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Editorial

Transforming Toxic Research Cultures: Protecting the Future of Medical Students and Early Career Researchers – Part I

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The Hidden Crisis in Academic Research

The Royal Society defines research culture as the behaviors, values, expectations, attitudes, and norms of our research communities. It influences researchers' career paths and determines the way that research is conducted and communicated.[1] Medical research suffers from a hidden problem: a toxic culture that threatens the well-being and development of its participants. While it is known for contributing to scientific medical advances, the reality for many medical students and early career researchers is very different.

Have you ever worked tirelessly on research, only to have your supervisor demand being listed as the primary author, leaving you demoted to a secondary position or not acknowledged at all? Or perhaps you have faced a situation where permission to conduct research was denied because you did not include someone as a co-author, despite their lack of involvement in the actual work. Or have you experienced constant criticism and belittlement from your supervisor, causing you to doubt your abilities and reconsider your research career? If you have experienced any of these situations, you have been a victim of a toxic research culture. These are some examples but not all the potential situations that summarize this issue.

This culture undermines research integrity and threatens the health and career prospects of young researchers eager to advance medicine. It remains covered in a culture of silence and acceptance, despite its prevalence. Addressing this is essential to protecting researchers' interests, maintaining the integrity of medical research, and advancing scientific progress.

Historical Context: Evolution of Research Culture in Medicine

Medical research culture has evolved through various historical milestones being shaped by social norms, scientific advances, and economic pressures. From the systematic observations of Hippocrates[2] to the competitive grant-driven research environment post-World War II.[3] The emphasis on quantitative outputs over qualitative contributions, driven by technological innovations in the 20th century, has significantly shaped today's research culture leading to a publish-or-perish mentality[4].

Defining Toxic Research Culture

The term "toxic research culture" refers to the spectrum of harmful practices in academic and research institutions that undermine the well-being and professional development of researchers.

Hugh P. McKenna defines it a range of harmful practices,[5] including:

1. Bullying and harassment
2. Poor employment terms and conditions
3. Inadequate practices in equality, diversity, inclusion, and belonging
4. Breaches of research integrity
5. Pathological pursuit of higher league table positions, H-indices, and impact factors
6. 'Ghost authoring' where senior researchers take undue credit for work primarily done by junior staff

Factors cultivating this culture include short-term contracts, inadequate salaries (especially for early-career researchers), competitive work environments, and the relentless pressure to publish.[6]

Shahnawaz MG and Siddiqi N. describe toxic research supervisors as individuals who tear apart your work without mercy, publicly humiliate you, offer no support whatsoever, abandon you to fend for yourself, and actively work to erode your confidence and progress.[7]

The pathognomonic feature of these toxic environments is a hierarchical structure that grants substantial power to a select group of senior researchers. This power mismatch creates a cycle in which junior researchers are compelled to tolerate harsh conditions to advance their careers.[8,9]

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Manifestations of a Toxic Research Culture

Toxic research culture manifests in various detrimental ways, including:

1. Higher risk of depression and anxiety compared to the general population.[10]
2. Bullying and harassment reported by 43% of researchers, with 61% witnessing such behavior (Wellcome, 2020).[11]
3. Post-traumatic stress disorder, and suicide in severe cases.[12]
4. The COVID-19 pandemic exacerbated these issues by shifting from traditional face-to-face bullying to new forms such as abusive emails.[13]
5. Authorship abuses, such as coercion, guest authorship, gift authorship, mutual support authorship, duplication, ghost authorship, and denial of authorship, which are rampant in hierarchical research structures.[14,15]

Over the last decade, researchers identified several significant issues in research settings such as poor management of personnel, work-life imbalance, bullying and harassment, a culture of publishing that suppresses creativity, high levels of stress, and a lack of diversity.[16]

Breaches of Research Integrity

Researchers who felt underappreciated or denied proper credit are more likely to engage in misconduct and unethical behavior.[17] According to Smith R, the primary reason researchers resort to research misconduct is pressure to publish.[18] In toxic environments, the emphasis on productivity metrics often overshadows ethical research practices.[19] For instance, a meta-analysis of survey data revealed that 1.97% of researchers admitted to manipulating data and 33.7% admitted to questionable research practices to meet publication pressures.[20] This highlights the ethical compromises researchers might make under intense productivity pressures. Junior researchers are especially vulnerable to the negative impacts of such breaches, which can have long-lasting effects on their professional careers. Eric Poehlman, a University of Vermont researcher who spent 12 months in federal prison for falsifying data, attributed his actions partly to a toxic research culture "I was on a treadmill, and I could not get off".[21]

The Vulnerability of Medical Students and Early Career Researchers

The inexperience of medical students and early career researchers navigating the complexities of research ethics and professional conduct makes them vulnerable. The intense competition for funding and positions in academic medicine may create a culture of secrecy and self-protection rather than openness and collaboration.[22] This further isolates junior researchers who are still establishing their professional identities.

A study by Casadevall and Fang indicates that early career researchers are particularly vulnerable to ethical lapses due to the intense pressure to publish. This pressure is intense for medical students navigating their first research projects because of academic and professional stakes.[23] This underscores the need for comprehensive support systems for junior researchers.

Junior researchers often face situations where supervisors or senior authors impose honorary authorship due to hierarchical power.[24] The promised authorship or order can suddenly change without their consent. Furthermore, a junior researcher may become a ghost author if they leave their lab before the research is published as their contributions are not properly recognized as co-authorship.

Current Policies

Table 1 outlines key policies and charters aimed at improving research culture.[25-31] For instance, the Wellcome Trust's Bullying and Harassment Policy (2021) and BEIS's People and Culture Strategy (2021), aim to foster positive research environments by addressing workplace conduct and promoting diversity and ethical practices. Initiatives like DORA (2023) advocate for reforming research assessment to prioritize quality over quantity, while CoARA (2022) works to standardize evaluation practices within the EU. The Research Development Concordat (2023) supports researchers' career development and well-being, and the Race Equality Charter (2023) focuses on improving ethnic representation in academia.

Strategies for Change

1. In a survey of 13,000 researchers from over 160 countries, with strong representation from the top 10 research-producing countries and diverse minority groups, 49% stated they were afraid of getting in trouble if they asked for assistance.[32] It is therefore essential to create an environment where whistleblowing is not seen as a threat to one's own career. This is important for medical students and early career researchers who worry that senior researchers may affect their professional profiles and limit future opportunities.

2. The current system concentrates power in the hands of a few people. Principal investigators are usually given sole responsibility for grants instead of sharing them more evenly among team members. Because of this hierarchical structure, a single principal investigator oversees a large number of junior researchers. Similarly, heads of departments are led by a single person. A fairer environment can be achieved by encouraging leadership diversity and equitable responsibility distribution among team members.

3. According to Rice et al.'s[33] review of 92 faculties worldwide, 95% of promotion and tenure guidelines are influenced by peer-reviewed publications, authorship order, journal impact factors, grant funding, and reputation. It is necessary to update these traditional criteria to reflect modern research practices that encourage diverse contributions.

4. Structured educational interventions could be used to immunize academic environments against toxicity.[34] A Course

on Research Ethics and Integrity could function as a metaphorical vaccination. These would provide researchers with ethical frameworks and resilience against unethical practices and hostile work environments.

5. Initiatives to reduce the over-dependence on quantitative metrics and research output in evaluating promotions and grant applications. A more holistic view of researchers' contributions could be achieved by Introducing narrative CVs and concordat for career development.[16]

The Swiss National Science Foundation successfully introduced the SciCV narrative CV format, which broadens evaluation criteria providing insights into academic backgrounds.[35] Harvard University's introduction of narrative CVs in 2022 has shown promising results in reducing the emphasis on quantitative metrics and encouraging a more holistic evaluation of researchers' contributions.

Table 1. **Key Policies and Charters Influencing Research Environment.**[25-31]

Policy / Charter	Description
Wellcome Trust's Bullying and Harassment Policy (2021)	Policy aimed at addressing and preventing bullying and harassment within the research community supported by the Wellcome Trust.
People and Culture Strategy (BEIS, 2021)	The strategy focuses on creating a positive research culture by addressing aspects of workplace culture and professional conduct.
Vitae Reports (Parr, 2021)	An organization dedicated to supporting the professional development of researchers. It provides an understanding of current issues and practices.
San Francisco Declaration on Research Assessment (DORA, 2023)	Declaration advocating for the reform of research evaluation practices. It emphasizes the need to assess research based on its merit rather than journal metrics.
Coalition for Advancing Research Assessment (CoARA, 2022)	Agreement within the European Union to standardize and improve research assessment practices.
Research Development Concordat (2023)	An agreement between universities, research institutes, and funders to support the career development of researchers in the UK
Race Equality Charter (2023)	It focuses on improving the representation of ethnic staff within universities with the aim of equity and diversity in academic environments.

Conclusion: A Call to Action

In conclusion, addressing toxic research cultures is imperative for the future of medical research. By prioritizing mentorship, mental health, ethical behavior, collaboration, and inclusivity, we can create a supportive environment for medical students and early career researchers. Institutions must take decisive action to safeguard the welfare of junior researchers and uphold the integrity of scientific research.

Another important action is to avoid fake mentors. A mentor should be transparent, serve as a role model, and provide experience, support, and knowledge.[36] A real mentor will help mentees develop their skills, navigate challenges, and achieve their career goals.[37-38] Tackling toxic research culture includes steering clear of individuals with a poor record of successful mentees, those who are unavailable, unwilling to invest time in your growth, and those with a poor reputation. Genuine mentors will foster a positive and constructive learning environment, unlike fake mentors who may exploit their position for personal gain or fail to provide meaningful support.

Moving forward, abolishing toxic research culture requires implementing policies such as the Wellcome Trust's Bullying and Harassment Policy and advocating for reforms like those in DORA and CoARA. This includes revising evaluation criteria to prioritize quality over quantity, promoting diversity and equitable distribution of responsibilities, and enhancing educational interventions in research ethics.

Role of the International Journal of Medical Students

The International Journal of Medical Students (IJMS) can play a pivotal role in addressing and mitigating the toxic research culture by promoting ethical research practices and supporting early career researchers. IJMS is dedicated to fostering positive change by prioritizing publications that involve mentorship, emphasizing articles that highlight successful mentorship models and strategies for creating inclusive and supportive research environments. By partnering with organizations that advocate for research quality, IJMS ensures that its standards align with the best practices in the field. The journal is committed to accessible research, offering free open access to its publications to ensure widespread dissemination of knowledge. Additionally, IJMS promotes ethical and sustainable research practices, providing a platform for early career researchers to share their experiences and challenges. Through webinars, workshops, and discussion forums on topics like research ethics, mental health, and professional development, IJMS can and will offer valuable resources and support. By advocating for fairer and more holistic evaluation criteria within academic institutions and funding bodies, IJMS aims to transform the research culture into one that is nurturing, ethical, and conducive to scientific advancement.

In this Issue

In the upcoming issue of the International Journal of Medical Students, we feature a diverse array of articles addressing crucial health issues and educational insights. One highlight includes a study on antibiotic use awareness among the Indian community during the later stages of the COVID-19 pandemic, revealing significant gaps in knowledge and proper usage.[39] Another study

explores the disparities in blindness prevalence among different racial and ethnic groups in Texas, uncovering higher rates among Black individuals, which underscores ongoing healthcare inequalities.[40]

Additionally, we present an evaluation of tuberculosis-related information on Instagram, noting that posts by medical professionals tend to be more accurate.[41] Further, we describe menopausal symptoms in post-menopausal women in Eluru, Andhra Pradesh,[42] and examine the quality of intimate area examination training among Pakistani medical students.[43] The issue also delves into innovative educational methods, such as leveraging podcasts for nutrition education and the impact of skipping breakfast on sleep duration among medical students.[44,45]

Moreover, the impact of COVID-19 on the U.S. healthcare system and children's physical activity is analyzed,[46,47] alongside a systematic review of stress factors affecting medical students' academic outcomes.[48] Other notable articles include an exploration of intrinsic factors causing tendinopathy,[49] and three case reports, one about Bardet Biedl syndrome,[50] another about disseminated tuberculosis and how challenging this diagnostic can be,[51] and a discussion on the potential for continuous rifampicin therapy to induce acute kidney injury in tuberculosis patients.[52] Personal reflections from medical students on their experiences with research and patient loss,[53,54] and an acting internship in colorectal surgery,[55] round out this comprehensive issue. These articles aim to enrich the ongoing dialogue on improving healthcare education and addressing health disparities.

References

1. Royal Society. Research culture. Available from: https://royalsociety.org/topics-policy/projects/research-culture/. Cited Jun 15, 2024.
2. Kenneth Walker H. The origins of the history and physical examination. Chatswood, NSW, Australia: Butterworths; 1990.
3. UNESCO. Scholarly communication. Available from: https://unesdoc.unesco.org/ark:/48223/pf00002319387. Last updated 2015; cited Jun 17, 2024.
4. Daily Trojan. 'Publish or Perish' culture is toxic to academia. Available from: https://dailytrojan.com/2022/02/02/publish-or-perish-culture-is-toxic-to-academia/. Last updated Feb 2, 2022; cited Jun 15, 2024.
5. McKenna HP. Toxic research cultures: The what, why and how. Int J Nurs Stud. 2023;140:104449.
6. Shahnawaz MG, Siddiqi N. Examining toxic supervision in higher education in India. High Educ Eval Dev. 2023;17(1):2–22.
7. Encourage whistle-blowing: how universities can help to resolve research's mental-health crisis. Nature. 2023;617(7962):651–651.
8. Essex R, Kennedy J, Miller D, Jameson J. A scoping review exploring the impact and negotiation of hierarchy in healthcare organisations. Nurs Inq. 2023;30(4).
9. LARI. Management issues in the lab. Available from: https://lari.lu/2023/06/16/management-issues-in-the-lab/. Last updated Jun 16, 2023; cited Jun 15, 2024.
10. Hall S. A mental-health crisis is gripping science — toxic research culture is to blame. Nature. 2023;617(7962):666–8.
11. Moran H, Karlin L, Lauchlan E, Rappaport SJ, Bleasdale B, Wild L, et al. Understanding Research Culture: What researchers think about the culture they work in. Wellcome Open Res. 2020;5:201.
12. The Times Higher Education. Bullying by supervisors is alive and well – now is the time to tackle it. Available from: https://www.timeshighereducation.com/campus/bullying-supervisors-alive-and-well-now-time-tackle-it. Last updated 2021; cited Jun 15, 2024.
13. ARMA. ARMA research culture survey report. Available from: https://arma.ac.uk/arma-research-culture-survey-report/. Cited 2024 Jun 15.
14. Strange K. Authorship: why not just toss a coin? Am J Physiol Cell Physiol. 2008;295(3):C567–75.
15. Olesen A, Amin L, Mahadi Z. Unethical authorship practices: A qualitative study in Malaysian higher education institutions. Dev World Bioeth. 2018;18(3):271–8.
16. Martin R, Nasir N, Carusi A. Enhancing research culture through PhD training: a systems approach to identifying leverage points for policy formation. Wellcome Open Res. 2023;8:422.
17. Martinson BC, Anderson MS, Crain AL, De Vries R. Scientists' perceptions of organizational justice and self-reported misbehaviors. J Empir Res Hum Res Ethics. 2006;1(1):51–66.
18. Smith R. Research misconduct: the poisoning of the well. J R Soc Med. 2006;99(5):232–7.
19. Research Gate. Research Integrity & Ethics Scientific Misconduct. Available from: https://www.researchgate.net/publication/373719345_Research_Integrity_Ethics_Scientific_Misconduct/. Last updated Sep, 2023; cited Jun 15, 2024.
20. Fanelli D. How many scientists fabricate and falsify research? A systematic review and meta-analysis of survey data. PLoS One. 2009;4(5):e5738.
21. The New York Times. An Unwelcome Discovery. Available from: https://www.nytimes.com/2006/10/22/magazine/22sciencefraud.html. Last updated Oct 22, 2006; cited Jun 17, 2024.
22. Fang FC, Casadevall A. Competitive science: Is competition ruining science? Infect Immun. 2015;83(4):1229–33.
23. Casadevall A, Fang FC. Reforming science: Methodological and cultural reforms. Infect Immun. 2012;80(3):891–6.
24. Al-Herz W, Haider H, Al-Bahhar M, Sadeq A. Honorary authorship in biomedical journals: how common is it and why does it exist? J Med Ethics. 2014;40(5):346–8.
25. Wellcome. Bullying, harassment, abuse and harm policy. Available from: https://wellcome.org/grant-funding/guidance/bullying-and-harassment-policy. cited 2024 Jun 15.
26. BEIS. R&D people and culture strategy. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004685/r_d-people-culture-strategy.pdf Last updated 2022; cited Jun 17, 2024.
27. Parr. Female researchers more likely to be bullied, less likely to report it. Available from: https://www.researchprofessional.com/0/rr/news/uk/careers/2021/2/Women-researchers-more-likely-to-be-bullied–less-likely-to-report-it.html#sthash.oV93qBJG.dpuf. Last updated Feb 2021; cited Jun 17, 2024.
28. DORA. The San Francisco declaration on research assessment. Available from: https://sfdora.org/. Last updated 2023; cited Jun 17, 2024.
29. CoARA. Agreement of reforming research assessment. Available from: https://coara.eu/app/uploads/2022/09/2022_07_19_rra_agreement_final.pdf. Last updated July 19, 2022; cited June 17, 2024.

30. Race Equality Charter. Available from: https://www.race-equality.admin.cam.ac.uk/race-equality-charter. Last updated 2023; cited Jun 17, 2024.
31. Research Development Concordat. The concordate to support the career development of researchers. Available from: https://researcherdevelopmentconcordat.ac.uk/. Last updated 2023; cited Jun 17, 2024.
32. Cactus Foundation. Joy and Stress Triggers: A Global Survey on Mental Health Among Researchers. Available from: https://www.cactusglobal.com/mental-health-survey. Last updated 2020; cited Jun 17, 2024.
33. Rice DB, Raffoul H, Ioannidis JPA, Moher D. Academic criteria for promotion and tenure in biomedical sciences faculties: cross sectional analysis of international sample of universities. BMJ. 2020;m2081.
34. Yeo-Teh NSL, Tang BL. Research ethics courses as a vaccination against a toxic research environment or culture. Res Ethics. 2021;17(1):55–65.
35. Strinzel M, Kaltenbrunner W, van der Weijden I, von Arx M, Hill M. SciCV, the Swiss National Science Foundation's new CV format. bioRxiv. 2022.
36. Pizzolato D, Dierickx K. The Mentor's Role in Fostering Research Integrity Standards Among New Generations of Researchers: A Review of Empirical Studies. Sci Eng Ethics. 2023;29(3):19.
37. Manthiram K, Edwards KM. Reflections on the Mentor-Mentee Relationship. J Pediatric Infect Dis Soc. 2021:piab025
38. Tenorio-Lopes L. Mentor-mentee relationships in academia: insights toward a fulfilling career. Front Educ (Lausanne). 2023;8:1198094.
39. Ghosh H, Gupta K. Antibiotic Use Awareness and Practices in the Indian Community During Later Stages of COVID-19 Pandemic: A Cross-Sectional Survey. Int J Med Stud. 2024;12(2):133-140.
40. Garcia A, Anderson K, Funkhouser M. Blindness Disparities Between Racial/Ethnic Groups in the State of Texas. Int J Med Stud. 2024;12(2):141-145.
41. Singhal R, Anugu NR. A Cross-Sectional Survey of Instagram to Assess Quality and Reliability of Information Regarding Tuberculosis. Int J Med Stud. 2024;12(2):146-151.
42. Mediboina A, Pratyusha P, Kumar GS. Determining the Prevalence and Severity of Menopausal Symptoms in Post-Menopausal Women of Eluru Andhra Pradesh India using the Menopause Rating Scale (MRS). Int J Med Stud. 2024;12(2):152-160.
43. Bakhtiari M, Ijaz MT, Umar Farooq RM, Shahab A, Hameed Daula MI. Learning of Intimate Area Examination Amongst Pakistani Medical Students: Knowledge, Attitudes, and Practices Study. Int J Med Stud. 2024;12(2):161-168.
44. Vellek J, Rosen J, Hecht G, Ciuffo F, Thommen R, Petersen KH. Leveraging a Podcast Series for Nutrition Education in Medical Curriculum. Int J Med Stud. 2024 Apr-Jun;12(2):169-177.
45. Bhoopatkar H, Sharma S, Moir F, Nakatsuji M, Wearn A, Falloon K. Skipping Breakfast is Associated with Shorter Sleep Duration in Medical Students. Int J Med Stud. 2024;12(2):178-184.
46. Williams R, Srinivasan A, Periasamy M. Exploring the Impact of COVID-19 on the Healthcare System and Vulnerable Populations in the United States. Int J Med Stud. 2024;12(2):185-194.
47. Ramirez A, Rapp AB, Santarossa S. Effects of the COVID-19 Pandemic on Physical Activity in Children: A Systematic Review. Int J Med Stud. 2024;12(2):195-218.
48. Jeyapalan T, Blair E. The Factors Causing Stress in Medical Students and their Impact on Academic Outcomes: A Narrative Qualitative Systematic Review. Int J Med Stud. 2024;12(2):219-227.
49. Poole JR, Alaia E, Meislin RJ. Integrating Tendinous Pathophysiology Into Rotator Cuff Tears And Greater Trochanteric Pain Syndrome: A Narrative Review. Int J Med Stud. 2024;12(2):228-235.
50. Babar B, Shaukat MA, Manzoor M, Bibi S, Khan H. A Case Report of Bardet Biedl Syndrome in a Patient from Pakistan who Presented with Osmotic Symptoms associated with Diabetes Mellitus. Int J Med Stud. 2024;12(2):236-239.
51. Kundu A, Mukherjee R, Parichha A, Mukhopadhyay G. Disseminated Tuberculosis with Testes Involvement: An Intriguing Case Report. Int J Med Stud. 2024;12(2):240-243.
52. Shaukat MA, Ali MF, Irtaza A, Khan SY, Khan SM, Babar S. Continuous Rifampicin Therapy Induced Acute Kidney Injury in a Tuberculous Patient: A Case Report. Int J Med Stud. 2024;12(2):244-250.
53. Rodrigues-Gomes J. Conducting Research as a Medical Student: A Need for Change. Int J Med Stud. 2024;12(2):254-257.
54. Kim G. Silent Suffering: Recognizing and Addressing the Emotional Impact of Patient Loss on Medical Students. Int J Med Stud. 2024;12(2):258-259.
55. Misra S. A Medical Student Experience as an Acting Intern in Colorectal Surgery. Int J Med Stud. 2024;12(2):251-253.

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