OPINION

Barriers in surgical research: A perspective from the developing world

Nadeem Ahmed Siddiqui,[1] Muhammad Aanish Raees,[2] Rehan Nasir Khan,[3] Farhan Zafar[4]

Abstract

Research in surgery has led to significant advances over the last century in terms of how medicine is practised in and outside the operating rooms today. Surgical research in the developed countries is responsible for most of this advancement, but it is often inapplicable in resource-limited settings in the developing world. Lower- and middle-income countries are in a unique position to take this work further, but they are limited by certain barriers. These barriers could broadly be classified under social and cultural, infrastructure, financial, ethical, and personal categories. These barriers are often not fully realised, but can potentially be addressed with concerted efforts to continue the advancement of medicine for everyone.

Keywords: Surgical research, Cultural barriers, Infrastructure, Limitations, LMICs.

DOI: https://doi.org/10.47391/JPMA.AKU-19

Introduction

Evidence-based practice is a cornerstone of efforts to improve the quality of healthcare the practitioners provide. The practice relies on integrating evidence acquired through research into patient preferences, resources and clinician skills. It is often easier said than done, with authors suggesting a global disparity between available literature and its translation into eventual clinical practice still not being up to par.[1-3] Surgical research faces some uniquely inherent obstacles, which differ from studies into pharmaceutical and medical treatments.[4,5] Matters like a surgeon's expertise and personal preferences in procedure or technique, lack of interest of patients towards participation, and the variation in skill level of the operating surgeon may all contribute to underpowering of studies, like randomised controlled trials (RCTs), with potentially misleading results.[5-7]

This issue aside, it must be emphasised that though global standards tend to encourage implementation of more standardised recommendations, these may not always be viable alternatives in the developing world due to geopolitical or cultural limitations, amongst other reasons. In such a case, it is critical for practitioners and researchers to generate evidence which is better suited to their demands and applicable within the limitations they face.

It goes without saying that improvement in the overall standards in study design and control of potential obstacles may aid in improving the quality of research,[7] especially from those originating in the developing world. The current narrative review was planned to explore the potential barriers faced in surgical research, particularly in the context of low- and middle-income countries (LMICs).

Social and cultural barriers: In LMICs, probably one of the most important barriers to conduct surgical research is the social and cultural behaviour. Unfortunately, and contrary to common belief, this is not limited to patients only, as studies have cited various reasons for the healthcare providers (HCPs) not participating in research-related activities,[8] imparting a negative influence on the overall research process. Globally, and particularly in LMICs, there is a general reluctance on the part of patients to participate in research. Partly this has to do with the historical mishaps, like the Tuskegee study, the infamous syphilis study where even after knowing that penicillin would be effective for syphilis, it was not prescribed to the subjects for the sake of experimentation and continuity of research.[9] Another example from the horrors of the past includes a study at the University of Cincinnati where late-stage cancer patients, for the sake of understanding its effects, were exposed to high-dose radiation, and the subjects were told that it was the final attempt to arrest disease progression.[10] Later, the investigators admitted their inability to take adequate informed consent, and compensations were handed out to the families of the patients.[11] Besides the effects of such events, lack of education also negatively impacts the participation in research projects and therefore the ultimate impact of research on future generations. Patients and their families consider becoming a part of any research similar to subjecting themselves to a larger learning experiment. Many diseases are seen as a taboo in these societies and there is great reluctance to even seek treatment for these, let alone getting involved in research. Mental health, genitourinary, perianal and breast conditions for women are few of these to name.[12,13] This combination of lack of

[1,3]Department of Surgery, Aga Khan University Hospital, Karachi, [2,4]Cincinnati Children's Hospital and Medical Center, Ohio, USA.

Correspondence: Rehan Nasir Khan. Email: doc.rnk@gmail.com

education and certain religious beliefs, ranging from considering ailments as punishment from the Divine to stopping the treatment and relying solely on prayers, results in patients avoiding treatment or seeking alternative ways of treatment for their diseases. Furthermore, in LMICs, due to lack of governing bodies and accountability or their dysfunctional presence, a variety of treatment modalities are often seen offered by individuals who are not experts in these fields, and the practice continues to flourish due to lack of awareness.[14] The growth of alternative medicine has further increased the options that patients prefer to utilise before contemplating any surgical procedure.[15,16] Many surgical pathologies are managed with a wide array of treatment modalities prior to surgery, adding multiple unmeasurable confounders for a research project aimed at studying surgical management as an intervention. There is significant heterogeneity in such cultural and alternative pre-treatments sought by the patients, making it impossible to adjust statistically in a retrospective study or in the power of a prospective trial.

The disconnect between patients and healthcare staff is even more significant in rural areas of countries like Pakistan. The intentions of practising physicians and surgeons are sometimes questionable. Thoughts of doctors prioritising private practice and performing unindicated procedures for financial gains are deeply rooted in these societies.[17] The study comprising two rural districts of Pakistan found many physicians doing unindicated Caesarean Section (CS) because of financial incentives. This further minimises patients' trust in their HCP and translates into their hesitancy to join any research.[17] Even in situations where patients do initially get enrolled in studies, there is a significant proportion of population that is lost to follow-up as patients fail to realise the importance of these studies and their responsibility in making them a success. This again is multifactorial as there are situations where they just do not feel obligated to comply since it does not involve monetary, medical or personal incentives. Furthermore, it is often financially burdensome, making it difficult for them to travel from rural to urban areas to attend follow-up visits[18] or for research-related activities. Many population-based studies do anticipate this issue and address it either by making the research team go to patient's doorstep or providing adequate monetary support for travels.

Lastly, there is a general lack of interest in research both on the part of patients as well as HCPs. The inability to train the residents in research-related activities leads to general lack of interest among the trainees.[19] Limited internet facilities, non-existent concept of surgeon-scientist, inability to identify relevant research questions, paucity of allocated research time, no financial support and lack of mentorship are a few of the factors that eventually lead to this concept of research being a 'waste of time' for undergraduates[19] and postgraduate students.[20,21] Unfortunately, when these young doctors become attending surgeons, their interest in surgical research is driven mostly by the requirements of career progression and promotions or sometimes due to motivation from the pharmaceutical industry.[22] In LMICs, most career progressions and promotions are linked to the number of publications rather than the quality of research work.[23] This quest for going after numbers rather than the essence of research inquiry, results in selecting already addressed and learned topics with very little emphasis on exploring new knowledge frontiers. There is no doubt that acquiring the art of surgical skill is a tedious process involving lifelong struggle for the surgeons, so there is always a tendency to view their own anecdotal experiences as standard of treatment, rather than utilising evidence-based medicine (EBM). A questionnaire-based study[24] reported that surgeons depend most on their own judgment and confidence and least on clinical practice guideline. Hindrance to do surgical research may have many other causative factors, but cultural and social barriers probably are not just important ones, but are also difficult to modify, as they involve both the patients and the surgeons. For any meaningful research to be done, it is probably of utmost importance to deal with these barriers. Inclusion of quality research training during undergraduate and postgraduate surgical training can be a potential solution to some of the above-mentioned issues. But, more importantly, fostering the careers of young trainees as young research-scientists by means of allocating protected facilities, commitment and becoming part of different surgical research groups, though sounding like a long road, can eventually be fruitful. Crossing these hurdles will take time and collective efforts are needed to get over them one at a time.

Infrastructure barriers: For the uninitiated, research can be a daunting task best left alone. Even under the best of circumstances and even with unlimited funding, research is challenging. Research often requires a deep understanding of methodology, statistics and institution-specific logistics. So why take part in it? Because the payoff offers a chance to change practice and improve outcomes. There is almost no research training in the undergraduate years of education, unlike countries where research productivity is high and research training starts as early as high-school, and undergraduate students get

to spend considerable time in laboratories developing basic research skills and grantsmanship. Possibly the biggest challenge to surgical research in Pakistan and other resource-poor countries is lack of effective training during the formative years of a medical professional.

Since the Pakistan Medical Council (PMC) has not made research training mandatory for medical students, the onus shifts to medical colleges and universities to decide the status of research in their respective curricula. Even under the most well-designed and holistic medical curriculum in the country, research is often allotted 1-2 months during the 5 years of medical education; a period often structured to teach basic statistical skills and to churn out a qualitative study. These strategies, while effective for a minority of the students, often lack the intentionality to drive home the simple inspiring concept behind research: to question the norm.

With the faculty seeking to publish to meet requirements set out by the PMC and the Higher Education Commission (HEC), a preponderance of un-indexed journals, and a culture in which research is a 'means to an end', research transforms into a robotic task akin to administrative paperwork. Perhaps a curriculum that promotes critical thinking, teachers who promote a questioning mind, and a system that enjoys being proven wrong for the sake of progress can together lead to a shift in the mindset and, therefore, culture. Student-led journal clubs can, for instance, encourage an appreciation of the impact of research. Not only can this inspire students, but also help them critically appraise literature; skills that they can then employ during their faculty years.[25]

All this having been said, it is also important to address one of the biggest challenges to research is the lack of opportunities to disseminate and share knowledge.[26] If one were to draw comparisons with resource-rich nations and review the legacy of research institutions, a clear conclusion would take shape: the reason why research impact is high in these nations is because research exists in a self-perpetuating ecosystem and entire separate ecosystems have been created to support it. Put simply, research is not simply an activity, but a calling, a lifestyle and a profession. It is also important to note that this system simply cannot exist without a common belief in the power of research.[26,27] If one were to open Google Scholar, one would see the following text on the main page: 'Stand on the Shoulder of giants', This sentiment is only possible if one can find these 'giants', locate their 'shoulders', and know how to 'stand on them'. It is, therefore, in the interest of countries like Pakistan to celebrate their researchers, highlight their work, invest in the scientific process, and champion change as suggested by the scientific process. It also goes without saying that investment in physical infrastructure like internet, workspace, libraries etc., as well as human infrastructure, like capacity development, training programmes, research implementation workshops etc., will act as a catalyst of change in the research world.

Financial barriers: When it comes to funding research, the financial barriers in Pakistan are huge. It goes without saying that a lot of research in resource-rich nations would not have been impossible without federal funding and private endowments. Some efforts have been made in Pakistan to establish a funding stream for researchers. The development of the Pakistan Medical Research Council (PMRC) was one such step.[28,29] Under the PMRC funding for research as well as research allowances were allocated in the budget. Unfortunately, political forces, budgetary issues, poor utilisation of funds, and a lack of planning have limited the scope of such programmes.[28] Compared to research institutions, like those in the United States, with their many funding options, a methodical approach to spending research dollars, a preponderance of oversight boards, and a well-trained research staff, research in poor countries lack expertise in these key areas. At some level, the narrative turns into one in which money spent on research is money that could have been conserved for other endeavours, such as increasing health delivery in extremely resource-poor areas of the country. However, the country stands to benefit from advances in research, especially when such research is specific to the local community.[30]

Ethical barriers: A major hallmark of conducting ethical research is ensuring that there is oversight in the form of a review board, legislative oversight from national bodies, equal representation, and a clear emphasis on the principles of patient care. A well-informed and well-staffed institutional review board is of paramount importance when it comes to ensuring ethical standards. Additionally, ethical frameworks also need to be informed by national medical bodies. At baseline, all research studies, regardless of their design, should be proposed to the ethics board for protocol review. This should also hold true for retrospective studies, arguably the most common form of published surgical research, to ensure that patient privacy is always a priority, and that the results are useful. Additionally, when it comes to interventional studies, it is very important to always question the short- and long-term benefits of evaluating the intervention. This framework of thought also helps prevent unnecessary research, as McDonald et al, so aptly asked: 'When is further research no longer required; that is, what constitutes sufficient evidence of the efficacy of a surgical intervention?.[31] Routine expert panels, even in the

absence of expensive RCTs, can often help reach consensus statements, thereby obviating the need for further study.

The role of industry funding is important to discuss, especially in the context of developing nations. Given the limited resources provided by national bodies, a natural dependence on private endowments and industry funding emerges. As the role of industry increases in surgical research, so too should awareness increase around declaring conflicts of interest. Many studies have found associations between reporting positive findings and receiving royalties.[32] Mechanisms to reduce the influence of these conflicts on the integrity of research should be built into the very fabric of the institutional review process so as provide insight to any biases that may exist.

Personal barriers: It goes without saying that scientific research is a fundamental cog in the development of societal constructs. Yet, ironically the two share an interesting, dichotomous relationship in the sense that without proper funding and infrastructure, loco-regional healthcare systems may lack the necessary ingredients for the propagation of meaningful literature. Differences in geopolitical structures and regional dynamics may influence healthcare priorities, which may dictate alternative routes of medical management, custom-tailored to those situations. That being said, even though institutional bodies may push for more standardised treatment and training options, due to regional limitations this may not always be ideal. In fact, often literary works conducted in developing countries are of undesirable quality compared to that from the developed world.[31] While commenting on the countries of South Asia,[34] make the point that despite the linguistic, cultural and geographical differences between the countries in and adjacent to the region, various healthcare systems face similar obstacles and limitations.

On review of literature produced on this topic from developing countries, one of the most common themes noticed was that of the variability of training in terms of research methodology. This has been found to have stemmed from clinical priorities being more focussed on providing healthcare than generating quality research, and may manifest in a myriad of ways. A common complaint had been the lack of dedicated research training, or inadequate knowledge on terminologies or means of how to gather data.[32-37] The authors of these studies found that a limited familiarity with research in general may be a key demotivating factor for physicians to embark on such endeavours. This has been found to run hand in hand with the lack of dedicated research facilities and resources, be it as basic as a library or access to recent medical literature.[32-35, 37]

Similarly, another key factor can be boiled down to 'time and money'. Given busy clinical schedules, and work demands, researchers may find little available time to pursue research activities or seek out help from mentors and supervisors.[34] Furthermore, lack of monetary incentive in most research projects has been found to be a key deterrent. Keeping in mind the financial situation of most of the countries in the developing world, it would be understandable for the practitioners to prefer clinical practice over scholarly work, especially given that they would have to sacrifice their own personal time to get the job done.[33]

Provided the limited dedicated training, and unavailability of time, a more relevant and common theme would be that of lack of appropriate mentorship. This issue may present itself either as clinical supervisors and senior faculty being unable to dedicate attention to their fellows due to heavy/busy schedules, and thereby may not exuberate interest in such projects.[35,38] There is thus a need for more positive role models and professionals at more dedicated research positions to alleviate this shortcoming and offer not only guidance but also counselling and statistical services. This matter is made worse by prolonged waiting times and complicated steps involved in institutional approval; a matter which often stems from institutional bureaucracy and policies.[34,35,37]

An issue often overlooked is that of linguistic limitations. Considering most data and literature is in the English language, and that practitioners and researchers in the region may not be dominant English users, they face the unique challenge of requiring translations and linguistic support from librarians and associated platforms. Interestingly, this has been a common theme spanning regions from Africa to South Asia.[33-35,38-40]

The most devastating of personal barriers to research, however, is the little explored entity of research anxiety, which can negatively influence productivity, and potentially lead to mental and physical exhaustion, burnout, and organisational and personal deterioration.[41,42] Stress and anxiety can take root at any stage of a given project, from personal skill levels or lack thereof, to institutional approval, perpetual deadlines, and to the uncertainty of the authenticity of their works.[42-44] Thus, institutional laws, policies, local facilities and basic knowhow play a vital role in this issue.[41] Lack of attention to such barriers may lead to irreparable losses in terms of overall quality, while, for the investigator it may

result in decreased job satisfaction and long-term psychological harm.

Conclusion

LMICs face certain barriers in terms of surgical research. These barriers can broadly be classified under social and cultural, infrastructure, financial, ethical, and personal categories. These barriers are often not fully realised, but can potentially be addressed with concerted efforts to continue the advancement of medicine for everyone. There may still be numerous barriers at the individual level, that are beyond the scope of this review. A multi-pronged systematic approach is needed to overcome these challenges. Organisational, financial and infrastructure barriers need both institutional and national commitment to research. This should not only include short-term steps, like funding, facilities, etc., but, more importantly, long-term policies, incentives and collaborative initiatives to make a meaningful impact. Research education and internship opportunities from at least the undergraduate level is key to fostering a culture, a mindset and eventually a habit in surgeons. Social, cultural and some ethical barriers, although difficult to modify, could be addressed with investments in population-wide education programmes and focussed awareness campaigns. These may be lofty ideas for an LMIC, but there is no better time to start investing in such initiatives than now. Having said that, some barriers are going to be insurmountable and something that we will learn to work with and others will require time to overcome.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

References

1. Hutchinson AM, Johnston L. Beyond the BARRIERS Scale: commonly reported barriers to research use. J Nurs Adm 2006;36:189-99. doi: 10.1097/00005110-200604000-00008.
2. Crane J. The future of research utilization. Nurs Clin North Am 1995;30:565-77.
3. Bostrom J, Wise L. Closing the gap between research and practice. J Nurs Adm 1994;24:22-7. doi: 10.1097/00005110-199405000-00006.
4. Yu J, Hu YF, Liu H, Li GX. Difficulties and countermeasures of surgical clinical research according to CLASS experience. Zhonghua Wei Chang Wai Ke Za Zhi 2020;23:129-33. doi: 10.3760/cma.j.issn.1671-0274.2020.02.006.
5. Tulandi T. Logistical difficulties in surgical research. BJOG 2017;124:e269. doi: 10.1111/1471-0528.14208.
6. Ferreira LM. Surgical randomized controlled trials: reflection of the difficulties. Acta Cirurgica Brasileira. 2004 Dec;19:2-3.
7. McCulloch P, Taylor I, Sasako M, Lovett B, Griffin D. Randomised trials in surgery: problems and possible solutions. BMJ 2002;324:1448-51. doi: 10.1136/bmj.324.7351.1448.
8. Jahan F, Maqbali AA, Siddiqui MA, Zadjali NM. Attitude and barrier towards research amongst health care professionals working in primary care service of Oman. J Health Edu Res Dev. 2015;3(144):2.
9. Park J. Historical Origins of the Tuskegee Experiment: The Dilemma of Public Health in the United States. Uisahak 2017;26:545-78. doi: 10.13081/kjmh.2017.26.545.
10. Office of Scientific and Technical Information. Advisory Committee on Human Radiation Experiments - Final Report. [Online] 1996 [Cited 2021 November 22]. Available from URL: https://www.osti.gov/opennet/servlets/purl/129478/129478.pdf
11. Branson RD, Davis K Jr, Butler KL. African Americans' participation in clinical research: importance, barriers, and solutions. Am J Surg 2007;193:32-40. doi: 10.1016/j.amjsurg.2005.11.007.
12. Dhar J, Griffiths CA, Cassell JA, Sutcliffe L, Brook GM, Mercer CH. How and why do South Asians attend GUM clinics? Evidence from contrasting GUM clinics across England. Sex Transm Infect 2010;86:366-70. doi: 10.1136/sti.2009.036004.
13. Khan NH, Duan SF, Wu DD, Ji XY. Better Reporting and Awareness Campaigns Needed for Breast Cancer in Pakistani Women. Cancer Manag Res 2021;13:2125-9. doi: 10.2147/CMAR.S270671.
14. Waraich RS. Healthcare System and Medical Malpractice Law in Pakistan. Policy Perspectives 2018;15:85-98. Doi: 10.13169/polipers.15.3.0085
15. Bodeker G, Kronenberg F. A public health agenda for traditional, complementary, and alternative medicine. Am J Public Health 2002;92:1582-91. doi: 10.2105/ajph.92.10.1582.
16. Jan HA, Jan S, Bussmann RW, Wali S, Sisto F, Ahmad L. Complementary and alternative medicine research, prospects and limitations in Pakistan: A literature review. Acta Ecologica Sinica 2020;40:451-63. Doi: 10.1016/j.chnaes.2019.12.005
17. Mumtaz Z, Bhatti A, Salway S. Challenges to achieving appropriate and equitable access to Caesarean section: ethnographic insights from rural Pakistan. J Biosoc Sci 2020;52:491-503. doi: 10.1017/S0021932019000567.
18. Irfan FB, Irfan BB, Spiegel DA. Barriers to accessing surgical care in Pakistan: healthcare barrier model and quantitative systematic review. J Surg Res 2012;176:84-94. doi: 10.1016/j.jss.2011.07.046.
19. Saeed I, Khan NF, Bari A, Khan RA. Factors contributing to the lack of interest in research activities among postgraduate medical students. Pak J Med Sci 2018;34:913-17. doi: 10.12669/pjms.344.15411.
20. Elkbuli A, Narvel RI, Zajd S, Hai S, McKenney M, Boneva D. Factors Affecting Research Productivity of Burn Surgeons: Results from a Survey of American Burn Association Members. J Burn Care Res 2020;41:293-8. doi: 10.1093/jbcr/irz156.
21. Elkbuli A, Zajd S, Narvel RI, Dowd B, Hai S, McKenney M, et al. Factors Affecting Research Productivity of Trauma Surgeons. Am Surg 2020;86:273-9.
22. Evans I, Thornton H, Chalmers I, Glasziou P. Testing Treatments: Better Research for Better Healthcare, 2nd ed. London, UK: Pinter & Martin Ltd; 2011.
23. ESHRE Capri Workshop Group. Protect us from poor-quality medical research. Hum Reprod 2018;33:770-6. doi: 10.1093/humrep/dey056.
24. Kitto S, Villanueva EV, Chesters J, Petrovic A, Waxman BP, Smith JA. Surgeons' attitudes towards and usage of evidence-based medicine in surgical practice: a pilot study. ANZ J Surg 2007;77:231-6. doi: 10.1111/j.1445-2197.2007.04022.x.
25. Ukrani RD, Munir MM, Bhatti A, Noordin S. Student-led surgical research network: Enhancing medical student research opportunities. J Pak Med Assoc 2021;71(Suppl 1):s117-9.
26. Grimes CE, Bowman KG, Dodgion CM, Lavy CB. Systematic review of barriers to surgical care in low-income and middle-income countries. World J Surg 2011;35:941-50. doi:

10.1007/s00268-011-1010-1.
27. Garas G, Ibrahim A, Ashrafian H, Ahmed K, Patel V, Okabayashi K, et al. Evidence-based surgery: barriers, solutions, and the role of evidence synthesis. World J Surg 2012;36:1723-31. doi: 10.1007/s00268-012-1597-x.
28. Akhtar T, Khan JA. Health research capacity in Pakistan. [Online] 2000 [Cited 2021 November 22]. Available from URL: http://www.cohred.org/downloads/681.pdf
29. Ghaffar A, Zaidi S, Qureshi H, Hafeez A. Medical education and research in Pakistan. Lancet 2013;381:2234-6. doi: 10.1016/S0140-6736(13)60146-4.
30. Saqib MAN, Rafique I. Health research funding and its output in Pakistan. East Mediterr Health J 2021;27:906-10. doi: 10.26719/emhj.21.038.
31. McDonald PJ, Kulkarni AV, Farrokhyar F, Bhandari M. Ethical issues in surgical research. Can J Surg 2010;53:133-6.
32. Okike K, Kocher MS, Mehlman CT, Bhandari M. Conflict of interest in orthopaedic research. J Bone Joint Surg Am 2007;89:608-13. doi: 10.2106/JBJS.F.00994.
33. Ataee M, Hesamzadeh A, Kheradmand M. Research barriers from experts' viewpoints who attended the research workshops of Mazandaran University of Medical Sciences. J Med Life 2015;8:12-17.
34. Alamdari A, Venkatesh S, Roozbehi A, Kannan A. Health research barriers in the faculties of two medical institutions in India. J Multidiscip Healthc 2012;5:187-94. doi: 10.2147/JMDH.S27841.
35. Okoduwa SI, Abe JO, Samuel BI, Chris AO, Oladimeji RA, Idowu OO, et al. Attitudes, perceptions, and barriers to research and publishing among research and teaching staff in a Nigerian Research Institute. Front Res Metr Anal 2018;3:e26. Doi: 10.3389/frma.2018.00026.
36. Ashrafi-Rizi H, Fateme Z, Khorasgani ZG, Kazempour Z, Imani ST. Barriers to Research Activities from the Perspective of the Students of Isfahan University of Medical Sciences. Acta Inform Med 2015;23:155-9. doi: 10.5455/aim.2015.23.155-159.
37. Dadipoor S, Ramezankhani A, Aghamolaei T, Safari-Moradabadi A. Barriers to research activities as perceived by medical university students: A cross-sectional study. Avicenna J Med 2019;9:8-14. doi: 10.4103/ajm.AJM_121_18.
38. Farzaneh E, Amani F, Molavi-Taleghani Y, Fathi A, Kahnamouei-aghdam F, Fattahzadeh-Ardalani Gh. Research barriers from the viewpoint of faculty members and students of Ardabil University of Medical Sciences, Iran, 2014. Int J Res Med Sci 2016;4:1926-32. DOI: 10.18203/2320-6012.ijrms20161735
39. Nikrooz L, Rouzitalab M, Rayegan Shirazi AR, Naghizadeh MM, Taghavi F. Student Research Projects Inhibiting Factors from the Students Perspective. Journal of Fasa University of Medical Sciences 2012;2:113-9.
40. Memarpour M, Fard AP, Ghasemi R. Evaluation of attitude to, knowledge of and barriers toward research among medical science students. Asia Pac Fam Med 2015;14:e1. doi: 10.1186/s12930-015-0019-2.
41. Ashrafi-Rizi H, Zarmehr F, Bahrami S, Ghazavi-Khorasgani Z, Kazempour Z, Shahrzadi L. Study on research anxiety among faculty members of isfahan university of medical sciences. Mater Sociomed 2014;26:356-9. doi: 10.5455/msm.2014.26.356-359.
42. Davis-Roberts G. Sources of stress, levels of stress, and coping strategies of faculty and staff at Northern Caribbean University. [Online] 2006 [Cited 2021 November 22]. Available from URL: https://digitalcommons.andrews.edu/cgi/viewcontent.cgi?article=1319&context=dissertations
43. Higgins C, Kotrlik J. Factors associated with research anxiety of university human resource education faculty. Career Tech Educ Res 2006;31:175-99. DOI: 10.5328/CTER31.3.175
44. Erfanmanesh MA, Didegah F. Researchers' and faculty members' research anxiety and its causes: literature review. Journal of National Studies on Librarianship and Information Organization 2012;23:58-72.