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Media Exposure and Health Behavior during Pandemics: The Mediating Effect of Perceived Knowledge and Fear on Compliance with COVID-19 Prevention Measures

Jad Melki ^a, Hani Tamim ^b, Dima Hadid ^c, Sally Farhat ^a, Maha Makki ^b, Lara Ghandour ^c, and Eveline Hitti ^c

^aInstitute of Media Research and Training, Department of Communication Arts, Lebanese American University; ^bDepartment of Internal Medicine, American University of Beirut Medical Center; ^cDepartment of Emergency Medicine, American University of Beirut Medical Center

ABSTRACT

Emerging research has examined the role of media coverage of diseases in influencing people's health behavior, particularly their compliance with prevention measures. This study examines whether increased media exposure to COVID-19 news and interpersonal communication about the disease positively relate to people's abidance by prevention measures, and whether perceived knowledge and fear mediate this relationship. The study focuses on Lebanon, whose government and media responses led to a successful containment of COVID-19 in its first phase, although the country was experiencing a severe economic crisis, widespread political unrest, and a massive influx of refugees. It examines both legacy media (Television) and social media, as well as interpersonal communication, through a cross-sectional researcher-administered phone survey of 1,536 adults and a nationally representative probability sample. The fieldwork was conducted between March 27 and April 23, 2020, and resulted in a 51.6% response rate. The findings support the hypotheses that increased media exposure to COVID-19 news positively relates to people's abidance by prevention measures and that perceived knowledge and fear mediate this relationship. However, the same hypotheses for interpersonal communication were not supported.

Introduction

The 2019 Novel Coronavirus (COVID-19) pandemic sparked substantial media coverage that significantly varied across countries and subsequently contributed to different outcomes in mitigating the disease. Research examining the relationship between media coverage and the public's response showed that media are the main source of information during disease outbreaks (Allan, 2002). They affect the public cognitively and emotionally and guide them toward particular responses (Zhang et al., 2015). Consistent, accurate and effective communication during disease outbreaks is among the most important methods of containing them (Reynolds & Quinn, 2008). Emerging research also suggests that media exposure tends to be stronger when it generates fear and promotes perceived knowledge (Zhang et al., 2015). However, in this era's information overload and fake news phenomenon, widespread confusing and contradictory information could threaten national and global efforts to contain disease outbreaks (Mian & Khan, 2020).

This study explores the news consumption of individuals in Lebanon, covering Television, social media, and interpersonal communication. Despite its dire economic and political circumstances, the Middle Eastern state's pandemic response led to a successful containment plan in the first phase, with one of the lowest case count (251 per million) and test positivity rates (1.5%) worldwide (Khoury et al., 2020). Although the country was in the midst of a political uprising and facing an economic crisis – as well as a massive refugee influx from the Syrian civil war, its newly appointed government and its traditionally partisan media system

succeeded in focusing the public's attention on the pandemic (Melki et al., 2020a). Despite the precarious circumstances and scarce resources, Lebanon surpassed many developed countries in mitigating the disease during the first six months of the pandemic (Khoury et al., 2020). As such, Lebanon provides a unique case where many resources, processes and functions available in rich developed countries did not exist, and thus the success in mitigating the pandemic is more confidently attributed to media and communication strategies.

This study is unique and significant on several levels: pandemic period; focus on legacy media, social media, and interpersonal communication as contributors; inclusion of media literacy as a potential intervention; and the geographic region studied. First, the hypotheses we examine have rarely been applied to pandemic situations. Although scholars have examined this topic from various perspectives (Wei et al., 2008), studies that tackled the issue of media exposure during pandemics remain scarce, and all of them focused on the 2009 H1N1 Flu pandemic (Ho, 2012; Jhummon-Mahadnac et al., 2012; Taha et al., 2013). Second, most studies mainly focused on legacy media and excluded interpersonal communication (Zhang et al., 2015), while those that examined social media were conducted prior to these platforms' permeating global penetration era and the subsequent ubiquitous expansion of fake news. The importance of examining interpersonal communication lies in the nature of the disease. Being both highly contagious and novel, COVID-19 precludes the ability of healthcare professionals from directly participating in the

interpersonal communication campaigns, as is the case usually. The disease's novelty also presents a problem where knowledge about the virus is scarce and continuously evolving – thereby creating seemingly inconsistent and contradictory information. Third, our study is the first to ever examine media literacy in a pandemic context. As an educational approach that develops critical media consumption and production skills (De Abreu et al., 2017), media literacy has been shown to be effective as an intervention in other health contexts (Halliwell et al., 2011; Jeong et al., 2012; Yates, 1999). Finally, no studies have covered Lebanon or the Arab region, and rarely have similar studies focused on developing countries and low-resource settings – let alone a country undergoing multiple momentous crises.

Lebanon's media and government response to the pandemic

Lebanon's chronically partisan media system reflects its sectarian and confessional politics and societal composition. Each religious community has its own political groups and media channels (Melki, 2014). However, something unique occurred at the onset of the pandemic. During the first few weeks, the media coverage followed predictable partisan framing. But “[f]or a short period during March and April, the normal politicization of the issue was briefly set aside before a return to business as usual in May” (Melki et al., 2020a). Lebanese media became so invested in mitigating the pandemic that some overzealous channels went overboard and declared a state of emergency – a prerogative of the government alone – while others uncharacteristically used strong vulgar language to lash out at people not abiding by prevention measures. Activists and the public also flooded social media channels with dramatic accounts about the disease – not all of them accurate. Exaggerated infection numbers, conspiracy theories, and fake claims of infected people spread fear and panic across the country.

Such media coverage was accompanied by a national strategic communication plan led by healthcare experts who were organized under a neutral and depoliticized national committee – a rare phenomenon in this chronically divided state, where nepotism, cronyism and corruption are perennial. It just happened that a month before the virus reached the country, a mostly technocratic government took power as a result of the October 2019 uprising. Within weeks of the first cases identified outside of China, the newly appointed government established the national committee to oversee the pandemic response, bringing together academics, professionals, NGOs, representatives from different ministries and the private sector, including the media (Khoury et al., 2020).

[The committee] was able to work as a unified team and mount a coherent response to the pandemic, instead of being distracted by internal divisions. The government moved swiftly and set up a national committee tasked with handling Lebanon's COVID-19 response on 31 January 2020, three weeks before the first case of the disease was confirmed in the country. The committee's mission was to coordinate preparations for the arrival of the pandemic as a multi-ministerial public-private partnership, and its motto was 'a whole government response.' (Melki et al., 2020a).

The committee launched a national strategic communication campaign four days after the first COVID-19 case reached Lebanon.

The main strategy centered around flooding media outlets with information by healthcare professionals: talk shows hosted physicians and public health experts, and public service messages featuring physicians were streamed through social media and television outlets, in addition to governmental directives around 'stay home' orders. (Khoury et al., 2020).

The outcome was a synergy between the government's strategic communication efforts and independent media coverage. It resulted in widespread abidance by government recommendations for prevention measures.

Media coverage

Once a novel disease emerges, media coverage focuses on informing the public about the disease, its symptoms, risks and precautionary measures (Davidson & Wallack, 2004). Studies have found that media coverage during pandemics tends to focus on four main aspects: statistics, education, prevention and transmission (Pratt et al., 2002). As soon as COVID-19 emerged, legacy media presented information about the disease's origin, nature and diagnosis. The global coverage suggested preventive actions, how to manage the disease, and the time it takes for a person to show symptoms. The media also covered widely the Centers for Disease Control and Prevention's recommended hygienic measures and drew attention to the importance of regular hand washing, social distancing, not touching one's face, and the need for elderly and immunodeficient individuals to remain at home.

Previous studies examining the role of media in framing public health emergencies identified three main frameworks. First, the media framing tended to focus on main events, such as the recently detected cases and government actions (Shih et al., 2008). Second, the framing displayed great sensationalism with substantial coverage of worst-case scenarios (Dudo et al., 2007). Finally, the coverage used strong language by credible sources who discussed risks (Berry et al., 2007).

In today's hyper-networked communication climate, social media also play a major role. Unlike legacy media that tend to be local and filtered by gatekeepers, information flowing through social media networks can originate anywhere (Kulshrestha et al., 2017). This creates two problems: information overload and the increase of misinformation and disinformation – or what is publicly conflated as fake news. It also offers some advantages, especially the ability of officials and experts to communicate directly with the public.

While COVID-19 was not the first outbreak to spread during the social media era, healthcare organizations were much more prepared to directly communicate about it online. Social media and search engines also released several tools that limited the dispersion of fake news and guided users to credible information (Allcott et al., 2019). However, the amount of misinformation and disinformation about COVID-19 spreading on social media continued to mount (Kluger, 2020). Accordingly, the World Health Organization warned against the “infodemic” associated with COVID-19 (Zarocostas, 2020).

The false information included conspiracy theories, speculations about the origins and effects of the virus, and dangerous or ineffective prevention measures. It put societies at larger health risks and threatened governments' abilities to effectively respond to the pandemic (Pulido et al., 2020).

Although social media do not have the traditional gatekeepers and controls of legacy media, the overwhelming amount of information and people's attention to source credibility may offset the effect of widespread misinformation and disinformation on these networks. To address this phenomenon, this study inquired about both legacy and social media, as well as interpersonal communication.

Interpersonal communication and mediating health messages

Extant research has established interpersonal communication as pivotal for patient-provider interaction and health campaigns, particularly for promoting health awareness, building knowledge, stimulating behavioral change, adopting prevention measures, adhering to treatment, and reducing stigma (Hutchinson et al., 2006; Simba & Kakoko, 2012; Southwell & Yzer, 2007). Studies have demonstrated the effectiveness of interpersonal communication campaigns by healthcare professionals that closely engage targeted communities and patients to adopt established precautions for known diseases, such as Malaria (Keating et al., 2012). However, less is known about the effectiveness of interpersonal communication in the context of a highly contagious novel virus, where knowledge about its symptoms, causes, and prevention measures continuously evolve. In such situations, the infectious disease largely precludes healthcare professionals from the interpersonal communication campaign, while individuals of varying levels of health literacy diffuse information encountered in the media.

The effectiveness of interpersonal communication varies depending on the targeted health behavior and individual's perceptions of risk. Seo and Matsaganis (2013) found that interpersonal communication is most effective when promoting health-enhancing behaviors (adopting healthy habits) but not health-threatening behaviors (avoiding unhealthy habits). Studies that compared the effects of legacy media and interpersonal communication on people's health behaviors and perceptions of skin cancer, HIV, and Aids found that media effects were stronger for people's perceptions of health risks to others, while interpersonal communication effects were stronger for people's perceptions of health risks to themselves (Brashers et al., 2004).

The interaction between mass media and interpersonal communication plays an important role (Morton & Duck, 2001). Jeong and Bae (2017) meta-analysis found that interpersonal conversations that emerged from media campaigns contributed – albeit with a small average effect size – to the campaign's success. Other studies found that interpersonal discussions of health issues that were present in the media decreased uncertainty by providing individuals with the needed emotional support and validation and by encouraging individuals to seek more information (Brashers et al., 2002). Such conversations offered individuals the opportunity to process complex health information and more confidently make

decisions within the context of social support, shared experiences (people who previously experienced the disease), and expert opinions (Brashers, 2001). Additionally, the personalization of media's health messages in interpersonal contexts allowed individuals to elaborate on the presented information and create personal relevance (Noar et al., 2009). This in turn, generated reoccurring thoughts about the messages and increased message processing (Jeong & Bae, 2017).

However, the abundance of information in today's rich media environment may cause higher levels of uncertainty, especially given the continuously changing COVID-19 guidelines and the politicization of prevention measures and vaccines. Furthermore, the effect of interpersonal communication on health attitudes and behavior is influenced by education level (Seo & Matsaganis, 2013). Additionally, stigma associated with illness is another factor that challenges interpersonal communication (Greene et al., 2002). Lastly, age biased communication can shape individuals' behaviors and lead to poor health outcomes (Baltes & Wahl, 1996). This is particularly important for COVID-19, given the higher risk for older populations. Since no previous research has examined interpersonal communication within the context of pandemics, we examine whether interpersonal communication played a role in encouraging individuals to take prevention measures and whether it affected the level of fear and perceived knowledge about the disease.

Fear and perceived knowledge

Zhang et al. (2015) examined whether perceived knowledge and fear mediate the relationship between media exposure and preventative health behaviors during the 2009 H1N1 Flu pandemic. They found that media exposure, along with people's perceived knowledge about the threats associated with the disease and subsequent feelings of fear, lead to increased willingness to take health-related protective actions. The authors utilized Bandura's (2001) social cognitive theory to conceptualize perceived knowledge and used media framing theory and extended parallel processing frameworks to conceptualize fear.

Perceived knowledge

Research has established that individuals' perceived knowledge can affect their behavior through increased self-efficacy. Bandura (2001) found that people are likely to acquire information conveyed in legacy media and assume that perceived knowledge as their own. Self-efficacy, positive reinforcement, and heavy media exposure are three key factors to encouraging behavior adoption. Social cognitive theory predicts that individuals will retain and perform the recommended actions when motivated effectively (Witte, 1991). It provides an understanding of the four mechanisms (attention, retention, motivation and production) individuals acquire from the media (Bandura, 2001). Individuals' judgment of their ability to control circumstances that impact their lives is most crucial in guiding actions and self-efficacy is a crucial factor in initiating positive human behavior change (Bandura et al., 1997). In terms of risk prevention, self-efficacy pertains to when individuals feel confident about their ability to fulfill measures needed to prevent a threat. Self-efficacy has been examined

by several researchers for its potential to influence positive health-related behavior (Milne et al., 2000). Moreover, research has shown that higher level of perceived knowledge increased individuals' confidence, which ultimately increased their self-efficacy, and is therefore treated as a predictor of behavioral change.

Fear

Another crucial factor in the relationship between media exposure and preventative health behavior is fear. Media framing and extended parallel processing frameworks are often applied to this relationship – although others have used social amplification risk models. Media framing refers to the manner in which media producers include certain elements of reality and exclude other aspects to influence a particular viewpoint or construct a specific narrative (Entman, 2007). Extant research has established the role of news framing in influencing audiences' perceptions of the problem and its solution (Reese et al., 2010). While pandemics are often framed negatively, the framing could direct individuals' attention toward certain aspects of this problem (Shih et al., 2008). Accordingly, the elements emphasized in the news will influence peoples' perception of the information conveyed and stimulate thoughts or feelings that lead to predictable behaviors (Price et al., 1997). For example, during pandemics, negative news framing focuses on the number of deaths, newly diagnosed cases, and negative local outcomes. Focusing on how the news are framed helps recognize the dynamics of the audience's perceptions of these concerns (Shih et al., 2008).

The framework of extended parallel processing emphasizes the fundamental role of fear stimulation and its impact on defensive responses, such as denial of information. This framework identifies two cognitive processes in response to threatening messages: fear control response and danger control response. When the risk perception is heightened, the appraisal of efficacy will ascertain which response the individual will adopt. The danger control route allows people to assess the existing threat (threat seriousness and personal susceptibility) and the proposed coping responses (self-efficacy and response efficacy) (Ruiter et al., 2004). It allows individuals to develop defensive strategies that deter their chance of being infected. Perceived susceptibility describes the likelihood that the threat may directly have on someone, whereas perceived severity refers to how significant one perceives the threat to be (Li, 2018). Self-efficacy is how an individual perceives themselves as able to fulfill the required actions to deter a certain risk (Witte & Allen, 2000), whereas response efficacy is one's belief in the effectiveness of the suggested measures to reduce the risk (Witte, 1991). A combination of high threat perception and high efficacy belief may encourage acceptance of the recommended actions demonstrated by positive change in attitude and behavior (Ruiter et al., 2004). Fear control, however, operates with heightened risk and low efficacy. The resulting increased feelings of fear will ultimately promote a defensive avoidance and denial of risk messages. Fear control is defined as an affect-driven cognitive response that leads to maladaptive behavior as it is not aimed at effectively deterring the existing threat (Lazarus, 1991).

Zhang et al. (2015) found that through these three theoretical frameworks, fear and perceived knowledge were evident mediators in the H1N1 flu prevention behaviors, especially when people were worried about infection and considered themselves well-informed about the disease after extensive media exposure. The heightened news exposure positively affected the audience and subsequently led to higher compliance with prevention measures. Zhang et al. (2015) emphasized the positive role of legacy media during emerging pandemics in motivating the audience to follow precautionary actions, even though the coverage was focused on negative frames.

Other research has found that interpersonal communication influences people's perceived knowledge as well as their health behavior (Lee & Ho, 2015). Engelberg et al. (1995) established a relationship between interpersonal communication and perceived (and actual) knowledge about AIDS. Some studies have also found that interpersonal communication with friends and opinion leaders is more effective than interpersonal communication with experts (Bertrandias & Vernet, 2012). This is relevant to COVID-19, where the disease's contagiousness precludes healthcare experts from being part of the interpersonal communication equation, except through media interaction. Other factors may also influence the relationship between interpersonal communication and perceived knowledge, such as interest in science, low-literacy, and low-resource contexts (Bingham et al., 2011; Kim, 2019).

Studies have established that media play a strong and positive role during public health emergencies, but some issues tend to capture the public's attention more than others, and this is largely related to media framing. Berry et al. (2007) found that the instilled fear associated with an invisible pandemic successfully captured the public's attention, as messages that draw on fear were more effective when the recommended actions were easily implemented. However, evidence suggests that fear appeals are not as effective when individuals feel incapable of adequately controlling the threat (Ruiter et al., 2004). Maximizing fear in such circumstances will result in distress and panic, which will lead individuals to disregard and deny the information communicated. This highlights the importance of self-efficacy through perceived knowledge.

This study attempts to expand upon Zhang et al.'s (2015) study, which found that both perceived knowledge and fear mediated the relationship between media exposure and compliance with prevention measures during the 2009 H1N1 Flu pandemic. In line with their recommendation, our study additionally examines this relationship within the context of interpersonal communication about the disease. Therefore, we pose the following hypotheses:

H1: Media exposure to COVID-19 news will be positively associated with (a) taking COVID-19 prevention measures, (b) perceived knowledge about COVID-19, and (c) fear of COVID-19.

H2: Exposure to COVID-19 information through interpersonal communication will be positively associated with (a) taking

COVID-19 prevention measures, (b) perceived knowledge about COVID-19, and (c) fear of COVID-19.

H3: Perceived knowledge about COVID-19 mediates the relationship between media exposure to COVID-19 news and the likelihood of taking COVID-19 prevention measures.

H4: Fear of COVID-19 mediates the relationship between media exposure to COVID-19 news and the likelihood of taking COVID-19 prevention measures.

Methodology

The study uses a cross-sectional researcher-administered phone survey of adults living in Lebanon during the period of March 27 to April 23, 2020. Phone surveys were the only viable option, given the need for social distancing.

Questionnaire

Two versions of the survey questionnaire (Arabic and English) were developed and pre-tested. The questionnaire comprised 15 close-ended questions, required on average 12 minutes to complete, and generated 52 variables.

To assess media exposure for television and social media, participants were asked “How often did you follow Coronavirus news through the following?” The responses were measured on a 4-point scale of “never,” “rarely,” “sometimes,” and “often.” The same was used for “talking to people about COVID-19” (interpersonal communication).

To assess compliance with prevention measures, participants were asked “How often do you do the following as a prevention measure for Coronavirus?” Responses were measured on the same 4-point scale mentioned above. The list of prevention activities included: Avoid crowds, wash hands with water and soap, stay at home, avoid shaking hands, avoid touching my face, and cover my cough. These were the common recommendations of the Lebanese Ministry of Public Health at the time.

Perceived knowledge was assessed through the question “Do you agree or disagree with the following?” and the following statements: “I am knowledgeable about Coronavirus” and “If someone asks me about Coronavirus, I have enough information to inform them about the subject.” Responses were measured on a 4-point scale of “strongly disagree,” “somewhat disagree,” “somewhat agree,” and “strongly agree.”

Fear was assessed using the same question and 4-point response scale and the following statements: “The thought of Coronavirus makes me feel scared” and “I am afraid that someone in my family may get sick from Coronavirus.”

Sample

An overall sample size of 1,536 participants was calculated based on a population of 6 million people, a 95% confidence level, and a $\pm 2.5\%$ sampling error. The study adopted a proportional random sampling technique based on all possible mobile phone numbers in Lebanon. First, we acquired all possible number

ranges from the Ministry of Telecommunication. Second, we developed a sampling frame based on the groups of numbers and calculated the proportion for each group. Then, a proportional random sample of numbers was selected from each group of phone numbers. Eight trained researchers contacted their designated list of phone numbers. Numbers that did not respond after five calls and invalid numbers were replaced up to two times by adding +1 to the original number.

For those who answered, researchers read the IRB-approved (LAU.SAS.JM1.20/Mar/2020) consent form and ensured they are older than 18 before they conducted the survey with those who consented. Those who declined were not replaced in the sample. Some respondents who accepted to participate but did not complete more than 85% of the questionnaire were removed from the dataset. The final tally came to 792 responses with an overall response rate of 51.6%.

Statistical analysis

Data were described as number and percent for categorical variables, whereas the mean and standard deviation (\pm SD) were calculated for continuous variables. Media exposure to COVID-19 news via Television and social media was combined into four groups: those who had low exposure to both (Low/Low), those who had high exposure to both (High/High), those who had low exposure to Television and high exposure to social media (Low/High), and vice versa (High/Low). The association between Media exposure (4 groups) and other categorical variables was assessed using the Chi-square test (for sample sizes more than 30) or the Fisher test (for sample sizes less than 30), whereas ANOVA was used for the association with continuous variables. Moreover, a multivariate linear regression was carried out to test the direct effects of media exposure (TV/social media) on fear, perceived knowledge, and prevention behaviors. To test for mediation, Baron and Kenny (1986) three-step approach was used. Conditions to establish mediation suppose that the independent variable affects the mediator and the dependent variable, and the mediator affects the dependent variable. “If these conditions all hold in the predicted direction, then the effect of the independent variable on the dependent variable must be less” when the mediator is introduced into the equation. “Perfect mediation holds if the independent variable has no effect when the mediator is controlled” (Baron & Kenny, 1986, p. 1177). Results are presented as Betta (β) and their corresponding 95% confidence intervals (CI). P -value ≤ 0.05 indicated statistical significance.

Limitations

The following issues were noted during the implementation of the survey: 27.2% (418) refused to participate, 18.2% (279) of phone numbers were not valid or did not answer despite two replacements, and 3% (47) of respondents did not sufficiently complete the survey. Although participants came from all Lebanese governorates and their geographic distribution was largely proportional to the actual population distribution, three governorates were somewhat underrepresented: Baalbek/Hermel, Akkar, and Nabatieh, while Beirut was slightly overrepresented.

Like other survey-based research, our study suffered from the limitation of self-reported compliance, as well as social desirability bias when reporting about fear, especially among men. Our reliance on mobile phone surveys may have missed some respondents of a specific demographic, but this is not a major limitation given that mobile phone penetration in Lebanon is above 90% (Statista, 2017). Moreover, only 7% of participants reported receiving media literacy training. This small number dictated the use of Fisher's statistical test to establish association with media exposure and introduced the possibility of chance to our findings regarding media literacy. Finally, the study could have benefitted from a longitudinal approach to test the hypotheses over time, particularly after the Beirut explosion (August 4, 2020).

Results

Overall

Table 1 presents the overall characteristics of study participants and the comparison with media exposure (TV/social media). The sample included 56.1% (443) men and 43.9% (346) women.

The majority (63.0%) were older than 30, with 37.9% (291) having completed a university degree. Participants were asked if they had undergone any media literacy training. Only 7% answered yes. We found media exposure (TV/social media) to be significantly associated with age ($p = .1$) and education ($p = .002$).

Media exposure and prevention measures

Table 2 presents the comparison of outcomes with media exposure (TV/social media). Our results show a significantly higher prevention measure score for those exposed to high levels of Television and low levels of social media, and for those exposed to high levels of both Television and social media ($p = .02$). This was particularly supported for people younger than 30 and those with a university education. Therefore, hypothesis H1a was supported.

Media exposure and perceived knowledge

Moreover, the results show a significantly higher perceived knowledge score for those exposed to high levels of both

Table 1. Comparison of demographic characteristic with media exposure (TV/social media).

Media Exposure (TV/Social media)		Total N = 792	Low/Low N = 31	Low/High N = 83	High/Low N = 137	High/High N = 541	P-value
Gender	Men	443 (56.1)	20 (64.5)	51 (61.4)	74 (54.4)	298 (55.3)	0.54
	Women	346 (43.9)	11 (35.5)	32 (38.6)	62 (45.6)	241 (44.7)	
Age	≤30	288 (37.0)	12 (38.7)	34 (42.0)	33 (24.6)	209 (39.2)	0.01
	>30	491 (63.0)	19 (61.3)	47 (58.0)	101 (75.4)	324 (60.8)	
Education	<University	477 (62.1)	14 (46.7)	44 (55.0)	97 (75.8)	322 (60.8)	0.002
	University	291 (37.9)	16 (53.3)	36 (45.0)	31 (24.2)	208 (39.2)	
Media Literacy	No	736 (93.0)	30 (96.8)	74 (89.2)	128 (93.4)	504 (93.3)	0.44
	Yes	55 (7.0)	1 (3.2)	9 (10.8)	9 (6.6)	36 (6.7)	

Table 2. Comparison of outcomes with media exposure (TV/social media).

Media Exposure (TV/Social media)		Low/Low N = 31	Low/High N = 83	High/Low N = 137	High/High N = 541	P-value
Prevention measures (score)		86.38 ± 14.12	89.84 ± 11.24	92.09 ± 10.12	91.76 ± 10.73	0.02
Perceived knowledge (score)		62.37 ± 28.54	63.54 ± 24.60	61.70 ± 26.29	67.00 ± 26.50	0.01
Fear (score)		57.53 ± 23.51	60.21 ± 29.35	70.58 ± 26.84	72.11 ± 26.06	<0.0001
Men	Prevention measures	84.17 ± 14.34	88.44 ± 12.08	90.84 ± 10.97	90.73 ± 12.04	0.075
	Perceived knowledge	60.83 ± 31.19	64.96 ± 25.29	60.33 ± 23.80	65.71 ± 27.20	0.435
	Fear	53.33 ± 22.69	58.50 ± 27.24	70.60 ± 26.61	69.09 ± 26.34	0.004
Women	Prevention measures	90.40 ± 13.40	92.01 ± 9.56	93.46 ± 8.91	93.08 ± 8.66	0.685
	Perceived knowledge	65.15 ± 24.10	61.29 ± 23.72	63.33 ± 29.08	73.08 ± 25.12	0.010
	Fear	65.15 ± 24.10	62.90 ± 32.69	70.56 ± 27.34	75.87 ± 25.32	0.034
Age≤30	Prevention measures	84.72 ± 13.84	88.07 ± 13.75	92.09 ± 8.37	91.76 ± 10.00	0.041
	Perceived knowledge	56.94 ± 27.94	65.20 ± 22.24	59.09 ± 25.38	71.39 ± 26.12	0.019
	Fear	65.28 ± 20.67	61.76 ± 27.38	67.17 ± 30.19	72.60 ± 24.35	0.090
Age>30	Prevention measures	87.43 ± 14.56	91.18 ± 8.89	92.41 ± 9.65	91.62 ± 11.27	0.334
	Perceived knowledge	65.79 ± 29.12	62.32 ± 26.40	62.89 ± 26.40	67.55 ± 26.83	0.357
	Fear	52.63 ± 24.38	59.06 ± 30.97	71.43 ± 25.66	71.69 ± 26.99	0.001
<University	Prevention measures	90.08 ± 9.54	90.66 ± 12.26	92.55 ± 9.55	91.06 ± 12.10	0.668
	Perceived knowledge	52.38 ± 31.25	59.85 ± 26.00	60.42 ± 26.19	68.63 ± 27.05	0.005
	Fear	67.86 ± 24.86	63.64 ± 28.82	69.24 ± 27.57	72.15 ± 27.58	0.244
University	Prevention measures	85.42 ± 14.75	88.57 ± 9.90	92.11 ± 7.96	92.74 ± 8.23	0.002
	Perceived knowledge	70.83 ± 24.72	67.66 ± 22.49	65.05 ± 27.00	69.63 ± 25.91	0.790
	Fear	48.96 ± 19.69	56.19 ± 30.27	75.27 ± 25.04	72.20 ± 23.57	<0.0001
No Media Literacy	Prevention measures	86.48 ± 14.35	90.03 ± 11.71	91.71 ± 10.32	91.68 ± 10.85	0.06
	Perceived knowledge	61.11 ± 28.14	62.73 ± 24.94	61.47 ± 26.25	68.27 ± 26.88	0.03
	Fear	57.78 ± 23.87	61.57 ± 29.16	69.92 ± 27.22	72.48 ± 25.84	<0.0001
Media Literacy	Prevention measures	83.33	88.27 ± 6.48	97.53 ± 4.04	92.90 ± 9.16	0.08
	Perceived knowledge	100.00	70.83 ± 21.36	64.81 ± 28.19	78.70 ± 18.52	0.18
	Fear	50.00	47.92 ± 30.13	79.63 ± 20.03	68.52 ± 27.83	0.11

Television and social media ($p = .01$). This was particularly supported for women, people younger than 30, those with no university level education, and those with no media literacy training. Therefore, hypothesis H1b was supported.

Media exposure and fear

The data show a significantly higher fear score for those exposed to high levels of Television and low levels of social media, and for those exposed to high levels of both Television and social media ($p < .0001$). This was particularly supported for people older than 30, those with a university education, and those with no media literacy training. Therefore, hypothesis H1c was supported.

Interpersonal communication

Table 3 shows the comparison of outcomes with interpersonal communication (talking to people). Our results show no significant differences for the prevention measure score, the perceived knowledge score, or the fear score across the different levels of engagement in interpersonal communication about the COVID-19. Therefore, hypotheses H2a, H2b, and H2c were not supported.

Perceived knowledge and fear as mediators

Table 4 presents the results of multivariate linear regression analyses, which test the effect of media exposure on taking prevention measures, perceived knowledge, and fear. To test the mediating effect of perceived knowledge and fear on media exposure, we applied Baron and Kenny (1986) three-step

regression procedure. First, Model 3 ($\beta = 0.84$, 95% CI: $[-0.07, 1.75]$) shows that the independent variable (media exposure) affected the dependent variable (prevention measures) and was borderline significant ($p < .07$). Second, Model 1 ($\beta = 3.09$, 95% CI: $[0.84, 5.34]$) and Model 2 ($\beta = 4.66$, 95% CI: $[2.41, 6.91]$) show that the independent variable (media exposure) also affects the mediators (perceived knowledge and fear, respectively) and is statistically significant for both. Third, Model 4 shows that the mediator (perceived knowledge) continues to be significant and affects the dependent variable (prevention measures), while the contribution of the independent variable (media exposure) drops from ($\beta = 0.84$, 95% CI: $[-0.07, 1.75]$) to ($\beta = 0.73$, 95% CI: $[-0.18, 1.64]$) and becomes not significant. Therefore, hypothesis H3, was supported. Consistently, Model 5 shows that the mediator (fear) continues to be significant and affects the dependent variable (prevention measures), while the contribution of the independent variable (media exposure) drops from ($\beta = 0.84$, 95% CI: $[-0.07, 1.75]$) to ($\beta = 0.61$, 95% CI: $[-0.30, 1.53]$) and becomes not significant. Therefore, hypothesis H4 was supported.

When accounting for control variables, Table 4 shows that the prevention behavior of women is more likely to be affected by media exposure and the mediation of both perceived knowledge and fear. Additionally, the prevention behavior of people who have undergone media literacy training is more likely to be affected by media exposure and the mediation of perceived knowledge, although this may be due to chance given that very few people in the sample reported receiving media literacy training.

Discussion

This study examined media influence on people's health behavior, particularly compliance with prevention measures. It tested whether increased media exposure to COVID-19 news, as well as interpersonal communication about the disease, positively related to people's abidance by prevention measures,

Table 3. Interpersonal communication engagement and COVID-19.

Interpersonal Communication	Never/rarely N = 333	Sometimes/often N = 459	P-value
Prevention measures score	92.14 ± 10.13	90.90 ± 11.36	0.11
Perceived knowledge score	67.80 ± 26.63	66.34 ± 26.37	0.45
Fear score	69.28 ± 27.33	70.59 ± 26.34	0.50

Table 4. Linear regression analysis to test the direct effects of media exposure (TV/social media) on fear, perceived knowledge, and prevention behaviors. * P -value < 0.05, ** P -value < 0.0001, #borderline significant (p -value < 0.07).

Independent variables	Knowledge	Fear	Prevention behavior		
	Model 1 β [95% CI]	Model 2 β [95% CI]	Model 3 β [95% CI]	Model 4 β [95% CI]	Model 5 β [95% CI]
Main effects					
Media use	3.09 [0.84, 5.34]*	4.66 [2.41, 6.91]**	0.84 [-0.07, 1.75]#	0.73 [-0.18, 1.64]	0.61 [-0.30, 1.53]
Mediating effects					
Perceived Knowledge				0.04 [0.01, 0.07]*	
Fear					0.05 [0.03, 0.08]*
Control variables					
Gender	5.20 [1.42, 8.97]*	5.76 [1.98, 9.54]*	2.65 [1.13, 4.17]*	2.47 [0.95, 4.00]*	2.37 [0.85, 3.89]*
Age	-1.88 [-5.78, 2.03]	-0.85 [-4.75, 3.06]	0.59 [-0.99, 2.16]	0.64 [-0.93, 2.21]	0.63 [-0.93, 2.19]
Education	2.61 [-1.31, 6.53]	-1.28 [-5.20, 2.64]	0.41 [-1.17, 1.99]	0.33 [-1.25, 1.91]	0.47 [-1.10, 2.04]
Media literacy	8.59 [1.20, 15.98]*	-2.81 [-10.20, 4.59]	1.78 [-1.20, 4.76]	1.46 [-1.52, 4.44]	1.91 [-1.05, 4.88]

and whether perceived knowledge about COVID-19 and fear of the disease mediated this relationship.

We found that media exposure to COVID-19 news positively related to taking prevention measures, particularly for people younger than 30 and those with a university education. Media exposure also positively related to perceived knowledge about COVID-19, particularly for women, people younger than 30, those with no university education, and those with no media literacy training. And media exposure positively related to fear of COVID-19, particularly for people older than 30, those with a university education, and those with no media literacy training.

However, the study found no significant relationship between exposure to COVID-19 information through interpersonal communication and taking prevention measures, perceived knowledge about COVID-19, or fear of the disease. Further statistical analysis shows that only three subgroups registered different scores for prevention measures that were statistically significant: men ($p = .04$), people older than 30 ($p = .02$), and those with less than a university education ($p = .02$). However, in all three cases, higher exposure to interpersonal communication was associated with lower prevention scores, which contradicts the hypothesis.

Finally, we found that both perceived knowledge about COVID-19 and fear of the disease mediated the relationship between media exposure and taking prevention measures, particularly for women. Additionally, prevention behavior is more likely to be affected by perceived knowledge for people who have undergone media literacy training, although given the small sample of media literacy trained individuals, this latter finding should be taken cautiously, given the high probability of chance.

Our findings are consistent with previous studies that found that media play a major role in mitigating disease outbreaks (Allan, 2002) and persuading the public to follow prevention measures and to ultimately contain outbreaks (Reynolds & Quinn, 2008). These findings support Zhang et al.'s (2015) hypotheses that perceived knowledge and fear mediate the effect of media exposure to news about diseases, despite the different geographic and historical context of the study.

However, our study was not consistent with the literature when it comes to interpersonal communication. Research that established a significant role for interpersonal communication in helping achieve the goals of health campaigns has not been applied to pandemics previously nor to emerging diseases where the healthcare professional is not part of the interpersonal communication campaign – due to the high risk of infection. This means that most of the interpersonal communication about COVID-19 occurred without the contribution of knowledgeable healthcare experts, which may have led to mixed outcomes that depend on the level of health literacy of the individuals engaged in the discussion. Our data show that among certain groups (men, those older than 30, and those with less than a university education), interpersonal communication was negatively related to prevention measures. Future research on this issue should explore manners in which interpersonal communication campaigns can better be streamlined with legacy media and social media campaigns without the presence of healthcare professionals.

Nevertheless, our findings demonstrated that despite numerous economic and political obstacles that faced the Lebanese state, the consistent coverage of independent media and the coherent governmental strategic communication campaign played a crucial role in influencing people's behavior and in ultimately mitigating the pandemic (Melki et al., 2020b). When the pandemic hit Lebanon, almost half of its population found themselves living below the poverty line due to a sudden severe economic crisis. The widespread news of impending starvation, prevalent unemployment, refugee crisis, and political discontent, as well as mass demonstrations against corruption, gave way to pandemic mitigation efforts. Compared to some of the richest countries in the world, especially the US and the UK, which exhibited incoherent official messaging and contradictory media framing and politicization of the pandemic, Lebanon was able to keep its infection and death rates at bay for over six months – enough time to prepare its fragmented and under-resourced healthcare system (Khoury et al., 2020). Lebanon was able to keep the infection rates in the double-digits up until mid-July and mostly below 150/day up until August 4, when a massive explosion devastated Beirut. Subsequently, government communication broke down, media coverage shifted attention, and infection numbers surged. Much of this may be attributed to the country's understandable shift in attention to more pressing concerns about the casualties, the widespread internal displacement from damaged homes, and the civil unrest that has ensued. Nevertheless, the shift in media framing confirms the paramount role of coherent strategic communication and consistent media coverage in mitigating pandemics.

Furthermore, our findings demonstrated that despite the concern about the ubiquitous misinformation and disinformation spread through social media, media exposure and the mediating effect of perceived knowledge and fear remained relevant (Kluger, 2020). While our study is consistent with extant research that shows audiences relying more on legacy media in crises, especially Television (Holland et al., 2014; Melki & Kozman, 2019), the findings also demonstrate that a combination of high exposure to both legacy media and social media may be optimal for inducing compliance with prevention measures. It points to the advantage of excessively communicating about the disease, particularly through social media, to counter and overwhelm the false and harmful news posted, instead of focusing energy on blocking and filtering fake news. This supports a key recommendation from a recent Johns Hopkins pandemic simulation exercise: “developing the ability to flood media with fast, accurate, and consistent information” (Event 201, 2019). Future research should delve further into the phenomena of infodemics and their role in undermining pandemic mitigation efforts.

In addition, our findings show that the mediation of perceived knowledge and fear is more effective with women. This may explain numerous reports about higher levels of morbidity and mortality among men, which may be attributed to economic, cultural and lifestyle factors (Bwire, 2020; Jin et al., 2020). First, men remain globally the main breadwinners, despite decades of women's advancement in the workplace. This makes it more difficult for men to stay at home. Second, in most cultures, men are socialized to suppress feelings,

especially fear, and sustain a tough and stoic demeanor. Third, partly due to this machismo factor, men are more likely to engage in unhealthy behaviors that put them in high risk categories. Future research should examine communication strategies that more effectively influence men's health behavior.

Despite the high probability of chance given the small sample of media literacy trained participants, our findings show that media literacy may play an important role in boosting confidence in individuals' perceived knowledge. Media literacy is an educational movement that aims to develop people's critical skills about the media consumption and production. It empowers them with digital competencies and social media skills (De Abreu et al., 2017). Studies have demonstrated that media literacy are effective in various healthcare interventions, particularly when used for a long time, for instance, in school and university curricula (Jeong et al., 2012; Watson & Vaughn, 2006). Media literacy often trains on evaluating the credibility of online content, managing information overload, and verifying information in various media. This invariably develops a strong sense of self-efficacy, which may explain the higher levels of perceived knowledge. Generalizing media literacy education in schools and universities, in addition to integrating health literacy modules, could help prepare whole societies to face future pandemics effectively. However, a more robust sample size is needed to confirm this finding, which should be taken with caution and treated as an exploratory departure point for future research.

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ORCID

Jad Melki  <http://orcid.org/0000-0003-4248-1597>
 Hani Tamim  <http://orcid.org/0000-0002-2019-4362>
 Dima Hadid  <http://orcid.org/0000-0001-7610-2984>
 Sally Farhat  <http://orcid.org/0000-0002-0840-1381>
 Maha Makki  <http://orcid.org/0000-0003-4559-0457>
 Lara Ghandour  <http://orcid.org/0000-0002-6630-4635>
 Eveline Hitti  <http://orcid.org/0000-0001-9619-6092>

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