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Knowledge, attitude and practice of evidence-based medicine among primary care practitioners in Malaysia: a cross-sectional study

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ABSTRACT

Objectives To determine the level of knowledge and practice of evidence-based medicine (EBM) and the attitudes towards it and to identify the factors associated with its practice among primary care practitioners in Selangor, Malaysia.

Setting This cross-sectional study was conducted in randomly selected health clinics in Selangor. Data were collected from primary care physicians using self-administered questionnaires on knowledge, practice and attitudes regarding EBM.

Participants The study included 225 respondents working in either government or private clinics. It excluded house officers and those working in public and private universities or who were retired from practice.

Results A total of 32.9% had a high level of EBM knowledge, 12% had a positive attitude towards EBM and 0.4% had a good level of its practice. The factors significantly associated with EBM practice were ethnicity, attitude, length of work experience as a primary care practitioner and quick access to online reference applications on mobile phones.

Conclusions Although many physicians have suboptimal knowledge of EBM and low levels of practising it, majority of them have a neutral attitude towards EBM practice. Extensive experience as a primary care practitioner, quick access to online references on a mobile phone and good attitude towards EBM were associated with its practice.

Strengths and limitations of this study

- This is the first study to explore the knowledge, attitude and practice and the associated factors for evidence-based medicine in Malaysia.
- The study applies a new, validated questionnaire on knowledge, practice and attitudes regarding evidence-based medicine.
- The study was conducted in a densely populated state involving government and private primary care practitioners.
- The high patient workload might pressure primary care practitioners to complete the questionnaire.

BACKGROUND

Since the introduction of evidence-based medicine (EBM), several cross-sectional studies have been conducted in various countries to assess knowledge and attitudes regarding EBM and its practice by medical staff and students. A study of 302 general practitioners in England showed that 40% were aware of the Cochrane Database of Systematic Reviews, 52% of Bandolier and 60% of the Effective Health Care Bulletins. The study concluded that doctors had a low level of awareness of extracting journals, review publications and databases.[1]

A study of 398 physicians in different specialties in a teaching hospital found that 10.5% have good EBM knowledge. In contrast, 54% and 35.5% of the study population had adequate and poor knowledge, respectively. Regarding attitudes towards EBM, 76.4% of the physicians welcomed the current promotion of EBM and 89.9% thought that practising EBM improved patient outcomes. The barriers to practising EBM were patient overload (68.1%), lack of tie (60.1%), colleagues' attitude (47%), lack of skills (46.7%) and fear of criticism (44.5%).[2]

Lack of time has been a common barrier reported among physicians for the past 20 years.[2 3] It has been suggested that for clinicians to have a good grasp of EBM, they would need to read at least 19 original articles every day of the year.[4] In contrast, near a decade ago, authors suggested that clinicians should spend 1 hour a week searching for and reading evidence to apply to daily practice.[5] In recent years, the increased adoption of smartphones by physicians demonstrates the opportunity to access information systems and clinical tools to facilitate the practice of EBM at the point of care.[6] No study has found a significant relationship between factors associated with poor clinical practice of EBM; instead, they have addressed only the prevalence of factors that support or impede

its implementation. This study aimed to determine the level of knowledge and practice of EBM and the attitudes towards it and to identify the factors associated with its practice among primary care practitioners in Selangor, Malaysia.

METHODOLOGY

Population and sample

This cross-sectional study included primary care practitioners in Selangor, including all private general practitioners, government medical officers and family medicine specialists. It also included those working in either government or private clinics. It excluded house officers and those working in public and private universities as the work setting is already conducive for EBM training and practices.

Simple random sampling by computer-generated application was applied to a list of primary care physicians' names from all clinics in the state. The sample size was calculated for the prevalence of a high level of knowledge of EBM using a single proportion formula.[7] In the pilot study, this prevalence was 27.8%. After considering the study's feasibility, a precision of 0.06 was applied with 95% confidence and a non-response rate of 10%. A sample of 237 primary care practitioners was required.

Questionnaire development

Questionnaire development involved various stages, including extensive literature search on the topic of interest, identifying the content validity with a panel of expert and presurvey evaluation through cognitive debriefing to assess for clarity and understanding. Further details of developing and validating the EBM questionnaire are described elsewhere.[8] The EBM knowledge domain's 15 items used 3-point Likert scale (correct=3, not sure=2, wrong=1) with Cronbach's alpha of 0.81. The attitude domain's 17 items used 5-point Likert scale (strongly agree=5, agree=4, neutral=3, disagree=2, strongly disagree=1) with Cronbach's alpha of 0.81. Similarly, the practice domain's 11 items used the same 5-point Likert scale with Cronbach's alpha of 0.84. The per cent score for each domain was categorised using Bloom's cut-off point (60%–80%),[9] as in other studies.[10–12] Within this range, scores were said to have moderate, neutral and fair levels of knowledge, attitude and practice, respectively. Neutral means that the respondents neither 'agree' nor 'disagree' with the items. It places them into neither 'positive' nor 'negative' attitude in general. Scores above this cut-off point were equated to high level, positive and good knowledge, attitude and practice. Scores below this cut-off point were equated to low level, negative and poor knowledge, attitude and practice.

Data collection

Data collection was conducted from February to May 2019. After the eligible participants were identified using stratified proportionate random sampling, the researcher made appointments with the prospective participants at their respective facilities, explained the study and distributed the informed consent forms. When the participants understood and consented to join the study, they were given the self-administered questionnaire and were free to ask the researcher if questions arose while answering it. The questionnaires were checked for completeness, and the participants were thanked for their cooperation.

Data entry and analyses

The data were entered and analysed using IBM SPSS Statistics V.24.0. Descriptive analyses were conducted to determine a high level of knowledge, a positive attitude and a good practice of EBM. Simple and general linear regressions were used to determine the factors associated with EBM practice scores.

We applied simple linear regression to determine the potential associated factor for practice score on EBM. Subsequently, we applied general linear regression to find the significant associated factors while controlling for other confounders in the model. The predictors were determined based on clinical judgement and statistical significance of $p<0.3$ in simple linear regression. The p value was set as such for screening variables in simple linear regression before being selected into the subsequent analysis of general linear regression. Simple linear regression was done on all independent variables at the univariable level. The analysis was continued with general linear regression. Variable selection was done by automatic backward and forward stepwise procedure. Interaction and multicollinearity were checked. All possible two-way interaction terms and multicollinearity of the variables were checked. The model assessment was done by checking the linearity, equal variance and normality assumption as well as outliers by using standardised residual plots. Findings were presented with crude and adjusted regression coefficient, 95% CI and p value. The level of significance was set at 0.05 in a two-tailed fashion.

Patient and public involvement

It was not appropriate or possible to involve patients or the public in the design, or conduct, or reporting or dissemination plans of our research.

RESULTS

Of the 237 respondents invited to participate in the study, 225 participated, a rate of 94.9%. The other 12 were excluded from further analyses because they either failed to participate or did not complete the questionnaires. The sociodemographic profiles of the 225 primary care practitioners are shown in table 1.

Seventy-four respondents (32.9%) were classified as having a high level of knowledge. This was followed by moderate (60.9%, n=137) and low (6.2%, n=14) level of knowledge. The knowledge items and the possible responses to them are shown in table 2.

Table 1 Sociodemographic profiles

Variables	Median (IQR*)	n (%)
Age (year)	33 (4.0)	
Duration in current workplace (year)	5 (4.0)	
Sex		
Male		45 (20.0)
Female		180 (80.0)
Ethnicity		
Malay		157 (69.8)
Non-Malay		68 (30.2)
Marital status		
Single		29 (12.9)
Married		196 (87.1)
Highest academic qualification		
MBBS/MD/MBChB		199 (88.4)
Specialist		26 (11.6)
Place of practice		
Government clinic		208 (92.4)
Private clinic		17 (7.6)
Average number of patients seen per day		
<20		18 (8.0)
21–30		45 (20.0)
31–40		57 (25.3)
41–50		46 (20.4)
>51		59 (26.2)
Availability of provided internet access in workplace		
Yes		71 (31.6)
No		154 (68.4)
Availability of subscribed online databases in workplace		
Yes		71 (31.6)
No		154 (68.4)
Presence of online quick reference application		
Yes		146 (64.9)
No		79 (35.1)
Presence of continuous medical education in workplace		
Yes		195 (86.7)
No		30 (13.3)

*interquartile range

Twenty-seven respondents (12%) were classified as having a positive attitude towards EBM. This was followed by neutral (81.8%, n=184) and negative (6.2%, n=14) attitude towards EBM. The attitude items and the possible responses to them are shown in table 3.

One respondent (0.4%) was classified as having a good level of practice. Most respondents had poor level of practice (84.0%, n=189), followed by moderate level of practice (15.6%, n=35). The practice items and the percentage of respondents are shown in table 4.

General linear regression showed that ethnicity, attitude towards EBM, length of work experience as a primary care practitioner and having quick access to online reference applications on a mobile phone were significantly associated with EBM practice scores (table 5).

When asked their opinions regarding EBM use, 68.4% (n=154) were bound to follow locally available clinical practice guidelines and standard operating procedures, 48.4% (n=109) said it was time-consuming, 32% (n=72) thought that expert opinions and practices from experienced consultants were the most critical factors in decision-making, 31.1% (n=70) did not understand the research terms, 21.3% (n=48) lacked research interest, 17.3% (n=39) said that no colleagues or senior doctors practised EBM or guided them to do so, and 8% (n=18) cited lack of financial incentive to use EBM.

Only 33.3% (n=75) had trained on search strategy/critical appraisal. Among them, 20.9% (n=47) did so in college, 10.7% (n=24) during continuous medical education, 5.8% (n=13) in an online course, 4% (n=9) from other methods, which were not explicitly stated, and 3.6% (n=8) learnt from self-study. In addition, 49.3% (n=111) performed online database search meta-analyses/systematic reviews for clinical evidence to manage patients. Of these, 3.1% (n=7) searched daily, 9.8% (n=22) weekly, 15.6% (n=35) monthly, 11.6% (n=26) bimonthly, 5.8% (n=13) biannually and 3.6% (n=8) annually. Furthermore, 38.2% (n=86) accessed online bibliographic databases from home, 13.8% (n=31) from hospitals/clinics, 1.3% (n=3) from local libraries and 8.4% (n=19) from other places. However, 40.4% (n=91) did not perform online database searches.

DISCUSSION

This study was performed among primary care practitioners, of whom 80% were women. This gender imbalance is commonly seen in primary care settings in industrialised countries. The proportion of female primary care physicians has doubled over the last 30 years. Globally, 32% of all physicians who graduate worldwide are female, and this percentage is higher, on average, in primary care practice.[13]

Prevalence of good EBM knowledge

In the present study, 60.9% had a moderate level of knowledge, 32.9% had a high level and 6.2% had a low level. When compared with the results of other studies, most of the reported results showed limited or poor EBM knowledge. Most studies assessed EBM knowledge based on related statistical or technical terms. One systematic review of physicians' knowledge, practice and attitudes regarding EBM included 57 studies of primary care practitioners, residents, specialists and subspecialists. They found that most studies had adopted the McColl questionnaire, four the Fresno test and seven self-developed

Table 2 Knowledge items with percentage of responses

Item	Description	Correct n (%)	Unsure n (%)	Wrong n (%)
K1	Evidence-based medicine involves the process of critically appraising research findings as the basis for clinical decisions.	218 (96.9)	7 (3.1)	–
K2	Evidence-based medicine focuses on the best currently available research without considering clinical experience.	68 (30.2)	69 (30.7)	88 (39.1)
K3	Evidence-based medicine is suitable for making decisions about the care of patients rather than for policymaking.	136 (60.4)	60 (26.7)	29 (12.9)
K4	Patients' preferences should be prioritised over clinicians' preferences in making clinical decisions.	60 (26.7)	80 (35.6)	85 (37.8)
K5	Evidence-based medicine improves clinical management by using evidence from meta-analysis only.	74 (32.9)	68 (30.2)	83 (36.9)
K6	Evidence-based medicine does not help to promote self-directed learning.	19 (8.4)	34 (15.1)	172 (76.4)
K7	Meta-analysis is superior to case–control studies in evidence-based medicine.	102 (45.3)	95 (42.2)	28 (12.4)
K8	Four essential components structured in the PICO format (Patient or problem, Intervention, Comparison and Outcome) will make a good clinical question.	183 (81.3)	38 (16.9)	4 (1.8)
K9	Evidence-based medicine improves clinicians' understanding of research methodology.	200 (88.9)	18 (8.0)	7 (3.1)
K10	Clinicians who practise evidence-based medicine become less critical in using data in systematic reviews.	47 (20.9)	85 (37.8)	93 (41.3)
K11	Evidence-based medicine can be practised in situations where there is doubt about any aspect of clinical management.	189 (84.0)	30 (13.3)	6 (2.7)
K12	Improving access to summaries of evidence is appropriate to encourage evidence-based practice.	192 (85.3)	30 (13.3)	3 (1.3)
K13	The increasing number of systematic reviews that are applicable to general practice can be found in the Cochrane Library.	149 (66.2)	76 (33.8)	–
K14	Difficulty in understanding statistical terms is the major setback in applying evidence-based medicine.	163 (72.4)	53 (23.6)	9 (4.0)
K15	Application of evidence-based practice is cost-effective to healthcare system.	129 (57.3)	82 (36.4)	14 (6.2)

quizzes. As the three tools have different methodologies, a meta-analysis was impossible.[14]

In the present study, the majority understood that EBM involves critically appraising research findings as to the basis for clinical decisions, indicating awareness that EBM does not accept results without critically appraising them systematically. This result is supported by those of an Australian study in which primary care practitioners trained in the critical appraisal were more likely to translate evidence from systematic reviews into practice.[15]

About 60% believed EBM suitable for making decisions about patient care but not policymaking. However, this is not an accurate understanding of EBM and policymaking. Relevant systematic reviews can help policymakers, clinicians and consumers make informed decisions. Guidelines and reliable research summaries based on sound evidence also help establish professional standards.[16] One of the WHO's goals for the 21st century is to produce and expand EBM knowledge to policy and implementation.[17]

Regarding the item about influences of decision-making in clinical settings, 37.8% disagreed that patients' preferences should be considered first before clinicians' preferences. To make a clinical decision, the physicians will recall their experiences with previous patients. Then, they will divide those patients into collections of subgroups or series and make a comparison with the present patient clinical condition.[18] However, EBM is an integration of clinical expertise with the best available evidence from systematic research with consideration of patients' preferences.[19] In other words, clinical expertise does not belong within the evidence hierarchy's decision-making pyramid. Rather, it is represented as a complementary source of knowledge, with consideration of patients' preferences, that supports the process of EBM.[20]

The majority knew that EBM has four essential components structured in the PICO format (Patient or problem, Intervention, Comparison and Outcome), which is a framework to formulate clinical questions.[21] Previous

Table 3 Attitude items with percentage of responses

Item	Description	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)
A1	I believe that evidence-based medicine is a threat to good clinical practice.	3 (1.3)	2 (0.9)	12 (5.3)	144 (64.0)	64 (28.4)
A2	I believe practising evidence-based medicine improves patient health outcome.	65 (28.9)	152 (67.6)	8 (3.6)	–	–
A3	I am keen to learn evidence-based medicine if given the opportunity.	72 (32.0)	134 (59.6)	18 (8.0)	1 (0.4)	–
A4	I am ready to practise evidence-based medicine in my work.	47 (20.9)	147 (65.3)	30 (13.3)	1 (0.4)	–
A5	I feel that research findings are very important in my day-to-day management of patients.	45 (20.0)	154 (68.4)	23 (10.2)	3 (1.3)	–
A6	I feel that evidence-based medicine is of limited value in general practice because management in primary care requires less scientific evidence.	5 (2.2)	17 (7.6)	57 (25.3)	122 (54.2)	24 (10.7)
A7	I believe that years of clinical experience is more valuable than evidence-based medicine.	11 (4.9)	36 (16.0)	92 (40.9)	73 (32.4)	13 (5.8)
A8	I am convinced that applying evidence-based medicine in clinical practice increases the effectiveness of my work.	29 (12.9)	162 (7.02)	31 (13.8)	2 (0.9)	1 (0.4)
A9	I feel confident managing patients with evidence-based medicine.	38 (16.9)	164 (72.9)	20 (8.9)	2 (0.9)	1 (0.4)
A10	I am certain that understanding basic mechanism of disease is sufficient for good clinical practice.	38 (16.9)	117 (5.02)	25 (11.1)	38 (16.9)	7 (3.1)
A11	I feel that access to databases is vital in obtaining journals on evidence-based medicine.	57 (25.3)	144 (64.0)	19 (8.4)	2 (0.9)	3 (1.3)
A12	I feel that reading the conclusions of a systematic review is adequate for clinical practice.	8 (3.6)	53 (23.6)	92 (40.9)	66 (29.3)	6 (2.7)
A13	I feel that practising evidence-based medicine would produce better health practitioners.	38 (16.9)	170 (75.6)	14 (6.2)	3 (1.3)	–
A14	I often feel burdened whenever needing to use evidence-based medicine in practice.	5 (2.2)	42 (18.7)	100 (44.4)	71 (31.6)	7 (3.1)
A15	I think it is mandatory for physicians to continuously update their knowledge to deliver efficient patient care.	81 (36)	125 (55.6)	18 (8.0)	1 (0.4)	–
A16	I am interested in receiving education materials on evidence-based medicine as they relate to various topics.	60 (26.7)	151 (67.1)	14 (6.2)	–	–
A17	I think that educational interventions and incorporating formal teaching of evidence-based medicine at medical education are very important.	67 (29.8)	145 (64.4)	13 (5.8)	–	–

studies, including two systematic reviews, did not test PICO use to assess EBM knowledge, but tested standard terms used in the literature.[1 14 22] The PICO framework has been tested and found adequate and suitable for representing knowledge for clinical questions.[21]

In the present study, most had difficulty understanding statistical terms, which impeded EBM practice. This was further indicated by the 42.2% who were unsure whether a meta-analysis is superior to a case–control study in EBM, showing that they did not understand terms common in the EBM literature. This result was supported by those of a study in Melaka that found that a majority did not understand the terms 'number needed to treat', 'meta-analysis', 'odds ratio' and 'confidence interval', although the majority had some understanding of 'relative risk' and 'absolute risk'.[23] In comparison, less than 38% of medical officers understood 'systematic review' and 'meta-analysis' and that understanding of 'number needed to treat' and 'risk difference' was poor.[16] A study found that most had some knowledge of the technical terms used in EBM and that one-third could explain their meaning to others.[1] These results indicate that local doctors are not well exposed to the commonly used terms in the scientific literature compared with those in other countries. There is a measurable disconnection between what physicians should know before starting clinical practice and what they actually do know. To narrow this gap, there is a need to make EBM training mandatory in both undergraduate

Table 4 Practice items with percentage of responses

Item	Description	Always n (%)	Often n (%)	Sometimes n (%)	Seldom n (%)	Never n (%)
P1	I apply evidence-based medicine in practice.	7 (3.1)	101 (44.9)	99 (44.0)	16 (7.1)	2 (0.9)
P2	I use multiple search engines for systematic review.	10 (4.4)	64 (28.4)	107 (47.6)	35 (15.6)	9 (4.0)
P3	I search for evidence-based medicine material from published journals only.	12 (5.3)	58 (25.8)	98 (43.6)	51 (22.7)	6 (2.7)
P4	I do not have enough time to study on evidence-based medicine.	32 (14.2)	51 (22.7)	120 (53.3)	19 (8.0)	4 (1.8)
P5	I cannot practise evidence-based medicine due to limitations of the management that I can offer to patients in clinical settings.	45 (20.0)	79 (35.1)	84 (37.3)	15 (6.7)	2 (0.9)
P6	I use evidence-based medicine for answering the questions in clinical setting.	28 (12.4)	105 (46.7)	82 (36.4)	9 (4.0)	1 (0.4)
P7	I join continuous medical education for an update regarding evidence-based medicine.	35 (15.6)	73 (32.4)	74 (32.9)	30 (13.3)	13 (5.8)
P8	I promote evidence-based practice to my colleagues at the workplace.	19 (8.4)	75 (33.3)	68 (30.2)	40 (17.8)	23 (10.2)
P9	I share my knowledge on evidence-based medicine with my colleagues.	18 (8.0)	81 (36.0)	81 (36.0)	32 (14.2)	13 (5.8)
P10	I am involved in the development of clinical practice guidelines in Malaysia.	6 (2.7)	19 (8.4)	24 (10.7)	18 (8.0)	158 (70.2)
P11	I usually translate a clinical question into a form that can be answered from the literature.	6 (2.7)	21 (9.3)	75 (33.3)	54 (24.0)	69 (30.7)

and graduate level for future practising physicians to become more proficient in EBM skills.

In the present study, most agreed that improving access to summaries of evidence is appropriate to encourage evidence-based practice. In a study of physicians in the Middle East, 27.4% perceived a lack of availability of and access to evidence as barriers to EBM practice.[24] Similar barriers have been reported by medical students and nurses.[25] In the present study, the majority knew about the availability of the Cochrane Database for evidence searches. However, in Sri Lanka, 30% of doctors were aware of the Cochrane Database, but only 8.5% of them currently used it.[16] In Saudi Arabia, 48.7% were aware of the database, but only 8.5% used it.[24]

Prevalence of good attitude towards EBM

We found that only 12% and 6.2% of respondents had positive and negative attitudes, respectively, towards EBM and that the majority had a neutral attitude towards it. The results regarding positive attitudes were lower than in other studies. For example, in Sri Lanka, more than 70% of the respondents had a positive attitude towards EBM and the rest had a negative one.[16] Another study, which reported responses using a Likert scale based on a median, reported that the majority had a positive attitude towards EBM.[23] A similar result was seen in Saudi Arabia, with a median of 70% having a positive attitude.[5]

In the present study, 96.5% believed that EBM improved patient health outcomes, a finding consistent with those of studies conducted in Sri Lanka (92.5%), Jordan (90%) and Saudi Arabia (90%).[3 16 26] In contrast, 41.1% of Jordanian primary care physicians strongly agreed and 48.9% agreed that practising EBM improves patient care.[26]

Despite most respondents having a neutral attitude towards EBM, between 32% and 59.6% showed some degree of keenness to learn EBM. The responses were similar regarding attitudes towards receiving EBM educational materials and the belief that incorporating EBM into medical education is essential. Besides, 68.4% agreed that research findings are essential to day-to-day patient management. A similar result was found among Jordanian primary care physicians.[26]

In the present study, 54.2% disagreed that the value of EBM in primary care management is limited. In the Jordanian survey of primary care physicians, 51% disagreed that EBM has limited value.[26] In contrast, in Saudi Arabia, only 18% disagreed that EBM is of limited value.[5] In the present study, only 20.9% agreed that they felt burdened when using EBM in practice. This contrasts with the Jordanian study findings, in which 62.4% agreed that adopting EBM would place more demands on already-overloaded family practitioners.[26]

Prevalence of good practice of EBM

In the present study, the good practice of EBM was low, but percentages were similar in most studies. We found that 3.1% and 12.4%, respectively, used EBM in their clinical practice and to answer questions in clinical settings.

Table 5 Factors associated with EBM practice among 225 primary care practitioners

	SLR			GLR*		
Variables	**b† (95% CI)**	**t statistics**	**P value**	**Adjusted b‡ (95% CI)**	**t statistics**	**P value**
Age (year)	0.34 (–0.000 to 0.688)	1.97	0.051			
Experience in current work place (year)	0.47 (0.077 to 0.873)	2.35	0.02	0.439 (0.064 to 0.814)	2.31	0.022
Sex						
Male						
Female	–4.20 (–8.370 to –0.038)	–1.99	0.048			
Ethnicity						
Malay						
Non-Malay	2.60 (–1.038 to 6.251)	1.41	0.16	3.45 (0.042 to 6.854)	2	0.047
Marital status						
Single						
Married	0.81 (–4.204 to 5.828)	0.32	0.75			
Highest academic qualification						
MBBS/MD/MBChB specialist	6.12 (0.924 to 11.316)	2.32	0.021			
Place of practice						
Government clinic						
Private clinic	6.59 (0.294 to 12.896)	2.06	0.04			
Average number of patients seen per day						
<20						
21–30	–3.03 (–10.074 to 4.013)	–0.85	0.397			
31–40	–0.24 (–7.068 to 6.589)	–0.07	0.945			
41–50	–0.77 (–7.780 to 6.238)	–0.22	0.828			
>51	–2.94 (–9.742 to 3.860)	–0.85	0.395			
Availability of provided internet access in workplace						
Yes						
No	–0.64 (–4.504 to 3.225)	–0.33	0.745			
Availability of subscribed online databases in workplace						
Yes						
No	–0.381 (–7.395 to –0.230)	–2.10	0.037			
Presence of online quick reference application						
Yes						
No	–0.49 (–8.348 to –1.422)	–2.78	0.006	–4.67 (–8.033 to –1.317)	–2.74	0.007
Presence of continuous medical education in workplace						
Yes						
No	–1.66 (–6.595 to 3.285)	–0.66	0.51			
Knowledge categories						
High level						
Moderate level	–2.83 (–9.890 to 4.229)	–0.79	0.43			
Low level	–4.34 (–7.768 to 6.898)	–0.12	0.907			
Attitude categories						
Positive attitude						
Neutral attitude	2.53 (–4.124 to 9.173)	0.75	0.455			
Negative attitude	14.59 (6.688 to 22.484)	3.64	0	13.46 (5.675 to 21.245)	3.41	0.01

*R^2=0.189; there was no significant interaction and no multicollinearity problem; model assumptions met.
†Crude regression coefficient.
‡Adjusted regression coefficient.
EBM, evidence-based medicine; GLR, general linear regression; SLR, simple linear regression.

In comparison, less than 10% of Jordanian primary care physicians used EBM resources in their clinical practice.[26] EBM updates refer to physicians getting new updates on new diseases and the latest treatment best available for the patients. Continuing medical education (CME) is one platform for physicians to collaborate to select and appraise evidence in an explicit way, summarise them and present comments by clinical experts. In the present study, 94.2% received EBM updates through CME. This high percentage may be due to a policy of the Malaysian Medical Council requiring physicians to acquire at least 20 credit hours of continuing professional development as a condition of renewing their practice licence annually.[27] Despite this, nearly 99% of them claimed they were unable to apply EBM in their clinical setting due to management limitations that can be offered in a clinical setting.

The majority of respondents chose 'sometimes' to indicate their use of multiple search engines to conduct systematic reviews. It may be because some literature is not free and not readily available to the public. Using various search engines may increase the chances of finding articles that are free and accessible.

Nearly half of respondents lacked time to practise EBM, a limitation noted in other studies. A systematic review of physicians' EBM practices noted clinicians' lack of time as a barrier to implementing EBM.[14] In Melaka, a higher percentage (72.5%) of primary care doctors perceived a lack of time as a barrier to practising EBM.[23] In a local qualitative study, EBM was perceived as demanding resources, including time.[28]

Another reason for low EBM practice rates among our respondents was that clinical settings offer patient management that is limited in investigatory and laboratory tests and medications. Lack of facilities and financial resources in primary care settings have also been noted as barriers to practising EBM.[14]

Although 69.3% of respondents applied PICO principles when answering clinical questions, only 2.7% of them 'always' did so. However, most were aware that PICO could be used to create good clinical questions. Nevertheless, the lower percentage who always used it could be explained by Sackett *et al*'s[19] conclusion that physicians think they are practising EBM when they are not. A study of Dutch-speaking insurance physicians in Belgium found a lower prevalence, with 21% having good to perfect knowledge of formulating a PICO question.[29]

One reason why the practice of EBM is low among our respondents was due to limitations in the management that the clinician can offer to patients in clinical settings. This limitation in management can include investigation tests, laboratory tests or medications. Lack of facilities and financial resources in a primary care setting were among the barriers to practising EBM.[14]

Factors associated with poor EBM practice

Based on the present study's results, we concluded that four factors are associated with poor EBM practice: Malay ethnicity, negative attitude towards EBM, shorter duration of working experience and absence of quick access to online reference applications. The shorter the duration of work experience as a primary care practitioner, the weaker the EBM practice, indicating that experienced clinicians are likely to have had more exposure to EBM, which can occur by reading local clinical practice guidelines, attending CME, participating in conferences and receiving formal EBM training. A study in Hungary reached similar conclusions, finding that healthcare work experience had a significant positive effect (OR=1.59, 95% CI 1.01 to 2.52, p=0.048) on EBM knowledge.[30]

The present study also found that those of Malay ethnicity self-described as having poor EBM practice. The study's demographic data indicate that Malays constituted 69.8% of respondents and that those who self-described as non-Malay had higher EBM practice scores. There are no studies with which to compare these findings regarding ethnicity as previous studies did not include it in their demographic data.[23 31 32]

The third factor associated with poor EBM practice in this study is the absence of quick online access to reference applications. Clinicians who have such access via mobile phones had improved EBM practices, likely because these resources make EBM practice more practical for clinicians lacking time and workplace facilities, including libraries or computers. One study found that having a quick reference or 'evidence cart' affected decisions about diagnosis and treatment in 81% of cases, and that of those cases 91% had successful patient outcomes.[33] Easily accessible, quick references may aid in rapid decision-making. A widely used evidence-based clinical smartphone tool is UpToDate, which has been useful for practising EBM at the bedside and integrating test results with clinical information.[6 34] In a study in Singapore, 93.4% of physicians found UpToDate useful and would recommend it to colleagues, and for about three-fifths of them using the application led to changes in patient management decisions.[35]

The fourth factor is attitude towards EBM. We found that the more negative the attitude, the weaker the EBM practice. A study in the USA reported that EBM courses improved medical students' attitudes towards EBM.[36] We believe that this aspect is lacking in our medical education system, and in our study only 20.9% had received formal EBM training in a university.

Before this study, the main barrier noted had been lack of time due to high patient loads. In this study, the average number of patients seen per day was not associated with the poor practice of EBM. This finding is interesting, although it may be incorrect, as the number of patients recorded by the respondents may have been influenced by recall bias. In Sri Lanka, 71% of specialists and postgraduate students perceived patient load as a barrier to EBM practice.[16] In a study of family physicians in Jordan, 14.9% strongly agreed and 47.5% agreed that EBM places another demand on already-overloaded family practitioners.[26] However, these studies were based

on respondents' perceptions rather than statistical data regarding the numbers of patients visiting their centres.

In our study, the absence of CME has not been statistically proven to be associated with poor EBM practice. However, a review of 50 randomised controlled trials on the effectiveness of CME concluded that it could improve clinicians' performance and healthcare outcomes.[37]

Strengths and limitations

This is the first study to use a new, validated questionnaire on knowledge, practice and attitudes regarding EBM. It was conducted in the most highly populated state in Malaysia, Selangor. It involved randomly selected primary care physicians from both the government and private sectors and all nine districts in Selangor.

This study has several limitations. Primary care physicians in Selangor have high patient workloads and therefore limited time to answer questionnaires, which can lead to non-response bias. The questionnaire relied on respondents' self-rated assessments of their knowledge and beliefs. Participants might have felt pressured into completing the questionnaire or unwilling to divulge deficiencies in their knowledge and skills, all of which might introduce response bias. This study found that those with a negative attitude towards EBM will have a poor practice of EBM. However, we believed that this finding might have social desirability bias as data were gathered from a self-reported questionnaire.

CONCLUSIONS

Although many physicians have suboptimal knowledge of EBM and low levels of practising it, most of them have a neutral attitude towards its practice. Factors associated with high scores in EBM practice include good attitude towards EBM, more extended work experience as a primary care practitioner and quick access to online references via a mobile phone. This study will be replicated in different Malaysian states and different healthcare specialties to provide a comprehensive overview of EBM knowledge, attitude and practice. It is recommended that the appropriate authorities provide primary care practitioners with broader access to EBM resources, including enhancing medical school curricula to teach students to apply EBM skills, making such skills part of vital medical training assessments and incorporating training on EBM skills into CME.

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