Original Article

# A cross-sectional study evaluating the knowledge, attitude, and practice of evidence-based medicine among resident doctors of a health-care Institution of National Importance in India

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## Abstract

**Background and Objectives:** Evidence-based medicine (EBM) promotes the integration of updated– best evidence with patient preferences and medical expertise for clinical decision-making. Despite the availability of high-quality evidence such as systematic review and meta-analysis, some clinicians manage their patients based on past experiences and expert opinion. Thus, this study was proposed to assess the knowledge, attitude, and practice of EBM among resident doctors at a tertiary care hospital in India.

**Participants and Methods:** This cross-sectional questionnaire-based study was conducted among senior residents and final-year postgraduates (PGs) who were independently involved in clinical decision-making. By convenience sampling method, the participants were recruited, and the validated EBM Questionnaire (EBMQ) was distributed online for assessing the knowledge, attitude, and practice of EBM. Descriptive statistics were represented as frequency and proportions.

**Results:** A total of 102 resident doctors participated with male preponderance (74.5%). Nearly, 96 (94.1%) participants were already practicing EBM and 21.6% had undergone EBM training. Textbooks (50%) were the most often referred sources for EBM information. Specific EBM databases such as MEDLINE and Cochrane were also utilized by 37.3% of participants. More than 70% of participants understood the terms such as a randomized controlled trial, case–control study, and *P* value. A higher proportion (80.4%) of participants showed a positive attitude about patient care improved by EBM.

**Conclusions:** The majority of the resident doctors exhibited good knowledge and a positive attitude toward applying EBM in clinical decision-making. Periodic training through workshops or courses and integration of EBM with the PG curriculum would potentially enhance the EBM practice.

**Keywords:** Attitude, cross-sectional study, evidence-based medicine, knowledge, practice, resident doctors

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## INTRODUCTION

Evidence-based medicine (EBM) is defined as "the conscientious, explicit, and judicious use of the best evidence in making decisions about the care of patients."[1] Recently, the definition of EBM has been revised as the integration of best research evidence with clinical expertise and patient's values.[2] EBM promotes the utilization of the best research evidence in clinical decision-making. Thus, it paves the way for delivering the best treatment suitable for a particular patient. Better clinical outcomes are documented with patients treated based on recent research evidence compared to those who did not receive evidence-based treatment. Practicing EBM offers more cost-effective benefits in developing countries as the limited resources are utilized effectively.[3] Despite the advantages, these practices are not routinely incorporated into health-care delivery. A hierarchy of the available evidence exists. The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) had developed a transparent approach to grade the quality (or certainty) of evidence and strength of recommendations.[4,5]

GRADE has four levels of evidence which is described as follows:

1. Very low: The true effect is probably markedly different from the estimated effect
2. Low: The true effect might be significantly different from the estimated effect
3. Moderate: The authors believe that the true effect is probably close to the estimated effect
4. High: The authors have a lot of confidence that the true effect reflects the estimated effect.

Meta-analysis, systematic reviews, and randomized controlled trials are considered to be the highest level of evidence for clinical decision-making. Other study designs, case series, case reports, and expert opinions belong to the category of low level of evidence. It is highly necessary to incorporate the results of controversial clinical areas that are significantly explored through randomized controlled trials and meta-analysis in the process of health-care delivery.

The practice of EBM is a lifelong, self-directed, problem-based approach, in which caring for one's own patient is given utmost importance.[6] Since the establishment of the concept of EBM, a tremendous improvement in the quality of patient care has been witnessed. Physicians have also been able to hone their skills by updating themselves regularly with the rapid increase in validated information available at their fingertips. The five-step model of EBM includes asking the right clinical research question, finding the answers through a thorough literature review, critically appraising the acquired evidence, applying the information to the specific patient, and last but not least evaluating the feedback.[7]

The positive impacts of EBM have kept in continuous evolution through continuing medical education (CME) programs for both undergraduate and postgraduate (PG) students. However, many clinicians are still managing their patients mainly based on their past clinical experiences, and expert opinions which have failed to translate research evidence into clinical application.[8] Only limited studies in our country have addressed the awareness and practice of EBM among PG medical students and senior residents. We intended to assess the current state of EBM awareness among the residents for implementing effective training programs in the future. Thus, this study sought to assess the prevalence of EBM awareness and practice among senior residents and PG students of a tertiary care hospital and identify the barriers retarding the practice of EBM.

## PARTICIPANTS AND METHODS

### Participants

The senior residents and the final year PGs of clinical specialties belonging to medical and surgical branches were included in the study. Senior residents are the doctors who had recently completed their 3 years of postgraduation in the concerned specialty. These study participants were considered they were involved independently in clinical decision-making. The 3rd-year PG students and senior residents of preclinical and paraclinical departments were excluded from the study. The participants were involved after obtaining informed consent for study participation.

### Study design and setting

A cross-sectional online questionnaire-based study was conducted in the tertiary care hospital under the Institution of National Importance from February 2022 to June 2022. The study was approved by Institutional Ethics Committee JIP/IEC/2019/068

### Study instrument

The study utilized a validated EBM Questionnaire (EBMQ) for assessing the knowledge, attitude, and practice of EBM by resident doctors.[9] This questionnaire was validated by Hisham *et al.* among primary care physicians in Malaysia.[9] The face and content validity of EBMQ were verified by a panel of nine experts. Cronbach's alpha coefficient for the overall EBMQ was 0.909. EBMQ was found to be a valid and reliable instrument for assessing the knowledge and practice of EBM along and barriers to the implementation of EBM among primary care physicians. The permission

was obtained from the EBMQ developers for data collection. The questionnaire was slightly modified to make it more relevant to the study participants.

### Procedure

By convenience sampling method, the participants were recruited for the study. The study participants were distributed the EBMQ, and the details of demographic characteristics, knowledge, source of information, and practice of EBM were collected through online messaging platforms. The data were further subsequently subjected to statistical analysis.

### Sample size calculation

Assuming the proportion of residents applying EBM in clinical practice as 94% based on previous studies, absolute precision of 5%, and an alpha error of 5%, a minimum of 87 individuals was needed for the study.[10] The sample size was calculated using the formula, $n = Z^2_{\alpha/2} p\ (1 - p)/d^2$, where $P$ denoted the expected proportion, $Z_{\alpha/2}$ and d represented $Z$ statistic for a level of confidence (1.96 at 95% confidence interval) and absolute precision, respectively. After accounting for 10% nonresponse rate, the final sample size calculated for this study was 96.

### Statistical analysis

Descriptive statistics were used to analyze the baseline demographics of the participants. The answers given by the participants related to knowledge, attitude, and practice of EBM were also expressed as frequency and proportions. All statistical tests were done using SPSS software version 22 (IBM Corp., Armonk, New York, USA).

## RESULTS

The baseline demographic characteristics of study participants are presented in Table 1. Among 102 participants, 74.5% and 25.5% were males and females, respectively. Senior residents who participated in the study were 67 (65.7%) which was twice the number of PGs. Participation from medical and surgical specialties was almost similar around 50%. Out of 102 participants, 96 physicians were already practicing EBM and all of them were familiar with the term "evidence-based medicine." Nearly 80% of the participants revealed the habit of reading research articles regularly and 21.6% of participants had attended a course or workshop on EBM. Regarding the formal training, 60.8% attended training on literature search, whereas only 38.2% and 39.2% attended training on question formulation and critical appraisal, respectively.

**Table 1: Baseline demographic characteristics of study participants (*n*=102)**

| Parameters | *n* (%) |
|---|---|
| Gender | |
| Male | 76 (74.5) |
| Female | 26 (25.5) |
| Current designation | |
| Postgraduate | 35 (34.3) |
| Senior resident | 67 (65.7) |
| Type of specialty | |
| Medical | 51 (50) |
| Surgical | 51 (50) |
| Do you practice evidence-based medicine? | |
| Yes | 96 (94.1) |
| No | 6 (5.9) |
| Do you read research articles in medical journals regularly? | |
| Yes | 82 (80.4) |
| No | 20 (19.6) |
| Have you heard of the term "evidence-based medicine" | |
| Yes | 102 (100) |
| Have you ever attended a course or workshop on EBM? | |
| Yes | 22 (21.6) |
| No | 80 (78.4) |
| Have you ever received any formal training in the following area-question formulation? | |
| Yes | 39 (38.2) |
| No | 63 (61.8) |
| Have you ever received any formal training in the following area literature search? | |
| Yes | 62 (60.8) |
| No | 40 (39.2) |
| Have you ever received any formal training in the following area-critical appraisal | |
| Yes | 40 (39.2) |
| No | 62 (60.8) |
| Did you conduct any research after graduating from medical school? (as an investigator or involved in data collection) | |
| Yes | 76 (74.5) |
| No | 26 (25.5) |
| Have you published any article? | |
| Yes | 73 (71.6) |
| No | 29 (28.4) |

EBM=Evidence-based medicine

### Assessment of source of information

The source of information utilized for acquiring knowledge on EBM by the study participants is denoted in Table 2. The frequency of usage of those sources was categorized into five types, ranging from never in the past 1 year to always (several times a week). Participants preferred textbooks (50%) predominantly for looking at evidence several times a week. The next preferred option was e-medicine, UpToDate, and Medscape databases (47.1%). The participants (37.3%) had also referred to specific EBM databases such as MEDLINE, Cochrane, and Turning Research into Practice (TRIP) databases often. About 55.9% of the participants relied on journal articles for EBM evidence at least once a week. Pharmaceutical representatives were the least preferred source of information reported by 53.9% of the participants and admitted that they had never used them in the past 1 year.

### Assessment of knowledge

The knowledge of resident doctors about salient EBM-related terms is represented in Table 3. A randomized

**Table 2: Source of information for evidence-based medicine referred by the resident doctors (*n*=102)**

| Sources of information | Never in the past 1 year, *n* (%) | Rarely (once in a few months), *n* (%) | Sometimes (at least once a month), *n* (%) | Often (once a week), *n* (%) | Always (several times a week), *n* (%) |
|---|---|---|---|---|---|
| Textbooks | 0 | 3 (2.9) | 13 (12.7) | 35 (34.3) | 51 (50) |
| Journal articles | 0 | 1 (1) | 15 (14.7) | 57 (55.9) | 29 (28.4) |
| Clinical practice guidelines | 0 | 15 (14.7) | 32 (31.4) | 33 (32.4) | 22 (21.6) |
| MEDLINE, Cochrane, and TRIP databases | 4 (3.9) | 13 (12.7) | 26 (25.5) | 38 (37.3) | 21 (20.6) |
| e-medicine, UpToDate, and Medscape | 3 (2.9) | 7 (6.9) | 14 (13.7) | 30 (29.4) | 48 (47.1) |
| General database (eg., Google and Wikipedia) | 5 (4.9) | 7 (6.9) | 20 (19.6) | 32 (31.4) | 38 (37.3) |
| Social media (Whatsapp, Wechat, and Facebook) | 39 (38.3) | 10 (9.8) | 23 (22.5) | 17 (16.7) | 13 (12.7) |
| Medical apps | 26 (25.5) | 14 (13.7) | 26 (25.5) | 24 (23.5) | 12 (11.8) |
| Peers/colleagues | 2 (2) | 10 (9.8) | 12 (11.8) | 43 (42.2) | 35 (34.3) |
| Family medicine specialist | 44 (43.1) | 18 (17.6) | 25 (24.5) | 7 (6.9) | 8 (7.8) |
| Hospital specialist | 28 (27.4) | 12 (11.8) | 20 (19.6) | 27 (26.5) | 15 (14.7) |
| Pharmaceutical representatives | 55 (53.9) | 16 (15.7) | 18 (17.6) | 8 (7.8) | 5 (4.9) |
| Conferences/talks/seminars/forum | 15 (14.7) | 19 (18.6) | 32 (31.4) | 30 (29.4) | 6 (5.9) |

TRIP=Turning Research into Practice

**Table 3: Knowledge of resident doctors about salient terms of evidence-based medicine (*n*=102)**

| Terms | Never heard of this term before, *n* (%) | Heard of this term but do not understand what it means, *n* (%) | Do not understand this term but would like to, *n* (%) | Have some understanding of this term, *n* (%) | Understand this term well and able to explain what it means to others, *n* (%) |
|---|---|---|---|---|---|
| Systematic review | 0 | 5 (4.9) | 1 (1) | 39 (38.2) | 57 (55.9) |
| Meta-analysis | 0 | 4 (3.9) | 1 (1) | 35 (34.3) | 62 (60.8) |
| Case–control study | 0 | 2 (2) | 1 (1) | 20 (19.6) | 79 (77.5) |
| Randomized controlled trial | 0 | 3 (2.9) | 0 | 18 (17.6) | 81 (79.4) |
| Relative risk | 0 | 2 (2) | 1 (1) | 28 (27.5) | 71 (69.6) |
| Absolute risk | 0 | 2 (2) | 1 (1) | 28 (27.5) | 71 (69.6) |
| OR | 0 | 3 (2.9) | 1 (1) | 30 (29.4) | 68 (66.7) |
| *P* | 0 | 2 (2) | 1 (1) | 24 (23.5) | 75 (73.5) |
| Level of evidence | 1 (1) | 2 (2) | 2 (2) | 35 (34.3) | 62 (60.8) |
| Number needed to treat | 2 (2) | 2 (2) | 6 (5.9) | 35 (34.3) | 57 (55.9) |
| CI | 0 | 2 (2) | 5 (4.9) | 34 (33.3) | 61 (59.8) |
| Heterogeneity | 2 (2) | 3 (2.9) | 18 (17.6) | 45 (44.1) | 34 (33.3) |
| Publication bias | 1 (1) | 2 (2) | 9 (8.8) | 45 (44.1) | 45 (44.1) |
| Test sensitivity and specificity | 0 | 2 (2) | 0 | 23 (22.5) | 77 (75.5) |
| Positive predictive value | 0 | 2 (2) | 1 (1) | 23 (22.5) | 76 (74.5) |
| Clinical effectiveness | 1 (1) | 3 (2.9) | 9 (8.8) | 36 (35.3) | 53 (52) |

CI=Confidence interval, OR=Odds ratio

controlled trial was the most familiar term among residents (79.4%) and they also reported their confidence in explaining it to their peers. The other familiar terms for residents were *P* value, test sensitivity and specificity, relative risk, absolute risk, and case–control study. The terms systematic review, meta-analysis, level of evidence, number needed to treat, and confidence interval were also understood well by more than 50% of the study participants. Heterogeneity was the least familiar term and nearly 17.6% of residents did not understand this term at all.

## Assessment of attitude

The attitude of the resident doctors toward EBM is depicted in Figure 1. Around 50% of the participants strongly agreed for supporting EBM. About 43.1% of the participants agreed that EBM had improved patient care and 42.2% agreed that reading research articles were important to them. More than half of the participants agreed that EBM could be implemented in clinical practice and EBM had guided their clinical decision-making. Nearly, an equal proportion of residents opined neutral (34.3%)

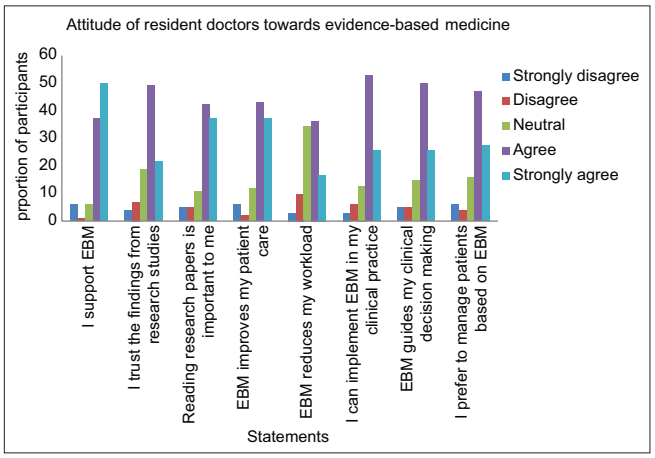


**Figure 1:** Attitude of resident doctors toward EBM (*n* = 102). EBM = Evidence-based medicine

and agree (36.3%) options for the statement, EBM had reduced their workload.

### Barriers and challenges to evidence-based medicine practice

The challenges encountered by the participants while practicing EBM are presented in Table 4. More number of participants (53.3%) agreed that they were able to access the quality of the research. More than 50% of the participants agreed that they had access to Internet facilities, had time to read research articles, and practice EBM in their clinic and the clinical facilities were adequate for incorporating EBM practices. A higher proportion of residents (52%) declared neutral opinions on patients' preferences for EBM.

### Assessment of practice of evidence-based medicine

The practice of five salient steps of EBM by the study participants is shown in Figure 2. It was observed that a greater proportion of participants had often adapted the practice of defining the clinical problem with a clinical question, explored the reliable medical literature, integrated the evidence with clinical knowledge, and also applied it in patient care. Critical evaluation of research evidence was practiced merely sometimes by the resident doctors.

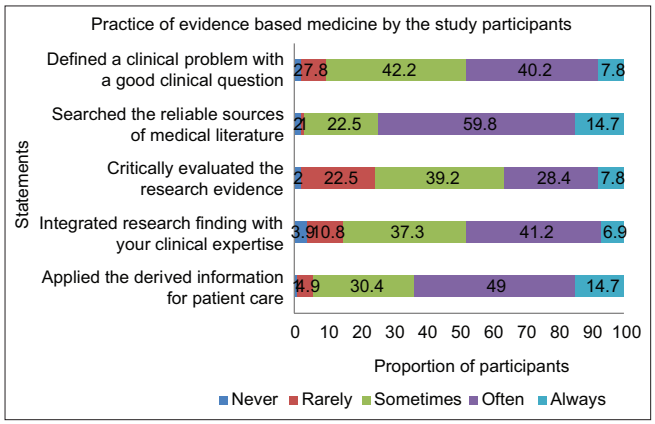


**Figure 2:** Practice of EBM by the study participants ($n$ = 102). EBM = Evidence-based medicine

## DISCUSSION

This study was conducted among the resident doctors of a tertiary care hospital affiliated with an Institution of National Importance. This study population was considered they would immensely contribute to clinical practice in outpatient as well as inpatient settings.[11] Besides substantial patient care, they were also potentially involved in the teaching and training of undergraduate and junior PG students of medical, nursing, and allied health science courses. Thus, their knowledge and attitude toward EBM would play a paramount role in the dissemination of the importance of evidence-based clinical practice. The studies exploring the knowledge and application of EBM principles in clinical practice by resident doctors in India were limited. Hence, this study was formulated.

Almost 80% of the participants accepted reading research articles which was slightly lower than the study among Sri Lankan specialists (88%).[12] The proportion of participants (21.6%) who attended EBM courses in our study was lower than that of studies conducted in Egypt (55.8%) and higher than the study (7.2%) done by Boulos *et al*.[13,14] These findings signal the lesser prevalence of the organization of EBM workshops in India. The percentage of participants who had critical appraisal training in this study was 39.2%. This was higher than the studies conducted by Boulos *et al*. (4%) and Ismail *et al*. (19.1%) and the recent Egypt study (6.8%).[13-15] This could be attributed to the mandatory journal club presentation recommended by the PG medical education curriculum of India. Contemporary studies conducted in different countries have highlighted the need for the integration of EBM skill training into the medical curriculum of both undergraduate and PG courses.[13,16]

Regarding EBM sources of information, 96.1% of the study participants were aware of MEDLINE, Cochrane, and TRIP databases. Awareness of MEDLINE among study participants was higher compared to Japanese

**Table 4: Challenges faced by the study participants while practicing evidence-based medicine ($n$=102)**

| Statements | Strongly disagree, $n$ (%) | Disagree, $n$ (%) | Neutral, $n$ (%) | Agree, $n$ (%) | Strongly agree, $n$ (%) |
|---|---|---|---|---|---|
| I am able to assess the quality of research | 5 (4.9) | 12 (11.8) | 24 (23.5) | 55 (53.9) | 6 (5.9) |
| I have access to Internet to practice EBM | 6 (5.9) | 10 (9.8) | 9 (8.8) | 60 (58.8) | 17 (16.7) |
| I have time to read research articles | 7 (6.9) | 17 (16.7) | 21 (20.6) | 54 (52.9) | 3 (2.9) |
| I have time to practice EBM in my clinic | 7 (6.9) | 12 (11.8) | 27 (26.5) | 51 (50) | 5 (4.9) |
| My clinic facilities are adequate to support the practice of EBM | 5 (4.9) | 13 (12.7) | 27 (26.5) | 52 (51) | 5 (4.9) |
| Research articles are easily available to me | 9 (8.8) | 14 (13.7) | 21 (20.6) | 52 (51) | 6 (5.9) |
| My patient prefers me to practice EBM | 4 (3.9) | 8 (7.8) | 53 (52) | 32 (31.4) | 5 (4.9) |
| My patient believes in the information that is based on evidence | 8 (7.8) | 6 (5.9) | 43 (42.2) | 42 (41.2) | 3 (2.9) |
| My colleagues support the practice of EBM | 7 (6.9) | 2 (2) | 16 (15.7) | 67 (65.7) | 10 (9.8) |
| My organization supports the practice of EBM | 9 (8.8) | 2 (2) | 12 (11.8) | 64 (62.7) | 15 (14.7) |

EBM = Evidence-based medicine

physicians (90%) and study in Egypt (50%).[11,17] Similarly, the knowledge of the Cochrane database was also higher than in studies conducted on resident physicians (71.8%) and family medicine doctors in Egypt.[13] These results might be attributed to the heightened spread of EBM awareness all over the world.

Despite the larger participants (94.1%) practicing EBM in this study, only 80.4% read research articles in medical journals regularly as more participants always preferred textbooks and electronic clinical resource tools such as Medscape and UpToDate over journal articles for EBM sources of information. Likewise, only 39.2% of participants had received critical appraisal training, which also substantiates their lack of proficiency in assimilating the conclusions of research articles that indirectly hamper their practice of reading research articles. The proportion of participants who had a better understanding of the highest level of research evidence such as systematic review and meta-analysis was 55.9% and 60.8%, respectively. This was also reflected in this study result that only 53.9% agreed with their ability for assessing the quality of research. The number of participants practicing EBM in the current study was higher than that of the study conducted in a similar population in Kenya (67%) and Sri Lanka (83.6%) and among physicians of Singapore (45%).[12,18,19]

The knowledge of resident doctors about EBM was explored in this study because EBM promoted clinical decision-making with the best existing research evidence instead of assuming all available literature as equal and also taking into consideration, patient preferences.[13] EBM insists on the delivery of health care based on conclusions derived from a controlled research environment as their conclusions were in proximity to truth. Randomized controlled trials are declared as high-quality evidence based on the latest GRADE classification of quality of evidence and also promote policy making. The important advantages acquired by practicing EBM are an appropriate use of available resources especially in resource-limited countries, constant amendments of management guidelines, and improvement in clinical and communication skills.[12] Physicians' clinical knowledge is also genuinely improved by referring to the current reliable higher-order scientific literature. The EBM cultural adaptation would potentially favor the equitable allocation of resources, besides cutting down on health expenditure, and also justifying the treatment cost.[20]

The resident doctors (87.3%) of this study expressed a favorable attitude toward EBM. Similar results were obtained from the studies conducted among primary health-care doctors in Saudi Arabia, government doctors from Sri Lanka, and physicians from Singapore.[12,18,21] Around 80.4% of participants in our study declared that EBM improved patient care. Studies conducted among resident doctors (90%) from Egypt and Kenya and Japanese physicians (65%) also declared similar results.[11,13,18] In an Indian study conducted among perioperative health-care professionals, 98% of participants accepted that the practice of EBM strengthened patient care.[22]

The potential barriers halting the clinical incorporation of EBM were overcrowding of patients at the health-care facilities, lack of access to the EBM literature, limited healthcare funding, time constraints, peer criticism, and the attitude of colleagues and mentors toward EBM.[23,24] The other major obstacles to practicing EBM were inadequate knowledge of EBM and lack of proficiency in critically evaluating the research evidence.[25] A similar study conducted in India also declared that lack of skills for critical appraisal of evidence, increased cost of new treatments, and the necessity to adhere to local treatment policies as the major obstacles to EBM practice.[22] In this study, 75.5% of participants agreed that they had Internet access for referring to EBM evidence. This study was organized in a health-care Institution of National Importance in India so the availability of Internet facilities was sufficient, but the facility might not be similar in hospitals located in remote places of the country. The study conducted among Sri Lankan specialists and PG students reported that 85% had access to EBM in their organization.[12] In a study involving French health-care professionals, around 21.7% reported a lack of access to Internet facilities.[25] The scarcity of library and Internet facilities at grassroots level health-care settings in resource-limited countries and poor access to newer effective drugs often impede the practice of EBM.

Time is one of the critical challenges for practicing EBM by the study participants (44.2%) in spite of the availability of facilitating factors such as Internet access. Based on study participants' responses, it was evident that patient's preference for EBM practice was also only 36.3%. Thus, the patients are also need to be frequently sensitized about the impact of EBM on the quality of care. Around 87.4% of participants accepted the support of the organization for EBM practice but this result might vary across the institutions.

The application of EBM in clinical practice can be enhanced by some reforms such as the inclusion of EBM in the undergraduate curriculum, hands-on

sessions for critical appraisal of the research evidence, and mandatory completion of a short course on EBM by resident doctors and obligatory integration of EBM with clinical postings. In a United States-based study, the integration of EBM with a residency program significantly improved the awareness and attitude of medical students (83%) toward EBM.[26] Similarly, the EBM workshop for medicine and pediatrics residents also promoted their attitude toward EBM, reflected in the improvement in postinterventional attitude and skills scores.[27] Finally, EBM can be achieved only through a multifaceted approach to identifying and breaking the existing barriers. Even after all the training, there is difficulty in implementing EBM in medical colleges and hospitals in India. To ease this process, a multidisciplinary EBM committee could be formed to generate local evidence and ensure the practice of EBM by conducting periodic audits of prescriptions. Furthermore, CME can be organized regularly to update on research-based recommendations which can be included in the standard treatment guidelines of the hospital. Furthermore, an online portal for EBM can be created on the hospital website to enable active discussions and clarify doubts.

The limitation of the study includes the generalizability of data to the target population as a convenience sampling method was incorporated for data collection. The strength of the study was the equal representation of residents from both medical and surgical specialties.

## CONCLUSIONS

The study confirmed the positive attitude of resident doctors in a tertiary care center besides sufficient knowledge of EBM and competency to incorporate it into day-to-day clinical practice. Nevertheless, the exclusive training for EBM through skill development programs, workshops, and integration with mainstream PG curriculum would potentially upgrade their proficiency and application of EBM.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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