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The Influence of Social Media on Public Health Protection against the COVID-19 Pandemic through Public Health Awareness and Changes in Behavior: An Integrated Model

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Abstract

In the case of COVID-19, researchers have found a statistically significant improvement in public health protection against COVID-19 with social media platforms. Multiple studies suggest that evidence of social media's influence on health knowledge, behaviors, and outcomes indicates its potential benefits in meeting the needs of individuals and populations. Therefore, this study aims to investigate the influence of social media on public health protections against COVID-19 in terms of public health awareness and behavioral changes. It adopted a quantitative research design to identify the relationship and used questionnaires to

collect the data. Data was collected throughout Malaysia using convenience sampling. The results underscore the potential of social media as a valuable tool for disseminating crucial health information and promoting positive behavioral changes during public health crises like the COVID-19 pandemic.

Keywords: Social Media, Public Health Awareness, Behavior Change, Public Health Protection

Introduction

The global impact of COVID-19 has underscored the critical role of social media in influencing human behavior and shaping public health responses (Claeys & De Waele, 2022). As the pandemic has unfolded, social media platforms have served as essential channels for the dissemination of information, ranging from updates on infection rates and preventive measures to vaccination campaigns and public health guidelines. This pervasive presence of social media in our everyday lives has allowed for unprecedented reach and immediacy in communicating crucial health information to individuals and communities worldwide.

However, despite the evident importance of social media in public health communication, there remains a significant gap in our understanding of its effectiveness, particularly in the context of addressing pandemic diseases like COVID-19. Existing research, as highlighted by Korda et al. (2013), often focuses on specific interventions and approaches, leading to a fragmented understanding of the overall landscape. These interventions vary widely in their focus, target populations, theoretical foundations, mode of delivery, and usability, among other factors. Consequently, it becomes challenging to discern what strategies are most effective in leveraging social media to disseminate health information and drive behavioral change during public health crises.

Moreover, the rapidly evolving nature of the COVID-19 pandemic presents additional challenges in assessing the impact of social media campaigns. Factors such as changing public perceptions, evolving scientific knowledge, and the emergence of new variants can all influence the effectiveness of communication strategies over time. Therefore, there is a pressing need for comprehensive research that examines the dynamics of social media in the context of pandemic diseases, considering the multifaceted nature of both the platforms themselves and the public health challenges they seek to address.

By bridging this knowledge gap, researchers can contribute to the development of evidence-based strategies for leveraging social media effectively in future public health crises. This research is not only essential for improving our response to the current COVID-19 pandemic but also for enhancing preparedness and resilience against future infectious disease outbreaks. As public health continues to gain visibility and importance in the public consciousness, understanding how social media can be harnessed as a tool for disseminating

accurate information, fostering positive behavioral change, and promoting community resilience is paramount (Domnariu, 2021).

Literature Review

Social media platforms, such as YouTube and Facebook, have been instrumental in promoting public health during the COVID-19 pandemic by facilitating the dissemination of crucial information. Research by Al-dmour (2020) highlights their positive impact on raising awareness and encouraging behavioral changes. These platforms serve as vital conduits for health information during crises, as noted by Allington et al. (2021), providing rapid access to pandemic-related updates. Utilizing a combination of audio and visual formats in presenting risk information, as suggested by Sullivan et al. (2017) and Ismail et al. (2018), enhances comprehension, especially among individuals with limited literacy skills. This dual modality approach, combined with the increasing reliance on online health information, holds promise for effective COVID-19 communication. Social media not only allows for greater public involvement in content creation and sharing within digital networks but also fosters empowerment, thereby enhancing engagement in healthcare delivery and improving outcomes.

Therefore, social media platforms have attracted the interest and attention of researchers and practitioners in the health domain, who use them for different purposes. These include professional training and development of clinicians; formation of health networks and support groups; provision of funding for health institutions; facilitation of cooperation and coordination among health professionals; and monitoring of infectious diseases (Giustini et.al., 2018). However, the effectiveness of these platforms in improving health knowledge and promoting healthy behaviors across different cultures requires further investigation (Al-Dmour, 2020) therefore, the study developed an integrated conceptual model to guide its objectives, assuming that social media interventions within health promotion programs would enhance public protection and prevention against COVID-19 by fostering interaction between public awareness and behavior changes. These key constructs were primarily derived from theoretical frameworks adopted from Al-Dmour et al. (2020). The main focus of the study was on the independent variables represented by different social media platforms. The study aimed to explore how these independent variables influenced the dependent variable, public protection against COVID-19, through mediating factors such as public awareness and behavioral changes. The expected relationships among these constructs are depicted in the accompanying Figure 1.

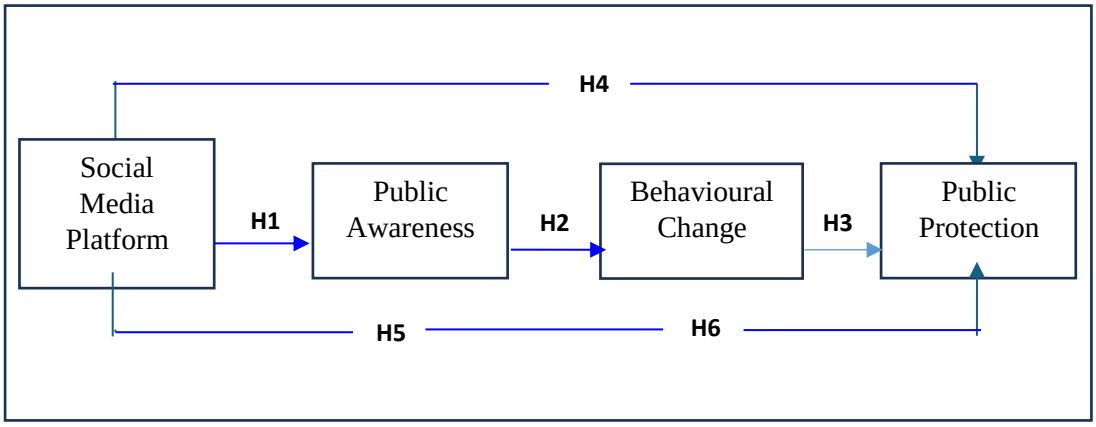

Figure 1. Study Model (Adopted from Al-Dmour et al. (2020))

Based upon the above framework, the following hypotheses were formulated concerning the role of social media campaigns in increasing public awareness of COVID-19 as a pandemic disease in Malaysia:

Hypothesis 1 (H1): The use of social media platforms is significantly increasing public health awareness.

Hypothesis 2 (H2): Public health awareness is significantly contributing to public health behavioral change.

Hypothesis 3 (H3): Public health behavioral change is significantly increasing public health protection.

Hypothesis 4 (H4): The use of social media platforms is significantly increasing public health protection.

Hypothesis 5 (H5): Public health awareness is significantly mediating the relationship between social media platforms and public health protection.

Hypothesis 6 (H6): Public health behavioral change is significantly mediating the relationship between the use of social media platforms and public health protection.

Methodology

This study adopts a deductive approach, formulating hypotheses based on the model adopted from Al-Dmour et al. (2020). The unit of analysis comprises individuals with experience in using social media platforms in Malaysia. Data collection spanned three months from October to December 2023, employing an online questionnaire administered through the Google Form platform. Filter questions were strategically designed to focus on our specific target audience.

The content of the questionnaire (constructs and measures) was mainly selected and adopted from previous relevant studies using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

This study assesses the research model in two sequential steps: (1) evaluating model measurements and (2) assessing the structural model, as outlined by Astrachan et al. (2014). Validation is crucial to uphold empirical work standards for measurement and structural models. Given the study's objective of predicting significant target constructions or identifying key "driver" constructs, the Partial Least Squares Structural Equation Modelling (PLS-SEM) approach is employed, as recommended by Hair et al. (2011). This method allows researchers to visually analyze the relationships that emerge between variables.

Results

Demography Analysis

Table 1. Respondent Profile

	Frequency (n) = 135	%
Gender		
Male	67	50
Female	68	50
Age		
18 - 27	73	54
28 - 37	29	21
38 - 47	28	21
48 - 57	3	2
58 and above	2	1
Race		
Malay	339	94
Chinese	90	1
Indian	14	1
Others	60	4
Profession		
Entrepreneur	11	8
Student	55	41
Retiree	1	1
Government servant	20	15
Private sector	39	29
Housewife	5	4
Others	4	3
Education		
SPM/STPM	28	21
Diploma/Bahelor's degree	89	66
Masters/PhD	15	11
Others	3	2
Living Area		
City	82	61
Countryside	53	39
Income		
Below RM4000	102	76
RM4000 – RM10,000	30	22
RM10,000 and above	3	2

The gender distribution of the respondents in this demographic analysis is balanced, with 50% identifying as male and 50% as female. In terms of age, the majority (54%) fall within the 18 to 27-year-old range, followed by those aged 28 to 37 years and 38 to 47 years (21%

each). A smaller proportion of respondents are aged 48 to 57 years (3%), and only 2% are over 58 years old.

Regarding the subject of race, most respondents (97%) are Malays and only 1% each identify as Chinese and Indian, whereas 4% identified as others.

Forty-one percent of respondents are students, followed by 29% working in the private sector and 15% employed in the government sector. These three groups represent the majority of the respondents' professions. In terms of education, 66% have obtained a diploma or bachelor's degree, 21% have completed SPM/STPM, and 11% hold a master's degree or PhD. Regarding income, 76% of respondents belong to the B40 group, 22% fall into the M40 group, and 2% are in the T20 group. Additionally, most respondents live in urban areas rather than rural areas.

Measurement Model Assessment

Internal Consistency Reliability

Cronbach's Alpha values for each construct are greater than 0.7, which means that the measurement model has a satisfactory level of internal consistency reliability. However, each construct's rho A coefficient value exceeds 0.7 (Dijkstra & Henseler, 2015), each composite reliability (CR) construct exceeds the tolerance value of 0.7, and values of 0.8 or 0.9 in the later phases are preferred (Malkewitz et al., 2023). (Dijkstra & Henseler, 2015; Hennington et al., 2009). As indicated in Table 2, the study's constructs' rho A, Cronbach's Alpha, and CR are all higher than the suggested threshold value. Consequently, the scores show that the items that were used to represent the constructs are trustworthy and internally consistent.

Indicator Reliability

This study adopts Chin's suggestion that factor loadings be greater than 0.7. (1998). Except for SMP3, PAW3, BEC3, which were eliminated owing to low loading, Table 2 displays every item that received a loading value of greater than 0.7 (optimal value).

Table 2. Internal Consistency Reliability

	Items	Loadings	Cronbach's Alpha	rho_A	CR	AVE
Social Media Platform	SMP1	0.732	0.796	0.798	0.86	0.551
	SMP2	0.748				
	SMP4	0.797				
	SMP5	0.716				
	SMP6	0.715				
Public Awareness	PAW1	0.663	0.767	0.769	0.843	0.519
	PAW2	0.746				
	PAW4	0.739				
	PAW5	0.707				
	PAW6	0.743				
Behavioural Change	BEC1	0.77	0.787	0.792	0.855	0.542
	BEC2	0.755				
	BEC4	0.781				
	BEC5	0.64				
	BEC6	0.725				
Public Protection	PUP1	0.88	0.893	0.901	0.933	0.824
	PUP2	0.937				
	PUP3	0.905				

** SMP3, PAW3, BEC3, was deleted due to low loadings.

Convergent Validity

The value of the average variance extracted (AVE) is assessed to determine the model's convergent validity. The value of AVE should be 0.5 or greater, according to Ab Hamid et al. (2017), to attain this validity. According to Table 3, all the constructions met the required threshold value of 0.5, with values ranging from 0.519 to 0.824. These statistics demonstrate that the research measurement model has enough convergent validity.

Discriminant Validity

The Fornell and Larker (1981) criterion and the Heterotrait-Monotrait (HTMT) test were used to evaluate the model's discriminant validity. When all correlations between the measure and all other measures are smaller than the square root of the AVE and the indicators' loadings against their constructs are higher than loadings against other constructs, the model is said to have discriminant validity. When the HTMT value is less than 0.9, the model is said to have discriminant validity.

Table 4's bold elements reflect the AVE's square roots, whereas the regular values represent the inter-correlation value between constructs. All off-diagonal elements have values less than the square roots of AVE (bold on the diagonal), according to Table 3. As a result, the finding confirmed that Fornell and Larker's condition is satisfied.

The HTMT output from SmartPLS is shown in Table 3. The HTMT value for each construct in this investigation is less than 0.9, according to Gold et al., (2001) and Henseler et al., (2014). As a result, none of the constructs in this study have a problem with discriminant validity. Overall, the measurement model's reliability and validity tests were successful. All reliability and validity tests were successful, showing that the measurement model for this survey is suitable and valid for use in estimating model structural parameters.

Table 4. Discriminant Validity

Fornell Larker Criterion				
	PAW	BEC	PUP	SMP
PAW	0.72			
BEC	0.816	0.736		
PUP	0.389	0.525	0.908	
SMP	0.848	0.661	0.338	0.742
Heterotrait-Monotrait (HTMT)				
	PAW	BEC	PUP	SMP
PAW				
BEC	1.048			
PUP	0.472	0.62		
SMP	1.081	0.832	0.406	

*PAW = Public awareness; BEC = Behavioural change; PUP = Public protection; SMP = Social media platform

Structural Model

To measure the structural model, Hair et al. (2017) recommended examining R^2, beta coefficients, and the corresponding t-values. A bootstrapping procedure with 1,000 resamples was employed to calculate the t-values.

Path Coefficients

The term "path coefficient" is a particular diagram-based approach that was used to consider the relations between variables in a multivariate system.

Table 4. Result of the Structural Path Analysis

Hypothesis	Relationship	Std Beta	Std Error	t-value	P-value	Decision	R^2
H1	SMP → PAW	0.847	0.031	27.117**	0.000	Supported	0.718
H2	PAW → BEC	0.816	0.053	15.286**	0.000	Supported	0.669
H3	BEC → PUP	0.534	0.176	3.04**	0.002	Supported	0.283
H4	SMP → PUP	-0.013	0.174	0.075	0.940	No	

PAW = Public awareness; BEC = Behavioural change; PUP = Public protection; SMP = Social media platform. * = P < 0.05, ** = <0.01

As stated by Hair et al. (2017), the path coefficients must surpass 0.100 to account for a particular impact within the model and be significant at least at the 0.05 level of significance. About Table 5, social media platforms ($\beta = 0.8470$, $p < 0.01$) positively related to public awareness by explaining 71.8% of the variance in public awareness. Public awareness ($\beta = 0.816$, $p < 0.01$) positively related to behavioral change by explaining 66.9% of the variance in behavioral change, and behavioral change ($\beta = 0.176$, $p < 0.01$) positively related to public protection by explaining 28.3% of the variance in public protection. While social media platform construct was seen to have no strong direct relationship with public protection.

Mediation Analysis

To examine the mediation effect of public awareness and behavioral change.

Table 5. Mediation Analysis

Hypothesis	Relationship	Std Beta	*t*-value	*P*	Sig
H5	SMP*PAW→PUP	-0.093	0.460	0.646	No
H6	SMP*BEC→PUP	0.408	2.483**	0.013	Yes

Table 5 presents the mediation analysis of public awareness and behavioral change in the relationship between social media platforms and the intention to donate. The results indicate that public awareness did not significantly act as a mediator in the hypothesized relationship. However, behavioral change significantly served as a mediator in this relationship. The table also shows that the p-value for H5 exceeds 0.05, while the p-value for H6 is less than 0.05. Therefore, the mediation hypothesis H5 was not supported, whereas mediation hypothesis H6 was supported.

Discussion

Social media platform and public awareness

The positive relationship between engagement with social media platforms and public awareness has significant implications, especially in the context of the COVID-19 pandemic. As supported by Muhtar et al. (2024), visually appealing content and engaging storytelling on social media are effective in capturing attention and fostering user engagement, which in turn enhances public health awareness. During the pandemic, social media served as a crucial channel for disseminating vital information about the virus, including preventive measures, vaccination campaigns, and government guidelines. Increased social media engagement was linked to greater awareness of key COVID-19 information, such as mask-wearing, social distancing, and vaccination. Additionally, the rapid spread of information facilitated community support initiatives, volunteer efforts, and resource sharing.

Public awareness and behavioral change

The research findings reveal a statistically significant positive relationship between public awareness and behavioral change, as highlighted by Dogbe et al. (2022). Their study underscores the crucial role of government communication in raising awareness and influencing behavior, particularly evident during the COVID-19 pandemic. Increased public awareness is closely associated with a higher likelihood of individuals adopting behavioral changes in response to health crises. During the pandemic, public health campaigns that focused on preventive measures such as wearing masks, practicing social distancing, and getting vaccinated were pivotal in shaping public behavior. This positive correlation emphasizes the effectiveness of these awareness campaigns in driving behavioral change. Individuals who are well-informed about risks and recommended actions are more inclined to modify their behaviors accordingly.

Behavioral change and public protection

The research findings reveal a statistically significant positive relationship between behavioral change and public protection. During the COVID-19 pandemic, healthcare workers were instrumental in implementing crucial behavioral changes, notably through the adoption of enhanced personal protective equipment (PPE) protocols, as detailed by Guan et al. (2019). This demonstrates that individual modifications in behavior, such as adopting preventive measures and following health guidelines, lead to increased public protection. Specifically, behaviors like mask-wearing, hand hygiene, and social distancing have been essential in reducing virus transmission and safeguarding public health. The emphasis placed by governments and public health authorities on these behavioral interventions underscores their effectiveness in controlling the pandemic. This research supports the notion that when individuals adhere to recommended behaviors, they contribute significantly to collective efforts in managing public health crises, thereby highlighting the critical role of behavior change in enhancing public protection and health during emergencies.

Social media platforms and public protection

Social media platforms have demonstrated their effectiveness in disseminating information and influencing behavioral change, though their impact on public protection may be less direct. While some studies suggest that the role of social media in enhancing public protection is complex and indirect (Kancha n& Gaidhane, 2023), Al-dmour et al. (2020) found that social media significantly improves public health awareness and drives behavioral changes. The rapid spread of vital health information, engaging content, and community support facilitated by these platforms play a crucial role in encouraging behaviors such as mask-wearing and social distancing, which are essential for mitigating the spread of COVID-19. Despite potential limitations like misinformation and variable engagement, social media's ability to rapidly inform and motivate individuals underscores its importance in supporting public health efforts and enhancing public protection during crises.

Mediating effect of public awareness and behavioral change

The research findings indicate that while public awareness does not significantly mediate the relationship between social media engagement and public protection, behavioral change does play a significant mediating role. This contrasts with the findings of Al-dmour et al. (2020), which emphasize that public awareness, influenced by social media, directly contributes to improved public protection. According to Al-dmour et al., social media's role in raising awareness is pivotal for fostering behaviors that enhance public health outcomes. In their study, increased awareness through social media was seen as a direct pathway to better public protection. In contrast, the current research suggests that although social media engagement may increase public awareness, this awareness alone does not directly translate into improved public protection. Instead, it is the resulting behavioral changes such as adopting preventive measures and following health guidelines that play a crucial role in mediating the relationship between social media engagement and public protection. This finding highlights a more nuanced understanding: while awareness is important, it is the actual change in behavior that significantly impacts public health outcomes. This discrepancy underscores the need to focus not just on increasing awareness but also on encouraging tangible behavioral changIn conclusion, the study underscores the intricate dynamics between social media engagement, public awareness, and public protection, particularly during health crises like the COVID-19 pandemic. While social media platforms effectively raise public awareness through engaging content, this awareness alone does not directly enhance public protection. Instead, it is the resulting behavioral changes—such as adopting preventive measures and adhering to health guidelines—that play a crucial mediating role in translating awareness into improved public health outcomes.

Theoretically, this finding contributes to a deeper understanding of how social media influences public health. It challenges the assumption that increased awareness directly leads to better public protection, highlighting the necessity of examining behavioral change as a critical mediator. This perspective enriches existing models of health communication by

emphasizing the importance of behavioral outcomes in the public health impact of social media.

Practically, the study provides valuable insights for public health practitioners and policymakers. It suggests that while social media can be an effective tool for raising awareness, successful public health strategies must also focus on encouraging and facilitating behavioral changes. Campaigns and interventions should therefore not only aim to inform but also to motivate and support individuals in adopting protective behaviors.

The implications of these findings are significant: to enhance public health protection, it is essential to design strategies that bridge the gap between awareness and action. This involves creating compelling content that not only informs but also drives tangible behavioral changes. By addressing both awareness and behavior, public health initiatives can more effectively harness the power of social media to protect and promote community health. Distancing, has been vital in enhancing public protection and controlling the spread of the virus, as evidenced by Morales-Burton and Lopez-Ramirez (2023). In conclusion, the study underscores the intricate dynamics between social media engagement, public awareness, and public protection, particularly during health crises like the COVID-19 pandemic. While social media platforms effectively raise public awareness through engaging content, this awareness alone does not directly enhance public protection. Instead, it is the resulting behavioral changes—such as adopting preventive measures and adhering to health guidelines—that play a crucial mediating role in translating awareness into improved public health outcomes.

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Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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