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The Role of Media Literacy in Mitigating COVID-19 Vaccine Hesitancy and Conspiracy Theories

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This study examines the relationship between media literacy, belief in conspiracy theories, and vaccine hesitation through a survey of 3,009 university students in 8 Arab countries. The findings provide evidence that believing in COVID-19 vaccine conspiracy theories and being opposed to all vaccines has a negative effect on the intention to get vaccinated, while perceptions of the safety and effectiveness of COVID-19 vaccines and the perception that the COVID-19 disease is more dangerous than the vaccine, as well as media literacy level and trust in media and information sources about COVID-19 have a positive effect on vaccination intention. In addition to theorizing about the role of media literacy in pandemics, the study offers an effective measure for media literacy that can be deployed quickly in pandemic situations.

Keywords: media literacy, vaccine hesitancy, media education, COVID-19, infodemics, conspiracy theories, Arab media

The COVID-19 pandemic caused widespread death and global disruptions at scales not witnessed in almost a century. It sparked excessive media coverage, misinformation, conspiracy theories, and controversies that affected vaccination efforts. Many lessons may be learned from this global catastrophe, in preparation for the next health crisis, particularly in relation to media exposure, misinformation, conspiracy theories, and vaccine hesitancy.

In this era of information overload, infodemics and misinformation, ubiquitous false and confusing information, and conspiracy theories could threaten efforts to contain disease outbreaks and deploy vaccines. Emerging research shows that media exposure varies in affecting vaccine acceptance and is mediated or moderated by various demographic and behavioral variables (Khamis & Geng, 2020). One promising factor that few scholars have explored is the role of media literacy in countering the effects of infodemics and conspiracy theories and ultimately in reducing vaccine hesitancy (Melki et al., 2021, 2022).

This study attempts to explore the relationship between media literacy and COVID-19 vaccine intention/hesitation. It examines several potentially mediating variables, including the belief in COVID-19 conspiracy theories, trust in media and information sources, media exposure, media posting behavior, attitudes toward vaccines (safety and effectiveness), and previous experience with vaccines.

The study deploys theoretical frameworks that have rarely been applied to pandemic situations and outside of Western countries, particularly media literacy. It also fills a major gap in providing an effective design and instrument to measure media literacy within pandemic and crisis contexts. Its implementation in several Arab countries from the Global South is an added value.

Literature Review

Vaccine Controversies and Vaccine Hesitancy

Vaccine controversies date back to the 18th century when the first vaccine was developed. The anti-vaccination movement, however, did not take shape until late in the 20th century (Plotkin, 2014), propelled by

several media programs and questionable studies. In 1982, a U.S. TV station aired the infamous "Vaccine Roulette" documentary, which blamed the pertussis vaccine for causing severe brain damage in children (Chen, Zhang, Young, Wu, & Zhu, 2020). The documentary triggered anxieties around vaccine risks without attributing its findings to scientific evidence (Boom, Cunningham, & McGee, 2018). Another milestone in the rise of the anti-vaccination movement in the 1980s was Andrew Wakefield et al.'s (1998) study that claimed a link between the (measles, mumps, and rubella) MMR vaccine and the development of autism (Barraza, Reiss, & Freeman, 2019). Published in the reputable medical journal the *Lancet*, Wakefield et al.'s article was later retracted on grounds of "fraudulent findings" (Boom et al., 2018, p. 3). Despite its retraction, the study continues to cause panic and vaccination hesitancy among parents today, resulting in outbreaks of preventable diseases, surplus hospitalizations, and preventable deaths (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). In 2002, a study by Hargreaves, Lewis, and Speers (2003) found that 20% to 25% of British citizens believe in the purported link between childhood vaccination and autism. This belief was linked to lower vaccination rates and further vaccine-preventable outbreaks (Lewandowsky et al., 2012; Owens, 2002).

In the past two decades, online media have facilitated the spread of anti-vaccination content and empowered anti-vaccination activists (Kata, 2012). Much of the online anti-vaccination content exaggerates the limitations of science, claims that vaccines are not safe or effective, and emphasizes that they are unnatural. Spreading quickly online, these claims have found a strong footing in related conspiracy theories.

Conspiracists often try to depict that behind every occurrence there is a hidden agenda that intends to cause harm, fool the public, or hide the truth (Chen et al., 2020). Studies on anti-vaccination conspiracy theories led to the development of the Vaccine Conspiracy Belief Scale (VCBS) to better evaluate the role of conspiracy theories in accepting or rejecting vaccination (Dixon, 2020; Sallam et al., 2021; Shapiro, Holding, Perez, Amsel, & Rosberger, 2016). The scale grouped conspiracy theories into seven major categories, including (1) data about vaccine safety are sometimes fabricated, (2) pharmaceutical companies are hiding potential vaccine risks, (3) the government is responsible for covering up alarming information about vaccine safety and its link to autism, (4) data about vaccine efficacy are fabricated, and (5) vaccines are harmful to children (Shapiro et al., 2016). Extant research has shown that many media messages supported the conspiratorial belief that vaccines mainly profit doctors, pharmaceutical companies, and governments (Briones, Nan, Madden, & Waks, 2012). Other messages are more menacing. For example, Chen and colleagues (2020) found that across several social media platforms, conspiracists claimed that the real intention behind the human papillomavirus (HPV) vaccine is to "eliminate the Chinese ethnic group" (p. 3).

Extant research has attributed vaccine hesitancy to exposure to anti-vaccination conspiracy theories (Hornsey, Harris, & Fielding, 2018; Jolley & Douglas, 2014; Sallam et al., 2021). According to a SAGE Working Group, vaccine hesitancy is the "delay in acceptance or refusal of vaccines despite availability of vaccination services" (Hickler, Guirguis, & Obregon, 2015, p. 4,155; MacDonald, 2015). This refusal or delay poses serious health risks to a growing number of people worldwide (Boom et al., 2018). For example, Pakistan has never fully eradicated poliomyelitis (polio) due to the high spread of conspiracy theories and high vaccine hesitancy (Khan & Idris, 2019). Similarly, in the United States, the circulation of health conspiracy theories caused a major decrease in vaccination rates, prompting multiple outbreaks of preventable diseases such as measles, *Haemophilus influenzae*, pertussis, and varicella (Boom et al., 2018). In fact, measles was nearly eliminated in the United States in 2000 due to high vaccination rates, but in

2019, several outbreaks were reported, setting the highest record of cases since 1994 (Patel et al., 2020). Seventy-one percent of these cases were unvaccinated.

In light of the COVID-19 pandemic, the anti-vaccination movement reignited, and vaccine hesitancy resurfaced with new claims that fueled skepticism about the COVID-19 vaccines. According to Pulido, Villarejo-Carballido, Redondo-Sama, and Gomez (2020), a global COVID-19 conspiracy theory that spread on Twitter blamed the United States for engineering the virus. Another one claimed that COVID-19 vaccines are a tool to implant people with microchips (Arshad et al., 2021; Islam et al., 2021; Sallam et al., 2021; Thelwall, Kousha, & Thelwall, 2021). Some conspiracies claimed that the COVID-19 vaccines aim to eliminate older generations by injecting them with contaminated vaccines (Islam et al., 2021). Arshad and colleagues (2021) found that in Pakistan, some people believed that COVID-19 is simply anti-Muslim propaganda. Another study found that people in Arab countries believed that COVID-19 vaccines cause infertility (Sallam et al., 2021). In a study that examined the process of othering COVID-19 news in four Arab countries, Richter, Al-Shami, Khalifa, Osman, and Mundua (2021) found several labels attributing the spread of the virus to external forces, including the Chinese dragon, Iran, Trump, or the United States—as a means of biological terrorism. Consistently, Diaz, Reddy, Ramasahayam, Kuchakulla, and Ramasamy (2021) found a global surge in online search queries regarding COVID-19 vaccines and infertility during December 2020. Other conspiracy theories claimed that the COVID-19 vaccines are made from cells of aborted fetuses or that the human population will decrease to 1 billion after everyone gets the COVID-19 vaccination (Islam et al., 2021). Additionally, the verbal war between U.S. and Chinese government officials triggered conspiracies about the origin of the virus, resulting in more skepticism toward immunization (Naeem, Bhatti, & Khan, 2021).

The belief in COVID-19 vaccines conspiracy theories is linked to the rate of COVID-19 vaccination (Sallam et al., 2021; Yang, Luo, & Jia, 2021). A survey by the *Economist* attributed the slow rate of COVID-19 vaccination in the United States to a significant group of mostly Republicans who believe Donald Trump's conspiracy theories ("The Republican Anti-Vax Delusion," 2021). Such behavior hindered the efforts of the government and large health organizations to mitigate the spread of the virus. Chen and colleagues (2020) anticipated that, in the future, conspiracy theories may have more influence on the public than scientific facts due to the use of persuasive techniques and the fast spread of information through social media.

Infodemics and Vaccine Hesitancy During the COVID-19 Pandemic

During pandemics, media are among the predominant sources of health information (Melki et al., 2022). And despite their many advantages in spreading accurate health information, social media have long encouraged misinformation about vaccines and contributed to discouraging people from making informed health decisions (Kata, 2012).

The abundance of information during the COVID-19 pandemic exposed people to an unprecedented amount of health-care news (Cinelli et al., 2020) through broadcast media, print media, social media, search engines, or interpersonal communication (Soroya, Farooq, Mahmood, Isoaho, & Zara, 2021). The public actively sought out health information about the new virus, its symptoms, preventive measures, and vaccine efficacy (Khalifa et al., 2020; Yin et al., 2021). This excessive exposure to health content is of considerable importance since it is linked to future behavioral attitudes and reactions toward vaccines (Chan, Jamieson,

& Albarracin, 2020; Luo et al., 2021; Zhang, Featherstone, Calabrese, & Wojcieszak, 2021). In addition, the role of social media in spreading both accurate and false information played a significant role in exacerbating the situation and creating an information pandemic.

The World Health Organization (WHO; 2020) declared on February 2, 2020, that an *infodemic* was spreading alongside the COVID-19 pandemic. The WHO defined infodemic as the availability of a massive volume of health-related information, which comprises both accurate information and misinformation. The health misinformation spread took many forms, including incorrect information, incomplete information, rumors, conspiracy theories, fallacious use of data, and information that still required scientific evidence (Chou, Oh, & Klein, 2018; Jamison et al., 2020; Southwell et al., 2019). The rapid spread of misinformation impeded the effective communication of accurate and reliable health information (WHO, 2020; Zarocostas, 2020). Therefore, the infodemic threatened global efforts to mitigate the pandemic and weakened the public's trust in government and health-care officials (Cinelli et al., 2020). It also decreased the adoption of preventive health measures (Melki et al., 2022) and increased vaccine hesitancy (Jamison et al., 2020; Zhang et al., 2021).

Furthermore, with the surge of accessible health information, audiences had vastly more content to select from (Sharot & Sunstein, 2020). According to Festinger's (1957) theory of cognitive dissonance, audiences tend to ignore media content that contradicts their initial beliefs and seek media content that confirms such beliefs to avoid mental discordance. Thus, audiences self-selected media content that was anti-vaccination or pro-vaccination according to their preexisting beliefs (Puri, Coomes, Haghbayan, & Gunaratne, 2020). In addition, people's exposure to COVID-19 content varied from one media platform to another, which was called "platform-specific exposure" by Cinelli and colleagues (2020, p. 2). On the one hand, exposure to legacy media, such as newspapers and television, was related to positive behavior toward awareness about pandemics and vaccination (Ho, 2012; Ho, Peh, & Soh, 2013; Melki et al., 2022). Ho and colleagues (2013) found that exposure to health-care news content through legacy media increased the adoption of preventive measures against the 2009 H1N1 virus. Consistently, Melki and colleagues (2022) found that exposure to COVID-19 content in legacy media increased the individuals' adherence to preventive measures. Conversely, exposure to self-selected social media content contributed to negative behavior toward awareness about pandemics and vaccination (Bridgman et al., 2020; Melki et al., 2021; Puri et al., 2020). Exposure to social media content was associated with lower engagement in social distancing practices (Bridgman et al., 2020), increased vaccine hesitancy (Puri et al., 2020), believing in COVID-19 conspiracy theories, and spreading such false information online (Melki et al., 2021). Sallam and colleagues (2021) found that in Jordan and Kuwait, the highest VCBS scores were among those who relied the most on online media for health information. This is likely because social media platforms lack editorial and scientific gatekeeping and promote the users' self-selected content, which increases selective exposure to attitude-consistent content and channels (Schmidt, Zollo, Scala, Betsch, & Quattrociocchi, 2018).

Media Exposure, Media Literacy, and Fact-Checking

Nevertheless, social media and the Internet in general also provide potent tools for audiences to fact-check misinformation. Fact-checking is the sum of efforts deployed in investigating published content in the news and on social media (Chan, Jones, Hall Jamieson, & Albarracín, 2017). As health misinformation spreads, fact-checking efforts increase proportionally (Krause, Freiling, Beets, & Brossard, 2020) and

subsequently help in debunking misinformation about the COVID-19 vaccines. These fact-checking efforts include those by major health institutions and news agencies, for example, the WHO's MythBusters, Reuters Fact Check, and AP Fact Check. According to Zhang and colleagues (2021), fact-checking vaccine-related misinformation on social media increased the audiences' trustworthiness in the vaccines. As a result, correcting the audiences' misconceptions about the COVID-19 vaccines on social media was related to positive attitudes toward getting vaccinated (Zhang et al., 2021).

To be sure, audiences react differently to misinformation, depending on various factors, including education and income level. Highly educated audiences are less likely to believe conspiracy theories (Melki et al., 2021; van Prooijen, 2017). People who believe conspiracy theories have lower critical thinking abilities than those who do not—although both groups can be highly intelligent (Lantian, Bagneux, Delouvée, & Gauvrit, 2021). This highlights the need to develop better critical thinking skills to resist conspiracy theories. One approach that promotes both critical thinking and effective fact-checking of misinformation is *media literacy*.

Most definitions of media literacy revolve around the conceptions of critical media consumption and production (Hobbs, 2001; Potter, 2013). The decades-old call of media literacy scholars and activists to universalize media literacy education has become even more pressing in today's hyper-connected media world, where social media platforms harbor endless divergent views, dubious information, algorithm-driven content, and fake news (Ku et al., 2019).

Media literacy promotes the ability to critically verify information, seek credible sources and quality content, identify mis/disinformation and biased news, understand media effects in various contexts, and detect stereotypes in media representation (Potter, 2013). Media literacy has also been shown to support public health goals and efforts when incorporated with health and information literacy (Bergsma & Carney, 2008; Halliwell, Easun, & Harcourt, 2011; Khamis & Geng, 2020; Melki, Hitti, Oghia, & Mufarrij, 2014; Melki et al., 2021; Potter, 2013; Yates, 1999). This makes it even more relevant for the COVID-19 pandemic.

According to Bergsma and Carney's (2008) systematic examination of 28 media literacy interventions specifically related to health, "media literacy education has the potential to be a useful health-promoting strategy for ameliorating a number of harmful health behaviors" (p. 537). However, the authors noted that scholars have produced little peer-reviewed empirical research on the most effective health-promoting media literacy methods, and most of the claims remain theoretical.

Emerging research has found that media literacy's incorporation in health literacy curricula helps combat dubious health-related media content (Halliwell et al., 2011; Melki et al., 2014; Yates, 1999). Potter (2013) highlighted researchers' interest in using media literacy for obtaining better constructive health habits among media users. For example, media content could encourage users to adopt unhealthy habits through the romanticization of alcohol and tobacco. Media literacy interventions could help counter such glamorization through critical examination and deciphering of media content.

Halliwell and colleagues (2011) argued for the inclusion of media literacy interventions when dealing with body satisfaction. The authors found that most adolescent girls were shielded from the negative effects of viewing unrealistic body standards when exposed to a short media literacy video. Consistently,

Yates (1999) recognized the power of combining media literacy with health literacy and its positive effects on adolescents' well-being, including their nutritional habits, alcohol and tobacco avoidance, and safe methods of obtaining sexual information. The study argued for the extension of media literacy interventions to health literacy as media literacy could allow audiences to critically assess health media messages.

Furthermore, Melki and colleagues (2014) argued that media literacy could address issues related to exposure to unrealistic mediated body images. The study found a positive relationship between Arab men's exposure to mediated images of muscularity and their use of steroids. However, with the inclusion of media literacy interventions, media users could question media content and decipher image manipulation.

Media Literacy, Information Verification, and Mis/Disinformation

Media literacy helps people enhance their information verification, fact-checking, and sourcing skills (Hameleers, 2020; Ku et al., 2019). Ku and colleagues (2019) studied how news literacy and online news intake can enrich youths' critical thinking in Hong Kong. Using a survey in which they measured the relationship between critical thinking, news literacy, and news intake on social media, they found that news-literate users had better and stronger critical thinking habits, such as the identification of credible news sources (Ku et al., 2019).

Furthermore, to identify credible sources and information as a tactic to counter misinformation, Hameleers (2020) found that it is most productive to combat misinformation through the integration of "media literacy intervention and a fact checker" (p. 14). Through experiments conducted in the United States and the Netherlands, Hameleers (2020) found that media literacy intervention has a more positive effect on people's critical judgment of information and not on "issue agreement" (p. 14). Issue agreement is "when people's perceptual screens align with information, they are more likely to accept this information to remain at cognitive consonance, irrespective of its veracity" (Hameleers, 2020, p. 3). Therefore, media literacy alone cannot positively rectify a user's agreement with misinformation. It needs to be combined with fact-checking to yield effective results although arguably fact-checking is a core media literacy competency and an integral part of its curricula.

Indeed, emerging research shows that media literacy plays an important role in mitigating the COVID-19 infodemic (Khamis & Geng, 2020; Melki et al., 2021, 2022). Khamis and Geng (2020) found that social media offer fewer risks to media-literate users when exposed to COVID-19 mis/disinformation while posing a threat to users with no media literacy as they can succumb to misinformation. The study examined how social media could play a role in reducing coronavirus infections in Zanzibar through qualitative interviews with health and communication experts. Consistently, Melki and colleagues (2022) found that perceived knowledge encouraged the adoption of preventative measures against COVID-19, especially among media-literate users. The study argued that perceived knowledge is related to media literacy since the latter improves self-confidence when it comes to media assessment. Additionally, Melki and colleagues (2021) found that media literacy training partook in mitigating the spread of false COVID-19 news and myths. The study advocated for using media literacy as a long-term strategy for mitigating infodemics and encouraging positive health behaviors. Therefore, this study examines the following hypotheses and research question:

H1: *(a) Media literacy level and (b) trust in media and information sources about COVID-19 discourage COVID-19 vaccine hesitancy.*

H2: *(a) Believing in COVID-19 vaccine conspiracy theories and (b) being opposed to all vaccines encourage COVID-19 vaccine hesitancy.*

H3: *The perception that the COVID-19 vaccines are (a) safe and (b) effective and that (c) the disease is more dangerous than the vaccines discourages COVID-19 vaccine hesitancy.*

RQ1: *Do (a) media exposure to COVID-19 vaccine news, (b) the tendency to post and share information on social media about the vaccines, and (c) previous bad experience with vaccines affect vaccine hesitancy?*

In addition, the study develops a research instrument that can effectively measure media literacy during pandemics (see supplementary material[1]).

Methods

This study uses a cross-sectional survey of university students in eight Arab countries: Egypt, Iraq, Jordan, Lebanon, Oman, Palestine, Tunisia, and Yemen. The fieldwork was conducted between October 30, 2021, and July 30, 2022. A minimum sample of 260 per country was calculated with a 95% confidence level and ±6% sampling error. However, researchers from each country collected more responses than the minimum. The final overall sample size reached 3,009.

Instrument and Procedure

The questionnaire comprised 66 closed-ended questions, required an average of 6 to 9 minutes to complete, and generated 68 variables. The survey was provided in English and Arabic. Researchers visited a diverse number of classes and asked students to access the online survey on their mobile. After confirming consent, as per Institutional Review Board protocol LAU.SAS.JM1.1/Nov/2021, students filled out the questionnaire.

Measures

Beyond demographics (gender, age, country, and academic year), the following variables were used.

Media Literacy

As per Hobbs (2001), we defined media literacy as the critical consumption and production of media content. First, we adopted nine variables from Van de Vord's (2010) operationalization of media literacy level and measured them on a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree). The

[1] https://drive.google.com/file/d/1dZJGQOZbVLXrq3xunm7_oRZBDAbnBl5K

variables measured the concept of self-efficacy in seeking information, the veracity of advertisements, and awareness of media effects. To measure self-efficacy in seeking information, respondents were asked whether they are certain enough to (1) find credible online information and (2) avoid misleading online information. To measure the veracity of advertisements, respondents were asked whether they believed that advertisements (3) are truthful in general and (4) provide consumers with all the essential information they need to know about the product (both variables were dropped from the composite average due to low correlation). For awareness of media effects, respondents were asked whether individuals' perceptions of the world (5) are influenced by social media depictions and (6) come from examples shown through social media and not from real-life examples.

Media literacy was also measured by adopting seven variables from the Danish Technological Institute (2013) that assessed two concepts: Critical understanding and communicative abilities. The variables were measured on a 10-point Likert scale (1 = never/strongly disagree, 10 = always/strongly agree). To assess critical understanding, participants were asked whether they (1) agree that the same information is portrayed in different ways by different media sources, (2) verify information by comparing it with more than one media source, and (3) suspect that the images they see often present people with unrealistic representations of reality. To assess communicative abilities, respondents were asked how often they usually post content on social media, including (4) written text, (5) photos, and (6) videos. In addition, respondents were also asked how often they (7) write comments or replies on social media, (8) share posts or links on social media, (9) suspect that the information they find online is untrue or misleading, and (10) check who the authors or owners of the website they visit are.

Five variables were adopted from Ashley, Maksl, and Craft (2013) to measure news literacy on a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree). Respondents were asked whether they agreed or disagreed with the following statements: (1) media content is highly influenced by the owner of the media company, (2) stories chosen by news companies are based on what will attract the largest audience, (3) people mainly watch news that matches with their beliefs, and (4) production techniques can be used to influence viewers' perceptions.

Finally, we used Vraga, Tully, Kotcher, Smithson, and Broeckelman-Post's (2016) concept of self-perceived media literacy, defined as an individual's perception and insight into their own media literacy level. On a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree), respondents rated the following statements: (1) I have a good understanding of the concept of media literacy, (2) I am not sure what people mean by media literacy (the variable was later dropped from the composite due to low correlation), (3) I am confident in my ability to detect fake news, and (4) I have had extensive media literacy training.

After dropping three variables (noted above), the averaged 21 variables achieved a Cronbach's α = .82. The composite variable range was [1–10].

Conspiracy Theories

Relying on Chen and colleagues (2020), we defined conspiracy theories as "an allegation regarding the existence of a secret plot between powerful people or organizations to achieve some goal (usually

sinister) through systematic deception of the public" (p. 2). We measured conspiracy theories on a 10-point scale (1 = strongly disagree, 10 = strongly agree). Respondents were asked whether they believed the following statements, adopted from Romer and Jamieson (2020): (1) the pharmaceutical industry created the coronavirus to increase sales of its drugs and vaccines, (2) coronavirus is a human-made biological weapon against certain countries, (3) the WHO overexaggerated the danger posed by coronavirus to damage some politicians, and (4) the media intentionally overexaggerated the danger of coronavirus to damage some politicians. Furthermore, we adopted Jensen and colleagues' (2021) variables through the following statements: (1) COVID-19 is a result of a global aim to enhance mandatory vaccination, (2) COVID-19 was in military labs to reduce the population of some countries, and (3) COVID-19 is just a hoax to trick people. In addition, we included four statements commonly circulating about the COVID-19 vaccines using the same scale: (1) The COVID-19 vaccines are a tool to implant people with microchips, (2) the COVID-19 vaccine aims to eliminate older people, (3) the coronavirus was intentionally created to target Muslims/Arabs, and (4) the COVID-19 vaccines cause infertility. The averaged 11 variables achieved a Cronbach's α = .927. The composite variable range was [1–10].

Vaccine Intention/Hesitancy

Following Hickler and colleagues' (2015) definition of vaccine hesitancy as refusal to get vaccinated despite vaccine availability, we measured this concept by adopting Costantino and colleagues' (2021) measurement of public willingness to receive the COVID-19 vaccination. Respondents were asked whether they (1) received or plan to receive the coronavirus vaccination if it was available to them. Answer options were the following: (1) yes, I have already taken the coronavirus vaccine, (2) yes, I plan to take the coronavirus vaccine soon, (3) I am not sure if I will take the coronavirus vaccine, and (4) no, I will not take the vaccine. This was followed by a question where respondents had to choose one of the following: (1) I took/will take the vaccine only because it is required, (2) I will not take the coronavirus vaccine even if it was required, and (3) I will take the vaccine even if it was not required. The averaged two variables achieved a Cronbach's α = .675. The composite variable was converted to a [1–10] scale.

In addition to vaccine hesitancy, we used as control variables questions that took into consideration preconceptions and past experiences about vaccines in general. Participants were asked whether they agreed or disagreed [1–10] with the statements: (1) I am opposed to all vaccines and (2) I have had a personal negative experience with vaccinations in the past.

Perception of Vaccine Safety and Effectiveness

In addition, respondents were asked on a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree) to rate the following: (1) the coronavirus vaccine is safe, (2) the coronavirus vaccine is effective, and (3) the coronavirus disease is far more dangerous than the vaccine.

Trust in Media and Information Sources

We measured trust in media and information sources as the extent to which participants trusted COVID-19 news from major information sources. Respondents were asked to rate on a 10-point Likert scale

(1 = not at all, 10 = fully trust) how much they trust COVID-19 vaccination news and information from (1) TV channels, (2) social media, (3) health-care experts, (4) government officials, (5) clerics/religious scholars, (6) social media influencers, and (7) fact-checking websites. The averaged seven variables achieved a Cronbach's α = .847. The composite variable range was [1–10].

Media Exposure

We operationalized media exposure as exposure to COVID-19 vaccination information from major information sources. Respondents were asked to rate on a 10-point Likert scale (1 = never, 10 = always) how often they follow COVID-19 vaccination news and information from (1) TV channels, (2) social media, and (3) websites. The averaged three variables achieved a Cronbach's α = .858. The composite variable range was [1–10].

Media Posting

Media posting was measured by adopting Khalifa and colleagues' (2020) variables on participants' interaction with COVID-19 related topics online. Respondents were asked on a 10-point Likert scale (1 = never, 10 = always) how often they (1) post news and information related to COVID-19 vaccine on social media, (2) post or share corrections to false information about the COVID-19 vaccine on social media, (3) verify COVID-19 vaccine information before posting it on social media, and (4) report false information about COVID-19 vaccines on social media. After the third variable was dropped due to low correlation, the averaged three variables achieved a Cronbach's α = .823. The composite variable range was [1–10].

Statistical Analysis

SPSS was used to perform data management and analysis. Singular variables and demographics were presented as frequencies and percentages, while combined scales were presented as means and standard deviations. Researchers used a multivariate linear regression to examine the relationship between the dependent variable (vaccination intention/hesitancy) and the independent variables (media literacy, conspiracy theories, perception of vaccine safety and effectiveness, trust in media and information sources, media exposure, media posting, and opposition to all vaccines). Results are presented as beta (β) and corresponding 95% confidence intervals (CI).

Results

According to Table 1, the sample majority identified as female (56.4%), was between 18 and 23 years of age (81.5%), and was in the fourth year of college or pursuing a higher degree (77.9%). Participants were roughly equally distributed across the eight studied Arab countries, with Lebanon and Jordan being overrepresented.

When it came to vaccine intention, only 8.4% said they would not take the vaccine if it was available, and 6.6% said they were not sure if they would take it. The overwhelming majority had taken the COVID-19 vaccine or planned to take it soon (85%). Similarly, 11.2% said they would not take the vaccine

even if it was required, 49.9% said they would only take it if it was required, and 38.9% said they had taken it or would take it even if was not required.

Table 1. Sample Distribution.

Demographics	*n* (%)
Gender	
Men	1,302 (43.6)
Women	1,684 (56.4)
Age (years)	
18–20	853 (28.5)
21–23	1,590 (53.0)
24–26	344 (11.5)
27–29	89 (3.0)
>30	122 (4.0)
Year at university	
First	308 (10.3)
Second	352 (11.8)
Third	801 (26.8)
Fourth	1,085 (36.3)
Fifth or higher	443 (14.8)
Country	
Egypt	342 (11.4)
Iraq	264 (8.8)
Jordan	488 (16.3)
Lebanon	804 (26.8)
Oman	263 (8.8)
Palestine	257 (8.6)
Tunisia	262 (8.7)
Yemen	315 (10.5)
Vaccination intention (if available)	
I will not take the vaccine	251 (8.4)
I am not sure if I will take the vaccine	197 (6.6)
I plan to take the vaccine soon	175 (5.8)
I have already taken the coronavirus vaccine	2,370 (79.2)
Vaccination intention (if required)	
I will not take the vaccine even if it was required	333 (11.2)
I took/will take the vaccine only because it was/is required	1,494 (49.9)
I took/will take the vaccine even though it was/is not required	1,165 (38.9)

Table 2 presents the means and standard deviations for the scales used in the subsequent linear regression. All scales ranged between 1 and 10. Participants scored on average the highest on the intention to get the COVID-19 vaccine (7.85), media literacy (7.08), and the perception that the COVID-19 disease is more dangerous than the vaccine (6.8). The lowest averages were for participants who said they were opposed to all vaccines (3.51), had a bad experience with vaccines in the past (3.48), and those who post on social media about the COVID-19 vaccine (3.37).

Table 2. Means and Standard Deviations of the Measured Scales, Range = [1–10],* N = *3,009.

Scales	Mean (±*SD*)
Vaccine intention/hesitation (dependent variable)	7.85 (±2.43)
Media literacy	7.08 (±1.13)
COVID-19 conspiracy theory	4.54 (±2.20)
Trust in media and information sources about COVID-19	4.70 (±1.82)
COVID-19 media exposure	4.74 (±2.40)
COVID-19 media posting	3.47 (±2.37)
Opposition to all vaccines	3.51 (±2.88)
Perception: COVID-19 vaccine is safe	5.69 (±2.67)
Perception: COVID-19 vaccine is effective	5.66 (±2.60)
Perception: COVID-19 disease more dangerous than vaccine	6.80 (±2.82)
Bad personal experience with vaccines in the past	3.48 (±2.89)

Table 3 shows the results of the linear regression analysis predicting intention to get COVID-19 vaccination. The model explains 26.5% of the variance in the dependent variable. Although all the variables significantly correlated (individually) with vaccine intentions (zero-order), when entered into the regression model, three variables had no significant effect on the dependent variable (vaccine intention): Participants' media exposure to COVID-19 vaccine news (RQ1a), their posting and sharing of information on social media about the COVID-19 vaccines (RQ1b), and whether they had a bad experience with vaccines previously (RQ1c) show no significant association with the intention to get vaccinated.

Seven variables showed significant effects on the dependent variable. H1a, media literacy level (β = .070, p < .001), and H1b, trust in media and information sources about COVID-19 (β = .063, p < .001), had significant and positive effects on vaccination intention. H2a, believing in COVID-19 conspiracy theories (β = −.202, p < .001), and H2b, being opposed to all vaccines (β = −.133, p < .001), had significant and negative effects on the intention to get vaccinated. In contrast, H3a, perception of COVID-19 vaccine safety (β = .415, p < .001); H3b, perception of COVID-19 vaccine effectiveness (β = .402, p < .001); and H3c, perception that the COVID-19 disease is more dangerous than the vaccine (β = .077, p < .001), had significant and positive effects on vaccination intention.

Table 3. Linear Regression Analysis to Test the Effects of the Independent Variables on Intention to Get COVID-19 Vaccination (*p < .01). Dependent Variable: Vaccine Intension.

	Zero-Order	*β* [95% CI]
Media literacy	.119*	.070* [.079, .220]
COVID-19 conspiracy theory	−.324*	−.202* [−.263, −.181]
Trust in COVID-19 information sources	.234*	.063* [.028, .141]
COVID-19 media exposure	.126*	.015 [−.026, .056]
COVID-19 media posting	.055*	.019 [−.022, .061]
Opposition to all vaccines	−.288*	−.133* [−.145, −.080]
Perception: COVID-19 vaccine is safe	.415*	.159* [.101, .189]
Perception: COVID-19 vaccine is effective	.402*	.124* [.071, .162]
Perception: COVID-19 more dangerous than the vaccine	.283*	.077* [.037, .097]
Bad personal experience with past vaccines	−.102*	.027 [−.008, .053]
R^2 *(%)*		.265

Since media literacy level and belief in conspiracy theories are two important concepts for this study, we ran a correlation test between the two scales and found that the two registered a small positive and statistically significant correlation (r = .141, p < .001).

Discussion and Conclusion

This study examined the relationship between media literacy level, belief in conspiracy theories surrounding the COVID-19 vaccines, and vaccine intention/hesitancy among Arab university students. The data show that media literacy (H1a) and trust in media and information sources (H1b) discourage vaccine hesitancy while believing in conspiracy theories (H2a) and being opposed to all vaccines (H2b) encourage vaccine hesitancy. In addition, believing that the vaccine is safe (H3a) and effective (H3b) and that the disease is more dangerous than its vaccine (H3c) discourages vaccine hesitancy. Finally, individuals' media exposure to vaccine news (RQ1a), their tendency to share information on social media about the vaccines (RQ1b), and their previous bad experience with vaccines (RQ1c) had no significant effect on vaccine hesitancy.

The findings are consistent with emerging research that positions media literacy education as a long-term society-wide strategy for public health promotion (Bergsma & Carney, 2008; Halliwell et al., 2011), health interventions (Melki et al., 2014; Potter, 2013; Yates, 1999), and the mitigation of future pandemics, as well as dealing with infodemics (Khamis & Geng, 2020; Melki et al., 2021, 2022). They also support previous findings that belief in conspiracy theories negatively affects the effort to vaccinate the public and reach herd immunity (Hornsey et al., 2018; Jolley & Douglas, 2014; Sallam et al., 2021; Yang et al., 2021). Interestingly, we found a small but significant positive correlation between media literacy and belief in conspiracy theories. We expected a negative correlation although previous research has shown the propensity of media literacy to inadvertently push students beyond healthy skepticism and critical thinking and into cynicism, which may encourage belief in conspiratorial theories (boyd, 2017; Mihailidis, 2011). Uscinski and colleagues (2020) found that among other political and

social factors, two psychological factors—denialism and conspiracy thinking—were the strongest predictors of people's belief in COVID-19 conspiracy theories. The former refers to a "predisposition to reject expert information . . . of major events," while the latter refers to a tendency to see major events as results of conspiracies (Uscinski et al., 2020, p. 1). Media literacy educators address these psychological predispositions the same way they deal with other similar tendencies, such as selective media exposure and avoidance. Also, integrating into media literacy curricula pedagogical activities that analyze conspiracy theories can perhaps build some critical defenses against believing in them. Shermer (2019), for example, provides a thorough rendition of the anatomy of conspiracy theories, along with a conspiracy detection kit (Lecture 7). Shermer advanced 10 questions to examine the truthfulness of conspiracy claims. Similar critical tools can easily be adopted for building media literacy competencies that specifically target conspiracy theories, as documented by several media literacy scholars and teachers (Craft, Ashley, & Maksl, 2017; Friesem, 2019).

Furthermore, we note the relatively smaller positive effect of media literacy on vaccine intention compared with the almost three times more powerful negative effect of conspiracy theory on vaccination intention. We believe that integrating health literacy and science literacy curricula (Jhummon-Mahadnac, Knott, & Marshall, 2012; Niu, Qin, Hu, & Wang, 2021; Sharon & Baram-Tsabari, 2020) into media literacy programs may strengthen the effects of media literacy and further weaken the effect of conspiracy theories. Another variable that had a strong negative effect on vaccine intention is opposition to all vaccines. While this issue is difficult to handle through media literacy, perhaps science literacy could help moderate its effect by building people's understanding of how vaccines work (Casino & Walag, 2020). This claim is corroborated by the strong positive effect of three perceptions on vaccination intention: Perception of vaccine safety, perception of vaccine effectiveness, and perception that the disease is more dangerous than the vaccines. Science literacy education, as well as health communication campaigns, can build on these three matters in communication strategies. In addition, trust in media and information sources (e.g., government, health officials, media, etc.) has a slight positive effect on vaccination, which other studies have also established (Fancourt, Steptoe, & Wright, 2020; Jennings et al., 2021; Parmet & Paul, 2020). This emphasizes the importance of government and health officials' credibility in the eyes of the public during pandemics.

Finally, our study has provided a robust methodology for media literacy measurement that can be deployed effectively during future health crises. Researchers should develop this instrument and examine its validity in relation to more commonly used qualitative assessments.

Limitations

Self-reported surveys suffer from social desirability bias, and intercept sampling methods could not be generalized beyond the target population (university students). We missed some recent media literacy measures and recommend future researchers explore other measures, such as Vraga, Tully, Maksl, Craft, and Ashley's (2021) news literacy behavior measures, that examine not only capabilities but also performance.

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