of those who are hesitant to be vaccinated varies, and some may be reluctant but ultimately decide to get vaccinated, or their hesitation to get vaccinated may remain and result in a complete refusal. These people may accept some vaccinations but reject others, meaning that some people may reject all vaccines while others may accept some but reject others [7]. Although this attitude is not unique to the coronavirus pandemic, the pandemic has intensified it, and this intensification might have long-term effects for global public health [8].

Although there are differences in vaccination rates between autonomous communities and age groups, the case of Spain is unique because it has a high vaccination coverage against this disease: 92.8% of the population over 12 years of age with complete coverage and 55.1% with first booster dose. However, there are differences in vaccination rates between autonomous communities as well as between age groups, with a low booster dose

vaccination rate among young people aged 18–19 of just 31.70% [9]. Still another challenge for health authorities is that 9% of the population has yet to receive the vaccination and has not demonstrated a willingness to do so [10].

Since governments began vaccinating their citizens at the end of the 19th century, protests against vaccines have been a part of history [11]. In this time period, the cases of Great Britain in Europe, where the government imposed the compulsory vaccine requirement led to citizen resistance [12], and Brazil in Latin America, where there was a vaccine uprising in Rio de Janeiro at the turn of the 20th century [13], stand out. A scientist's claim that vaccinations cause autism, which has survived to this day, was one of the main factors that led to the present anti-vaccine movement [14]. What differentiates the present is the capacity for these ideas to be quickly spread through social media at a time when their use is growing exponentially. With an average daily usage of 144 min on social media and messaging services in 2021, there were more than 4.26 billion users of social networks worldwide. This global use is anticipated to reach 6 billion consumers by 2027 [15]. Nine out of ten persons in Spain utilized social media in 2021, spending an average of one hour and fifty-three minutes each day on these sites [16].

Throughout the pandemic, social media has had a role in the spread of various forms of content linked to COVID-19 vaccinations, from misinformation to disinformation [17]. Both forms of information can be dangerous and have been more prevalent throughout the epidemic [18], but they have distinct characteristics. Misinformation contains some false information but was not produced to cause harm [19]; however, disinformation, considered a threat to democratic societies [20], is not gratuitous, as it is produced with clear objectives of harming people and institutions [19]. According to Das and Ahmed [19], "misinformation spreads on a lighter note, while disinformation destabilizes society by transforming consumers into active agents of interpretation and propagation". The use of bots and trolls is another tool that substantially accelerates the spread of misinformation/disinformation. The former are content-matching algorithms, while the latter are humans who use false identities to show conflict. Both are deemed malicious for spreading incorrect information about health on social media, further polarizing public opinion on the subject [21]. Anti-vaccine movements have used disinformation to generate doubts on the effectiveness or safety of vaccines at a time when everything about the pandemic was still unknown. In this sense, disinformation is a factor leading to increased vaccine hesitancy [22] which is a global public health challenge at a time when low vaccination rates against COVID-19 (full schedule, booster dose, childhood vaccination) in some countries that have full access to vaccines may contribute to the emergence of new variants [9,23,24].

Some of these anti-vaccine narratives have focused on the adverse effects of vaccines and are based on conspiracy theories, such as the claims that vaccines are a method for pharmaceutical companies to profit [25] or that Bill Gates is using the virus as a convenient excuse to start a massive vaccination campaign to increase global surveillance control [26]. Other anti-vaccine narratives have claimed that women who receive covid vaccines experience infertility [6]. These stories tend to be welcomed because they resonate with people's suspicion of governments or because they are founded on their concern that the vaccine would harm their health. This kind of sensationalistic and anti-vaccine information tends to receive more attention, increasing social media members' engagement [27].

When there is a need to understand what is occurring, individuals seek answers to their questions and worries, which leads to an increase in information consumption. In response to the public's demand for information, the Spanish media have been particularly active during the epidemic, creating a significant amount of informative content [28–30]. Casero-Ripollés [28] argues that consumers tend to consider traditional media news more favorably under risky circumstances because they associate it with reliability and trust. In this sense, it is important to understand how Spanish citizens behave towards COVID-19 vaccines and their consumption of information and social media related to this subject. However, no studies were found that have investigated this key perspective. For instance, Mosteiro-Miguéns et al. [31] used a survey to examine the intentions of Spanish citizens

regarding COVID-19 vaccines but the respondents were not regular social media users. Despite the relevance of their study, its focus was limited to health professionals in Spain and on being a nationwide survey.

Social media and traditional media (TV, radio, press, etc.) are an intrinsic part of today's society and have been widely used during the pandemic. In this sense, this study is based on the following research questions:

RQ1: Have social media been the primary source of COVID-19 information for Spaniards?
RQ2: Have Spaniards relied more on traditional media for COVID-19 information?
RQ3: Are Spaniards who obtain their information from alternative sources less likely to accept the booster shot?
RQ4: What are the reasons behind Spaniards' refusal to take the booster vaccine?

To answer these questions, our study thus aimed to investigate the characteristics of the Spanish population in relation to their use of both traditional and social media for vaccine-related information during the pandemic.

2. Materials and Methods

2.1. Study Population and Sample

This cross-sectional descriptive study conducted a nationwide online survey involving Spanish citizens in June 2022. A provider of online panel surveys, AsuFieldwork, handled both the survey's implementation and participant recruiting. People from Spain were recruited through this company's panel as well as social media. The persons were selected arbitrarily to complete the established quotas by gender, age and region of residence (autonomous community). Through this company's panel as well as social media, people from Spain were recruited. The respondents received an incentive for their participation.

2.2. Design and Sample

The questionnaire was self-administered to 1800 participants aged 18 years and older. To guarantee greater representativeness, the sample was distributed by quotas established by gender, age and autonomous community. The sampling error was ±2.34 confidence level of 95.5% and p = q = 0.5. A weighting was applied to adjust the population data by autonomous communities, gender and age, taking into account that those over 74 years of age obtained a lower participation rate.

All the respondents gave their permission to participate in the research, and the data were completely anonymized. To comply with the ethical requirements, the project PredCov (Multi-source and multi-method prediction to support COVID-19 policy decision making) in which this study was developed, had been approved by the Ethics Committee of Madrid University Carlos III under the CEI_22 protocol. At the end of the survey, the participants had access to a text related to the benefits of vaccination and the booster dose, as well as links to obtain more information on the subject. The research methodology has been previously published in AsPredicted under the code #97920.

2.3. Questionnaire

After the questionnaire had been developed and screened by four experts, a pilot study was carried out with 110 people to verify if the material complied with the proposed objectives. Those valid responses were included in the final sample of 1800 people. The questionnaire was structured into 17 items, divided into four sections: (1) sociodemographic data related to gender, age and educational level; (2) media use during the pandemic; (3) COVID-19 infection, vaccination schedule followed and booster dose against COVID-19, as well as reasons for not being vaccinated; (4) use and behavior of traditional and social media for pandemic information.

Most items included numerous choices, and occasionally the respondent may select more than one (questions related to symptoms; vaccination; types of vaccines administered; use of social media). We also introduced filters to some multiple-choice questions so that the following question would only be answered by persons who meet the required profile. For

example, if a person selected the option indicating they had not received the vaccination, the following question asked about the reasons for this choice. Additionally, there was a news-related item that used the Likert scale (1-not at all in agreement; 5-totally agree).

2.4. Statistical Analysis

The statistics package from R software was used to perform the analyses. Data were categorized into groups based on each variable that related to the survey questions. The frequency, percentage, and mean of the study outcomes were determined using descriptive statistics. Chi-square tests were performed to check whether the variables differed statistically significantly from each other (significance level $p < 0.05$). Additionally, we highlight the cells with a contribution to the overall chi-square value bigger than 2 [32].

3. Results

3.1. Sociodemographic Data

The sample's gender distribution was 51.1% men and 48.9% women, with a mean age of 45. As seen in Table 1, Those with a secondary school diploma (52.1%) exceeded those with a university degree (43.6%).

Table 1. Sociodemographic characteristics of the sample.

Variables	n (%)
Gender	
Male	920 (51.1)
Female	880 (48.9)
Age	
18–24	187 (10.4)
25–34	247 (13.7)
35–44	347 (19.3)
45–54	338 (18.8)
55–64	271 (15.1)
65–74	208 (11.6)
Over 74	202 (11.2)
Education level	
Secondary School	938 (52.1)
Higher Education	785 (43.6)
Primary School	66 (3.7)
Other	11 (0.6)

3.2. COVID-19 Infection and Vaccination

Thirty-eight percent of the respondents acknowledged having been infected with COVID-19 at some stage. However, 54% of respondents said they did not have it, and 8% of them were unsure if they had become infected. Of those who had COVID-19, 68.19% had moderate symptoms and passed it at home; 22.68% had symptoms that were more severe but also stayed at home; 2.85% were admitted to the hospital; and 6.28% had no symptoms at all. In addition, 62.91% of the respondents said they received their COVID-19 vaccination according to the full schedule, 3.39% said they only had one dose, and 27.91% said they received a booster shot. However, 5.04% of respondents said they had not had any vaccine, and 0.74% preferred not to report about this subject.

When taking into account the entire schedule, including the booster dosage, Pzifer (65%), Moderna (38%) and Astrazeneca (20%) were the brands of vaccines that were most often supplied. Less often occurring were Janssen (6.6%), Novavax (0.3%), and Hipra (0.2%). Of the respondents, 2.1% claimed they had no idea which vaccine they had received, 0.5% had received another immunization type beyond COVID-19, and 0.4% had chosen not to disclose their vaccination history.

In connection with the upcoming COVID-19 booster dosages, nearly 60% of respondents (n = 1072) said they would take the booster dose without thinking twice, while 22% (n = 409) said they would take it based on how severe the wave was. Nevertheless, 11% (n = 196) refused to take the booster dosage, and 7% (n = 123) did not respond. Individuals who stated they would not take the booster dose were asked about the circumstances surrounding their choice. Due to the multiple-choice nature of the question, 57 of the 196 respondents marked more than one response, resulting in 253 answers. The two primary factors were that these individuals did not trust the COVID-19 vaccinations (29%), and their concern of potential health risks (37%), as shown in Table 2.

Table 2. Reasons why respondents considered not getting vaccinated with a booster dose.

Variables	n (%)
Fear of the risks vaccines may have for my health	93 (36.76%)
No trust in these vaccines	74 (29.25%)
Having passed the COVID-19	32 (12.65%)
Having little risk to get infected	30 (11.86%)
I do not trust any vaccine in general	24 (9.49%)
Total answers	253 (100%)

3.3. Consumption of Traditional and Social Media

More than 85% of the respondents said they closely followed the news on COVID-19. Table 3 shows the information sources that individuals considered were most important when it came to COVID-19 over the last year: 26.5% of participants stated traditional media (TV, radio and the press), and 26.4% cited health authorities. We can also mention the government (16%), research institutions (11%), and social media (9%). For 4.8% of the respondents, alternative sources are the first to be mentioned as essential sources to be informed about COVID-19 (Table 3).

Table 3. The most important sources of information on COVID-19 during the last 12 months.

Variables	n (%)
Media (i.e., TVE, El País, El Mundo, Tele 5, Antena 3, Cadena SER, COPE, etc.)	477 (26.5%)
Health authorities (Ministry of Health, health counseling)	475 (26.4%)
National, regional, or local government	284 (15.8%)
Research organizations (CSIC, Health Institute Carlos III . . .)	204 (11.4%)
Friends and family on social media (i.e., Facebook, Twitter, Instagram . . .)	165(9.2%)
Alternative sources (p.e. Cuarto Milenio, Milenio Live, La Estirpe de los Libres . . .)	87 (4.8%)
Pharmacies and pharmaceutical company websites	60 (3.3%)
Universities	35 (1.9%)
Others	12 (0.7%)
Total	1800 (100%)

Table 4 shows the association between vaccination status and information sources. Having health authorities as a respondent's source of information is associated with their being more protected (whether vaccinated with booster doses or vaccinated only), compared with those whose main source of information is the government. Among people using alternative sources, 21.35% of them have not been vaccinated.

Table 4. The association between vaccination status and information sources.

Have You Received the COVID-19 Vaccine?	Main Source of Information COVID-19						
	Government	Health authorities	Research organizations	Friends and family on SM	Media	Alternative sources	Total
Booster shot	87	193	71	42	168	27	588
	31.99	41.59 *	28.74	24.00 *	35.52	30.34	34.19
Full schedule	159	236	139	108	257	41	940
	58.46	50.86	56.28 *	61.71	54.33	46.07	54.65
One dose	14	17	19	12	20	2	84
	5.15	3.66	7.69	6.86	4.23	2.25	4.88
Not vaccinated	12	18	18	13	28	19	108
	4.41	3.88 *	7.29	7.43	5.92	21.35 *	6.28
Total	272	464	247	175	473	89	1720
	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Notes: Pearson χ^2 = 31.59, Prob = 0.0005. * Cells that have a higher contribution to the χ^2 value. First row has *frequencies* and second row has *column percentages*.

If we relate whether the person would take the booster dose to the sources they have used for information about vaccines (Table 5), the associations that stand out the most are related to people who use alternative sources: 42.86% would only take a booster dose if there was a new wave and 22.86% would not take one. Respondents using these sources are also the least likely to use it without hesitation, compared with the other groups.

Table 5. Relationship between the intention to vaccinate with the booster dose and the most frequently used sources of information.

Take the Booster Dose	Main Source of Information COVID-19						
	Government	Health Authorities	Research Organizations	Friends and Family on SM	Media	Alternative Sources	Total
Yes, in any case	170	284	151	98	283	24	1010
	65.38	63.68	65.94	60.49	63.60	34.29 *	62.66
If there is a new wave	63	107	51	42	122	30	415
	24.23	23.99	22.27	25.93	27.42	42.86 *	25.74
No	27	55	27	22	40	16	187
	10.38	12.33	11.79	13.58	8.99 *	22.86 *	11.60
Total	260	446	229	162	445	70	1612
	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Notes: Pearson χ^2 = 31.59, Prob = 0.0005. * Cells that have a higher contribution to the χ^2 value. First row has *frequencies* and second row has *column percentages*.

The respondents had a variety of options on how they used social media during the pandemic. Facebook (68%), YouTube (61%), and Instagram (60%) were all close behind WhatsApp (87%) in terms of use. As shown in Table 6, lower use was obtained in relation to the social media platforms Twitter and TikTok. On average, people spent almost 3 h per day on social media, and participants reported having an average of 1450 followers on these platforms.

Table 6. The most social networks used by respondents.

Variables	n	%
WhatsApp	1561	86.72%
Facebook	1228	68.22%
YouTube	1096	60.89%
Instagram	1076	59.78%
Twitter	719	39.94%
TikTok	592	32.89%
Pinterest	331	18.39%
Tumblr	47	2.61%
Others	58	3.22%

In terms of how the respondents used social media during the pandemic, Table 7 shows that almost 50% of them read or saw content there, and that 33% went on to share the content on these networks.

Table 7. Most frequent activities on social media.

Variables	n	%
Read/view content on social media.	882	49%
Read/view content and also share it with my contacts/followers	600	33.3%
Read/view, share and post content	319	17.7%
Total	1800	100%

4. Discussion

The current study aimed to describe the characteristics of the Spanish population in connection to COVID-19 infection, vaccination, and of the consumption of both traditional and social media for information about the pandemic. According to the findings, COVID-19 has infected less than half of the Spanish population. More than 80% received the full COVID-19 vaccination, but only 60% of the population decided to receive the subsequent booster dose, indicating "fear of potential health risks" and "lack of trust in the vaccinations against COVID-19" as the primary hesitant arguments. The majority of respondents considered that traditional media (TV, press, radio) was the most important source of information about the pandemic, followed by health authorities. Only 9% of respondents considered social media for this purpose, with WhatsApp, Facebook, YouTube, and Instagram being the most used ones.

Our research shows that more than half of the Spanish people have yet to be infected by COVID-19, and that 38% had at some point reported having the illness. This finding suggests that over 15.2 million Spaniards have caught COVID-19, considering the country's 40 million adult population (age > 18). The official data, which indicate that over 13.3 million people have been infected [33], differ from our findings. This can be explained, given that, in accordance with our findings, three of four infected respondents reported not having any symptoms or only having mild ones, and we can partly explain this 2.1 million case difference by considering that self-diagnosis was potentially possible and largely used nationwide.

In relation to vaccination, we can confirm what other studies have found in relation to COVID-19 vaccination, that Spain is one of the leading countries in COVID-19 vaccination adherence and acceptance [34,35]. However, although the booster dose of the COVID-19 vaccine has shown high effectiveness in the general population and comorbid patients in Spain [36], our study confirms an acceptance decrease of the booster shot to 60%. Our findings are consistent with official data: only 55.9% of the Spanish population aged 18 and older had received the first booster dosage, and coverage rates vary considerably between age groups and autonomous communities [9]. In November 2022, the level of coverage of people aged 60 or older (the recommended age to receive the booster) was 37.4% for

the second booster dosage of the vaccine [37]. This is a crucial finding that might reduce disease prevention among the Spanish population since the booster-based vaccination schedule increases protection against COVID-19 severity and SARS-CoV-2 infection while also protecting patients with considerable comorbidities.

According to our study, respondents believed that the press, radio, and television are the most reliable sources for receiving information about the epidemic. Similar findings were found in recent research conducted in the UK and Spain showing that, during the COVID-19 pandemic, the public's opinion of journalists as reliable sources of information increased [28,38]. The media has, in fact, drawn a lot of attention during the pandemic. Most likely, the widespread misinformation that circulated via social media, termed an "infodemic" by international organizations [39,40] might have indirectly reinforced the importance of journalistic media to communicate accurate and trustworthy information. Therefore, the media has been key in combating the dissemination of misleading information on social media throughout the pandemic and educating the public about health measures. In a way, journalism has regained its reputation, restored the public's confidence, and expanded upon its established procedures [41].

During the pandemic, those in a lockdown that had been implemented as a preventative measure to keep infection rates in control increasingly moved to use social media and private messaging platforms. In Spain, usage of instant messaging apps such as WhatsApp actually quintupled [42]. In fact, Spain had the largest rise in WhatsApp usage worldwide, reaching 76% [43]. This is well aligned with our study, as we found that WhatsApp was the most used social media platform in Spain throughout the pandemic. The original WhatsApp messages on the Coronavirus that went viral and became extremely popular may be the origin of this phenomenon. These messages were in direct opposition to the official government communications stating that this pandemic was not harmful. WhatsApp was used to spread videos and audio from health personnel criticizing the exact situation they were facing in their own hospitals and pleading for better protective clothing [43].

4.1. Practical Implications

Through the survey responses, we were able to identify a number of characteristics of how the public was informed about the COVID-19 pandemic. With these regards, some important practical implications may be considered as follows. One of our main findings was that traditional media was the most important source of information about COVID-19. We can see how, as a result of the health crisis, the contents published by science and health journalists have received special attention. This involves professional reporting of news articles and features from the health and scientific disciplines. Before the pandemic, there was already a significant level of public interest in health news articles [44], but the coronavirus pandemic has increased that interest even more [45,46]. As a result, journalists had to put in extra effort to adapt how they covered this important health event and for many this was their first experience writing about these health and scientific subjects [47]. Given the importance that the Spanish population placed on professional media during the pandemic, it is essential to leverage this professional field to provide accurate and understandable information. In addition, standard collaborative efforts between health officials and journalists should be adopted. These might include not only holding press conferences and preparing media briefings, but long-term activities such as planning of training programs for journalists, setting up postgraduate studies in health journalism, and ensuring that journalists are aware of the key concepts in health, research, and science [48,49]. In order to use successful communication methods throughout public health campaigns, journalists should in fact be regarded a key target group [50].

The acceptance of vaccines is another significant practical implication. Despite the first COVID-19 immunization program's success in Spain, public health initiatives to combat vaccine hesitancy should be encouraged and sustained given the decline in the population's readiness to accept the COVID-19 booster dose. Our study has found factors such as concerns over potential adverse effects and a lack of trust in the vaccine. These data can aid

in the development of campaigns to promote vaccine uptake and are particularly crucial to take into account when developing global health campaigns run by organizations such as the ECDC and WHO, as it will assist national public health departments in developing ad hoc communication strategies against vaccine hesitancy [48].

4.2. Limitations and Future Research

Our study has several limitations. It is important to note that the survey was self-administered, which does not guarantee that all respondents understood the questions or were completely honest in their answers. Although we have tried to ensure an equitable distribution in terms of gender, regions (by autonomous communities), and age range, there were not enough elderly people over 74, which resulted in a lower participation rate. Though we conducted a ponderation to get around this constraint, more research is still required to determine whether the current results are representative of the senior population over 74 years old, who have been particularly affected by the pandemic. In addition, our sample was composed of a high percentage of people at the university level, which concentrates on a group with a specific profile and could have implications for the results. Besides this, another point to highlight is the cross-sectional nature of this investigation and the descriptive approach of the analysis. This prevents us from demonstrating the potential causal effects of specific behaviors or attitudes toward vaccines in relation to sociodemographic factors, previous experience with COVID-19, and use of both traditional media and social media. Future research could conduct cross-tabulation analysis to explore the relationship among these distinct variables. Additionally, studies should examine how people perceive the booster dosage of the COVID-19 vaccination and carry out experimental designs to identify which communication approaches would be most effective.

5. Conclusions

With the nationwide vaccination campaign successfully implemented, the booster dose's vaccination uptake, however, is still a challenge. The widespread disinformation that has been disseminated throughout the pandemic through social media might be responsible for the Spanish journalistic media's increased recognition as the most important source of information during this period. According to our study, it is essential to promote more collaboration between public health agencies and media organizations during pandemics given their importance in spreading accurate and reliable information to the population.

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