A call to action to improve research quality in Saudi Arabia

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Saudi Arabia has witnessed an expansion of biomedical research in recent decades attributable to the increased spending in research and establishment of new universities and research centers throughout the country. Its research productivity is second among the Arab states and 16th in the World.[1] The majority of its research comes from a few universities: King Saud University (KSU) in Riyadh and King Abdul-Aziz University in Jeddah; for example, 41% of all publications between 2008 and 2012 originated from KSU.[2]

Saudi Arabia ranks among the top countries for the prevalence of common chronic conditions (e.g., diabetes, obesity, and cardiovascular diseases [CVD]).[3,4] This necessitates that local researchers engage in high-quality research to identify causes of these conditions, their consequences, and the solutions to these health problems. They need to assess the incidence, risk factors, and prognosis of these diseases with prospective cohort studies and test the effectiveness of various drugs and interventions with experimental studies. Currently, the gamut of evidence comes mostly from studies done in the western countries. Therefore, the guiding principle for local researchers should be to confirm earlier findings as well as to identify unique aspects of these diseases for the Saudis. Hence, a quality assessment of research produced thus far in Saudi Arabia is timely and warranted.

Bibliometric studies are a useful tool to determine the quality, and they provide either direct, indirect, or both types of evidence. The indirect metrics that denote research quality include "number of publications in high-impact journals," citation frequency, and h-index. These indicators point out that Saudi Arabia not only is lagging behind from the western countries but also from the regional countries like Turkey or Israel.[5-7] The number of publications in high-impact journals and the overall citation frequency from Israel was 16 and 3 times higher, respectively, than their corresponding estimates from Saudi Arabia.[5] There are exceptions in certain fields where Saudi Arabia has made a marked improvement over the years. For example, it ranks 37th in the World in neuroscience

research, and the h-index of Saudi neurosurgeons is comparable to that of their colleagues from the USA and UK.[8]

In bibliometric studies, the direct evidence for quality assessment of included studies pertains to various parameters such as research design, sample selection, and analytic approaches. A few recent studies assessed the study quality in the leading public health problems for Saudi Arabia, namely, diabetes and CVD.[9,10] The main findings were that majority of the studies were cross-sectional (CVD = 58% and diabetes =65%) and only a small minority were experimental (CVD = 3% and diabetes = 4.5%) studies. Most cross-sectional studies were conducted at a local level (CVD = 74% and diabetes = 61%), with an insufficient size ($n < 500$ CVD = 66% and diabetes = 62%), and a non-random sample selection (CVD = 75% and diabetes =54%). These types of weaknesses seriously question the validity of a study and the representativeness of its results. Similarly, the majority of the experimental studies did not use randomization for group allocation (CVD = 66% and diabetes = 71%), which is key to control for confounders and minimize bias. Naturally, studies with great methodological deficiencies are less attractive to reputable journals for publication.

Further analysis of research quality in Saudi Arabia investigated the quality of randomized controlled trials, specifically ($n = 61$); the findings are equally dismaying.[11] Quality was assessed in seven domains (e.g., randomization, allocation concealment, blinding of assessors or participants, incomplete outcome data, selective reporting, and other sources of bias) with Cochrane Collaboration risk of bias tool.[12] Saudi-based trials were largely free from certain bias (low-risk) such as incomplete outcome data (87%) and selective reporting (93%). However, they exhibited high risk of bias in blinding domains (outcome: 13% and participants and personnel: 28%). Bias could not be assessed in more than half of the Saudi trials because of a lack of information (unclear-risk) in the domains of randomization (54%), allocation concealment (44%), and blinding of outcome assessment (57%). When all

seven domains were considered together (summary of the risk-of-bias), 0% trials had low risk, 39% had high risk, and 61% had unclear risk of biases. Greater proportion of high-risk trials had significant intervention effect than unclear-risk trials (79% vs. 67%).

Given this, all the concerned parties (i.e., funding agencies, policy makers, journal editors, and researchers) should take concrete steps to improve the research quality in Saudi Arabia. Several recommendations are made herein for their consideration.
1. Higher educational institutes should start a doctoral program in various medical fields to produce a new generation of highly skilled researchers.
2. Higher educational institutes should establish mechanisms (e.g., seed grant) that faculty members and students can utilize to develop innovative research to improve patient care, outcome, and services.
3. Funding institutions (e.g., government, universities, and private organization) should give priority to hypothesis-testing studies, particularly those with experimental designs. Similarly, epidemiological studies conducted on a national level should be prioritized over local studies.
4. The Ethical Review Committees in Saudi Arabia consider study methodologies in addition to ethical issues before they provide approval of the submitted proposals. The committees should ensure that their reviewers receive sufficient methodological training to guide researchers toward better designs and bias-free protocols for their projects.
5. Local journal editors should ensure that they publish research that follows standard guidelines for reporting. For example, consolidated standards of reporting trials for trials or strengthening the reporting of observational studies in epidemiology for observational studies.

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