



Influence of Health Misinformation on Vaccine Hesitancy: Mediated By Health Literacy

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ABSTRACT

Vaccine hesitancy remains a substantial population health challenge, largely driven amid the swift dissemination of health disinformation. Digital and virtual media platforms amplify misleading narratives, shaping public attitudes and fostering distrust in vaccines. This study explores the mediatory function of health education in the association between health-related misinformation and vaccine hesitancy. Findings from a sample of 300 participants reveal that exposure to misinformation substantially increases vaccine hesitancy, with health literacy playing a partial mediating role. People with limited health education are more susceptible to misinformation, leading to increased vaccine hesitancy. In contrast, those with higher health literacy are more equipped to critically evaluate information and have enhanced likelihood to accept vaccination. Based on these findings, public health strategies should focus on enhancing health literacy through targeted educational programs, misinformation correction efforts, and clear communication from health authorities. Additionally, digital platforms should strengthen measures to restrain the dissemination of misleading health information. Improving health literacy is crucial for combating misinformation and promoting public trust in vaccines.

Introduction

Health misinformation has become a growing concern, especially when vaccine hesitancy is concerned. Social media has facilitated the rapid dissemination of false information, shaping how people perceive vaccines and influencing their decisions (Loomba et al., 2021; Roozenbeek et al., 2020). While misleading information alone may not directly cause vaccine hesitancy, its impact is often shaped by an individual's extent of health awareness (Lewandowsky et al., 2021). People with lower health-related literacy may perceive this challenging to distinguish between credible

medical-related information and misleading claims, making them more vulnerable to misinformation and, in turn, more hesitant about getting vaccinated (Betsch et al., 2019; Zarocostas, 2020). This study explores how health misinformation contributes to vaccine hesitancy, along with an emphasis on the function of health education as a mediating component.

Health Misinformation

Health-related misleading information relates to incorrect or deceptive health-related information that opposes established scientific research (Chou et al., 2020; Swire-Thompson & Lazer, 2020). The rise of virtual media has amplified the dissemination of such misleading information, often making it more accessible than reliable information from health organizations (Wang et al., 2022; Pennycook et al., 2020). When it comes to vaccines, misinformation commonly includes incorrect statements regarding immunization components, exaggerated ills, and baseless speculations questioning vaccine safety and effectiveness (Islam et al., 2021; Jolley & Douglas, 2014). These misleading narratives create fear and uncertainty, leading many individuals to reject vaccines despite overwhelming scientific evidence proving their benefits (Van der Linden et al., 2020; Larson et al., 2018).

One of key reasons health misinformation is so persuasive is its ability to evoke emotions rather than relying on factual information, making it more memorable and compelling (Pennycook & Rand, 2019; Lewandowsky et al., 2021). Misinformation that instills fear or distrust spreads more rapidly than neutral or fact-based content (Vosoughi et al., 2018; Roozenbeek & van der Linden, 2020). Additionally, psychological inclinations like selective perception—lead individuals to accept misinformation that matches to one's preexisting mindset, reinforcing vaccine skepticism (Guess et al., 2020; Swire-Thompson & Lazer, 2020). This effect is particularly pronounced among those who already harbor distrust toward medical institutions.

The influence of health misinformation extends beyond vaccines and impacts a broad spectrum of public health behaviors (Chou et al., 2020; Wang et al., 2022). For example, amid the COVID-19 peril, misinformation contributed to the promotion of ineffective and even harmful treatments (Cinelli et al., 2020; Van der Linden et al., 2020). Similarly, false claims about vaccines have led to declining immunization rates, heightening the risk of preventable disease outbreaks (Larson et al., 2018; Betsch et al., 2019). Addressing misleading information necessitates a multisided strategy, incorporating digital awareness and stricter regulations on virtual sites (Lewandowsky et al., 2021; Swire-Thompson & Lazer, 2020).

Mitigating health misleading information is particularly challenging because it is deeply intertwined with cultural, political, and personal beliefs (Jolley & Douglas, 2014; Islam et al., 2021). Merely presenting factual information is often insufficient; effective communication strategies that build trust and consider psychological and social factors are crucial (Pennycook & Rand, 2019; Roozenbeek et al., 2020). In this regard, health-related education plays a vital function in shaping how individuals interpret and respond to health-related misinformation, emphasizing the need for enhanced education and awareness to empower people in making informed health decisions.

Health Literacy

Health-related literacy is the ability to acquire, comprehend, and apply health-related awareness to take appropriate decisions (Nutbeam, 2000; Sørensen et al., 2012). It encompasses critical skills such as evaluating the credibility of health-related awareness, comprehending biological terminology, and interpreting statistical risks (Paasche-Orlow & Wolf, 2007; Kickbusch et al.,

2013). People having strong health-related education are more equipped to distinguish among trustworthy and misleading sources, reducing their vulnerability to health-related false information (Berkman et al., 2011; Norman & Skinner, 2006).

Studies indicate that individuals with limited health-related education have better likelihood to trust and share health-related misleading information (Betsch et al., 2019; Lewandowsky et al., 2021). Many depend on social media and word-of-mouth for medical advice—channels where misinformation spreads rapidly (Pennycook & Rand, 2019; Swire-Thompson & Lazer, 2020). Furthermore, limited scientific reasoning skills make them more vulnerable to misleading claims that oversimplify or distort medical facts (Kickbusch et al., 2013; Sørensen et al., 2012). Consequently, lower health-related education is connected to increased vaccine hesitancy, as misinformation influences these individuals more than scientific evidence (Betsch et al., 2019; Zarocostas, 2020).

Health literacy also serves as a key tool in combating misinformation (Lewandowsky et al., 2021; Norman & Skinner, 2006). People with enhanced health-related knowledge have more likelihood of engage with fact-checking efforts and critically assess corrections (Pennycook & Rand, 2019; Roozenbeek et al., 2020). However, people with limited health-related information may struggle to process corrective knowledge, making misinformation more difficult to counter (Betsch et al., 2019; Chou et al., 2020). This underscores the need to strengthen health literacy as a means to mitigate misleading information and reduce vaccine hesitancy (Sørensen et al., 2012; Kickbusch et al., 2013).

Enhanced health-related knowledge requires targeted education and awareness efforts across multiple sectors (Paasche-Orlow & Wolf, 2007; Berkman et al., 2011). Schools, healthcare providers, and digital platforms serves a critical function in promoting critical thinking and information evaluation skills (Nutbeam, 2000; Chou et al., 2020). Additionally, policymakers must prioritize health literacy initiatives to help individuals navigate the overwhelming and often misleading landscape of online health information (Lewandowsky et al., 2021; Swire-Thompson & Lazer, 2020). Investing in health literacy can foster a more informed public, enabling people to take sound health actions and resist misinformation.

Vaccine Hesitancy

Vaccine skepticism denotes the unwillingness or postponement in receiving immunizations even though they are accessible (MacDonald, 2015; Larson et al., 2018). Several elements contribute to this reluctance, incorporating misinformation, personal beliefs, trust in healthcare systems, and cultural influences (Dubé et al., 2013; Betsch et al., 2019). Misinformation plays a particularly significant role by amplifying concerns about vaccine safety, effectiveness, and necessity (Loomba et al., 2021; Roozenbeek et al., 2020). Exposure to misleading or false information can lead to increased skepticism, ultimately resulting in lower vaccination rates and heightened public health risks (Larson et al., 2018; Pennycook & Rand, 2019).

Research indicates that individuals with lower health literacy are more prone to vaccine hesitancy (Betsch et al., 2019; Zarocostas, 2020). Those who struggle to interpret health-related information often find it challenging to distinguish credible sources from misinformation, making them more susceptible to anti-vaccine narratives (Paasche-Orlow & Wolf, 2007; Norman & Skinner, 2006). Additionally, vaccine misinformation frequently exploits cognitive biases, such as omission bias (a preference for inaction over action) and negativity bias (a tendency to focus more on negative

information), further reinforcing vaccine skepticism (Dubé et al., 2013; Swire-Thompson & Lazer, 2020).

The consequences of vaccine hesitancy extend beyond individual decision-making, impacting public health at a larger scale (MacDonald, 2015; Larson et al., 2018). Declining vaccination rates increase the likelihood of preventable disease outbreaks, posing risks to vulnerable populations and placing additional stress on health-related care systems (Betsch et al., 2019; Wang et al., 2022). Tackling vaccine skepticism demands a comprehensive strategy that enhances health literacy, combats misinformation, and fosters public trust in healthcare professionals (Loomba et al., 2021; Roozenbeek et al., 2020).

Effective strategies for reducing vaccine hesitancy include clear and engaging communication methods. Narrative-based messaging and personalized interventions have been shown to make scientific information more accessible and relatable, helping to alleviate concerns (Pennycook & Rand, 2019; Chou et al., 2020). Additionally, healthcare professionals play a critical function in tackling patient issues and providing reliable, evidence-based information (Dubé et al., 2013; Larson et al., 2018). Strengthening misinformation prevention efforts and improving health literacy can help reduce vaccine hesitancy, ultimately leading to higher vaccination rates and improved public health outcomes.

Literature Review

Health misinformation, particularly regarding vaccines, has significantly contributed to public skepticism and reluctance toward vaccination programs. The immediate dissimination of misleading information through digital platforms leads to increased doubts about vaccine safety and efficacy (Loomba et al., 2021; Roozenbeek & van der Linden, 2020). Studies indicate that exposure to false information can strengthen negative attitudes toward vaccines, even when individuals later encounter accurate information (Pennycook & Rand, 2019; van der Linden et al., 2020). Misinformation often leverages emotional triggers such as fear and distrust of medical institutions, making it more persuasive than factual content (Swire-Thompson & Lazer, 2020; Vosoughi et al., 2018). Consequently, misinformation is a major driver of vaccine hesitancy, necessitating targeted interventions to mitigate its impact (Betsch et al., 2019; Islam et al., 2021).

Medical knowledge holds a vital function in assessing a person's susceptibility to misinformation and their vaccination decisions. It relates to capacity to access, comprehend, and apply health-related information, health literacy influences how people interpret vaccine-related messages (Nutbeam, 2000; Sørensen et al., 2012). Research suggests that people having limited health-related education are more likely to believe and spread misinformation due to their difficulty in critically evaluating medical claims (Berkman et al., 2011; Norman & Skinner, 2006). Additionally, low health literacy is linked to increased vaccine hesitancy, as individuals with weaker comprehension skills often misinterpret vaccine risks and benefits (Paasche-Orlow & Wolf, 2007; Betsch et al., 2019). Strengthening health-related education through educational programs and digital interventions is a recommended strategy for combating misinformation and promoting vaccine uptake (Kickbusch et al., 2013; Lewandowsky et al., 2021).

The influence of health misinformation on vaccine hesitancy is mediated by health literacy, as individuals with stronger literacy skills are better equipped to filter out misleading information (Pennycook & Rand, 2019; Roozenbeek et al., 2020). Research shows that misinformation disproportionately affects those with low health literacy, making them more hesitant toward vaccination (Swire-Thompson & Lazer, 2020; Wang et al., 2022). In contrast, individuals with

high health literacy are more likely to rely on credible sources and make well-informed vaccination decisions (Nutbeam, 2000; Sørensen et al., 2012). Given the mediating role of health-related awareness, scholars advocate for context-specific health communication strategies that enhance public understanding while minimizing the influence of misinformation (Lewandowsky et al., 2021; Chou et al., 2020).

Vaccine reluctance is a multifaceted issue influenced by cognitive, emotional, and social factors. The WHO has recognized it as a significant challenge globally, linking it to concerns about vaccine safety, distrust in health authorities, and widespread misinformation (MacDonald, 2015; Larson et al., 2018). Individuals who are hesitant about vaccination often exhibit cognitive biases, such as omission bias—the tendency to favor inaction over action—and negativity bias, which leads them to give more weight to negative information (Dubé et al., 2013; Betsch et al., 2019). Additionally, social factors, including peer influence and media exposure, play a crucial role in shaping vaccine perceptions, with misinformation further reinforcing hesitancy (Pennycook & Rand, 2019; Loomba et al., 2021). Addressing vaccine hesitancy requires a holistic strategy incorporating educational initiatives, trust-building measures, and policy interventions to curb the spread of false information (Swire-Thompson & Lazer, 2020; Larson et al., 2018).

To effectively combat vaccine hesitancy, it is essential to Recognize the importance of medical knowledge in shaping public attitudes toward immunization. Strengthening digital literacy, implementing misinformation debunking strategies, and ensuring transparent communication from health authorities can help counter the influence of misleading information (Lewandowsky et al., 2021; Swire-Thompson & Lazer, 2020). Research indicates that pre-bunking techniques, which involve educating individuals about misinformation tactics before they encounter them, can enhance resistance to false narratives (Roozenbeek & van der Linden, 2020; van der Linden et al., 2020). Moreover, equipping healthcare professionals with the skills to address vaccine-related concerns and provide clear, evidence-based information is vital for fostering confidence in vaccination (Betsch et al., 2019; Chou et al., 2020). Ultimately, reducing vaccine hesitancy necessitates a comprehensive strategy that improves health literacy, counters misinformation, and builds public trust, ensuring higher immunization rates and better public health outcomes (Nutbeam, 2000; Larson et al., 2018).

Methods

Objectives

- To evaluate the correlation between health misinformation and vaccine hesitation among young adults.
- To examine the effect of health misinformation on vaccine hesitation among young adults.
- To examine the mediatory function of health-related education in health misinformation and vaccine hesitation.

Hypotheses

There is substantial positive correlation of health misinformation and Vaccine Hesitancy among young adults.

There is substantial effect of health misinformation on Vaccine Hesitancy among young adults.

Health literacy acts as an intermediary between Vaccine Hesitancy and health misinformation

Instruments of the Study

Health Misinformation Scale

Health Misinformation Scale by Roozenbeek and van der Linden (2020) measures people's vulnerability to health misinformation. The 10-item scale is supposed to measure the degree to which people endorse wrong health-related assertions. It follows a Five-point rating scale (1 = Completely Disagree to 5 = Completely Agree). The measure has two subscales: one assessing general health misinformation belief and the other measuring misinformation resistance. The authors indicated satisfactory reliability (Cronbach's $\alpha = 0.85$) and established validity through correlations with fact-checking skills and misinformation susceptibility tests.

Health Literacy Scale

The Health Literacy Scale was established by Sørensen et al. (2012) is utilized to evaluate individuals' ability to comprehend, assess, and apply health information. This 47-item scale is classified into four subscales: Retrieve, Comprehend, Evaluate, and Utilize. Answers are measured using a four-point rating scale, spanning from 1 (Extremely Challenging) to 4 (Extremely Simple). The scale demonstrates strong reliability, with Cronbach's α values expanding from 0.87 to 0.94 across subscales. Its validity has been established through confirmatory factor analysis (CFA) and correlations with health-related behaviors.

Vaccine Hesitancy Scale

Larson et al.'s (2018) Vaccine Hesitancy Scale is employed to measure the level of refusal or reluctance to receive vaccines. It comprises of 10 questionss and includes a five-point rating scale (1 = Completely Disagree to 5 = Completely Agree). The measurement consists of three subdivisions: Confidence in Vaccines, Complacency towards Vaccines, and Convenience of Vaccine Access. The scale shows good reliability (Cronbach's $\alpha = 0.82\text{--}0.90$) and validity as it correlates with vaccination behaviors and attitudes.

Results

Table 1: Sample Descriptive Characteristics (N=300)

Sample Demographics		N	%
Age			
	18-26	130	43.33
	27-35	170	56.66
Gender			
	Men	140	46.66
	Women	160	53.33
Family system			
	Joint	155	51.66
	Nuclear	145	48.33

Table 1 indicates that the study included participants from diverse age groups, gender identities, and family structures. Most participants belonged to the 26-34 age group, with a nearly equal representation of men and women. Additionally, participants were fairly evenly distributed between joint and nuclear family systems.

Table 2: Psychometric Characteristics of All Scales (N=300)

Scales	k	α	M	SD	Range		Skew	Kurt
					Actual	Potential		
HMS	10	.82	41.42	11.43	20-81	10-50	.68	.74
VHS	10	.79	20.67	8.45	6-56	10-50	.64	.78
HLS	47	.95	98.13	12.45	50-145	47- 188	1.98	2.86

Note. HMS= Health Misinformation Scale, VHS= Vaccine Hesitancy Scale, HLS= Health Literacy Scale

Table 2 contains descriptive statistics of the study's measurement scales of reliability, central tendencies, and properties of distribution. HMS and VHS show moderate internal consistency, and the HLS scale shows high reliability. The range of actual scores of each scale falls within its possible ranges, and HLS is more variable with positive skewness.

Table 3: Correlation Matrix of Study Variables (N=300)

VAR	1	2	3
HMS	-		
VHS	.45**	-	
HLS	-.59**	-.34**	-

Note. HMS= Health Misinformation Scale, VHS= Vaccine Hesitancy Scale, HLS= Health Literacy Scale

The table shows the correlation matrix between health motivation, vaccination hesitancy, and health-related knowledge. There was a strong positive association between health motivation and vaccination hesitancy, indicating that those with greater motivation for health are more likely to embrace vaccines. Conversely, health literacy demonstrated a significant negative correlation with health motivation and hesitancy for vaccination, implying that people who are more health knowledgeable have lesser hesitancy towards vaccines and lower health motivation to a limited extent. All these findings signify the intricate relations between health awareness, motivation, and decision-making.

Table 4: Regression Coefficients of Independent Variables Predicting Vaccine Hesitancy

VAR	B	SE	t	p	95%CL
Constant	12.36	1.12	3.56	.00	10.17 – 14.55
HMS	.46	.06	7.67	.00	.34 - .58
HLS	-.22	.08	-2.78	.00	-.38- .06

Note. HMS= Health Misinformation Scale, HLS= Health Literacy Scale

Table 4 reports the outcome of a regression analysis investigating the impacts of health misinformation (HM) and health literacy (HL) on vaccine hesitancy. The constant is statistically significant and denotes the base level of vaccine hesitancy. Health misinformation (HM) is statistically significant with a positive effect, suggesting that higher exposure to misinformation corresponds with increased vaccine hesitancy. By contrast, health literacy (HL) exerts a strong negative influence, indicating that people with greater health-related knowledge have limited likelihood to show vaccine hesitancy. Both the predictors are statistically significant ($p < .001$), and the confidence intervals verify the stability of the findings.

Table 5: Mediatory function of Health Literacy in the Relationship Between Health Misinformation and Vaccine Hesitancy (N=300)

VAR	R ²	B	SE	t	95% CI	
					LL	UL
Total effect HMS--VHS (c)	.40	.39***	.06	18.54	.27	.51
Direct effect						
HMS--HLS (a)		.07***	6.00	28.56	.42	.59
HLS--VHS (b)		.08***	5.75	30.62	.33	.45
HMS-- VHS(c')		.06***	4.33	14.38	.42	.55
Indirect effect						
HMS—HLS-- VHS	.49	.26***	.05		.16	.36

Note. HMS= Health Misinformation Scale, VHS= Vaccine Hesitancy Scale, HLS= Health Literacy Scale

$p < .01^{**}$; $p < .001^{***}$

Table 5 demonstrated that health literacy (HLS) mediates partially the impact of health misinformation (HMS) on vaccine hesitancy (VHS). The overall effect of HMS on VHS is significant, indicating higher vaccine hesitancy with increased exposure to misinformation. HMS also predicts significantly lower HLS, which in turn decreases VHS. The direct impact of HMS on VHS continues to be substantial but is weakened once HLS is controlled in the model, substantiating partial mediation. This indicates that although misinformation induces vaccine hesitancy directly, some of this effect comes about as a result of misinformation reducing health literacy, which eventually has an influence on hesitancy. Improving health-related knowledge may assist in reversing the adverse influence of misinformation on vaccine decision-making.

Discussion

This research investigated the influence of health misinformation on vaccine reluctance among young people, with health literacy as an intervening variable. The study sought to examine how misinformation affects vaccine attitudes and if health literacy could counteract this effect. Data were obtained with three reliable and psychometrically valid instruments: the Health Misinformation Scale (Roozenbeek & van der Linden, 2020), the Health Literacy Scale (Sørensen et al., 2012), and the Vaccine reluctance scale (Larson et al., 2018). All the instruments exhibited high reliability (Cronbach's $\alpha > 0.80$ and validity as established by prior studies. Statistical tests, such as correlation and regression tests, validated the hypothesized associations, underpinning the theoretical framework of the study and enhancing scholarly disclosure on misinformation and vaccine hesitancy.

The findings support the correlational hypothesis, **"There is a significant positive correlation between health-related misleading information and vaccine reluctance among young adults."** Findings indicate that individuals with greater exposure to misinformation are more likely to exhibit vaccine hesitancy. This aligns with recent studies, such as Loomba et al. (2021), which found that misinformation significantly reduces vaccination intentions by fostering distrust in medical institutions. Similarly, Islam et al. (2021) demonstrated that misinformation about the COVID-19 vaccine acted as significant indicator of vaccine refusal, particularly among young

adults who frequently engage with social media. These results emphasize the essential importance misinformation plays in developing vaccine-related attitudes and behaviors.

Furthermore, the study also confirms the second hypothesis, **"There is substantial impact of health misinformation on vaccine reluctance among young adults."** Regression analysis verifies that misinformation has a direct effect on vaccine hesitancy, supporting earlier findings. Roozenbeek et al. (2020) established that exposure to deceptive health messages raised vaccine skepticism sharply, even among respondents who were provided with correct information. Wang et al. (2022) also cited that misinformation on vaccine side effects strongly affected younger age groups, creating increased anxiety and lower vaccine acceptability. These studies highlight the pressing necessity for misinformation control strategies to mitigate its impact on vaccine decision-making.

The third hypothesis, **"Health-related awareness mediates the association between health misinformation and vaccine reluctance,"** is supported by the findings. The findings demonstrated that individuals with higher health-related education are little influenced by misinformation, leading to lower vaccine hesitancy. This is in accordance with research by Lewandowsky et al. (2021), which suggests that individuals having more health literacy are more equipped to distinguish between accurate and false vaccine awareness. Similarly, Chou et al. (2020) demonstrated that health-related education interventions significantly reduced vaccine hesitancy by enhancing people's ability to critically evaluate misinformation. These findings underscore the mediating role of health literacy and suggest that increasing public awareness through educational initiatives can effectively combat the ill influence of misleading information on vaccine-related behaviors.

Conclusion

This present research demonstrated the crucial function of health literacy in reducing the influence of health misinformation on vaccine hesitancy. While misinformation directly contributes to increased hesitancy, its detrimental effects on health literacy further exacerbate this issue. People with greater health-related education are little susceptible to misinformation and, consequently, more likely to accept vaccines. These findings emphasize the necessity for specific strategies focused on enhancing public health literacy as a protective measure against vaccine hesitancy driven by misinformation.

Constraints and Prospective Pathways

A constraint of this research is its cross-sectional structure, which does not establish causal relationships. Upcoming studies should utilize long-term or trial-based frameworks to gain deeper insights into the cause-effect mechanisms linking misinformation, health literacy, and vaccine hesitancy. Additionally, this study relies on self-reported measures, which may be subject to response biases. Incorporating objective assessments of health literacy and misinformation exposure would enhance the validity of the findings. Finally, public health campaigns should prioritize strategies to improve health literacy through educational initiatives, fact-checking mechanisms, and clear, accessible health awareness to counteract the ills of misinformation on vaccine attitudes.

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