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ORIGINAL ARTICLE

Determinants of Maternal Health-Seeking Behaviour in the Digital Age: A Cross-Sectional Study in Selangor Malaysia

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ABSTRAK

Tingkah laku pencarian maklumat kesihatan kehamilan (MHSB) merujuk kepada usaha aktif wanita hamil untuk mendapatkan maklumat khusus bagi memastikan kesinambungan penjagaan, meningkatkan ketahanan terhadap risiko kesihatan serta mencegah komplikasi. Kemajuan dalam kesihatan digital (DH) serta peningkatan penggunaan media sosial (SM) sebagai sumber maklumat kesihatan semasa kehamilan berpotensi untuk memperbaiki MHSB dan akses kepada perkhidmatan kesihatan. Walau bagaimanapun, penyebaran maklumat yang tidak tepat boleh memberi kesan negatif terhadap kesihatan ibu dan janin. Kajian ini bertujuan untuk menentukan prevalen MHSB dalam kalangan wanita hamil serta hubungannya dengan penggunaan SM, DH dan sistem jagaan tele-primer kesihatan. Satu kajian keratan rentas melibatkan 385 wanita hamil yang dipilih secara rawak berstrata dari klinik kesihatan ibu dan anak terpilih di Selangor telah dijalankan dari Januari hingga Jun 2022 dengan menggunakan borang soal selidik jawab sendiri yang telah divalidasi. Dapatan kajian menunjukkan bahawa 50.9% wanita hamil mempunyai tahap MHSB yang baik, manakala selebihnya menunjukkan tahap penglibatan yang lebih rendah dalam pencarian maklumat kesihatan. Kajian ini juga mendapati terdapat hubungan yang signifikan antara umur ibu dan MHSB ($\chi^2(1) = 5.889$, $p = 0.015$) dan keperluan terhadap maklumat kesihatan ($\chi^2(1) = 33.0$, $p < 0.001$). Ujian regresi logistik binari multivariat menunjukkan bahawa setiap peningkatan satu unit dalam keperluan maklumat kesihatan dapat meningkatkan kemungkinan penglibatan dalam MHSB sebanyak 1.040 kali (AdjOR: 1.040; 95% CI: 1.023-1.058; $p < 0.001$). Kajian ini memberikan gambaran profail MHSB dalam kalangan wanita hamil bagi perancangan strategi yang berpotensi untuk meningkatkan capaian kepada maklumat kesihatan yang tepat dan relevan.

Kata kunci: *Celik kesihatan; kehamilan; kesihatan digital; maternal; tingkah laku kesihatan*

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ABSTRACT

Maternal health information-seeking behaviour (MHSB) refers to the active efforts of pregnant women to obtain specific information to ensure continuity of care, enhance resilience against health risks and prevent complications. Advances in digital health (DH) and the increasing use of social media (SM) as a source of health information during pregnancy have the potential to improve MHSB and access to healthcare services. However, the dissemination of inaccurate information may negatively impact maternal and fetal health outcomes. This study aimed to determine the prevalence of MHSB among pregnant women and its association with the use of SM, DH and tele-primary care systems. A cross-sectional study of 385 pregnant women through stratified random sampling from selected maternal and child health clinics in Selangor was conducted from January to June 2022 using a validated self-administered questionnaire. The findings indicated that 50.9% of pregnant women exhibited good MHSB, while the remaining proportion demonstrated lower engagement in information-seeking behaviour. The study also found a significant association between maternal age and MHSB ($\chi^2(1) = 5.889$, $p = 0.015$) and the need for health information ($\chi^2(1) = 33.0$, $p < 0.001$). A multivariate binary logistic regression analysis depicted that a one-unit increase in the need for health information raised the likelihood of engaging in MHSB by 1.040 times (AdjOR: 1.040; 95% CI: 1.023-1.058; $p < 0.001$). This study offers valuable insights into the MHSB of pregnant women in planning for potential strategies to enhance their access to accurate and relevant health information.

Keywords: Digital health; health behaviour; health literacy; maternal; pregnancy

INTRODUCTION

Health-seeking behaviour can be defined as intentional, active efforts to obtain specific information in improving the continuum of care, enhancing coping with health threats and preventing risk (Clark 2005; Hewitt et al. 2020; Wilson 2000). Maternal health is defined as the health of women during pregnancy, delivery and postnatal period. According to current literature, maternal health-seeking behaviour (MHSB) is considered the health-seeking behaviours among pregnant women, including decision-making and actions to seek maternal health services (Dapaah & Nachinaab 2019; Guo et al. 2021; Kifle et al. 2017). Findings from the literature indicate a growing awareness of the challenges experienced by new mothers, particularly in the online realm with numerous websites, applications and social media (SM) which is now actively disseminating information to pregnant mothers. Health literacy plays a crucial role in understanding and utilising health information effectively thus shaping information-seeking behaviour. Measurable indicators should be specific, measurable, achievable, relevant and time-bound to assess any health program. The MHSB is one of the important measurements that can be used as one indicator that reflects the practice and utilisation of maternal health information and services. This information was not routinely collected to evaluate the information-seeking behaviours among the antenatal mothers who had access to the clinic's services. Having a good or poor indicator can provide valuable insights and avenues for program intervention. Addressing these challenges and barriers which might be faced by individuals when seeking health information, such as information overload, misinformation or privacy concerns, is essential to support individuals in making informed decisions.

The Survey Report on the Use and Access to Information and Communications Technology (ICT) by Individuals and Households in 2021 reported that internet usage among individuals in Malaysia aged 15 and above increased to 96.8% in 2021 from 89.6% in 2020 (MCMC 2022). The most popular internet activity in 2021 was participation in social networking, accounting for 99.0% of the total time (DOSM 2023). The

report also indicated that 73.8% of individuals sought health information online (e-Health). These statistics highlight the increasing use of the internet and SM among Malaysians, including pregnant women. The pattern seems similar to other countries globally after the pandemic which is showing upward trends (Bangladesh Bureau of Statistics 2022; Eurostat 2024).

The rising adoption of technology and smartphones has further reinforced the use of the internet and SM as a source of health information, with platforms such as Google, TikTok, Facebook and Instagram have becoming increasingly prominent. A study conducted in South Korea found that 72.8% of pregnant women who participated in a survey used SM to seek pregnancy-related health information (Lee & Lee 2022), while research in Bali, Indonesia, revealed that 53.5% of respondents obtained pregnancy-related information through the internet (Ariyani et al. 2020). Factors such as trust, ease of use and cost savings encourage mothers to use SM for health information (Alanazy & Brown 2020; Smith et al. 2020). However, inaccurate health information disseminated through SM may contribute to misconceptions and hinder efforts to achieve shared goals regarding pregnancy-related health information, which is crucial for empowerment and the prevention of adverse outcomes.

Digital health (DH) refers to the use of information and communication technology in medicine and other health professions to manage diseases and health risks while promoting well-being (Ronquillo et al. 2023). Malaysia's Telemedicine Blueprint outlines the country's objective of developing a future healthcare system that relies on both individuals and technology-supported services. Currently, Malaysia offers DH initiatives such as Tele-Primary Care (TPC), Tele-Primary Care Oral Health Clinical Information System (TPC-OHCIS), the MyHealth portal and other applications to promote DH nationwide. DH is becoming more prevalent as technology advances and offers new ways for expectant mothers to access health-related information, services or support (Mohamed et al. 2025; Ibrahim et al. 2022; Sutan et al. 2025). Through an online survey, Smith et al. (2020) reported that DH was utilised by pregnant mothers for social and emotional support, as well as to access health-related information, for various purposes such as the normalcy of their pregnancy symptoms, learning about fetal development and acquiring knowledge about what to anticipate throughout their pregnancy journey. This paper aimed to provide a deeper understanding of factors influencing MHSB through advances in DH and SM.

MATERIALS AND METHODS

Study Design

A cross-sectional study was conducted from January to June 2022 among pregnant mothers who attended maternal and child health clinics in Selangor. A total of 385 pregnant mothers who were Malaysian citizens, aged ≥ 18 years, and spoke Malay or English participated in the study. Seven health clinics showed the highest number of antenatal cases recorded for a year before data collection (the year 2021) representing each of the seven districts of Selangor were selected. The selected clinics were stratified into TPC and non-TPC clinics. Permission from the Selangor Health State Director was granted before data collection started at the selected clinics. The sample size was calculated using two-proportion sampling with the formulae;

$$n = (Z\alpha/2+Z\beta)^2 * (p1(1-p1)+p2(1-p2)) / (p1-p2)^2$$

where $Z\alpha/2$ was the critical value of the normal distribution at $\alpha/2$ (e.g., for a confidence level of 95%, α was 0.05 and the critical value was 1.96), $Z\beta$ was the critical value of the normal distribution at β (e.g., for a power of 80%, β was 0.2 and the critical value was 0.84) and p1 and p2 were the expected sample proportions of the two groups (Wang & Chow 2007).

The calculated sample size was 359 based on a study done by Sutan et al (2016) with the prevalence of good health information-seeking

behaviour among antenatal mothers on health information need [high: 54.4% (p1) versus low: 44.0%(p2)]. An additional 10% of the calculated sample size required a minimum of 395. Participants were recruited by simple random sampling of daily registered antenatal cases from the selected clinics. Knowing the required sample size upfront allowed for a good allocation of resources (time, money and personnel). This helped to prevent overspending on a study that was ultimately underpowered or underutilisation of resources if the sample was too small. The present study was approved by the Universiti Kebangsaan Malaysia Ethics Research Committee (JEP-2022-376) and the Medical Research Ethics Committee Ministry of Health (NMRR ID23-00383-XNU(11R)). Following informed consent, respondents were requested to answer a questionnaire either in printed form or using Google Forms while waiting for their antenatal appointments at the clinic. However, respondents were keen to answer using Google Forms either on their handphones or using the researcher's tablet device.

The Study Questionnaire

A MHSB questionnaire contained seven sections: (i) socio-demographics; (ii) MHSB; health information needs (HIN); (iii) SM usage; (iv) health information barriers (HIB); (v) information-seeking attitudes; (vi) use of DH; and (vii) self-efficacy (SE). The questionnaire utilised a Likert scale for rating, where respondents could indicate their opinion or attitudes according to the level of agreement or disagreement, with 1 representing "strongly disagree," 2 for "disagree," 3 for "unsure," 4 for "agree," and 5 for "strongly agree." The scores for the domains of HIN, SM, HIB, attitudes and SE were then recoded into two score categories for 0 (disagree) and 1 (agree) representing Likert scale ratings of 4 and 5 into a score of 1, while ratings of 1-3 were recoded into a score of 0. Subsequently, MHSB, HIN, SM, HIB, attitudes and SE were evaluated as either good or poor based on the mean total score as the cut-off point. This method allowed for an assessment of the overall MHSB of the respondents relative to the domains of the questionnaire.

The socio-demographic data comprised 12 items of information about the respondents and their obstetric history. Questions included birth date, ethnicity, occupation, highest education, average monthly household income, clinic accessibility, type of health clinic attended (TPC or non-TPC), name of the clinic, state, first antenatal check-up, parity and history of pregnancy risks. The TPC category used in this study included the clinics with the TPC and TPC-OHCIS systems.

The MHSB section asked about the frequency of searching for maternal-related health information. The preferred source of maternal health information using a Likert scale rated from 1 being 'very much disagree' to 5 being 'very much agree'. This was to discover methods and information sources that the pregnant mothers had used (Alanazy & Brown 2020; Smith et al. 2020).

The HIN asked about topics that the mothers were interested to know more about at different stages of pregnancy. The topics were selected based on the questionnaire by Al-Dahshan et al. (2021) and Lee and Lee (2022). The items for the HIN domain were categorised according to the stages of pregnancy: pre-pregnancy (6 items), antenatal (16 items), intrapartum (5 items) and postpartum and lactation (13 items). In the adopted questionnaire, the questions were arranged according to the stages. The questions were answered in a Likert scale format and rated from 1 being 'very much disagree' to 5 being 'very much agree'.

The SM usage domain was designed based on the SM usage of pregnant mothers as observed in questionnaires by Al-Dahshan et al. (2021), Lee and Lee (2022), Kaaya et al. (2021) and Smith et. al (2020). The first two parts asked the respondents whether they used SM as an information source, which SM platform was preferred and the preferred time to access at daytime and night-time. The reasons for using SM as a maternal health information source were explored in the final part of this section in a Likert scale format rated from 1 being 'very much disagree' to 5

being 'very much agree'.

The HIB domain asked the respondents about the barriers they experienced in maternal health information seeking as adopted from the questionnaires by Alanazy and Brown (2020) and Kaaya et al. (2021). There were 13 items in the HIB domain. This domain explored the barriers experienced by mothers in obtaining health-related information about pregnancy.

The attitudes about pregnancy-seeking information (AT) were adopted from Alanazy and Brown (2020). This section explored the feelings and preparation of pregnant mothers regarding their maternal health check-ups and knowledge. The attitudes domain contained 11 items that explored maternal attitudes toward finding health-related information about pregnancy.

The SE domain enquired about the respondents' confidence in obtaining maternal health-related information. There were seven items in this domain. This domain explored the mothers' confidence in obtaining health-related information about pregnancy.

Back-to-back translations were performed by a language teacher who translated from English to Malay and back to English by another language teacher. The researcher assessed the agreement of the translation. Both languages were used in the questionnaire for better understanding. The measurement followed the original questionnaire for analysis technique and no construct or confirmatory were performed because all question items were from the respective original questionnaire and were adopted with permission from the authors. However, we tested for reliability of the questionnaire in the population. Internal consistency reliability using Cronbach alpha was performed to assess the validity of items in the MHSB questionnaire and found acceptable (α = 0.7).

Statistical Analysis

The collected data were analysed using the Statistical Package for Social Sciences version 27.0 (IBM Corp, Armonk, NY). Descriptive statistics were obtained for different types of data based on continuous and categorical variables. Pearson Correlation test of total score was performed for continuous data. Chi-square tests were performed to evaluate the association between categorical data of the dependent and independent variables. Multivariate binary logistic regression was conducted to assess the predictors of the dependent variable (MHSB). The level of statistical significance was set at 0.05.

RESULTS

Descriptive Analysis

A total of 400 mothers were approached, out of which 385 completed the questionnaire, yielding a response rate of 96.5%. Table 1 showed the characteristics of respondents. The majority were Malays (81.3%), of low-risk age group below 35 years (78.7%), with an educational level above secondary (68.6%), multiparous (57.4%), came for antenatal booking visit early before 3 months of pregnancy (60.5%), had access to government clinics alone (96.4%) close <5 km (83.1%) from home and used TPC clinics (70.6%).

Table 2 showed the descriptive analysis of all continuous variables. We used the mean of each variable as the cut-off point to divide it into two categories (good and poor). The MHSB was found to have a total mean score of 35.22 (SD 4.51), with 50.9% of respondents practiced good MHSB. The HIN was found to have a total mean score of 169.51 (SD 19.77) and 43.9% of respondents practiced good HIB. The SM scored a total mean of 37.49 (SD 4.87) and 41.8% of respondents practiced good SM usage. The HIB were found to have a total mean score of 5.96 (SD 3.71) with 50.9% of respondents categorised as having high HIB. The pregnancy-related attitudes (AT) were found to have a total mean score of 44.49 (SD 4.92) and 33.8% of respondents practiced good attitudes. SE was found to have a total mean score of 27.90 (SD 3.78) and 71.4% of respondents perceived poor SE.

The MHSB domain explored the information sources used by the mothers. Most respondents agreed with almost all items, particularly

TABLE 1: Characteristics of respondents

Characteristics	Number of respondents, n (%)	Mean (SD)	Median (IQR, 25th, 75th)
Ethnicity			
Malay	313 (81.2)		
Chinese	21 (5.5)		
Indian	36 (9.4)		
Others	15 (3.9)		
Age (year)		30.43 (5.07)	30 (30,27,34)
< 35	303 (78.7)		
≥ 35	82 (21.3)		
Education			
Up to the secondary level	121 (31.4)		
Diploma/Foundation/ Matriculation/Vocational	137 (35.6)		
Tertiary	127 (33.0)		
Parity			
Parity 1	164 (42.6)		
> 1 parity	221 (57.4)		
First antenatal booking			
< 3 months	233 (60.5)		
3 months and above	152 (39.5)		
Type of clinic access for antenatal care			
Government	371 (96.5)		
Private	13 (3.4)		
Both	1 (0.3)		
Clinic accessible within 5 km			
Yes	320 (83.1)		
No	65 (16.9)		
District for antenatal care			
Petaling	101 (26.3)		
Hulu Langat	89 (23.1)		
Kuala Langat	25 (6.5)		
Gombak	40 (10.4)		
Klang	29 (7.5)		
Sabak Bernam	51 (13.2)		
Sepang	50 (13.0)		
Digital health usage			
TPC clinic	272 (70.6)		
Non-TPC clinic	113 (29.4)		

IQR: Interquartile range; TPC: Tele-primary care

indicating 'Healthcare professionals such as doctors or nurses' (96.9%) as their primary information source. However, two items received a balanced response of agreement and disagreement among the respondents. These were 'Radio and television' (with 51.4% agreeing and 48.6% disagreeing) and 'Health campaigns or community health activities' (with 56.6% agreeing and 43.4% disagreeing).

The HIN found that the majority responded as needing information based on the stage of pregnancy. For the pre-pregnancy stage, the item with the most agreement was 'What lifestyle behaviour do I need to practice before pregnancy' (95.8%) and the lowest was 'What vaccination do I need to take before pregnancy?' (77.1%). In

TABLE 2: Total score of MHSB, HIN, HIB, SE and attitudes

Variables	Mean total score (SD)	Good n (%)	Poor n (%)
Maternal health seeking behaviour (MHSB) (9 items, Likert 1-5) Good: >35 Poor: ≤ 35	35.22 (4.51)	196 (50.9)	189 (49.1)
Health information needs (40 items, Likert 1-5) Good: >170 Poor: ≤ 170	169.51 (19.77)	169 (43.9)	216 (56.1)
Social media (9 items, Likert 1-5) Good: >38 Poor: ≤ 38	37.49 (4.87)	161 (41.8)	224 (58.2)
Attitudes related to pregnancy-seeking information (11 items, Likert 1-5) Good: >45 Poor: ≤ 45	44.49 (4.92)	130 (33.8)	255 (66.2)
Self-efficacy (7 items, Likert 1-5) Good: >28 Poor: ≤ 28	27.90 (3.78)	110 (28.6)	275 (71.4)
Health information barriers (13 items, Likert 1-5) High: >6 Less: ≤ 6	5.96 (3.71)	196 (50.9)	189 (49.1)

the antenatal stage, the items with the majority agreement were item 'Personal hygiene during pregnancy' (97.7%), and the least agreement item 'Consumption of tobacco and alcohol during pregnancy' (62.1%) respectively. In the delivery stage, the item with the highest agreement was item 'Choosing a place of delivery' (97.1%) and the lowest was item 'Do's and don't's for a family companion in labour room' (82.3%). For the postpartum and lactation stage, the item agreed by a majority of mothers was item 'Postpartum care' (97.9%), and the least agreed was item number 10 'Postpartum depr*ession* (blues)' (79.7%).

The SM usage was noted as agreeable by almost half of the respondents. The time preferred by mothers to access SM in the day was found to be a mean of 4.07 hours (out of 12 hours of daytime between 6 am-6 pm), 4.12 hours (out of 12 hours of night-time < 6 pm-< 6 am) and 4.21 hours on weekends (24 hours). The SM domain served to explore the mothers' reasons for using SM as a health information source. The majority of respondents agreed with almost all items especially item 'To access reliable information' (95.3%). The item least agreed upon by the mothers was the item 'To receive new information' (76.6%).

In the AT domain, the practice items were considered good by half of the respondents. The majority of the mothers agreed with the item 'I ask the doctor for further explanation if the information and recommendations are not clear enough' (97.9%). The lowest percentage was scored by the item 'I would search for some information before going for my check-up.' (37.9%).

The majority of the mothers agreed on items for SE. Most of them agreed with the item 'I know how to find helpful health resources on the Internet' (94.3%). The lowest percentage falls on the item 'I always check the information obtained from the internet with my healthcare providers' (67%).

The HIB assessment noted that most mothers encountered barriers. The majority of mothers disagreed with most of the items especially the item 'Finding a way to get to the hospital/clinic

is not easy' (86%). The items that were rated with the highest agreement were item 'When I need pregnancy health information, I am unsure how to get it' (92.7%) and item 'too much health information about pregnancy confuses me' (88.1%). There were two items with a balanced rating between agree and disagree - item 'It is time-consuming to find health information about pregnancy' (48.8% agree) and item 'My health care providers do not understand my worries' (48.3% agree).

Bivariate Analysis

Table 3 demonstrated the bivariate analysis using the Pearson Correlation test of the total score between MHSB total scores (dependent variables) and the independent variables total scores (HIN, HIB, SE and AT). HIN, SM and SE showed a moderate positive correlation with MHSB ($r > 0.5$; $p < 0.05$). HIB showed a negative correlation and was found not significant ($r = -0.620$; $p = 0.223$).

A Chi-Square test was conducted to assess the association between the independent categorical variables (HIN, SM, HIB, AT, SE and DH) and dependent categorical variables (MHSB). Table 4 showed that the Chi-Square test demonstrated a significant association between MHSB and HIN ($\chi^2(1) = 33.0$, $p < 0.001$), SM ($\chi^2(1) = 15.48$, $p < 0.001$), AT ($\chi^2(1) = 14.754$, $p < 0.001$) and SE ($\chi^2(1) = 22.458$, $p < 0.001$). However, there was no significant association between MHSB and HIB ($\chi^2(1) = 0.132$, $p = 0.716$) and between MHSB and DH ($\chi^2(1) = 0.11$, $p = 0.742$).

Multivariate Analysis

Multivariate analysis was conducted to further understand the relationship between MHSB and the effects of independent variables. Table 5 showed that the overall logistic regression model was statistically significant compared to the null model, as indicated by the Chi-square test result ($\chi^2(1) = 61.318$, $p < 0.001$). This result suggested that the predictors collectively contributed to explain the variability in MHSB. The model accounted for 19.6% of the variance in MHSB (Nagelkerke R^2), which indicated that approximately 19.6% of the variation in MHSB can be explained by the combined effect of HIN, SM, HIB, AT and SE. Furthermore, the model correctly predicted 50.9% of the cases, demonstrating its predictive power. The analysis revealed that HIN had a statistically significant effect on MHSB ($p < 0.001$). The adjusted odds ratio (Exp (B)) was 1.041. This meant that for each one-unit increase in HIN, there was an increase of 4.1% in engaging MHSB, holding all other variables constant. The findings showed the critical role of HIN in influencing MHSB.

DISCUSSION

The present study was conducted in government primary healthcare in an urban city on MHSB and found that pregnant women, particularly primigravidae actively seek health-related information concerning pregnancy, childbirth preparation and infant care. Good MHSB is observed among primigravid mothers (54.3%).

TABLE 3: Correlation between total scores of MHSB and independent variables

Domains	Pearson Correlation	p-value
Health information needs	0.568	<0.001
Social media usage	0.446	<0.001
Health information barriers	-0.620	0.223
Attitudes of pregnancy seeking information	0.405	<0.001
Self-efficacy	0.430	<0.001

TABLE 4: Bivariate analysis between MHSB and independent variables (categorical data)

Independent variables category	MHSB level			χ2	p-value
	Rating	Good, n (%)	Poor, n (%)		
Health information needs	Good (> 170) Poor (≤ 170)	114 (67.5) 82 (38.0)	55 (32.5) 134 (62.0)	33.00	<0.001
Social media usage	Good (> 38) Poor (≤ 38)	101 (62.7) 95 (42.4)	60 (37.3) 129 (57.6)	15.48	<0.001
Health information barriers	Less (≤ 6) High (> 6)	98 (50.0) 98 (44.4)	98 (50.0) 91 (55.6)	0.132	0.716
Attitudes in information seeking	Good (> 45) Poor (≤ 45)	84 (64.6) 112 (43.9)	46 (35.4) 143 (56.1)	14.75	<0.001
Self-efficacy	Good (> 28) Poor (≤ 28)	77 (70.0) 119 (43.3)	33 (30.0) 156 (56.7)	22.46	<0.001
Tele-primary care usage	Yes No	137 (50.4) 59 (52.2)	135 (49.6) 54 (47.8)	0.11	0.742

Lee and Lee (2022) stated that many mothers experience anxiety due to these changes and require information and emotional support to aid decision-making and alleviate concerns about their pregnancy.

The primary sources of health information for mothers are healthcare professionals such as doctors and nurses (96.9%), followed by internet sources such as websites (94%). Other studies have indicated that the primary sources of information regarding physical activity during pregnancy include television, radio, and other media (70.2%) (Okafor & Goon 2021). Lee and Lee (2022) reported that in South Korea, the

TABLE 5: Multivariate binary logistic regression for predicting a model for MHSB

Independent variables category		MHSB level		Wald	AdjOR (Exp B)	95% CI	p-value
		Good (>35) n (%)	Poor (≤35) n (%)				
Health information needs	Good (> 170) Poor (≤ 170)	114 (67.5) 82 (38.0)	55 (32.5) 134 (62.0)	1 21.653	1.040	1.023-1.058	<0.001
Social media usage	Good (> 38) Poor (≤ 38)	101 (62.7) 95 (42.4)	60 (37.3) 129 (57.6)	1 0.804	1.032	0.963-1.107	0.370
Health information barriers	Less (≤ 6) High (> 6)	98 (50.0) 98 (44.4)	98 (50.0) 91 (55.6)	1 3.380	0.945	0.890-1.004	0.066
Attitudes	Good (> 45) Poor (≤ 45)	84 (64.6) 112 (43.9)	46 (35.4) 143 (56.1)	1 0.414	0.978	0.913-1.047	0.520
Self-efficacy	Good (> 28) Poor (≤ 28)	77 (70.0) 119 (43.3)	33 (30.0) 156 (56.7)	1 0.536	1.033	0.947-1.128	0.464
Tele-primary care usage	Yes No	137 (50.4) 59 (52.2)	135 (49.6) 54 (47.8)	1 0.521	1.194	0.738-1.931	0.470

Note: reference = 1

most used sources of health information were SM (72.8%) and search engines (72.8%). There are also supported by Aryani et al. (2020) from Indonesia, where 53.5% of pregnant mothers primarily sought information online. Similarly, Al-Dahshan et al. (2021) found that 81.1% of pregnant women in Qatar relied on the internet as their main source of health information. While the internet and SM sources dominate other countries, Malaysian mothers rely primarily on healthcare professionals for health-related information. There are limited findings from local studies with regards to SM usage for antenatal mothers; however a recent study on online seeking behaviours using Ministry of Health Malaysia Facebook page found that good engagement with SM used are associated with health education post (A Rahim et al. 2019).

According to this study, out of the total number of respondents (n = 385), only 196 respondents 50.9% exhibited good MHSB, while 49.1% demonstrated poor MHSB (Table 2). Although more than half engaged in positive health-seeking practices, the proportion of those exhibiting weaker health-seeking behaviour remains nearly as high. This finding suggests the presence of specific challenges or barriers that need to be addressed.

The relationship between MHSB and its independent variables was seen based on analysis of both quantitative (Table 3) and qualitative data (Table 4). The results of the Chi-Square test, as presented in Table 4 suggest a significant association between HSB and SM usage ($\chi^2(1) = 15.48$, $p < 0.001$). A regression analysis was conducted, with the results displayed in Table 5, showing an odds ratio of 1.032 for SM usage. This indicates a slight increase in the likelihood of engaging in MHSB with each additional unit of SM usage. However, as the p-value is 0.370, this result is not statistically significant. Al-Dahshan et al. (2021) reported that 70.9% of mothers perceived online health information as reliable, and among them, 48.1% expressed greater confidence in the information when recommended by healthcare professionals. The advantage of using SM for information-seeking is due to quick accessibility and convenience compared to scheduling appointments with healthcare providers (Lee & Lee 2022).

A total of 272 respondents (70.6%) utilised the TPC or TPC-OHCIS clinics (DH), whereas 113 respondents (29.4%) attended clinics that did not offer DH, as shown in Table 4. The association between DH usage and the level of MHSB was found to be non-significant. As seen in Table 4, the Chi-Square test revealed no statistical significance ($\chi^2(1) = 0.109$, $p = 0.742$). Based on the regression analysis in Table 5, the odds ratio for DH was 1.194, suggesting an increase in the likelihood of MHSB, but it is not statistically significant ($p = 0.470$). There are many benefits of using a telehealth system such as computerised patient records that can be accessed faster compared to manual. Similarly, digitalised numbering compared to name-calling can increase efficiency. Moreover, facilitating online appointments over traditional face-to-face appointments might potentially reduce patient volumes. However, the existing system of DH (TPC or TPC-OHCIS) was only for the care provider to monitor health records. There is no health education information integrated into the system for mothers to retrieve interactively (Sutan et al 2024). Therefore, utilising DH in the present study in the study sites did not show any positive findings. Based on the HIB, mothers identified prolonged waiting times as a persistent barrier. This issue stems primarily from the high patient load experienced.

This study examines the relationship between sociodemographic factors and the level of MHSB. Among the factors analysed, only the respondents' age demonstrated a significant relationship with MHSB, as indicated by the Chi-Square test results ($\chi^2 (1) = 5.889$, $p = 0.015$). Other characteristics, such as ethnicity, education level and other demographic factors did not show a significant association with MHSB. This finding is consistent with the study by Al-Dahshan et al. (2021), which reported that pregnant women aged 26-35 years were more likely to seek health information online (86%). The Chi-Square test results also indicate a significant relationship

between HSB and HIN (χ^2 (1) = 33.0, $p < 0.001$). Logistic regression analysis in Table 5 further confirmed that HIN has a statistically significant effect on MHSB ($p < 0.001$). The significance of HIN ($p < 0.001$) suggests that an increased need for health information significantly influences MHSB. The odds ratio (Exp(B)) for HIN is 1.040, indicating that for each unit increase in HIN, the likelihood of engaging in HSB increases by a factor of 1.040. This finding highlights the association between MHSB and the demand for health information. The most frequently agreed-upon information needs among respondents were related to "Recommended lifestyle behaviours before pregnancy" (95.8%), "Personal hygiene during pregnancy" (97.7%), "Choosing a delivery facility" (97.1%) and "Postpartum care" (97.9%). Similarly, Aryani et al. (2020) found that pregnant women in Indonesia primarily sought information on nutrition, fetal development, pregnancy-related complaints, labour preparation and infant care.

There is no significant relationship between MHSB and HIB ($\chi^2(1) = 0.13$, $p = 0.716$). A logistic regression analysis in Table 5 shows that the odds ratio for HIB was 0.945, suggesting a negative association with MHSB. This implies that higher HIB are linked to lower MHSB. However, this result was not statistically significant ($p = 0.066$). Furthermore, the Chi-Square test in Table 4 demonstrated a significant relationship between MHSB and attitude (AT) ($\chi^2(1) = 14.754$, $p < 0.001$). However, a regression analysis of the data in Table 5 revealed that the odds ratio for attitude was 0.978, suggesting a decrease in the likelihood of health-seeking behaviour with increased attitude and self-efficacy. Nevertheless, this result was not statistically significant ($p = 0.520$). On the contrary, a significant relationship was seen between MHSB and SE ($\chi^2(1) = 22.458$, $p < 0.001$). Regression analysis in Table 5 shows that the odds ratio for SE is 0.536, suggesting a decrease in the likelihood of MHSB with increased attitude and self-efficacy. However, this result was also not statistically significant ($p = 0.464$).

Findings from this quantitative study indicate a moderate relationship between MHSB and factors such as HIN, SM, AT, SE and DH. However, no significant relationship was found between HIB and MHSB. This suggests that mothers actively seek health information when they encounter topics of interest. These topics can be categorised into those requiring immediate responses, benefiting from diverse and detailed personal experiences and necessitating expert-based insights. Therefore, it is crucial to utilise appropriate platforms and content tailored to the specific requirements of each topic. The participation of pregnant women in antenatal care has been linked to maternal health literacy, barriers and healthcare system factors (Alanazy & Brown 2020).

The present study has its limitations as it was conducted only in government primary healthcare facilities in an urban city which has good coverage for internet and the ability to own a smartphone among the population. Even though some districts have bigger population coverage, only one clinic was chosen to represent the district and may not be able to be generalised to the district. The selection of clinics was not determined for DH (TPC or TPC-OHCIS) status may result in a limited number of respondents selected from the DH clinics. Therefore, it was not able to be generalised to a population who used the DH.

From an institutional management perspective which practices in Primary healthcare, maternal health information is usually disseminated through leaflets or briefings covering various specific topics in the talks. However, these may not always align with the specific concerns of the individual mothers and may be less accessible compared to online sources. Aiming towards digitalising healthcare as written in the 12th National Plan (Government of Malaysia 2021), more health education customised to maternal care needs according to pregnancy stage should be developed to improve health promotion activity. Pregnant women require a combination of information and emotional support, where the priority for credibility, timeliness and empathy depend on the nature of the topic. For topics requiring higher emotional support, platforms

that provide storytelling, shared experiences and interactive discussions among mothers may offer greater benefits.

CONCLUSION

This study revealed that MHSB among pregnant mothers was influenced by HIN, SM, DH usage and maternal attitudes (AT). However, no significant correlation was found between health barriers and MHSB. The advantages of SM should be leveraged to disseminate reliable HIN. Influential SM platforms can serve as effective channels for delivering expert-based information to a large audience of pregnant women. However, it is crucial to monitor the dissemination of information to prevent misinterpretation and misinformation.

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