EDITORIAL

The rising menace of scholarly black-market: Challenges and solutions for improving research in low- and middle-income countries

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Academic integrity and ethical scientific research not only reflect the trustworthiness of the higher education institutions but also boost the respect and ranking of those institutions, their regulatory organisations and the countries they are based in. Academic institutions from high-income countries continuously strive to improve the quality of education and research to ultimately raise their ranking and prestige. However, higher education institutions in low- and middle-income countries (LMICs) have a relative lack of quality education, training and mentorship. During the last few years, the *Journal of Pakistan Medical Association* has published papers for increasing awareness of predatory publishers and conferences among the local and regional academic community.[1-5] The debate on predatory publishing led to the idea of revising the terminology, given that such publishers are not "predators" and solely responsible for this dark side of science, but some unethical researchers who deliberately publish in these journals are also equally responsible.[6] That is, these unethical authors publish in predatory journals knowing that the existing system would not catch them. Such authors are also likely to be involved in other unethical practices, such as plagiarism, fabrication, falsification, and questionable peer-review. The year 2020 was difficult for all of us, but it was also a learning experience. The rapid surge in the number of publications on COVID-19 forced the journals to fast track the peer-review process for rapid dissemination of information. However, this also revealed several loopholes in the process of scientific publishing, including research fraud and compromised peer-review.[7-9] For instance, Retraction Watch (https://retractionwatch.com), a blog that reports on the scientific misconduct and retractions of publications, has provided a list of papers on COVID-19 that were retracted for suspected scientific misconduct (see here: https://retractionwatch.com/retracted-coronavirus-covid-19-papers/). Some of the relevant ethical issues in scientific publishing include paper mills, and fake peer-review. Therefore, this editorial aims to bring awareness about paper mills and fake peer-review among the regional and global scientific community. In addition, suggestions are provided to address these unethical practices in low- and middle-income countries.

Scholarly black market is a term which often includes fraudulent and questionable publishers, sale and purchase of scientific papers (i.e., paper mills), unprofessional language editing agencies, and unethical (graduate) research supervision.[10,11] "Paper mills" are paid agencies that provide variety of services to their customers, ranging from data to fabricated scientific papers.[12] These questionable services are on a rise in LMICs for purchase by individuals in need for publishing a paper either to complete a degree (e.g., masters) or for career advancement (please see for a detailed list of papers on paper mills: https://pubmed. ncbi.nlm.nih.gov/?term=%22Paper+mills%22). Paper mills are run by group of individuals who do not necessarily have expertise and knowledge of research related to a specific field. Paper mills usually allure individuals to use their services through two approaches. First, they advertise on social media (e.g., Facebook, Twitter) using lucrative statements, such as "*get your papers published in ISI indexed journals*" or "*get your papers published in international journals*" or "*get your papers published in high impact factor journals*". Sometimes this advertisement may be in the shape of enticing email invitations, similar to how most of the predatory journals do. The second approach is that the individuals running these paper mills use a middleman (usually someone who availed their service before) who identifies clients for them. The clients of these services are students (e.g., bachelors, masters) or academics in urge for publications.[13] For instance, postgraduate students might utilise the services offered by paper mills to get their research thesis or dissertation. Most of the content of such theses or dissertations is either fabricated or plagiarised. Unfortunately, this 'easy to go' route prevents such individuals from learning the craft of research. Further, some academics also avail the services of paper mills for completing the required number of publications for promotion or for other benefits (e.g., monetary incentives). Authorship for sale is another ethical issue where one can get the authorship of a paper by paying some money.[14,15] Such practices should be a matter of grave concern for the

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academic community as this will produce researchers with no research integrity and skills.[16] Moreover, these unethical exercises seriously affect the competence and conduct of students in their future professional life, which would ultimately have a negative effect on industrial and economic growth of the country.[17]

The peer-review process is an integral part of the assessment of the scientific quality of a research paper. A paper published in 2018 reported that there were more than 600 records for fake peer-review in RetractionWatch (http://retractiondatabase.org) database, with papers predominantly from Asia.[18] A Retraction Watch database search on December 26, 2020 identified 36 papers from Pakistan which were retracted on account of fake peer-review. The problem of fake (or fraudulent) peer-review may arise when editors send the paper to the reviewers recommended by the authors.[19] In addition, the pressure to publish and presence of monetary incentives for publication may be likely reasons that have triggered fake peer-review scam and helped flourishing of the "*academic article brokering*".[15] Furthermore, some unethical authors submitting the manuscript to a journal provide an invented e-mail address for suggesting names of the peer-reviewers (fake or sometimes real), which allows them to receive the invitation to review their own manuscripts.[18] An alternative approach used by these unethical authors involves creating a peer circle to review each other's paper (e.g., "*Hey mate! Could you please review my paper and provide a positive recommendation? I will also be there to help you with peer-review in the future as you are helping me now").* or get the fake reviewers through third-party agencies.[15] The risk of the fake peer-review may be higher if the journal does not require the Open Researcher and Contributor Identifier (ORCID) or institutional email address for the reviewers.[18]

The current scenario in scientific publishing is highly competitive and constantly puts researchers, students, and faculty members under pressure to publish for getting jobs, promotions, grants and funding, monetary incentives and establishing strong research networks. However, this competition may be accompanied by several unethical practices we have discussed above; therefore, we have the following recommendations that may help curb these unethical practices:

1. **Establishing research repositories:** Most of the higher education institutions in high-income countries have research repositories where one can find theses, dissertations and research literature but LMICs (e.g., Pakistan) do not have well-established research repositories. The few repositories which exist, appear to be dis- or under-regulated and with limited dissemination of research.[20] This may contribute to the scholarly black market since the unpublished data can easily be stolen and one can get credit of others' work.[21] This poses a greater risk to the owner of the work, especially in research-based degree programmes, if the thief or stealer formerly publishes the work. Therefore, higher education institutions should have research repositories for deposition of theses, dissertations and research papers.
2. **Preferring quality over quantity of research:** Higher education institutions in LMICs should consider putting the quality of research above the quantity. The number of publications should not be the sole criteria for assessment of an individual's research output. Instead, number of citations to the papers, editorial experience, experience in research training, and author's h-index should also be taken into account for career advancement.
3. **Qualified and ethical research supervision:** Some individuals may deliberately publish in predatory journals knowing that they will not be caught (due to lack of knowledge of recruitment and promotion committees about predatory journals).[6,22] Research supervisors must be aware of predatory (fraudulent) publishers and should not publish papers in them. Morevoer, research supervisors should be selected on the basis of their research experience and the research output. Junior researchers and faculty should be encouraged to work as co-supervisors (secondary advisors) with primary supervisors.
4. **Adequate allocation of funds and resources:** While infrastructure is important for higher education institutions, their quality is rather determined by the credentials of the faculty, collaboration with academic sector and industry, and institutional research output. Therefore, the funds in higher education institutions should be directed to promote research. In addition, funding should be directed for getting high-quality research instruments and establishment of well-equipped research laboratories. While some institutions in LMICs offer monetary incentives to authors for publishing papers, others do not provide any funding support for research. This creates inequality in provision of opportunities to researchers. We suggest that emphasis should be given to supporting researchers through funding for research projects and open-access publishing. In addition, higher education institutions should help their researchers by getting free access to the scientific literature (e.g., journals and databases) through initiatives such as Research4Life (https://www.research 4life.org/).

5. **Appropriate selection of peer reviewers:** Selection of appropriate reviewers is a challenging task for journal editors. Sometimes reviewers are not willing or do not have time to review the manuscripts, which subsequently increases editorial workload during the manuscript workflow. Selection of appropriate reviewers is important to improve the quality of manuscripts submitted to a journal. Many journals ask authors to nominate reviewers during the manuscript submission process to facilitate the reviewer selection by editors.[23] However, to avoid fake or fraudulent peer-review, journal editors should always double-check the reviewers suggested by the authors, look for at least one alternative reviewer and preferably select at least one reviewer from the country or region different from the authors' location. It is always important to look for alternative reviewers if a reviewer suggested by the authors has previously worked with them, particularly in recent years. The use of ORCID can help avoid ambiguous (and fake) reviewers.[18]

6. **Research training and skill development:** It is essential for both the students and faculty to possess and improve their research skills. Higher education institutions should ensure that both the undergraduate and postgraduate students and faculty are adequately trained in research and writing skills. This can be provided in many different forms using a combination of face-to-face workshops, online sessions, peer supported learning and other innovative task-based learning and teaching strategies. It is recommended that institutions having a well-established training programme share their success stories with the newer organisations and institutions in order to support them. Also, senior faculty members should take a lead role in arranging training sessions both within and outside their own institutions. National scientific organisations, such as the Pakistan Science Foundation and Pakistan Health Research Council should support and arrange such training sessions for students and faculty in different parts of the country. In addition, funds for development of quality research laboratories should be allocated by the government in national budget to enhance the research productivity of the country. It should also be emphasised that these funding are adequately used for the foreseen objectives. In addition, individuals should be trained for using specialised research instruments. At present, different institutions in the country offer a variety of training programmes which vary in quality and duration. This suggests that there is a lack of central monitoring of these training programmes by a regulatory body, such as the Higher Education Commission of Pakistan and Pakistan Medical Commission. Therefore, mechanisms for monitoring of these training programmes by higher education institutions should be strengthened.

7. **Policy implementation:** There is a need to increase not only awareness but also enforce regulations against the rising threat of scholarly black market (e.g., paper mills and fake peer review). This can only be done by a close coordination among the regulatory organisations of health care and medical education in Pakistan. These include federal and provincial ministries of health, Pakistan Medical Commission, College of Physicians and Surgeons of Pakistan and the Higher Education Commission of Pakistan. The policies should be created after taking all stakeholders on board and considering the challenges being faced by students, faculty and researchers in Pakistan. The policy should be uniformly implemented across the country with a mechanism to ensure its effective monitoring.

Conclusion

The higher rates of papers on COVID-19 due to accusations for scientific misconduct have unfolded the loopholes in scientific publishing and side-effects of the "hot race for publication".[24,25] Therefore, there is a great need for both higher education institutions and regulatory organisations (e.g., the Higher Education Commission of Pakistan, Pakistan Medical Council) to take steps to curb the unethical practices in scientific research. We believe that the steps the recommendation we have put forward and efforts from the institutions would help control paper mills and fake peer review in low- and middle-income countries. We also encourage regional editors to increase scientific discourse on these issues and share their experiences for controlling these unethical practices. Doing this will help boost the quality and ranking of higher education institutions with more positive and better outcomes in the future.

Disclosure: The ORCID iD of authors are Aamir Raoof Memon (0000-0002-3203-418X), Farooq Azam Rathore (0000-0002-4759-0453).

Conflict of interest: The authors are Editorial Board Members of the Journal of Pakistan Medical Association. The views of the authors are their own and do not represent the policies of the journal.

Funding: None.

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