A SOCIAL MEDIA BASED ANTENATAL HEALTH PROMOTION SYSTEM FOR WOMEN IN THE LAO PDR

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Abstract

The Lao People's Democratic Republic (Lao PDR) continues to face the challenge of overcoming remarkably high maternal death. The maternal mortality rate (MMR) in Laos was reported at 185 per 100,000 live births, which was ranked 49th in the world and still behind Cambodia (160/100,000), Vietnam (43/100,000), Thailand (37/100,000), and China (29/100,000) (UNICEF, 2019). In the Lao PDR, it was found that inadequate maternal knowledge about antenatal care and birth complications was strongly associated with poorer maternal and infant health outcomes, especially among poor women from rural areas, low education, and ethnic minorities. Women who have better knowledge of antenatal care were more likely to recognize the complications associated with their pregnancy and seek medical attention. Therefore, it was critical to understand their health information needs. This research aimed to develop the social media-based antenatal health promotion system (SM-AHPS) based on women's health information needs during pregnancy and to evaluate its efficiency among prenatal women. The mixed research method was conducted by dividing the study into two parts (qualitative and quantitative). The samples, obtained through a purposive sampling technique, were forty first-time pregnant women for health information need analysis (qualitative part) and 110 pregnant

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women for knowledge assessment and SM-AHPS users' experience in quasi-experiment (quantitative part). The research instruments used were: (1) semi-structured interview on pregnant women's health information needs, (2) a structured questionnaire on antenatal care knowledge assessment, and (3) a semi-structured questionnaire on users' perceptions of using SM-AHPS. Results showed that SM-AHPS was an effective instructional tool for enhancing women's antenatal care knowledge (Pre-intervention: $\bar{x}$= 69.6, S.D.= 6.75, post-intervention $\bar{x}$ = 73.3, S.D. = 7.03) significantly at the level of .001. In addition, it was found that Perceived usefulness (PU), Perceived ease of use (PEOU), and Attitude toward usage (ATU) positively predicted the users' behavioral intention (BI) (F(3,106) = 50.494, p<.001), with R^2 = 0.588. Furthermore, it showed a significant effect on Users' satisfaction (US) by Behavioral intention (BI) (F(1,108) = 174.556, p<.001), with R^2 = 0.618. In summary, social media was a potential tool for health promotion.

Keywords: Antenatal care, social media, health promotion, TAM.

INTRODUCTION

The maternal and neonatal mortality rates in the Lao PDR were among the highest ranks in the region. These poor maternal and infant health outcomes were associated with low antenatal care attendance, leading to inadequate maternal knowledge and failure to detect complications during pre- and post-natal care. The evidence from many countries suggested that women who had better awareness of antenatal care were more likely to recognize the pregnancy-related complications and were more likely to seek medical attention on time (Estudillo, 2018). In contrast, pregnant women with inadequate antenatal care knowledge were more likely to fail to recognize important warning signs

leading to poor health outcomes. Thus, developing an effective health information delivery system was vital to enhancing women's antenatal care knowledge.

In the Lao PDR, most maternal deaths occurred among poor women with low education from rural areas and ethnic minorities (Estudillo, 2018). It was found that 72% of fatalities occurred postnatally, and almost 40% of these were due to postpartum hemorrhage (Fauveau, 1995). It was found that the high maternal mortality was attributed to several factors such as poor health literacy among women, especially those who live in rural areas, deficient health infrastructure, inadequate competency and quantity of health workers, financial barriers, demographic difficulties, and cultural practices (Scopaz et al., 2011). In addition, it was found that women with lower educational attainment were less frequently to access antenatal care services than those with higher education, and they were more likely to have birth complications. Hence, the critical interventions to overcome these challenges were better public health education and effective mass communication (Estudillo, 2018; Scopaz et al., 2011). Since social media like Facebook, YouTube, Tik Tok, etc. are widely used by the public, they could be a powerful and affordable instrument to deliver high impacted key health information to the targeted audiences. However, it is still limited literature on the impact of the social media-based health information platform from the users' perspective.

It was found that social media and mobile health applications were widely utilized in improving maternal health (Chan & Chen, 2019). Pregnant and postpartum women were increasingly dependent on social media as sources of health information for self-care and infant care (Guerra-Reyes et al., 2016; Lee & Moon, 2016). Systematic reviews showed that the use of social media was sufficient and suitable to support pregnancy care, including promoting a healthy lifestyle and providing health information in high-income countries (Chen et al., 2018; Overdijkink et al., 2018).

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The objectives of this research included: (1) To develop and implement the social media-based antenatal health promotion system (SM-AHPS) for women from the pregnant women's health information needs; (2) To evaluate its effectiveness on users' knowledge; (3) To investigate the effect of the SM-AHPS users' perceived usefulness and the perceived ease of use on their behavior intention; and (4) To evaluate the behavior intention influence on the users' satisfaction. This study would help to reaffirm if health education and mass communication need to be explored and integrated the social media into the national health policy and strategy.

This conceptual framework is modified from the Technology Acceptance Model (TAM) proposed by Fred D. Davis (Davis, 1985; Venkatesh & Davis, 2000). The TAM has been one of the leading models of technology, which suggested two primary factors i.e., perceived ease of use and perceived usefulness, were positively correlated with behavioral intention to adopt new technology, and behavioral intention was inspired by leading people to implement technology and was affected by a personal attitude on a technology. Figure 1 showed the conceptual framework of this study.
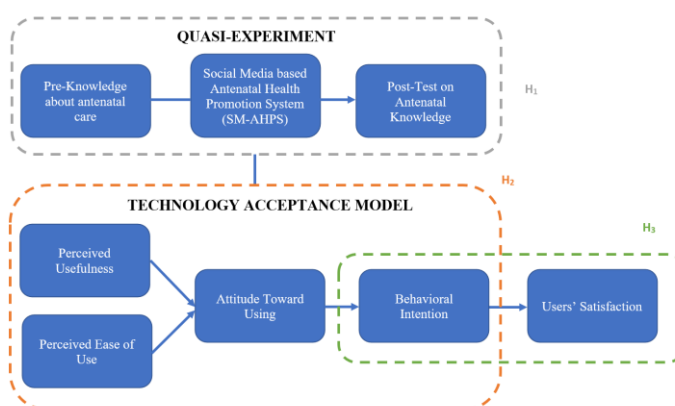

Figure 1 Conceptual Framework

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RESEARCH METHODOLOGY

Mixed method research was implemented in this study. The research process was divided into two phases. The first phase was qualitative research, whereas the needs analysis on antenatal care knowledge and planning & design of a new social media-based Antenatal Health Promotion System (SM-AHPS). The participants consist of forty first-time pregnant women and five obstetricians. The first group was forty first-time pregnant women recruited from the purposive sampling method with alteration in terms of age, education achievement, and gestational age. The inclusion criteria included women with a first pregnancy ($G_1P_0A_0L_0$), being over 18 years old, voluntary participation, and providing informed consent. The exclusion criteria involved hesitancy in joining at any time. The second group was five obstetricians working at the antenatal clinics at the Lao Medical Care clinics. They were consented to be interviewed to give their expert opinion on women's health information needs based on the health provider's perspective. Due to convenient access to participants, obstetric departments at the Lao Medical Care clinics in Vientiane were designated as research settings. Participants were enrolled over face-to-face discussions. The person-to-person or telephone interviews were then conducted. Respondent data were collected in face-to-face in-depth semi-structured interviews. Interviews were started by opened questions, "what kind of health information are you willing to receive during pregnancy? Please explain this?" Then, the participants' opened responses steered the discussion process. The results of the interviews were summarized into categories and sub-categories of topics. The most common interested sub-categories were selected and developed into the digital content, which were to be cooperated and launched into the social media-based antenatal health promotion system (SM-AHPS).

The second phase was quantitative research, whereas the quasi-experimental research was used to analyze the effectiveness of SM-AHPS.

Based on the research on the appropriate sample size for conducting regression analysis (Green, 1991), it was recommended that the following formula be used to calculate the sample size for an achieving a medium effect (R^2 = .07; β = .20), N≥104 + k, where k is the number of independent variables and N is the sample size. As there were three independent variables (k=3), hence, the minimum required sample size was 107 samples. The samples were selected by using purposive sampling from women attending antenatal care at the Lao Medical Care clinics. The participants consisted of 110 pregnant women who have used SM-AHPS.

Prior to access to the SM-AHPS, the participants were asked to take the pre-test to assess their baseline knowledge of antenatal care. After completing the SM-AHPS program, they are requested to take the post-test to measure their newly attained knowledge. The dependent variables were the pregnant women's knowledge comparing pre-intervention and post-intervention scores. A paired sample t-test was conducted to analyze if there is an improvement in the users' knowledge after the adoption of SM-AHPS.

In the final stage, the study attempted to identify the users' perception, behavioral intention, and their satisfaction with using SM-AHPS by applying the Technology Acceptance Model (TAM). The independent variables in this part were perceived usefulness (PU), perceived ease of use (PEOU), and attitude toward usage (ATU). The dependent variables in this part were behavioral intention (BI) and users' satisfaction (US). The self-reported survey adapted from the TAM model was conducted to examine technological innovation acceptance, behavior intention, and satisfaction with using SM-AHPS from users' points of view. The 5-Point Linkert scale was used to measure the variables with a value ranging from 1 to 5. Since the Linkert scale was an interval scale, the range between "strongly agree" (5, maximum) and "strongly disagree" (1, minimum) could be allocated into equally five descriptions. Consequently,

each description was equivalent to a range of 0.8. Hence, a score ranged 1.00-1.80, 1.81-2.60, 2.61-3.40, 3.41-4.20, and 4.21-5.00 could be described as "strongly disagree," "disagree," "neutral," "agree," and "strongly agree," respectively. Table 1 presented the mean value range for each description. Multiple linear regression and simple linear regression were applied to analyze the correlation among variables.

Table 1 Descriptions of the Mean Values

Mean Value Range	Description
1.00-1.80	Strongly Disagree (SD)
1.81-2.60	Disagree (D)
2.61-3.40	Neutral (N)
3.41-4.20	Agree (A)
4.21-5.00	Strongly Agree (SA)

The samples were selected by using purposive sampling from women attending antenatal care at the Lao Medical Care clinics. The study was conducted by following the Lao health ethical research guideline. Informed consents were received prior to initiating the interview and survey. The participants were voluntary to participate and to leave the study at any time if they chose to. The content validity was conducted using the index of item objective Congruence (IOC) for questionnaires and SM-AHPS by three experts in the field of Health Care team, Gynecologist and Obstetricians, and the Education and Technology team. The research instrument reliability was analyzed using Cronbach's Alpha Coefficient which the overall Cronbach's Alpha for the study was .948. The Statistical Package for the Social Sciences (SPSS) software was applied to analyze the data. The descriptive statistics, frequency, paired t-test, and simple and multiple linear regressions were implemented in this study.

RESULTS

In the health information needs analysis, it was found that data analysis indicated the extraction of eighty-one codes and nine sub-categories. Sub-categories include "nutrition in pregnancy," "complications in pregnancy," "common symptoms during pregnancy," "diagnostic tests in antenatal care," "fetal growth and development," "safe medication in pregnancy," "substance use (cigarette, alcohol, and illicit drug) during pregnancy," "supplements and vitamins in pregnancy," and "childbirth and preterm delivery."

Based on the content analysis of the health information needs, the most interested four sub-categories were (1) diagnostic tests in antenatal care, (2) common symptoms during pregnancy, (3) nutrition in pregnancy, and (4) complications in pregnancy. Therefore, these four sub-categories were further developed into the contents (Figures 2-3) and the pre-post assessment for the next step.
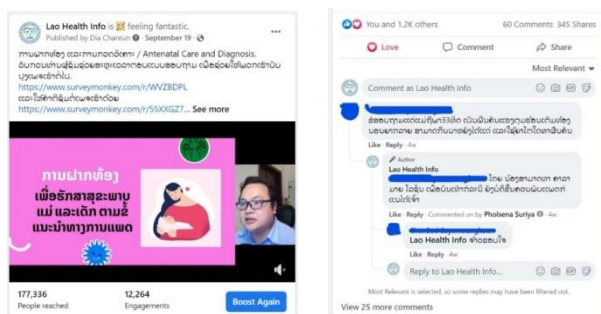

Figure 2 Developed video content launched on the social media.

Figure 3 Content performance and audience interaction

In the quasi-experiment, most of the respondents were from the age group of 25-29 years old (43.6%), followed by the 18-24 years group (38.2%), 30-34 years groups (13.6%), and over 35 years groups (4.5%). Most participants (90.9%) were from Lao Lum ethnic groups, and the remainder (9.1%) were from the other ethnic groups (Table 2-3).

Table 2 Descriptive Statistics of the Respondents' age

	$\overline{x}$	S.D.	Minimum	Maximum
Age	25.86	5.231	18	41

Table 3 Demographic Information of the Respondents' ethnicity

Items	Categories	Frequency	Percent (%)
Ethnicity	Lao Lum	100	90.7%
	Lao Theun	3	2.7%
	Lao Sung	7	6.4%

This research was to identify whether the SM-AHPS was effective in improving pregnant women's knowledge. A paired samples t-test was performed to compare the users' knowledge before and after the intervention of the SM-AHPS. The results showed that the post-intervention scores were higher than the pre-intervention (Pre-intervention: $\overline{x}$= 69.6, S.D.= 6.75, Post-intervention: $\overline{x}$= 73.3, S.D.= 7.03), t (109) = -9.765, $p<.001$ (two-tailed) as shown in Table 4 and Figure 4. The mean differences in pre-post test scores were equal to -3.73, with a 95% confidence interval ranging from -4.48 to -2.97 (Table 5). Thus, SM-AHPS was effective as the instructional tool to improve the women's antenatal care knowledge achievement.

Table 4 Mean and standard deviation of pre/post-intervention knowledge achievement

Variable	n	$\bar{x}$	SD	$\bar{d}$	$\dfrac{SD}{d}$	95% CI	t	df	p-value
Pre-intervention	110	69.6	6.75		12.47	68.29-70.84	108.155	109	<.001
Post-intervention	110	73.3	7.03	0.541	12.99	71.97-74.62	109.352	109	<.001

Figure 4 Effect of SM-AHPS on users' antenatal care knowledge

Table 5 Paired t-test for Mean Difference of Pre-Post intervention of knowledge achievements

	Mean Difference	S.D.	Sig	N
Pre-Post intervention	-3.73	4.003	.000	110

The respondents' perceived usefulness, perceived ease of use, attitude toward usage, their behavioral intention, and users' satisfaction with SM-AHPS were assessed by the questionnaire adapted from the Technology Acceptance Model (TAM). The 5-Point Linkert scale was used to measure the variables with

a value ranging from 1 to 5. The variables were grouped into the users' perceived usefulness (PU), the perceived ease of usage (PEOU), the attitude toward usage (ATU), the behavioral intention, and the users' satisfaction. The respondents generally have positive feedback, and these variables are summarized in Figures 5-9.
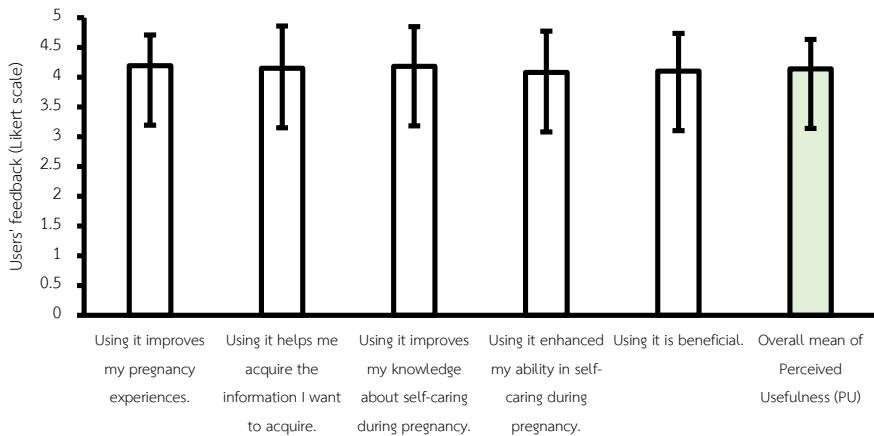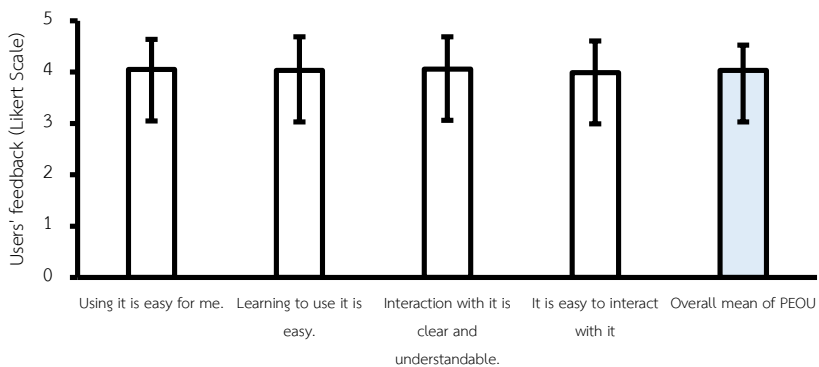

Figure 5 Users' Perceived Usefulness (PU)

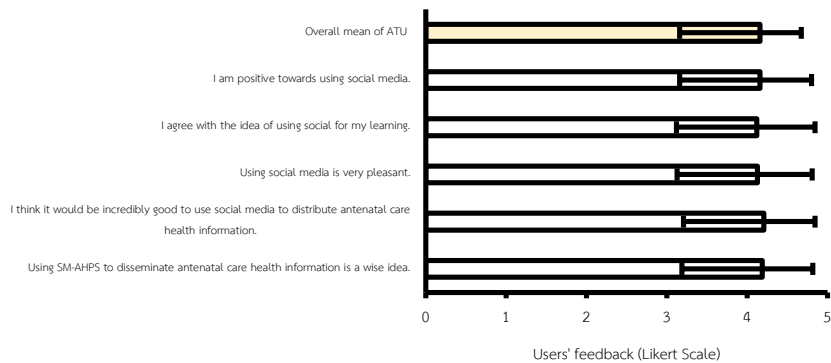**Figure 6** Users' Perceived Ease of Usage

Figure 7 Users' Attitude Toward Usage
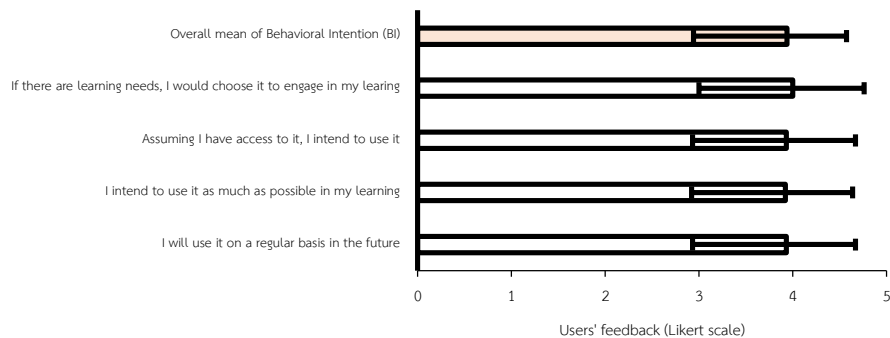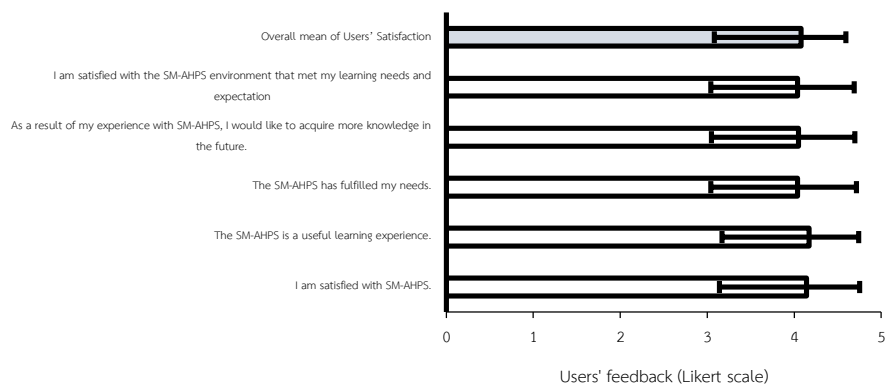

Figure 8 Users' behavioral intention

Figure 9 Users' satisfaction level

The results showed that samples had a good level of acceptance from Attitude Toward Usage (ATU) ($\overline{x}$=4.16, S.D.=.516), Perceived Usefulness (PU) ($\overline{x}$=4.14, S.D.=.494), Perceived Ease of Use (PEOU) ($\overline{x}$=4.03, S.D.=.495), and the level of Behavioral Intention (BI) ($\overline{x}$=3.94, S.D.=.633). Overall, the level of users' satisfaction (US) was shown to be good toward using SM-AHPS ($\overline{x}$ =4.09, S.D =.514), as shown in Table 6.

Table 6 Mean, standard deviation, and level of technology acceptance from users on SM-AHPS in each part (n=110)

Key Variables	Users' feedback on SM-AHPS		
	$\overline{x}$	S.D.	Level
Perceived Usefulness (PU)	4.14	.494	Agree
Perceived Ease of Use (PEOU)	4.03	.495	Agree
Attitude Toward Usage (ATU)	4.16	.516	Agree
Behavioral Intention (BI)	3.94	.633	Agree
Users' satisfaction (US)	4.09	.514	Agree

The study was conducted to determine if various forms of perception toward SM-AHPS usage affected an individual's likelihood of behavioral intention to respond with the acceptance of SM-AHPS. Multiple regression analysis was used. Results showed a significant effect on Behavioral intention (BI) (F(3,106) = 50.494, p<.001), with R^2 = 0.588, suggesting that 58.8% of the variation was predicted by the listed factors (Tables 7-9). The predicted BI score was equal to 0.377 + 0.112 (PU) + 0.119 (PEOU) + 0.102 (ATU), per one unit increase in each factor (Figure 10). This suggested that users who had positively perceived the usefulness of technology and perceived ease of use and had a positive attitude toward usage were more likely to have a positive behavioral intention to adopt the technology.

Table 7 Model Summary of Behavioral intention multiple regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.767[a]	.588	.577	.41216	.588	50.494	3	106	.000

a. Predictors: (Constant), ATU, PU, PEOU

b. Dependent Variable: BI

Table 8 ANOVA of Behavioral intention multiple regression analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	25.734	3	8.578	50.494	.000[b]
1	Residual	18.007	106	.170		
	Total	43.741	109			

a. Dependent Variable: BI

b. Predictors: (Constant), ATU, PU, PEOU

Table 9 Coefficients of Behavioral intention multiple regression analysis

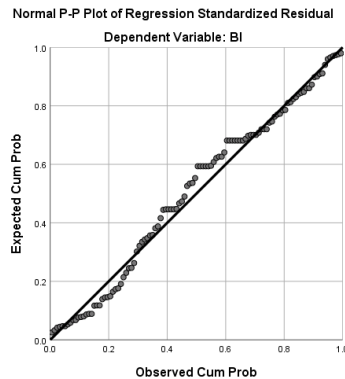| Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
	(Constant)	-.582	.377		-1.544	.126			
1	PU	.229	.112	.179	2.055	.042	.597	.196	.128
	PEOU	.295	.119	.231	2.485	.015	.647	.235	.155
	ATU	.572	.102	.466	5.614	.000	.713	.479	.350

a. Dependent Variable: BI

Figure 10 Behavioral intention (BI) Multiple regression analysis

The study was conducted to determine if behavioral intention toward using SM-AHPS affects individual users' satisfaction. A simple linear regression analysis was used. Results showed a significant effect on Users' satisfaction (US) ($F(1,108)$ = 174.556, $p<.001$), with R^2 = 0.618, suggesting that 61.8% of the variation was predicted by the listed factor. The predicted US score equals 0.193 + 0.048 (BI), per one unit increase in each factor. The result showed that Behavioral intention (BI) (β = .786, t=13.212, $p<.001$) positively predicted Users' satisfaction (US). This suggested that users with a positive behavioral intention to adopt technology were more likely to have positive satisfaction.

DISCUSSION

It was found that the health information needs among the first-time pregnant women in this study were (1) diagnostic tests in antenal care, (2) common symptoms during pregnancy, (3) nutrition in pregnancy, and (4) complications in pregnancy. Hence, the digital content was developed from these topics and launched on the social media platform.

It was found that the mean scores improvement of the knowledge of women using SM-AHPS were statistically significant (p<.001). This indicated that pregnant women who used SM-AHPS had better knowledge achievement. This

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finding was consistent with the results from previous studies that showed health promotion interventions using social media increased clients' understanding of their conditions (Akber et al., 2019; Bannor et al., 2017; Bugshan et al., 2014; Free et al., 2013; Honein-Abouhaidar et al., 2020; Yang et al., 2020). It was believed that the health education contents in the SM-AHPS were relevant to the pregnant women's interested topics and easily accessible through the widespread use of social media and internet technology without any additional cost. In addition, it was found that behavioral intention (BI) was positively associated with perceived usefulness (PU), perceived ease of use (PEOU), and attitude toward usage (ATU) on SM-AHPS ($p<.001$), which was supported by previous studies (Abd-Alrazaq et al., 2019; Chiu & Cho, 2020; Razmak & Bélanger, 2018; Wilkinson & Cole, 2018). So, women who perceived SM-AHPS as valuable and easy to use were more likely to use the instructional tool because it helped to remove physical barriers that usually obstruct access to healthcare support and resources. Moreover, it was found that user satisfaction (US) was positively associated with behavioral intention (BI) to use SM-AHPS ($p<.001$), consistent with the study conducted by (Lee et al., 2021). Thus, it was confirmed that user satisfaction was strongly related to users' behavioral intentions.

These findings have confirmed that social media allowed health professionals to create and share health information with their patients, and it was an effective tool to promote public health communication with broader reach, greater efficiency, and lower costs. It was found that the use of social media in health promotion has shown some success for effective health behavior change. Furthermore, this could potentially reduce the use of traditional communication channels such as television, radio, and printed media for health promotion. However, a number of issues associated with social media use like misinformation and user privacy protection, would be required to be addressed. Although social media-based health promotion would be welcome for those

who already use social media, the key challenge is among those with limited ability to use modern technology, such as the elderly and disabled people. Future research may be conducted on the impact of the long-term use of social media-based health promotion and to address the problems mentioned above. It is important to bring different experts from a health professional, education, mass communication, and even marketing to develop a social media-based health promotion platform that is responsive for general audiences and engages with specific population subgroups.

In summary, SM-AHPS played essential role in enhancing pregnant women's knowledge of antenatal care. In addition, it was indicated that users positively found that SM-AHPS as a helpful tool and easy to use. Hence, they have positive attitude toward the usage of SM-AHPS. So, they had a positive behavioral intention on SM-AHPS. Furthermore, it was found that users' perceived usefulness, perceived ease of use, and attitude toward usage were positive predictors of behavioral intention. Moreover, it was found that users were generally satisfied with SM-AHPS. Furthermore, it was indicated that user satisfaction was positively associated with behavioral intention. This research was the first to conduct media social media application in health promotion in Laos. This study provided insight into the Lao women's health information around antenatal care and birth. It also attempted to develop and launch a social media-based health promotion platform in the Lao language.

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