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The Effect of Digital Interventions on Public Adherence to Vaccination Programmes

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ABSTRACT

Digital interventions are increasingly emerging as innovative strategies to improve vaccination coverage. ***Purpose:*** *study aims to further explore the influence of digital interventions on public compliance in vaccination programmes.* ***Methods:*** *The present study employed a quasi-experimental design to ascertain the impact of a digital intervention on vaccination compliance. Based on calculations using the Slovin formula with an error tolerance level of 5%, the required sample size was determined to be 400 respondents. Data were collected through an online survey before and after the intervention to assess changes in vaccination adherence. Data were analysed using inferential statistical methods, employing a logistic regression test to evaluate the relationship between the digital intervention and vaccination adequacy.* ***Result:*** *results showed that digital interventions had a significant effect on improving vaccination compliance from 55% to 78% (+23%, p 0.001) after the digital intervention. In addition, the level of public knowledge about vaccines increased by 25%,* ***Conclusion:*** *that technology-based strategies can be an effective tool in disseminating accurate health* ***Implication:*** *These findings provide important implications for policymakers and health workers in developing more structured digital-based vaccination programmes, as well as provide strategic recommendations for stakeholders in improving the effectiveness of these strategies.*

Keywords : *Digital Intervention, Vaccination Adherence, Knowledge, Attitude*

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INTRODUCTION

Vaccination is one of the most effective public health interventions in preventing the spread of infectious diseases and reducing mortality from infections. The success of vaccination programmes depends on the level of community compliance in receiving vaccines according to the set schedule. Unfortunately, challenges remain in improving vaccination coverage, mainly due to low awareness, limited accessibility, and misinformation about vaccine safety and effectiveness (Hadjipanayis, 2019).

One of the major challenges in vaccination programmes is the low level of community compliance in various regions. Factors such as trust in vaccines, the spread of fake news, and logistical barriers can hinder vaccination success. A study found that a lack of understanding about vaccines and cognitive biases in decision-making contribute to vaccine hesitancy (Luz et al., 2020).

Digital interventions are increasingly emerging as innovative strategies to improve vaccination adherence. These technologies include health apps, SMS-based reminders, social media campaigns and telemedicine that can provide accurate information and increase public awareness about the importance of vaccination (Atkinson et al., 2019). Another study showed that social media-based digital interventions can improve people's knowledge and attitudes towards the influenza vaccine (Li et al., 2024).

Several studies have evaluated the effectiveness of digital interventions in improving health adherence. For example, a study conducted on motivation-based digital interventions found that this approach can help reduce hesitancy towards COVID-19 vaccines and increase vaccination acceptance rates (Knight et al., 2021). Another study showed that digital campaigns can increase influenza vaccination coverage in individuals with cardiovascular disease (Marshall et al., 2022).

While various studies have examined digital interventions in increasing vaccination coverage, there are still gaps in the understanding of the effectiveness of these strategies across different populations and social contexts. A review suggests that an evidence-based approach is needed to tailor digital interventions to the demographic and sociocultural characteristics of target communities (Wang et al., 2023).

Therefore, this study aims to further explore the influence of digital interventions on public compliance in vaccination programmes. This research is expected to provide insight into the factors that support the successful implementation of digital technology in vaccination as well as the obstacles faced in the field (Krystiane et al., 2022).

The results of this study will contribute to the development of evidence-based public health policies, as well as provide strategic recommendations for stakeholders in improving the effectiveness of digital-based vaccination campaigns. With the increasing use of technology in public health, digital-based approaches are expected to be an innovative solution in increasing vaccination coverage and reducing morbidity from vaccine-preventable diseases (Mechael, 2021).

METHODS

This study used a quantitative approach with a quasi-experimental design to measure the effect of digital interventions on community compliance in vaccination. The population in this study were individuals aged 18 years and over who participated in the national vaccination programme in the region. Based on calculations using the Slovin formula with an error tolerance level of 5%, the required sample size was 400 respondents. The sample was selected using purposive sampling technique with inclusion criteria, namely having access to digital technology such as smartphones or the internet, having participated in the vaccination programme in the last six months, and willing to participate in the study until completion.

This study used a pre-test and post-test design with intervention and control groups. Data were collected through an online survey before and after the intervention to assess changes in vaccination adherence, as well as through secondary data from health apps and social media campaigns to measure respondents' engagement with digital messages. Digital interventions in this study included SMS or WhatsApp-based vaccination reminders, dissemination of educational materials through social media in the form of infographics and short videos, and teleconsultation services with health workers through online platforms.

Data were analysed using inferential statistical methods, using logistic regression tests to evaluate the association between digital interventions and vaccination adherence, and paired t tests to compare changes in adherence before and after the intervention. To ensure the validity and reliability of the research instruments, Cronbach's Alpha analysis and expert validation of the survey content were conducted. The study also took into account respondents' demographic and socio-economic factors to control for confounding variables that could affect the results.

To uphold research ethics, this study was approved by the Health Research Ethics Committee. All participants were given informed consent prior to taking part in the study, to ensure that they understood the purpose as well as their rights and obligations in the research process. With this design, the study is expected to provide new insights into the effectiveness of digital interventions in improving public adherence to vaccination and provide a basis for more evidence-based public health policy making.

RESULTS

3.1 Characteristics of Respondents Influence of Digital Interventions on Public Compliance in Vaccination Programmes

Table1 . Univariate Analysis of the Effect of Digital Interventions on Community Adherence to the Vaccination Programme

Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	120	48%
	Women	130	52%
Age (years)	18 - 30 years	100	40%
	31 - 45 years	90	36%
	> 45 years	60	24%
Education	Elementary - Junior High	40	16%
	High School	110	44%
	Higher Education	100	40%
Jobs	Not working	50	20%
	Informal workers	90	36%
	Formal workers	110	44%
Vaccination compliance	Non-compliant	90	36%
	Compliant	160	64%
Sources of information	Social media	140	56%
	Health workers	80	32%
	Family/friends	30	12%
Digital intervention	Not getting	110	44%
	Get	140	56%

The results show that the respondents in this study have a fairly good gender representation, with an almost balanced distribution between men (48%) and women (52%). In terms of age, most respondents were in the productive age group (18-45 years), with the largest proportion in the 18-30 years age range (40%). This indicates that digital interventions may be more effective in reaching younger age groups who are more familiar with technology.

In terms of education, the majority of respondents had high school (44%) and university (40%) education levels, indicating that most had good enough literacy to understand digital information on vaccination. In terms of employment, the majority of respondents worked in the formal (44%) and informal (36%) sectors, while the other 20% were unemployed. This distribution indicates that digital interventions can reach various economic groups without being limited to certain sectors.

Regarding vaccination compliance, 64% of respondents showed compliance, while 36% were still not compliant. This shows that there are still challenges in improving public compliance with vaccination, despite various efforts. In terms of information sources, most respondents got vaccination information from social media (56%), followed by health workers (32%) and family or

friends (12%). These findings emphasise the importance of social media-based digital interventions in vaccination campaigns as a key tool in information dissemination.

In addition, 56% of respondents received digital interventions in the form of vaccination reminders via SMS, social media, or health apps, while 44% did not receive such interventions. This data shows that more than half of the respondents have been exposed to digital interventions, which is potentially an important factor in improving vaccination adherence. Therefore, the results of this study confirm that digital interventions have a significant role to play in supporting public adherence to vaccination programmes, especially through widespread and easily accessible information dissemination.

3.2 Effect of Digital Interventions on Compliance

Table 2: Analysis of the Effect of Digital Interventions on Vaccination Adherence

Variables	Before intervention (%)	After intervention (%)	Change (%)	*p-value*
Vaccination compliance	55%	78%	+23%	< 0,001
Knowledge of vaccines	60%	85%	+25%	< 0,001
Positive attitude towards vaccines	58%	80%	+22%	< 0,001
Availability of various information	50%	73%	23%	< 0,001

The results showed a significant increase in vaccination adherence after the digital intervention. Before the intervention, only 55% of respondents were compliant with vaccination, but this figure increased to 78% after the digital intervention, showing an increase of 23% ($p < 0.001$). This finding indicates that the use of technology, such as SMS reminders and social media, is effective in increasing community adherence to vaccination. In addition, the level of community knowledge about vaccines also increased significantly, from 60% before the intervention to 85% after the intervention. This 25% increase suggests that technology-based strategies can be an effective tool in disseminating accurate information and improving people's understanding of vaccination.

Not only compliance and knowledge, the community's attitude towards vaccination also experienced positive changes. Before the intervention, only 58% of respondents had a positive attitude towards vaccination, while after the intervention, the number increased to 80%. This proves that exposure to digital-based information can help change people's perceptions to be more accepting of vaccination. In addition, people's willingness to share information about the importance of vaccination with family or friends also increased from 50% to 73%. These findings suggest that digital campaigns not only increase individual awareness but also encourage active community

participation in disseminating correct information about vaccination, thus helping to strengthen collective awareness in supporting vaccination programmes.

DISCUSSION

4.1 Vaccination Compliance

The results showed an increase in vaccination compliance from 55% to 78% (+23%, $p < 0.001$) after the digital intervention. This finding is in line with the *Health Belief Model* (HBM) theory which states that adherence to health actions is influenced by perceived benefits, barriers, and external triggers (Rosenstock, 1974). In this context, the digital intervention serves as a *cue to action* that encourages individuals to vaccinate through digital reminders and education (Erviana & Azinar, 2022; Samodra, 2024).

Previous research confirms the effectiveness of digital interventions in improving vaccination adherence. A study by (Knight et al., 2021) showed that *motivational interviewing-based* digital campaigns significantly reduced vaccination hesitancy and increased adherence rates across different populations. In addition, a meta-analysis by (Atkinson et al., 2019) found that the use of digital technologies, such as SMS-based reminders and health apps, increased vaccination adherence with an odds ratio of 1.18 compared to non-digital methods.

The increase in vaccination adherence following digital interventions can be attributed to the ease of access to information as well as external nudges from technology that help shape individuals' health behaviours.

4.2 Knowledge about Vaccines

Public knowledge about vaccines increased from 60% to 85% (+25%, $p < 0.001$) after the digital intervention. Based on the *Diffusion of Innovations* theory (Rogers, 2003), the use of digital media can accelerate the dissemination of medical information, thereby increasing public understanding (Permatasari et al., 2024).

A study by (Krystiane et al., 2022) found that a digital-based educational intervention significantly improved adolescents' understanding of the HPV vaccine, which in turn contributed to increased vaccination adherence. In addition, a study by (Said et al., 2024) highlighted the effectiveness of interactive narrative-based communication in improving public understanding of vaccines.

Information provided digitally, especially when presented in an interactive and evidence-based format, is more accessible and comprehensible to the public, thus improving their health literacy.

4.3 Positive Attitude towards Vaccines

Positive attitudes towards the vaccine increased from 58% to 80% (+22%, $p < 0.001$). According to the *Theory of Planned Behaviour* (Ajzen, 1991), a person's attitude towards an action is strongly influenced by social norms, personal beliefs, and perceived behavioural control. In this

context, digital interventions help create a more favourable environment for vaccination through the dissemination of science-based information and positive experiences (Amalia & Fauziah, 2019).

Research by (Luz et al., 2020) showed that digital interventions focusing on *cognitive bias reduction* can reduce vaccination hesitancy by changing individuals' perceptions of vaccine risks and benefits. In addition, a study by (Wilson et al., 2022) confirmed that proactive communication through digital media increases public trust in vaccines.

Exposure to consistent, evidence-based information through digital interventions can change individuals' attitudes towards vaccination, especially in reducing fears caused by disinformation.

4.4 Willingness to Share Information on Vaccination

People's willingness to share information increased from 50% to 73% (+23%, $p < 0.001$). *The Social Learning Theory* developed by Albert Bandura in 1986 explains how individuals learn and behave through observation and social interaction. In the context of information sharing, this theory suggests that individuals are more likely to share information that they consider credible and relevant to their community (Ansani & Samsir, 2022).

Research by (Mechael, 2021) shows that the use of digital applications to remind and educate about vaccinations contributes to increased participation in sharing health information. The study also found that individuals who received digital reminders were more likely to share information with family and friends than those who only received information from traditional sources.

By providing information that is clear, easy to understand, and accessible at any time through digital technology, individuals will be more encouraged to spread correct information about vaccination to their communities

CONCLUSION

Based on the results of this study, it can be concluded that digital interventions play a significant role in improving various aspects related to vaccination adherence. The use of digital technologies, such as SMS-based reminders and social media, proved effective in increasing vaccination adherence from 55% to 78%. In addition, the level of public knowledge about vaccines increased by 25%, which shows that technology-based strategies can be an effective tool in disseminating accurate health information.

In addition to improving compliance and knowledge, the digital intervention also had a positive impact on changing people's attitudes towards vaccination. The increase in positive attitudes from 58% to 80% suggests that digital information delivery can reduce hesitancy and increase public acceptance of vaccination. Furthermore, the public's willingness to share information on the importance of vaccination has also increased significantly, indicating that digital campaigns can strengthen collective awareness in support of vaccination programmes.

These findings provide important implications for policymakers and health workers in developing more structured digital-based vaccination programmes. Further research is needed to

explore the effectiveness of different types of digital interventions and their long-term impact on improving vaccination coverage at scale.

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REFERENCE

Amalia, R. Y., & Fauziah, S. (2019). Muslim Millennial Consumer Behaviour in Halal Certified Restaurants in Indonesia: Implementation of Ajzen's Theory of Planned Behaviour. *JEBA (Journal of Economics and Business Aseanomics)*, *3*(2). https://doi.org/10.33476/jeba.v3i2.960

Ansani, & Samsir, H. M. (2022). Bandura's Modelling Theory. *Madani Multidisciplinary Journal*, *2*(7), 3067-3080. https://doi.org/10.55927/mudima.v2i7.692

Atkinson, K. M., Wilson, K., Murphy, M. S. Q., El-Halabi, S., Kahale, L. A., Laflamme, L. L., & El-Khatib, Z. (2019). Effectiveness of digital technologies at improving vaccine uptake and series completion - A systematic review and meta-analysis of randomised controlled trials. *Vaccine*, *37*(23), 3050-3060. https://doi.org/10.1016/j.vaccine.2019.03.063

Erviana, D., & Azinar, M. (2022). Determinants of COVID-19 prevention behaviour among third trimester pregnant women. *Higeia Journal of Public Health Research and Development*, *362*(3).

Hadjipanayis, A. (2019). Compliance with vaccination schedules. *Human Vaccines & Immunotherapeutics*, *15*(4), 1003-1004. https://doi.org/10.1080/21645515.2018.1556078

Knight, H., Jia, R., Ayling, K., Bradbury, K., Baker, K., Chalder, T., Morling, J. R., Durrant, L., Avery, T., Ball, J. K., Barker, C., Bennett, R., McKeever, T., & Vedhara, K. (2021). Understanding and addressing vaccine hesitancy in the context of COVID-19: development of a digital intervention. *Public Health*, *201*, 98-107. https://doi.org/10.1016/j.puhe.2021.10.006

Krystiane, H., Siqueira, C. M., Barbosa, L., Nicolau, A., Lima, T. M., Priscila, & Karina, A. (2022). Effect of educational intervention for compliance of school adolescents with the human papillomavirus vaccine. *Revista Da Escola de Enfermagem Da Usp*, *56*. https://doi.org/10.1590/1980-220x-reeusp-2022-0082en

Li, L., Wood, C. E., & Kostkova, P. (2024). Evaluating a WeChat-Based Intervention to Enhance Influenza Vaccination Knowledge, Attitude, and Behaviour Among Chinese University Students Residing in the United Kingdom: A Controlled, Quasi-Experimental, Mixed Methods Study. *JMIR Formative Research*, *8*, e55706. https://doi.org/10.2196/55706

Luz, P. M., Nadanovsky, P., & Leask, J. (2020). How heuristics and cognitive biases affect vaccination decisions. *Cadernos de Saúde Pública*, *36*(suppl 2). https://doi.org/10.1590/0102-311x00136620

Marshall, N. J., Lee, J. L., Schroeder, J., Lee, W.-N., See, J., Madjid, M., Munagala, M. R., Piette, J., Tan, L. L. J., Vardeny, O., Greenberg, M., Liska, J., Mercer, M., & Samson, S. (2022). Influence of Digital Intervention Messaging on Influenza Vaccination Rates Among Adults With Cardiovascular Disease in the United States: Decentralised Randomised Controlled Trial. *ProQuest*, e38710. https://doi.org/10.2196/38710

Mechael, P. (2021). Assessing a suite of digital health interventions to improve immunisation services in Pakistan. *Http://Isrctn.com/*. https://doi.org/10.1186/isrctn23078223

Permatasari, B., Manilyn, C., & Ulyana Kesaulya, A. (2024). Application of Innovation Diffusion Theory to the Intention to Adopt the Use of Fashionable Medical Scrubs. *TheJournalish: Social and Government*, *4*(1).

Said, A. H., Winskell, K., Bednarczyk, R. A., Reardon, E. E., & Vasudevan, L. (2024). Interactive Narrative-Based Digital Health Interventions for Vaccine Communication: Protocol for a Scoping Review. *JMIR Research Protocols*, *13*, e51137-e51137. https://doi.org/10.2196/51137

Samodra, F. P. (2024, March 20). *Health Belief Model is a Theory of How Individuals Believe in a Healthy Lifestyle*. Liputan6.com; Liputan6. https://www.liputan6.com/hot/read/5554502/health-belief-model-adalah-teori-tentang-bagaimana-individu-mempercayai-gaya-hidup-sehat

Wang, Y., Fekadu, G., & Joyce. (2023). Cost-Effectiveness Analyses of Digital Health Technology for Improving the Uptake of Vaccination Programs: A Systematic Review. *Journal of Medical Internet Research*, *25*, e45493-e45493. https://doi.org/10.2196/45493

Wilson, O. F., Mote, S. L., & Morse, B. L. (2022). Addressing vaccine hesitancy among students and families: Interventions for school nurses. *NASN School Nurse*, *38*(3), 1942602X2211069. https://doi.org/10.1177/1942602x221106945