4-7-2021

Are Medical Students Information Literate? investigation of skills through a cross sectional survey

Ihsan Basit
Shaikh Zayed Medical Complex, Lahore, Pakistan, librarian@skzmdc.edu.pk

Syeda Hina Batool
University of the Punjab Lahore Pakistan, hina.im@pu.edu.pk

Hafiz Nazeer Hussain
Govt. Graduate College, Ravi Road, Shahdara, Lahore, hafiznazeerhussain@gmail.com

Imran Ghaffar Sulehri
Pakistan School of Fashion and Designing, Lahore, igsulehri@hotmail.com

Muhammad Fazal Khan
Superior University, Lahore

Are Medical Students Information Literate? investigation of skills through a cross sectional survey

by

Ihsan Basit[1]
Dr. Syeda Hina Batool[2]
Hafiz Nazeer Hussain[3]
Imran Ghaffar Sulehri[4]
Dr. Muhammad Fazil Khan[5]

(1) PhD Scholar, Institute of Information Management, University of the Punjab, Lahore
(2) Assistant Professor, Institute of Information Management, University of the Punjab, Lahore
(3) Lecturer, Govt. Graduate College, Ravi Road, Shahdara, Lahore
(4) Librarian PIFD, Lahore
(5) Professor & Head Department of Library and Information Science, Superior University, Lahore
Email Address of corresponding author: librarian@skzmdc.edu.pk

Abstract

Introduction: Information literacy (IL) has great importance for medical students to make them capable of organizing and using critically accurate information from reliable sources. As the medical profession demands critical and lifelong learners due to its serious and sensitive nature, this study aims to examine the IL skills of undergraduate MBBS students of Shaikh Zayed Medical Complex (SZMC), Lahore, Pakistan. **Methods:** A contextual structured questionnaire, based on IL standards of Association of College and Research Libraries (ACRL) for higher education, was adapted to collect data**.** From total population of 466 enrolled students, through convenient sampling, 211 medical students enrolled in five years of MBBS program were approached for this purpose. **Results:** Findings revealed that majority of the respondents were found capable of determining the nature and extent of required information, were able to analyze and evaluate information and its sources alongside the understanding with ethical and legal use and communication of information produced. However, it was found that respondents scored low in the abilities of using ICTs, locating digital information by formulating advance queries, using reference management tools and information creation and presentation. **Implication:** The results highlight the importance of information literacy for medical profession, the current medical education curriculum and syllabi should be revised and integrated with advance IL instructions to produce future medical professionals as life-long learners. The findings also pointed out extensive role of medical library professionals, faculty and medical universities to develop updated and targeted IL instruction programs and training sessions.

Keywords- information literacy, IL skills, MBBS students, undergraduate medical students, information literacy instruction, Pakistan

Introduction/Background

Medical education is the backbone of effective healthcare system, patient care, diagnosis, prognosis and treatment of diseases and ultimately deals with producing health professionals for a society. These professionals have obligation to develop themselves as information literate in order to accurately serve their evidence-based practice. As the current digital society is harvesting and producing huge collection of information and knowledge in the field of medical sciences, the need of information literacy instruction becomes inevitable Similarly, medical learning, research, health care practices (Ullah & Ameen, 2019) and advances in medical sciences in the recent decades are significantly influenced by

modern technologies (Habibi, 2015). Thus, imparting IL skills to the medical students is crucially important in this present fast changing digital era (Oberprieler, Masters & Gibbs, 2005).

It has been suggested by the researchers that medical profession is of different nature and students need to educate through variety of instructional methods including problem-based learning (Eskola, 2005). Studies evidenced that positive learning experiences can only be possible through IL instruction in the field of healthcare (Sezer, 2020). Studies reported that medical students' who attended IL courses on campus or online confirmed the importance of this sort of learning in their academics and practice (Kratochvil, 2011).

The past studies focused on the effectiveness, evaluation and need of information literacy for medical students. A cohort study evaluated the effectiveness of IL program and reported that the medical students deliberately need the skills to find relevant information and must know the value of authenticity, validity, and reliability (Cullen R, Clark M, & R, 2009). Similarly, another study identified that medical students are required more IL skills to be successful in retrieving and appraising information for research development and for practice. Moreover, these skills are needed to seek information for committed evidence-based practice of clinicians who are entering the work force (Cullen, Clark, & Esson, 2011). Not only this, IL skills are significantly correlated for effective use of electronic information and its resources among postgraduate medical students for their academic purposes (Adeleke & Emeahara, 2016). Thus, the study of Bazrafkan et al. (2017) asserts that the current educational plans are needed to be revised due to the substantial importance of information literacy for medical students in this information age. Moreover, the medical librarians also perceived and considered that IL skills are very important for medical library users and they must be adequately equipped with information competencies (Ullah & Ameen, 2016) to achieve their academic and professional goals (Mohammed & Haliru, 2019).

As far as the scenario of Pakistan is concerned, several studies have explored IL skills of different population groups such as (Batool & Webber, 2019) highlighted the situation of primary and school teachers, (Rafique, 2014) investigated university faculty members' skills, undergraduate and postgraduate engineering students by (Kousar & Mahmood, 2013, 2015), management sciences' students IL skills (Rafique & Khan, 2018), workplace IL of scientists (M. A. Naveed & Rafique, 2018), using different self-efficacy scales to assess IL skills (Mahmood, 2017). However, only a couple of studies (Q. Naveed & Sharif, 2015; Ullah & Ameen, 2014) are carried in Pakistani medical institutes with focus on medical librarians. Though, there is a dearth of literature with reference to IL skills of undergraduate MBBS students with relevance to Pakistan. Prior studies neglected the most important group of population in Pakistan. This group of population essentially needed and required to develop their IL skills before entering to the practice based medical profession. Therefore, the aim of this study is to assess the IL skills of undergraduate MBBS students of Sheikh Zayed Medical Complex (SZMC), Lahore, Pakistan in order to bridge literature gap. The proficiency in IL skills for MBBS students during their course of study is of much importance. Thus, the study may be helpful to understand the level of IL skills of medical students and to promote IL practice in the libraries of medical institutes of Pakistan.

Objectives

The study addressed the following research objectives:

- To determine the extent of information needed by medical students;
- To identify how medical students access the needed information effectively and efficiently;
- To know how medical students evaluate information and its sources critically;
- To find out how medical students incorporate selected information into one's knowledge base;
- To know the use of information effectively to accomplish a specific purpose by the medical students;

Literature Review

Generally, a plethora of literature has been published on IL and a large number of research studies are found which evaluated the IL skills of students, teachers and engineers (Batool & Webber, 2019; Haider and Ya, 2021; Kousar & Mahmood, 2015; Rafique, 2014; Rafique & Khan, 2018) and less focused on the assessment of other population groups including MBBS students .

Bazrafkan et al. (2017) conducted an analytical-descriptive study followed by cross sectional method to evaluate IL status of medical students at Shiraz University. The results of the study revealed that male students were significantly higher than female students in four IL standards i.e. determination ability scope and nature, effective access, critical appraisal, and the ability of information targeted application. On the other side, female students were significantly higher than males only in one standard i.e. the ability to understand legal and economical cases related to the use of information. In addition, Liu and Sun (2012) also found that overall average rating of male students was much better than ladies while each gender had the same learning experience. Soleymani (2014) concluded that the IL skills of all the students other than medical field i.e. nursing, nutritionists were much higher. Management & Information Science students were found at the highest level of IL and the nutritionist students were at the least level.

However, the study of Carr, Iredell, Newton-Smith, and Clark (2011) has identified that first year medical students could not show their perceived IL skills satisfactory on the scale of "Australian and New Zealand Information Literacy (ANZIL) Standards and the Information Skills Survey for Assessment of Information Literacy in Higher Education (ISS)". Similarly, another study reported that the clinicians who are entering the work force have not retained high-level skills of searching, identifying and applying information in their best evidence-based practice (2011). Consequently, due to the inadequate IL skills, a discouragement is observed among the medical students for using electronic information resources which might of extensive use to lead research enquiry in this digital age (Adeleke & Emeahara, 2016). Later on, another study also has assessed the status of IL skill of medical students and reported the results, which were not at the desirable level in this high-tech globalization age even the students had undergone IL trainings (Bazrafkan et al., 2017). Henceforth, conducting regular IL skills self-assessments surveys of medical students are useful and effective for designing and implementing training programs for conducive teaching and learning purposes (Mohammed & Haliru, 2019).

Islam and Tsuji (2010) measured that the IL expertise of ISLM (Information Science & Library Management) for students of graduation level at Dhaka University, Bangladesh. Poor IL skill unnecessary to include the IL course in syllabus was explored in the findings. Mostly the students of 1st year level, had no awareness with the IL, because of deficiency in search of databases and analytical thinking abilities (Asher & Duke, 2010; Meyer et al., 2008). It has been evidenced by research that the academic institutions essentially need IL education plans (Russell, 2009). The development of information and technology enabled IL, the most significant for lifelong learning and for fixing troubles caused by inadequate information (Amalahu, Oluwasina, & Laoye, 2009).

Status of Information Literacy in Pakistan

A review of national literature found a good number of studies on measuring IL skills and importance among different population groups (Batool & Webber, 2019; Haider & Ya, 2021; Kousar & Mahmood, 2015; Rafique, 2014; Rafique & Khan, 2018). However, there is a dearth of literature on studies focusing MBBS students and medical professionals. Azra (2014) determined the level of perception of IL among the engineering students of Punjab University, Lahore. An ACRL based questionnaire was used. She found that the respondents were much competent in the IL abilities.

An effort was made to focus on the concerns of IL at school level by researchers (Batool, 2012). A total of 54 teachers were chosen through purposive sampling to assess the skills of their students. The results showed that students ranked higher by the teachers in IL skills. They mentioned that students were having these skills because of availability of essential resources and instruction to utilize those

resources.

Habib (2012) found that the undergraduate pharmacy students of University of Veterinary and Animal Science, Lahore possessed moderate IL skills while the 83.3% had been facing difficulties in the search and evaluation of existing information. A number of students (66.6%) were unable to evaluate online information. Half of the respondents pointed out the importance of orientation sessions about the library and its services. A same research was done by Kousar (2011), she explored in a survey conducted upon the Pakistani faculty members of engineering sciences to get their viewpoint regarding the IL skills of graduate scholars. It was showed that Ph. D scholars were good in IL skills as compare to the scholars of MS level. It was also found that some teachers were making efforts to provide guidelines to the scholars to improve their IL skills.

Keeping in view of the scenario of less literature focusing medical students, present study aims to investigate IL skills of this population group. There are numerous different disciplines in which the studies are required to enhance the understanding of information Literacy for community development.

Research Approach, Participants and Tool

The researchers found that the quantitative research method was quite suitable for this study. Survey method of research is usually adopted to discover opinions, perceptions,, interests, and the attitudes of individuals (Gay, Mills, & Airasian, 2009). A comprehensive review of related literature also determined that most of the studies applied questionnaire for the assessment of IL skills (Dao, Katzoff, Lipson, & Pham, 2011; Fain, 2011; Kousar, 2011; Kumar & Ochoa, 2011). So, the survey method was used in this study for the collection of data from the respondents.

Currently enrolled MBBS students in Shaikh Zayed Medical Complex, Lahore, were selected as population for this study. Total population (N=466) of enrolled MBBS students were the size of the population. Male students were 265, however, total females were 201 among enrolled students. Sample size was calculated through https://www.surveysystem.com/sscalc.htm, which was 211 on 95% confidence level. Through convenient sampling, 211 respondents were taken from MBBS 1st year to final year as sample. Questionnaires were distributed among sampled respondents. Out of 201 questionnaires, 193 were filled and returned by the respondents. Seven questionnaires were non-seriously filled which were excluded. The remaining 186 questionnaires were entered in SPSS and used for analysis.

Data collection instrument. A number of instruments were available in literature for data collection purpose, however, after getting the consent of principal investigator, a contextual survey instrument was adapted from the study (Ahmad, 2014) which was found most relevant to this research. The adapted questionnaire was semi-structured based on ACRL and CILIP standards of IL. The definition of IL and purpose of the study was stated on the top of the questionnaire for the understanding of the respondents. The instrument was divided into two portions i.e. IL skills and demographic information. The first portion of questionnaire which covers the questions related to information literacy competencies, was further categorized into seven elements as mentioned below:

- Nature and extent of the information needed.
- Access of needed information.
- Evaluation of the retrieved information and its sources.
- Use of information effectively to accomplish a specific purpose.
- Managing the findings (name of table will be changed as addition of information into one's knowledge base).

Results

Figure 1 and 2 show gender classification and age groups of the respondents. Female respondents were 78 (41.9%) and the male respondents were 108 (58.1%). Males are prominent due to their excess

percentage in Sheikh Zayed Medical Complex, Lahore. Most of the respondents belonged to the age group of 18-22, 162 (87%). The other age group between the ages 23-27 comprised of 24 (13%) respondents.

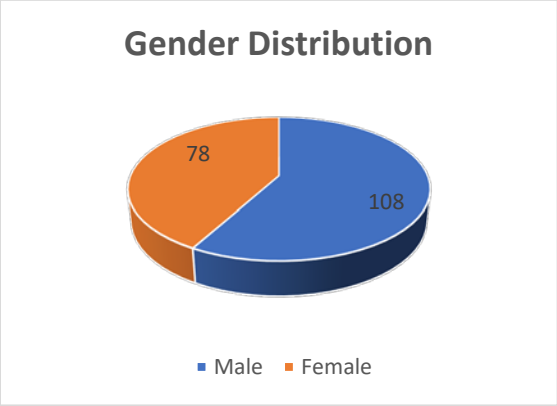

Figure 1. Gender distribution

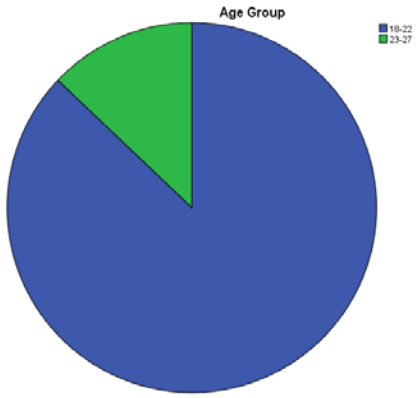

Figure 2. Age groups

Figure 3 represents the students' distribution according to their enrollment in MBBS degree in each academic year. Male students were dominant in 1st year with 30 males and 6 females, in 2nd year 21 males while no female student returned the questionnaire and in 3rd year 27 males and 12 females. Surprisingly the females were found dominant in 4th year and final year. In 4th year 18 males and 24 females while in final year 12 males and 36 females responded the questionnaire. This shows the consistent behaviour of females in medical profession as they seem to be more hardworking than males.

Research Objective 1: Determining the Extent of Information Needed by Medical Students

Table 1 summarized the findings related to the IL Standard-1 i.e. "nature and extent of information needed" of MBBS students. The results showed that most of the undergraduate medical students were found able to define and articulate their emerging information needs (M=3.95); re-evaluate the information need to clarify, revise or refine the question that needs to be answered (M=3.90); identify potential sources of information to fulfill their information need (M=3.85); understand costs and benefits of acquiring the needed information from different information sources (M=3.77); and scored less on statement "communicate their research report through web, or presentations" (M=3.55). However, the respondents were found less familiar with "academic writing (article) using the specified styles of referencing, footnotes etc. (M=3.29). These findings show that medical students were not familiar with ICTs and reference management styles.

Table 1. *Nature and extent of the information needed (N=186)*

Sr.	Statements	Mean	SD*
1	I am able to define and articulate the information need whenever it emerges.	3.95	.79
2	I am able to reevaluate the initial information need to clarify, revise or refine the question that needs to be answered.	3.90	.86
3	I am able to identify potential sources of information to fulfill my information need.	3.85	.82
4	I am able to consider the costs and benefits of acquiring the needed information from different information sources.	3.77	.91
5	I can communicate my research report through web, presentations etc.	3.55	1.13
6	I can write an academic writing (article) using the specified styles of referencing, footnotes etc.	3.29	1.14

*** Note: The data has been ranked according to the highest mean**

Objective 2: Identify How Medical Students Access Needed Information Effectively and efficiently

Table 2, highlighted the findings related to the 2nd standard of IL "access of needed information" of undergraduate medical students, enrolled in Sheikh Zayed Medical Complex, Lahore. Results revealed that majority of MBBS students were found able to select most appropriate methods or databases to meet their information need (M=3.73); retrieve the information by using variety of methods (M=3.69); refine the search strategy if necessary (M=3.66); use the appropriate hardware/software to extract and manage located information (M=3.60); with less score, record all pertinent references of information sources for their current and future need (M=3.50); while the respondents were found comparatively less familiar with constructing and executing effectively-designed search strategies to find out my required information from print or digital (M=3.42). Likewise, results of previous section, we can observe that medical students are less capable in managing references and not capable of structuring advance queries for obtaining information from digital sources.

Table 2. *Access of needed information (N=186)*

Sr.	Statements	Mean	SD*
1	I am capable of selecting the most appropriate methods and/or database for meeting my information need.	3.73	.79
2	I am capable of retrieving information using a variety of methods.	3.69	.856
3	I am capable of refining the search strategy if necessary.	3.66	.881
4	I am capable of using appropriate hardware/software to extract and manage located information.	3.60	1.010
5	I am capable of recording all pertinent references of information sources for current and future need.	3.50	.982
6	I am capable of constructing and executing effectively-designed search strategies to find out my required information from print or digital.	3.42	.776

*** Note: The data has been ranked according to the highest mean**

Objective 3: Know How Medical Students Evaluate Information and its Sources Critically

Table 3, demonstrates the 3rd standard of IL process i.e. "Evaluation of the retrieved information and its sources". Results revealed that a large number of the respondents were well aware of determining the valuable or not valuable information (M=4.11); summarizing the main ideas extracted from gathered information (M=3.85); synthesizing the main ideas to construct new concepts for their own academic work (M=3.74); comparing new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information (M=3.73); examining and comparing gathered information from various sources to evaluate reliability, validity, accuracy, authority etc. (M=3.69); determining that whether the information need is accomplished or not? (M=3.69). These results are not surprising as we may expect from science students to be expert in above mentioned capabilities. However, the MBBS students were less of validating their understanding and interpretation of information through discussion with others (M=3.66).

Table 3. *Evaluation of required information in an actual and well-organized way (N=186)*

Sr.	Statements	Mean	SD*
1	I can determine whether the information received is valuable or not?	4.11	.745
2	I can summarize the main ideas to be extracted from the information gathered.	3.85	.80
3	I can synthesize main ideas to construct new concepts for my own academic work.	3.74	.985
4	I can compare new knowledge with prior knowledge in determining the value added, contradictions, or other unique characteristics of the information.	3.73	.939
5	I can examine and compare information gathered from various sources in order to evaluate reliability, validity, accuracy, authority etc.	3.69	.946
6	I can determine whether the information need is accomplished or initial query needs to be revised.	3.69	.817
7	I can validate my understanding and interpretation of the information through discussion with other individuals, teachers, subject-area experts, etc.	3.66	.899

*** Note: The data has been ranked according to the highest mean**

Objective 4: know the use of information effectively to accomplish a specific purpose

Table 4, mentioned the findings related to the standard-4 of IL i.e. "Use of information effectively to accomplish a specific purpose" of undergraduate medical students. Results revealed that majority of MBBS students were found able to apply new and prior information to their task (M=3.90); maintain their notes of activities of information seeking, evaluating and communication process (M=3.77); while the respondents were found comparatively less familiar with communicating the outcome or performance created from the extracted information in effective manners (M=3.76). It seems that medical students

were good in evaluating information, however need to improve skills about knowledge creation and presentation.

Table 4. *Use of information effectively to accomplish a specific purpose (N=186)*

Sr.	Statements	Mean	SD*
1	I know how to apply new and prior information to my task.	3.90	.800
2	I know how to maintain my notes of activities related to the information seeking evaluating and communication process.	3.77	.890
3	I know how to communicate the outcome or performance created from the extracted information in effective manners.	3.76	.858

*** Note: The data has been ranked according to the highest mean**

Objective 5: Find out How Medical Students Incorporate Selected Information into One's Knowledge Base

Table 5 summarized the findings related to the IL Standard-5 i.e. "managing the findings". The results identified that mostly undergraduate medical students were proficient to backup, secure and manage their personal contents (M=3.85); organize searched information manually or electronically (M=3.81); store, relocate, retrieve and reuse stored information (M=3.77); re-find information resources within new databases (M=3.74); The respondents were appeared to be less familiar to "create document with computer assisted programmes (M=3.71) comparatively to other scores of this section.

Table 5. *Managing the findings (N=186)*

Sr.	Statements	Mean	SD*
1	I can backup, secure and manage my personal contents.	3.85	.960
2	I can organize searched information manually or electronically.	3.81	.984
3	I can store, relocate, retrieve and reuse the stored information.	3.77	.890
4	I can re-find information resources within databases.	3.74	.824
5	I can create document with computer assisted programmes (MS Word etc.)	3.71	1.159

*** Note: The data has been ranked according to the highest mean**

Discussion & Implications

Present study results will be a valuable addition into national level literature, moreover, the findings will guide practice by highlighting gaps and important components of information literacy. The baseline study will provide several research paths to future researchers, as there is a need to conduct multiple studies on this population group with different methodological lens and sample size.

Results of this study are aligned with some previous studies Carr et al. (2011) Soleymani (2014) Islam and Tsuji (2010) and Baro, Benake-ebide, and Ubogu (2011) also reported that IL skills are not

significant nor well updated. Our study also pointed out that medical students were less familiar with ICTs and also got low mean scores in locating digital information.

In contrast to previous studies (Carr et al., 2011), current study found that medical students were able to evaluate information sources (Table 4). Another observation upon this finding can be "cognitive bias" explored by David Dunning and Justin Kruger. According to these psychologists people overestimate their knowledge or competence due to Dunning-Kruger effect (Duignan, 2021). We may assume that high mean score of different information literacy standards in this study might be the impact of cognitive bias.

The present study also reported that selected medical students were less familiar with information management (using reference management software) strategies and information creation and presentation. An Australian study (Carr et al. (2011) in line with current study also found that first year medical students obtained lower scores in ANZIL standard 4, which is about information management and generation.

While regarding alignment with the previous studies, the results of this study are in complete agreement with the following national studies Habib (2012) Kousar (2011), which indicated that IL skills of the respondents (students, engineers) are acceptable and they are well aware of the IL process and its execution. These national level studies including current study conducted in developed areas of Pakistan, this might be the factor that all respondents reported their IL skills at moderate or high level. This indicates that there is a need to conduct studies in less developed areas of Pakistan.

On the basis of this study and keeping in view the previous literature it is recommended that an updated and advanced form of information literacy instruction should be the part of medical curriculum to improve their practice and research. Short courses and trainings should be organized by medical librarians at different levels to impart IL skills among MBBS students. Furthermore, information literacy should be given high importance as it develops lifelong learning among students.

Conclusion

The study concludes that medical students were found well aware of IL skills. Undergraduate medical (MBBS) students of Sheikh Zayed Medical Complex, Lahore were capable of finding information from reliable sources to meet their needed information. They were also found able to describe and convey their information need. However, it was observed that these students were less familiar with advance searching skills, reference management tools and information creation and presentation skills. These findings identified the gaps of IL instruction implementation in medical field and professional.

There is a need to integrate IL instruction into curriculum and must be part of continuing professional development in the field of medical sciences. Moreover, the study has implications for medical professional librarians, medical faculty and students.

References

Adeleke, D. S., & Emeahara, E. N. (2016). Relationship between Information Literacy and Use of Electronic Information Resources by Postgraduate Students of the University of Ibadan. *Library Philosophy and Practice (e-journal)*.

Ahmad, Z. (2014). *Assessing the Information Literacy Skills of Researchers.* (Unpublished M. Phil thesis), University of the Punjab, Lahore.

Amalahu, C., Oluwasina, O., & Laoye, O. (2009). Higher Education and Information Literacy: A Case Study of Tai Solarin University of Education. *Library philosophy and practice*.

Asher, A. D., & Duke, L. M. (2010). *Information Literacy and First Year Students: Evaluating Knowledge, Needs, and Instruction.* Paper presented at the National Resource Center Annual Conference on the First-Year Experience, Denver, CO.

Azra. (2014). *Perceived level of information literacy between the engineering students of Engineering University and University of the Punjab.* (M. Phil), Minhaj University, Lahore.

Baro, E. E., Benake-ebide, C. E., & Ubogu, J. O. (2011). Information literacy among medical students in the College of Health Sciences in Niger Delta University, Nigeria. *Program*.

Batool, S. H., Mahmood, K. . (2012). Teachers ' conceptions about information literacy skills of school children. *Pakistan Journal of Library and Information Science, 13*, 1-6.

Bazrafkan, L., Hayat, A. A., Abbasi, K., Bazrafkan, A., Rohalamini, A., & Fardid, M. (2017). Evaluation of information literacy status among medical students at Shiraz University of Medical Sciences. *Journal of Advances in Medical Education & Professionalism, 5*(1), 42.

Carr, S., Iredell, H., Newton-Smith, C., & Clark, C. (2011). Evaluation of Information Literacy Skill Development in First Year Medical Students. *Australian Academic & Research Libraries, 42*(2), 136-148. doi: 10.1080/00048623.2011.10722219

Cullen R, Clark M, & R, E. (2009). The Impact of IL training on clinicians enteriing the workforce. *International Congress on Medical Librarianship, Brisbane,*.

Cullen, R., Clark, M., & Esson, R. (2011). Evidence-based information-seeking skills of junior doctors entering the workforce: An evaluation of the impact of information literacy training during pre-clinical years. *Health Information & Libraries Journal, 28*(2), 119-129. doi: 10.1111/j.1471-1842.2011.00933.x

Dao, K., Katzoff, G., Lipson, B., & Pham, B. (2011). *Assessing first-year information literacy at WPI.* (Bachelor of Science), Worcester Polytechnic Institute.

Duignan, B. (2020, September 8). Dunning-Kruger effect. Encyclopedia Britannica. https://www.britannica.com/science/Dunning-Kruger-effect

Fain, M. (2011). Assessing information literacy skills development in first year students: a multi-year study. *The Journal of Academic Librarianship, 37*(2), 109-119.

Gay, L. R., Mills, G. E., & Airasian, P. W. (2009). *Educational research: Competencies for analysis and applications* (9th ed.). Upper Saddle River, N.J.: Merrill/Prentice Hall.

Habib, M. (2012). *Information Literacy Skills of Undergraduate Pharmacy Students of University of Veterinary & Animal Sciences (UVAS) Lahore: An Appraisal*. Library & Information Science.

Habibi, H. (2015). The relationship between information literacy and access to facilities with attitudes toward E-learning among students of Urmia University of Medical Sciences. *Iranian Journal of Medical Education, 15*, 1-8.

Islam, M. A., & Tsuji, K. (2010). Assessing information literacy competency of Information Science and Library Management graduate students of Dhaka University. *IFLA journal, 36*(4), 300-316.

Kousar, M. (2011). *Perceptions of faculty about the information literacy skills of postgraduate engineering students: A study of NUST.* (M.Phil unpublished), University of the Punjab.

Kousar, M., & Mahmood, K. (2013). *Information literacy skills assessment of undergraduate Engineering Students.* Paper presented at the European Conference on Information Literacy.

Kousar, M., & Mahmood, K. (2015). Perceptions of faculty about information literacy skills of postgraduate engineering students. *International Information & Library Review, 47*(1-2), 52-57.

Kumar, S., & Ochoa, M. (2011). *Student-centered library instruction: an assessment of online graduate students' information literacy skills and needs.* Paper presented at the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education.

Liu, T.-t., & Sun, H.-b. (2012). Gender differences on information literacy of science and engineering undergraduates. *International Journal of Modern Education and Computer Science, 4*(2), 23-30.

Mahmood, K. (2017). Reliability and validity of self-efficacy scales assessing students' information literacy skills. *The Electronic Library*.

Meyer, K. R., K., H. S., Megan, H. K., V., T. K., Van, T. V., & J., H. K. (2008). Assessing Information Literacy Instruction in the Basic Communication Course. *Communication Teacher, 22*(1), 22-34.

Mohammed, A., & Haliru, Z. A. (2019). Exploring the postgraduate students perceptions, usefulness and effectiveness of information literacy skills at University of Malaya library. *International Journal of Library and Information Science, 11*(4), 23-34.

Naveed, M. A., & Rafique, F. (2018). Information literacy in the workplace: a case of scientists from Pakistan. *Libri, 68*(3), 247-257.

Naveed, Q., & Sharif, A. (2015). Assessing the needs and measuring the impact of the information literacy sessions at the Aga Khan University's Institute for Educational Development, Pakistan. *Asian Review of Social Sciences, 4*(1), 20.

Rafique, G. M. (2014). Information literacy skills of faculty members: A study of the University of Lahore, Pakistan. *Library Philosophy and Practice*, 0_1.

Rafique, G. M., & Khan, H. A. (2018). Information Literacy Skills of Management Sciences' Students. *Pakistan Journal of Information Management and Libraries, 19*, 52-73.

Russell, P. (2009). Why universities need information literacy now more than ever. *Canadian Library Association, 55* (3), 92.

Soleymani, M. R. (2014). Investigating the relationship between information literacy and academic performance among students. *Journal of education and health promotion, 3*(1), 95.

Ullah, M., & Ameen, K. (2014). Current status of information literacy instruction practices in medical libraries of Pakistan. *Journal of the Medical Library Association: JMLA, 102*(4), 281.

Ullah, M., & Ameen, K. (2016). Perceptions of medical librarians towards the importance of information literacy skills. *Pakistan Journal of Information Management and Libraries, 16*.

Ullah, M., & Ameen, K. (2019). Teaching Information Literacy Skills to Medical Students: Perceptions of Health Sciences Librarians. *Health Information & Libraries Journal, 36*(4), 357-366.