Hunting Biomedical Literature in PubMed: Factors Affecting the Hunt

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ABSTRACT

Background: *Quest for knowledge is a good indicator for anyone involved in academics and research. However, finding what one exactly needs is the question we need to focus on. Accessing databases for retrieving information can be tricky unless one has knowledge to sail through it.* **Aim:** *To assess knowledge of accessing PubMed (biomedical database) among faculties of a deemed university in Pondicherry with a secondary objective to determine the influence of independent variables over overall score.* **Materials and Methods:** *The questionnaire consisted of items used to obtain scores which were categorized as poor, average and good. Total 200 questionnaires were distributed to faculties of dental, medical and nursing institutes. Designation, cadre, number of publications, experience, workshop attended, accessing tutorial and work profile in institution were the independent variables considered. Participants were requested to fill the questionnaire in the presence of the investigator.* **Statistical test:** *Logistic regression was done to determine the influence of independent variables on overall scores. Chi-square test was used to compare proportions.* **Results:** *Response rate was 92 percent. None of the faculties had adequate knowledge in accessing PubMed with least participation from dental specialty. Only 23 percent had more than 10 publications and only 33 percent had accessed PubMed tutorial. Specialty (OR: 5.9; p<0.05) rank/cadre (OR: 0.23) attending workshops (OR: 0.33) and accessing tutorials [OR: 0.26] were found to influence overall scores.* **Conclusion:** *Faculties knowledge to access PubMed ranged from poor to average. There is a need to rectify this loophole and efforts directed to strengthen and/or reinforce the knowledge through workshops and hands on courses.*

Keywords: Access to information, Cross-sectional, Dental faculty, Medical faculty, National Library of Medicine, PubMed

INTRODUCTION

We are living in a world, where medical field is advancing rapidly. Many questions arise in the medical field every-day, which are left un-answered due to "lack of skills in formulating questions, crafting effective search strategies, and accessing databases to identify best levels of evidence" [1]. For physicians to keep-up with the medical advances there need to be a common place to share and review the research being carried out in different fields of medicine and at various places.

PubMed is that "common place," PubMed can have a significant impact on patient care and clinical outcomes. Even though millions of articles seem like blessing, but searching through them is time-consuming [2]. PubMed is most popular and publicly available life science literature retrieval tool and is generally used for retrieval of specific information from MEDLINE rather than an exploratory medium [3]. PubMed provides free access to one of the largest searchable biomedical databases [4].

PubMed is a free resource that is developed and maintained by the National Centre for Biotechnology Information (NCBI), at the U.S. National Library of Medicine (NLM) located at the National Institutes of Health (NIH), it is a part of the Entrez information retrieval system. PubMed comprises over 22 million citations for biomedical literature from MEDLINE, life science journals, and online books. PubMed Central (PMC) offers all articles free to the users [5].

Faculty, due to the nature of their work-teaching, research, and, in some cases, clinical practice-should have ready access to medical information. By their teaching styles and course requirements, they affect the use of the library's collection and students' perception of the library. Computer-literate faculty may feel more comfortable using electronic information sources and thus gain more from using them [6]. Other reasons for medical faculty to use e-resources include relating to increasingly computer-literate students and keeping up to date in their fields. The latter is essential for those with clinical practice as more of their clients use e-resources to keep informed about health information [7].

Familiarity with search tools in PubMed helps users perform efficient citation retrieval. In view of the above statement, the present study was undertaken with the objective to determine faculty's knowledge of accessing PubMed for various purposes. The secondary objective was to find whether independent variables like gender, status, specialty, rank, activities, experience, and total number of publications had any influence on overall scores.

METHODOLOGY

Study design and setting

A cross sectional questionnaire study was conducted in September 2015 among colleges affiliated to a private deemed university in Puducherry, India. The study participants consisted of faculties employed by the university in three different disciplines (Dental, Nursing and Medical). Prior permission and ethical clearance was obtained from the concerned authorities of the Indira Gandhi Institute of Dental Sciences (IGIDS), and a letter seeking permission to conduct the study in sister constituent colleges was obtained from the dean of IGIDS.

The questionnaire consisted of two sections. Section one elicited the working status (part time/full time), the rank, their activities during the working hours, their duration of working years and the number of publications. Section two consisted a total of 27 items, with questions 1-4 eliciting information about the usage of computer, any workshop if attended (searching of dental/medical literature), the proportion of different electronic sources used for accessing literature. Questions 5-24 formed the crux of questionnaire. These questions formed a part of quiz that is used by United States National Library of Medicine (USNLM) to assess the knowledge gained after accessing the PubMed tutorial. An electronic-mail was sent to concerned department of USNLM for their permission to use the quiz as a questionnaire. Only on an affirmative response from USNLM was the present study proceeded. The PubMed tutorial is meant to provide first- hand information to researches, clinicians and academicians about accessing PubMed. These questions were then checked for content validity by two senior faculties with adequate experience and who were not a part of the present study. However, the questionnaire was not tested for its reliability and concurrent validity. The remaining questions elicited various means through which the participants wished to increase their knowledge. Each question irrespective of number of options had one right answer. The right answers were coded as "1" (one) and wrong answers were coded as "0" (zero). The number of correct answers was added and the score obtained was then used to categorize the participants as good, average and poor.

Participants

The dean/s of Dental, Nursing, and Medical colleges were approached and permission was obtained to approach all departments. This was followed by obtaining permission from heads of all departments (of respective institutes), later the faculties were approached to be included as participants. The faculties were approached, the nature of the study explained and questionnaire was handed only after obtaining the written informed consent. Those included were requested to fill the questionnaire in the presence of an investigator. Not more than 25 minutes was given to each participant. Those not present on the day of the study were again approached for two consecutive days, following which they were excluded from the study. No incentives were provided to any of the participants. Confidentiality and anonymity was assured to all the participants. The answers to the questionnaires were not revealed throughout data collection. Incomplete and those questionnaires with more than one response for an item were excluded from the study.

Statistical analysis

The dependent variable was categorized as 1 = ≤ 8 (poor), 2 for score 9 to 16 (average) and 3 for 17 and above (good). The independent variables analyzed were for gender, rank, status, specialty, area of interest, attending any workshop on literature search and whether or not having navigated PubMed tutorial. The data was dichotomized for length of time and number of publications. Length of time working was categorized as 1 for ≤ 5 years of experience and 2 for ≥ 6 years of experience. Number of Publication was categorized as 1 for ≤ 10 publications and 2 for 11 ≥ publications. Logistic regression was performed to determine the influence of independent variables on dependent variable.

The data was entered in Microsoft Excel Sheet (Microsoft 2010) and analyzed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 200 questionnaires were distributed. Adhering to the inclusion criteria, 184 questionnaires were included for analysis, indicating a response rate of 92 percent. About 53 percent of the participants were females, majority of them were full time faculty with 76 percent of them having less than five years of experience. Dental faculties were the least responsive (Table 1). About 46 percent of the participants were relatively young or new in their professional areas with 9.2 percent of them pursuing their Doctor of Philosophy (PhD). Fifty percent of participants concentrated on teaching whereas 9.3 percent were involved in teaching, research as well as attending patients at their work place. More than 75 percent of participants had less than 10 scientific publications. Only 2.7 percent had more than 30 scientific publications (Table 1). About 70 percent of the participants accessed computers every day.

Table 1 Descriptive statistics of independent variables

Variable		Number	Percentage
Gender	Males	86	46.7
	Females	98	53.3
Status	Part time	41	22.3
	Full time	143	77.7
Specialty	Dentistry	30	16.3
	Medical	94	51.1
	Nursing	60	32.6
Rank	Assistant prof	85	46.2
	Associate Prof	53	28.8
	Prof	29	15.8
	PhD Scholar	17	9.2
Activities	Teaching	92	50
	Research	32	17.4
	Clinical practice	43	23.4
	all of above	17	9.2
Experience	0 - 5 years	140	76.1
	≥ 6 years	44	23.9
Number of Publications	0 to 10	141	76.6
	≥ 11	43	23.4
Attended workshop	Yes	124	67.4
	No	60	32.6
Accessed Pub Tutorial	Yes	62	33.7
	No	122	66.3
Interpretation	Poor Scores	148	80.4
	Average Scores	36	19.5

A vast majority of the participants accessed PubMed (85.8 percent), SAGE journals and Google respectively (Table 2). About 68 percent (125) of participants had previously attended a workshop regarding literature search, with least proportion among the dentist (12.8 percent (16)), when compared with medical and Nursing specialty the difference was statistically significant (χ2 test- 25.66, p<0.001) (Table 3). About 33 percent (62) of the participants undertook PubMed tutorials. Of the 33 percent (62), dental specialty scored the lowest with only 14.5 percent (10) accessing the tutorial (Table 4).

Table 2 Distribution of participants according to most accessed online database, online Journal and search engine used among the specialty of SBVU (percentage)

Source		Dental	Medical	Nursing
Online Database	PubMed	96.6 (29)	89.3 (84)	75 (45)
	EMBASE	33. (1)	7.4 (7)	20 (12)
	EBSCO	0	2.12 (2)	2.1 (2)
	ScopeMed	0	1.06 (1)	1.6 (1)
Online Journals	SAGE	83.3 (25)	90.4 (85)	73.3 (44)
	Quintessence	13.3 (4)	5.3 (5)	10 (6)
	Wiley	3.3 (1)	2.1 (2)	8.3 (5)
	Others	0	2.1 (2)	8.3 (5)
Search Engines	Google	93.3 (28)	91.4 (86)	68.3 (41)
	Rediff	6.6 (2)	2.12 (2)	11.6 (7)
	Yahoo	0	5.3 (5)	18.3 (11)
	Others	0	1.06 (1)	1.6 (1)

Table 3 Distribution of participants on specialty and workshop attended on Literature search (overall participants)

Faculty	Any workshop on literature search			Chi test	Significance
	yes	No	Total		
Faculty of Dentistry	8.7 (16)	7.6 (14)	16.3 (30)	25.66	p<0.001
Faculty of Medicine	42.4 (78)	8.7 (16)	51 (94)		
Faculty of Nursing	16.3 (30)	16.3 (30)	32.6 (60)		
-	67.4 (124)	32.4 (60)	100		
*Significant at p<0.001					

Table 4 Distribution of participants accessing PubMed tutorials according to specialty

Accessed PubMed Tutorials	N (%)	Among those who accessed PubMed tutorials	
Yes	33.7 (62)	Dental	14.5 (10)
		Medical	53.2 (33)
		Nursing	30.7 (19)
No	66.3 (122)	-	-

Table 4a Distribution of participants undertaking various activities

| Activities undertaken by participants	N (%)	Specifically, Research only	N (%)
Only Research	17.4 (32)	Assistant Professor	84.3 (27)
Others (teaching, clinical and includes teaching, research and clinical work)	82.6 (152)	Associate Professor	9.3 (3)
-	-	Professor	6.3 (2)

The results of logistic regression showed that dental faculties were more likely to have poor scores when compared to medical and nursing faculties (OR: 5.39, 95% CI 1.51 - 23.08; p<0.05). Assistant professors were less likely to have poor scores than another cadre (OR: 0.23, 95% CI: 0.05 - 0.997, p<0.05). Those attending workshop and accessed PubMed tutorial were less likely to have poor scores than those who did not attend and/or undertook tutorials (Table 5).

Table 5 Model (Logistic regression) on independent variables and PubMed scores

Independent Variables	Proportion	odd's Ratio	95% CI	P value
Specialty				
Dentistry	30 (16.3)	5.9	1.51 - 23.08	0.01*
Medical	94 (51.1)	2.46	0.76 - 7.9	NS
Nursing[1]	60 (32.6)	-	-	-
Designation				
Assistant Professor	85 (46.2)	0.23	0.05 - 0.997	0.05*
Associate Professor	53 (28.8)	0.81	-	NS
Professor	29 (15.2)	0.17	-	NS
PhD Scholar[1]	17 (9.8)	-	-	-
Attended Workshop				
Yes	124 (67.4)	0.33	0.13 - 0.81	0.02*
No[1]	60 (32.6)	-	-	-
Accessed PubMed Tutorial				
Yes	62 (33.7)	0.26	0.09 - 0.74	0.01*
No[1]	122 (66.3)	-	-	-
Intercept	-	-	-	0.01*
R2 - 0.23; 1: Reference Category; NS: Not Significant; *Significant at 0.05				

In addition, about 65 percent of the participants preferred workshop to know more regarding biomedical literature search, followed by 54 percent of the participants recommending a provision for online mode of tutorial (Figure 1).
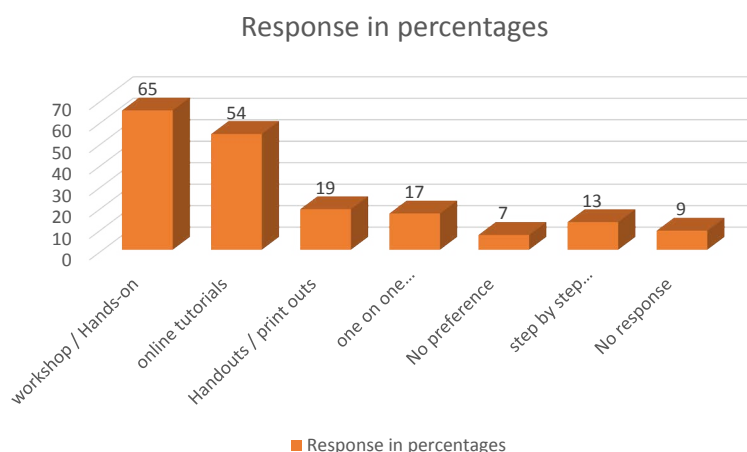
Figure 1 Distribution of participant's response according to their preference for learning

DISCUSSION

To our knowledge this is the first study which has used a questionnaire to determine researchers', academicians' and clinicians' knowledge of accessing PubMed for bio-medical literature search. Nicholas wrote that, ''you can only use what you know about and what you are experienced or trained in using'' [8]. The knowledge of accessing PubMed among faculties of the study setting ranged from poor to average. It was surprising to find that none of the participants in any of the three specialties could score above average. Only 19.6 percent (36) scored average, with highest contribution from the medical specialty (17). PubMed remains the choice for accessing biomedical literature among online databases, a finding observed in other studies as well [3,9,10]. This could be since PubMed database is more comprehensive, more current and allows access to citations even prior to their indexing with other databases [11].

In the home page of PubMed (www.ncbi.nlm.nih.gov/pubmed) it is generally recommended that before one starts to use PubMed, they undertake the "PubMed Tutorial," which is a web-based learning program that will show how to search and gather open access and non-open access articles. However, only 33.7 (62) percent of the participants reportedly undertook PubMed tutorial. The dental specialty contributed the least with only about 14 percent (10)

taking the tutorial. Participation from the dental faculty was the lowest, which can be comprehended as an attempt to 'mask' their little knowledge in searching biomedical literature since, during data collection, the faculties of dentistry were approached consecutively for two days. That means an attempt was made to include them (dental faculties) in the present study. Moreover, as Mehta and Young concluded that low response rate reflected the apathy of their participants in a study conducted in 1995. The same principle can be applied in the present study for participants under dental faculties [12]. In addition, less participation from the dental section could also be the reason. One also needs to be cautious in critically appraising the possible reasons for the same.

In an attempt to promote research work and academic development of the faculty, the Dental Council of India and the Medical Council of India introduced the criteria to award minimum specified points for their scientific publications [13,14]. Promotions of faculties are based on the number of publications. This has practically initiated the 'publication rat race', which becomes a matter of pride among their peers and gives them an edge over their rivals when applying for jobs overseas. In our study setting, overall only 23.4 percent (43) had more than 11 publications. Among the cadre, assistant professors had the maximum share and medical specialty was leading with 48.8 percent (21) of them having more than 11 publications. Such imbalance in publication could be due to non-acceptance of the manuscripts and/or reduced interest in publications soon after one is promoted. Since this study also involved those working in clinical departments, lack of time to prepare manuscripts can also be the reason for the same. Regular workshops with focus on manuscript preparation should be organized motivating the faculty to pursue their research work and urging them to publish the findings.

We also need to consider the fact that majority of participants preferred teaching than other activities. Only 17.4 percent (32) were interested in research related work. Among these, the younger faculty with less than 5 years of experience (27) were actively involved. The reason could be attributed to their desire to conduct more research in the early years of their academic careers. This phase was followed by a sudden drop in their interest from 27 participants to only three and finally two participants as hierarchy increased (Table 4a). This sudden drop can be due to promotions of the younger faculty who are then eligible to guide the post-graduate students. Hence, majority of their time is spent in guiding their post-graduate students. Also, those involved in teaching opt for publications only for their promotions which has been made mandatory by DCI and MCI respectively. However, the activities undertaken at work, gender, status and experience had no influence on the overall scores.

In the present study, specialty, cadre of the participants, and involvement of the participants in attending workshops and accessing PubMed tutorial was found to influence the scores. The logistic regression reveals the likelihood of participants from dental specialty to be more towards poor scores than medical and nursing. Active involvement by the latter specialties in the present study and more proportion of poor scores among the dental participants could be the reason for the above findings. Assistant Professors had an edge over their colleagues in the hierarchy among all specialties who were less likely to move towards poorer scores. Their increased participation coupled with more publications might have compelled them to learn searching papers/original articles/review articles from PubMed for referencing is the likely reason one can think off. The scenario was the same among those participants who had attended workshops on literature search and were less likely to have poor scores than those who did not attend such workshops who were more likely. The proportion of participants attending such workshops was more among Medical specialty than Dental and Nursing, which was statistically significant (Table 3).

Faculties participating in this study, stated a clear desire for training. They felt that workshops and hands on courses followed by online tutorials were the preferred format. It is imperative to have a crisp and clear knowledge of accessing any database, since lack of experience in search techniques often leads to missing many relevant citations that may have an impact on patient care [15]. A small proportion of participants, however provided no response on their preference of learning.

The present study made an attempt to probe the accessing capabilities for biomedical literature (PubMed) among faculties. The study to some extent confirmed the lack of knowledge among the faculties and suggested that the section "using PubMed" in homepage is under-utilized. This is in accordance with the statement made in earlier sections of discussions, that is, a low response rate might reflect apathy to using the resources [12]. However, relatively high response rate (92 percent) and levels of computer (72 percent) use among participants may imply that they were ready, with an interest directed towards knowing more about biomedical literature search, as in this case PubMed. Roberts in

1995 concluded that the burden of responsibility for informing faculty about information resources fell on the library [16], informing faculty about the available resources, how to access it and make the most of it. However, the role of library in disseminating information to the faculties and/or the usage of libraries by the faculties was not assessed in the present study. Overall, the study itself can be considered as a step in this direction, since the nature of its content served to provide a rough outline regarding accessing PubMed.

This study has several limitations: a) the questionnaire was not validated, it is important that the reliability and validity of the questionnaire be established before utilizing this questionnaire as an instrument for various objectives regarding accessing PubMed, b) given that searching through PubMed is a task which involves cognitive response, there are chances that one might forget the steps involved when assessed via a questionnaire. There were no diagrams and/or images used from the website for simulation, which are otherwise present in PubMed tutorial, c) the methodology states that the faculties were approached for two consecutive days to retrieve the questionnaire. So, it is quite possible that there is a spillover effect among participants. Also, few participants owing to their busy schedule took the questionnaires and returned the filled questionnaire next day, however, to avoid any bias such questionnaires were not included in the study, and d) the nature of the study is cross-sectional; therefore over a period of time, these results are likely to vary since every institute makes an attempt to upgrade the knowledge of their faculty for academic excellence via Continuous Dental/Nursing/Medical Education (CDE, CNE and CME) programs on research methodology and accessing articles among other things.

CONCLUSION

It can be concluded that the participants in the present study setting had poor to average scores when it comes to accessing through PubMed. Experience, gender, status, and activities undertaken at work had no influence on overall scores. Among the independent variables, specialty had an effect on overall scores while rank/designation, those attending workshop and those undertaking PubMed tutorial had a protective effect. Other parameters like those who have no publications, publications exclusively in PubMed database were not included. Future studies have to be conducted to provide a broader view of the situation so that the path for easy accessibility of abstracts and/or links to full text articles are cleared, and searching bio-medical literature becomes a core competency of every academician, researcher and teacher.

DECLARATIONS

REFERENCES

[1] Schardt, Connie, et al. "Utilization of the PICO framework to improve searching PubMed for clinical questions." *BMC Medical Informatics and Decision Making* Vol. 7, No. 1, 2007, p. 16.

[2] Schell, Mary Beth. "The use of free resources in a subscription-based digital library: a case study of the North Carolina AHEC Digital Library." *Biomedical Digital Libraries* Vol. 3, No. 1, 2006, p. 9.

[3] Joseph, Thomas, et al. "TPX: Biomedical literature search made easy." *Bioinformation* Vol. 8, No. 12, 2012, pp. 578-80.

[4] Sood, A., and A.K. Ghosh. "Literature search using PubMed: an essential tool for practicing evidence-based medicine." *Journal-Association of Physicians of India* Vol. 54, 2006, pp. 303-308.

[5] PubMed, National Center for Biotechnology Information, U.S. National Library of Medicine, http://www.ncbi.nlm.nih.gov/pubmed. Accessed 22 Jan. 2016.

[6] Henderson, Tona, and Bonnie MacEwan. "Electronic collections and wired faculty." *Library Trends* Vol. 45, No. 3, pp. 488-98.

[7] Majid, Shaheen, and Alfia Fanilievna Abazova. "Computer literacy and use of electronic information sources by academics: A case study of International Islamic University Malaysia." *Asian Libraries* Vol. 8, No. 4, 1999, pp. 100-111.

[8] Nicholas, David. *Assessing information needs: Tools, techniques and concepts for the internet age*. 2nd ed., London: Aslib Information Management, 2000.

[9] De Leo, Gianluca, et al. "Websites most frequently used by physician for gathering medical information." *AMIA Annual Symposium Proceedings*. Vol. 10, 2006. American Medical Informatics Association, 2006.

[10] Renwick, Shamin. "Knowledge and use of electronic information resources by medical sciences faculty at The University of the West Indies." *Journal of the Medical Library Association* Vol. 93, No. 1, 2005, pp. 21-31.

[11] Sood, A., and A. K. Ghosh. "Literature search using PubMed: an essential tool for practicing evidence-based medicine." *Journal-Association of Physicians of India* Vol. 54, 2006, pp. 303-308.

[12] Mehta, Usha, and Virginia E. Young. "Use of electronic information resources: A survey of science and engineering faculty." *Science & Technology Libraries* Vol. 15, No. 3, 1996, pp. 43-54.

[13] Dental Council of India, Government of India. http://www.dciindia.org.in/act,rules&regulations. Accessed 14 Jan 2016.

[14] Medical Council of India: Minimum qualifications for teachers in medical institutions. Regulations, 1998 (Amended up to August 2012), http://www.mciindia.org/Rules-and./TEQ-regulations-06-08-12-pdf. Accessed 14 Jan 2016.

[15] Haynes, R. Brian, et al. "Online access to MEDLINE in clinical settings: a study of use and usefulness." *Annals of Internal Medicine* Vol. 112, No. 1, 1990, pp. 78-84.

[16] Roberts, Jacqueline M. "Faculty knowledge about library services at the University of the West Indies." *New Library World* Vol. 96, No. 2, 1995, pp. 14-22.