Health information seeking behaviour using mobile devices among people with diabetes: A comparison between Middle and high income country

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Abstract

Objective: The internet has become a primary source of information for many individuals especially those with chronic diseases. This study aims to understand and compare the health seeking behaviour using mobile devices among individuals with diabetes and between a high (Singapore) and middle (Malaysia) income country.

Methods: A cross sectional survey was conducted among people with diabetes in Malaysia and Singapore. Participants attending the primary health clinic for the treatment of diabetes were approached to participate in this survey. Data on demographics, health status and beliefs to health were collected and compared.

Results: A total of 673 respondents were included in the study. Most of the respondents reported to have access to the Internet, with a high ownership of mobile phones (99.3%). However, only one in every three respondents sought information online. Younger individuals (≤50 years) and those with higher education more likely to seek information using mobile devices. Respondents in Singapore reported to be more likely to use mobile devices to monitor their health as compared to respondents in Malaysia. However, most respondents would seek health information from their healthcare professionals’ especially physicians.

Conclusion: There was limited differences in the health-seeking behaviour among the respondents from both countries, suggesting for a need to identify for more effective means of distribution of health related information.

Keywords

Type 2 diabetes, health-seeking behaviour, cross-sectional survey, m-health

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Introduction

Diabetes currently contributes to a large component of the global burden of disease1 and is one of the fastest growing non-communicable disease to affect people worldwide, with an estimated 425 million individuals globally affected by diabetes.2 In many individuals with diabetes, self-management has been shown to be an essential strategy to help in achieving treatment target. Information seeking is an important aspect to cope with the disease especially in people with type 2 diabetes.3–7 In this study, health-information seeking behaviours is defined as the way’s individuals seek...
“health related information such as risk, illnesses and health-protective behaviours”.8

While studies have suggested that majority of individuals prefer to learn and understand their condition from doctors personally, this may not be always possible due to time and geographical constrains as well as limited access to the attending doctor.9–12 The advent of the Internet has provided both patients and healthcare providers an alternative source of medical information.13,14 Among the attraction of online health information seeking is anonymity, potential for interactivity and social support.15

A recent Pew research report found that almost one in every three adults in the United States search for medical related information online.16 Some of the most common information sought were related to management of chronic illnesses, such as diabetes and hypertension. This was similarly noted in a recent review by Kuske and colleagues, where the authors reported that there has been a shift in the information seeking behaviour among individuals over the past few years. This was most evident among the younger generation, which preferred to seek information online compared to the older generation.17 However, Rains in their analysis of the Health Information Trends Survey found that many individuals still prefer to use traditional media or seek advice from healthcare professionals as their primary source of health information.18

Limited studies exist to explain such inconsistent findings. Studies have suggested that these could be due to the impact of readily health information leading to information overload which can also be conflicting and confusing. This is further confounded by the expectation of patients being an active partner of their own health management as well as cultural differences which may exist.19 As such, the ability to find and understand relevant quality health information is crucial for patients to participate in medical decision making, especially with the ease of availability of health information online. However, to date, there are limited studies that have examined the health seeking behaviour from Asian countries. The aim of the current study was to understand and compare the health seeking behaviour using mobile devices among people with type 2 diabetes between a middle and high income country.

**Methods**

**Procedure**

This study was a retrospective analysis of results from a self-administered surveys conducted clinics in Malaysia and Singapore. Both studies aimed to investigate the online health seeking behaviour and diabetes self management practices in each country. These countries were chosen primarily because Malaysia is a middle income country with a GDP per capita of USD $29,000 in 2017 while Singapore is a high income country with a GDP per capita of USD$93,900 in 2017.20

**Participants**

This study was conducted at the 5 primary care clinics in the district of Petaling, Selangor, Malaysia and serves a population of approximately 2 million individuals. In Singapore, participants were recruited from a clinic within a public hospital which serves individuals with chronic diseases. From December 2014 to February 2016, individuals aged 18 years and older with type 2 diabetes who sought care at these primary care clinics were approached by a nurse or research assistant and invited to participate in the study. All participants were given an explanation on the purpose of study and individuals who agreed to this study were asked to complete the paper based survey instrument which took approximately 10 minutes to complete and return to the nurse or physician at each individual clinic. All participants provided written informed consent prior to entering the study. The Monash University Human Research Ethics Committee exempted the study from a full review (CF16/2328-2016001168) while the Nanyang Technological University’s Institutional Review Board granted an expedited review (IRB-2014-09-13)

**Questionnaire development**

The questionnaire was developed and adopted based upon a literature review of previous studies that have examined the use of m-health for health literacy.14,17,21–23 The questionnaire covered domains including (1) socio-demographics, (2) online health seeking behaviour and, (3) diabetes self-management practice. Respondents were asked to rate their level of agreement on a 5-point Likert scale (strongly agree to strongly disagree) relating to statements on their health seeking behaviour. The instrument was pilot tested among 10 volunteers at both sites to ensure clarity and comprehension. The final instrument was subsequently adapted and translated into Malay language and Mandarin and back translated for before being used in the current study.14

**Statistical analysis**

Descriptive statistics were calculated and tested using $\chi^2$ test for categorical variables. To account for the imbalance in the number of responses collected between sites, we used the generalised estimating
equation (GEE) technique. Potentially significant variables from the univariate analyses were imputed into the multivariate models, and corrected using the quasi-likelihood independence model. All statistical tests were performed using IBM SPSS ver. 21.0 (Armonyx, NY), with a 2-sided statistical test at 0.05 significance level.

Results

Overall, a total of 673 respondents were included in the current study, with 512 from Malaysia and 161 from Singapore (Table 1). There was an almost equal number of males (56%) and females (44%) respondents in the study, and most were aged 41 years and above (85%). Participants from Singapore were slightly younger than Malaysia. Most respondents from both countries were married and had some form of education.

Internet access

Most of the survey respondents reported that they had frequently accessed the Internet. Only one-quarter of the respondents reported that they owned at least 1 or more desktops/laptops at home (n = 161/673; 23.9%). In comparison, almost all respondents reported that they owned either a mobile phone or smartphone (n = 668/673; 99.3%). There were no significant differences in mobile phone ownership between both countries, but more respondents in Singapore owned a computer compared to Malaysia (Odds ratio (OR): 4.90; 95% CI: 3.31–7.25, p < 0.01). We found that younger respondents (aged 50 and below) were more likely to own several devices compared to older respondents (OR:2.17; 95% CI: 1.30–3.64, p = 0.003). This trend was noted in both Malaysia and Singapore.

Use of technology for health

Nearly half of respondents from both Malaysia (n = 156/356; 43.8%) and Singapore (n = 72/160; 45.0%) reported that they sought health related information online on their mobile phones. However, only 14.7% of respondent actively use some mobile health related applications in their daily lives. Most respondents were reported that they were receptive to the idea of adopting and using any mobile health related application for either improving their health (n = 313/673, 46.5%) or monitoring their blood glucose levels (n = 316/673, 47.0%). Singaporean respondents were more receptive with the idea of using technology for health monitoring as compared with their Malaysian counterpart.

Regression analysis of respondents found that older individuals aged >50 years and those with lower levels of education (those without any form of graduate education) had lower odds of engaging in online health information-seeking behaviour (Appendix Tables 1 and 2) This trend was noted in both Malaysia (OR: 4.35; 2.56–7.69, p < 0.001) and

| Characteristics          | Total | Malaysia, n (%) | Singapore, n (%) |
|--------------------------|-------|-----------------|------------------|
| Age (years)*             |       |                 |                  |
| 21–30                    | 23    | 7 (1.4)         | 16 (9.9)         |
| 31–40                    | 75    | 57 (11.1)       | 18 (11.2)        |
| 41–50                    | 187   | 135 (26.4)      | 52 (32.3)        |
| 51–60                    | 388   | 313 (61.1)      | 75 (46.6)        |
| Gender                   |       |                 |                  |
| Male                     | 376   | 286 (55.9)      | 90 (55.9)        |
| Female                   | 297   | 226 (44.1)      | 71 (44.1)        |
| Marital status*          |       |                 |                  |
| Single                   | 63    | 12 (2.3)        | 51 (31.7)        |
| Married                  | 560   | 458 (89.5)      | 102 (63.4)       |
| Divorced                 | 18    | 13 (2.5)        | 5 (3.1)          |
| Widowed                  | 32    | 29 (5.7)        | 3 (1.9)          |
| Educational level*       |       |                 |                  |
| No education             | 45    | 42 (8.2)        | 3 (1.9)          |
| Primary/secondary        | 688   | 406 (79.3)      | 82 (50.9)        |
| Diploma                  | 102   | 51 (10.0)       | 51 (31.7)        |
| Bachelor or higher       | 36    | 13 (2.5)        | 23 (14.3)        |
| Comorbidities            |       |                 |                  |
| Hypercholesterolemia*    | 251   | 251 (49.0)      | 0 (0)            |
| Hypertension*            | 386   | 300 (58.6)      | 86 (53.4)        |
| Ownership of device      |       |                 |                  |
| Mobile phone*            | 383   | 313 (61.1)      | 70 (43.5)        |
| Smartphone*              | 324   | 218 (42.6)      | 106 (65.8)       |
| Tablet computer*         | 73    | 40 (7.8)        | 33 (20.5)        |
| Laptop*                  | 324   | 218 (42.6)      | 106 (65.8)       |
| Desktop computer*        | 57    | 19 (3.7)        | 38 (23.6)        |

*P < 0.05 based upon χ² test.
Singapore (OR: 3.85; 1.69–8.33, p < 0.001), where we found that younger individuals were more likely to seek health-related information online using mobile phones compared to the older adults. Interestingly, individuals who had a degree or higher were more likely to seek health related information online in Malaysia (OR 8.25; 2.06 – 33.10) but not Singapore (Table 2).

**Perception of using technology for health monitoring**

In general, most respondents (n = 440/673; 65.4%) reported that they were unaware of mobile health devices such as smartwatches or Bluetooth enabled glucometers (Appendix Table 2). They were, however, supportive of the idea of using such devices for the monitoring and management of their health condition. In particular, respondents from Singapore were more receptive to the idea of using technology for data collection and recording compared to respondents from Malaysia.

**Discussion**

Health information is increasingly being disseminated through the Internet.12,22–24 This network is a rich and versatile platform for information sharing and interaction among different people. However, results of our study suggest that the current cohort of adults (e.g., individuals above 50 years old) are not likely to benefit from this shift to an online delivery of healthcare related content especially when delivered using mobile phones. Among all respondents, only 14.7% had installed a mHealth app (Appendix Table 1). Our findings are consistent, albeit lower, with previous literature showing that on average one in every three individuals had used a mHealth app.25,26 Taken together, our study suggests that there is considerable space and opportunities for mHealth to grow in this region.

Education has been consistently shown to be one of the major determinant of health-seeking behaviour.21,27 Our findings concur with this and found that younger participants and those with higher level of education

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**Table 2.** Logistic regression on correlates of health information seeking behaviour between countries.

| Characteristics     | Malaysia                        | Singapore                       |
|---------------------|---------------------------------|---------------------------------|
|                     | Odds ratio (95% CI) | p-value | Odds ratio (95% CI) | p-value |
| Age (years)         |                   |         |                   |         |
| <50 years           | 4.35 (2.56–7.69)   | <0.001  | 3.85 (1.69–8.33)   | <0.001  |
| >50 years           | Ref                |         | Ref               |         |
| Gender              |                   |         |                   |         |
| Female              | Ref                |         | Ref               |         |
| Male                | 1.16 (0.79–1.69)   | 0.48    | 0.83 (0.44–1.55)   | 0.58    |
| Education           |                   |         |                   |         |
| No formal education | Ref                |         | Ref               |         |
| Primary/Secondary   | 1.43 (0.66–3.09)   | 0.36    | 3.10 (0.15–62.33)  | 0.74    |
| Diploma             | 3.26 (1.30–8.17)   | 0.01    | 10.76 (0.53–219.3) | 0.12    |
| Bachelor or higher  | 8.25 (2.06–33.10)  | 0.002   | 18.85 (0.85–417.1) | 0.06    |
| Marital status      |                   |         |                   |         |
| Single              | Ref                |         | Ref               |         |
| Married             | 0.61 (0.19–1.96)   | 0.83    | 0.73 (0.37–1.43)   | 0.92    |
| Divorced            | 0.62 (0.12–3.22)   | 0.57    | 1.44 (0.22–9.37)   | 0.38    |
| Widowed             | 0.53 (0.13–2.18)   | 0.88    | 0.14 (0.01–2.80)   | 0.20    |
were more willing use mobile devices to seek for health related information online. This observation is in part expected since individuals with higher levels of education generally have a higher socioeconomic status and thus own a smartphone. As such, efforts should be focused towards improving older adults' knowledge and comfort with using mobile phones to search for information using the Internet, especially health related information. We believe that increasing the digital literacy of older adults, such as teaching them to use computers and mobile phones as well as increasing accessibility to the Internet should be a given priority to ensure that only reliable and relevant health information is accessed by the patients.

Most participants expressed optimism and had a positive attitude towards the potential of using telehealth for disease management, education as well as monitoring. Given the increasing use of smartphones in the region, there is potential ramifications for public health policies. We believe that telehealth could be expanded to a larger population who are receptive towards this technology. For example, an e-health or telemonitoring program could be initiated to manage patients with diabetes in a particular region, fully managed by a central office. This could potentially lead to better patient outcome and cost savings.

Our study also highlights that some sub-categories of population such as the younger individuals, and those who are confident of taking care of themselves may benefit from using mHealth apps to achieve better health behaviours, and making medical care decision making, in line with the concept of person-centred care. Indeed, mHealth is now increasingly being used as a targeted intervention for the management of diabetes and other related chronic diseases. This study also suggests that when providing health related information online, the differences in cognitive preferences between age groups and countries should be taken into account. For example, when designing for health campaigns, a two-prong approach may be needed, such as using social media or other related forums to target the younger individuals while traditional print media may be a more effective means to reach out to older adults.

This is the first study that attempted to compare the health seeking behaviour using mobile health between two countries in South East Asia. However, this needs to be taken in the light of some of the study limitations. Firstly, the survey was collected via convenience sampling and thus may not reflect the actual demographic composition of both countries. This may partly explain the discrepancy in terms of respondents between both countries. While both Malaysia and Singapore are multi-cultural countries, differences still exist. We did not verify the actual use of Internet or mHealth apps among respondents, and there was no follow-up discussion. We also did not request on the types of health information (e.g. disease specific information, advice etc.) or where this information was sought from (e.g. Google, World Health Organisation website). The samples were also limited to participants with diabetes, and we did not deliberately include individuals with other chronic diseases such as hypertension or hyperlipidaemia. As such, the results of this study should be interpreted with caution as the results presented may not reflect the actual habits of using mobile phones to search for health information in both countries. We also did not include participants from the general population which did not seek for help from these health clinics, which may be less educated. Finally, due to the retrospective nature of this study, no sample size or power calculation was performed. As such, our study may be underpowered to detect any differences that may exist between both countries. As such, future studies should include individual level comparison, comparing individuals with chronic illness and general population, using a larger dataset and across multiple countries if possible.

**Conclusion**

We found that the health seeking behaviour using mobile phones were relatively similar between both countries. Younger individuals and those with those who have higher education were more likely to use mHealth to accomplish various health related task. This may help inform future researchers as well as industrial players on how they could further target their services and products to promote its use in the future.

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