

Representation of Developing Countries in Orthopaedic Journals

A Survey of Four Influential Orthopaedic Journals

Edward E. Aluede BSc, Jonathan Phillips BA,
Jamie Bleyer BA, Harry E. Jergesen MD,
Richard Coughlin MD, MSc

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Abstract

Background The developing world contains more than $\frac{3}{4}$ of the world's population, and has the largest burden of musculoskeletal disease. Published studies provide crucial information that can influence healthcare policies. Presumably much information regarding burden in the developing world would arise from authors from developing countries. However, the extent of participation of authors from the developing world in widely read orthopaedic journals is unclear.

Purpose We surveyed four influential English-language orthopaedic journals to document the contributions of authors from developing countries.

Methods We surveyed *Clinical Orthopaedics and Related Research*, *Journal of Orthopaedic Trauma*, and the American and British volumes of *The Journal of Bone and Joint Surgery*, from May 2007 through May 2010. The country of origin of all authors was identified. We used the designations provided by the International Monetary Fund to define countries as either developed or developing.

Results Two hundred sixty-five of 3964 publications (7%) included authors from developing countries. Ninety percent of these had authors from developing countries

with industrialized and emerging-market economies. Publications from Sub-Saharan Africa accounted for only 0.4% of the 3964 articles reviewed and 5.6% of the 265 articles with developing world authorship. Countries with the least robust economies were least represented. Less than $\frac{1}{3}$ of articles with authors from the developing world had coauthors from developed or other developing countries.

Conclusion Additional studies are needed to determine the reasons for the low representation noted and to establish strategies to increase the number of orthopaedic publications from parts of the world where the burden of musculoskeletal disease is the greatest.

Introduction

Medical science and public health research are necessary drivers of evidence-based health policies and improved patient care. Worldwide investments of \$73.5 billion (US dollars) were directed toward healthcare research in 1998, although the percentage aimed at developing countries to further advance medical research and health policy in these areas was a meager 5% to 10% [9, 21].

Musculoskeletal research productivity of authors from the developing world may parallel the low overall investment, and may be further obstructed by factors yet to be elucidated. Obstacles to publication may be numerous. English language proficiency [16, 34] or the discretion of journals to publish material deemed to be important and appeal to the primary reader base [27] might have a large impact on successful publication. The need for orthopaedic research from the developing world cannot be understated given the well-documented increasing burden of disease.

Studies of the global burden of disease and injury suggest that the burden of musculoskeletal conditions is

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E. E. Aluede (✉), J. Phillips, J. Bleyer, H. E. Jergesen,
R. Coughlin

Department of Orthopaedic Surgery, Institute for Global
Orthopaedics and Traumatology, San Francisco General
Hospital, 2550 23rd St, Bldg. 9, 2nd Floor, San Francisco,
CA 94110, USA

e-mail: Edward.Aluede@ucsf.edu

increasing relative to that of communicable diseases and is projected to exceed the latter by 2030 [2, 13, 14, 36]. The largest proportion of this burden is borne by the developing world, where 82% of the world's population resides and trauma-care systems are least developed [36]. Worldwide, there are an estimated five-million deaths annually from accidental injuries, with almost 90% occurring in developing countries [28]. For each person who dies as the result of trauma, many more are left with temporary or permanent musculoskeletal disabilities [19, 26, 36].

If efforts to decrease the burden are to be implemented successfully, they will depend on accurate estimates of the disease prevalence amenable to orthopaedic surgical intervention and other unique aspects of those populations and/or health systems. Authors from the developing world, knowing what questions to ask, and who can look for feasible solutions, are best suited to conduct research as it pertains to their home countries in a culturally sensitive manner. Not only should these researchers be included in the larger orthopaedic global community, but they should be in the lead to collect long-term followup data and pursue policy change at the level of the health ministries or departments of health. Native researchers provide the best chance for sustainable research efforts replicable in the future.

Despite the statistics, the scope and nature of the disease burden attributable to musculoskeletal conditions in populations in the developing world are underappreciated by most healthcare providers and policy makers in developed countries. Few published articles and the lack of good health statistics data have limited our understanding of the relationship between risk factors, disease, and interventions in the developing world [6]. The impact on publication patterns in widely read journals related to the World Health Organization's decade-old recommendation to increase global healthcare expenditures, including those for research, remains unknown [36]. The degree to which high-impact orthopaedic journals currently present the work from the developing world to manage musculoskeletal diseases is unknown.

We therefore (1) documented the representation of authors from the developing world in four high-impact English language orthopaedic journals during a recent 3-year period and (2) delineated potential obstacles to publication.

Materials and Methods

We retrospectively reviewed all 4329 papers published during a 3-year period (May 22, 2007–May 20, 2010) in four influential English-language orthopaedic journals using the PubMed database. The journals reviewed were:

Clinical Orthopaedics and Related Research (CORR), *Journal of Orthopaedic Trauma (JOT)*, and *The Journal of Bone and Joint Surgery American and British volumes (JBJS-Am and JBJS-Br, respectively)*. The Eigenfactor quantifies a journal's influence in its field [5, 32] and the rationale for selecting these journals is that all have high Eigenfactor scores (95th, 76th, 79th, and 42nd percentiles, respectively) compared with other national and regional orthopaedic journals [30, 32]. We scrutinized the published information in each article to determine the countries identified in the authors' affiliation addresses. All articles with at least one author affiliation address located in a developing country were categorized in their relevant developing world region. In cases where authors originated from multiple developing or developed countries, the allocation to region was based on the affiliation of the first author. The 2011 International Monetary Fund's (IMF) development index includes 153 countries categorized as developing and 34 as developed [12]. With the exception of China, which was listed in the report as developed (Hong Kong, Taiwan) and developing (China, Rest of), all other countries were listed exclusively as either one or the other. The index country designations were used for purposes of this study.

Abstracts of all original articles from the selected journals were independently reviewed by three of the coauthors (EA, JB, JP). Based on this review, the following published items were excluded: articles without listed authors, author responses, biographies, commentaries, editorial comments, introductions, letters to editor, and retractions. With these exclusions, 3964 (92%) of the 4329 articles met the inclusion criteria. A review of the abstract and methods section of each article in the developing countries category was conducted to ascertain the study type and content and to determine whether the study was conducted in collaboration with authors from the developed world. The CIA World Factbook [3] was used to determine the official language of countries listed in the IMF's development index. Official language data were used to gauge the number of publications originating from countries with or without English being the primary language. To assess the possible effect of differences in editorial policy, we contacted the editorial offices of the four journals to request information regarding acceptance and rejection rates of papers submitted from various regions.

Results

Two hundred sixty-five publications had one or more authors from the developing world. Among the articles included in the review, authors from the United States contributed the largest percentage (47%), followed by the

European Union (18%), and the United Kingdom (12%) (Fig. 1). JBJS-Br had the highest percentage (9.5%) of articles published with developing country authorship followed by CORR (9.4%), JOT (5.1%), and JBJS-Am (2.6%) (Table 1). Of these articles, 58% were clinical research studies. All 265 articles had data generated from, or documented problems directly relevant to developing countries. Eighty-five articles (32%) were coauthored by researchers from developed countries, and one article was coauthored by an investigator from another developing country (Table 2). Of the 85 articles coauthored by an investigator from a developed country, 2/3 listed a developing country researcher as the lead author.

Of the 265 publications with authorship originating from the developing world, 55% were from three countries: China (20%), India (18%), and Turkey (17%) (Fig. 2). Developing countries with emerging market economies accounted for the majority (93%) of authors represented in this group of publications. Fifteen (6%) of the total articles

ascribed to developing world countries had authors from Sub-Saharan Africa; South Africa accounting for 40% of the authors originating from this region (Fig. 3). From the point of view of populations represented, 55% of the 265 articles originated from three countries with a total population of 2.5 billion, whereas only 6% (n = 15) emanated from Sub-Saharan Africa, with a population of 861 million.

In developing countries with English as the official language, 20% were represented in the publications reviewed. In developed world countries, 78% that had English listed as the official language were represented. In countries with English not listed as the official language, 28% of developing and 92% of developed countries were

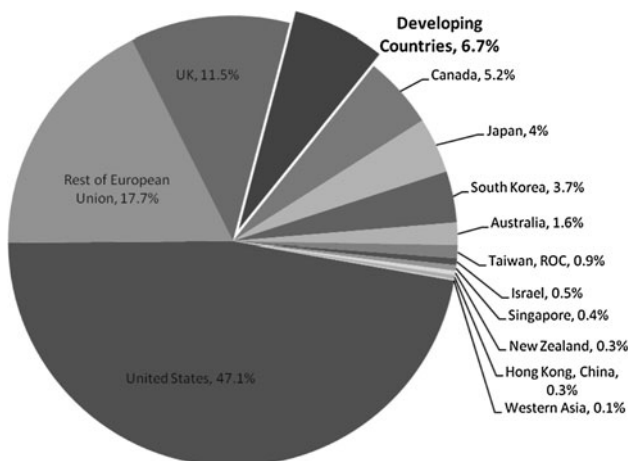


Fig. 1 The percentage of developing world authorship is shown in the context of overall global authorship in the orthopaedic publications reviewed. Two hundred sixty-five of 3964 publications (6.7%) included authors from developing countries.

Table 1. Articles reviewed for this study

Journal	Total number of articles reviewed	Number from developing countries
Clinical Orthopaedics and Related Research	1384	130 (9.4%)
Journal of Bone and Joint Surgery American Volume	1303	34 (2.6%)
Journal of Bone and Joint Surgery British Volume	866	82 (9.5%)
Journal of Orthopaedic Trauma	411	21 (5.1%)
Total	3964	265

Table 2. Characteristics of developing world country publications in the four journals surveyed

Study type	Number of publications (%)
Clinical Research	155 (58%)
Case Report	46 (17%)
Basic Research	33 (12%)
Survey	31 (12%)
Collaboration	
Noncollaborative study	180 (68%)
Collaborative study	85 (32%)
With developed country only	83 (31%)
With developing country only	1 (0.4%)
With developed and developing countries	1 (0.4%)
Number of collaborative studies with first author in a developing country	58/85 (68%)

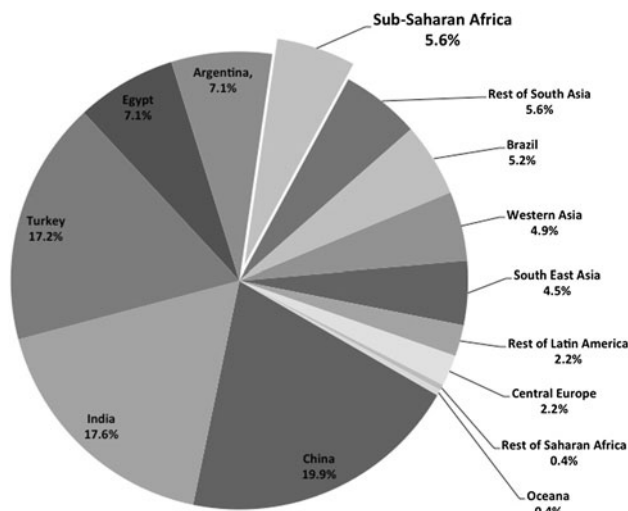


Fig. 2 The regional distribution of authorship of the 265 publications with authors from the developing world is shown. Publications from Sub-Saharan Africa accounted for only 0.4% of the 3964 articles reviewed and 5.6% of the 265 articles with developing world authorship.

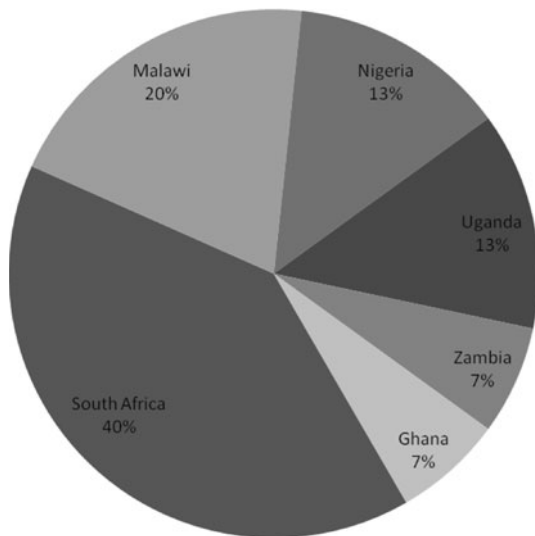


Fig. 3 Distribution of authorship emanating from Sub-Saharan Africa is shown. Nearly $\frac{1}{2}$ came from South Africa.

represented, respectively. When queried, the editorial offices of the four journals were unable to provide information or data related to submission, acceptance, or rejection rates of articles from the various countries.

Discussion

Orthopaedic research productivity of authors from the developing world is largely unknown and may be hindered by numerous obstacles. With continued growth of the burden of musculoskeletal disease in the developing world, policy makers and healthcare practitioners will be dependent on high-quality research to inform successful future interventions in these regions. We sought to document the prevalence of publications with subject matter and authorship from developing countries in four prominent English-language orthopaedic journals and delineate obstacles to publication.

Our study has several limitations. First, the study focused on English language articles in only four influential journals, and therefore did not assess publications in other languages that might be relevant. Nonetheless, English serves as the lingua franca for medical professionals from academic settings in many areas of the developing world [33, 35]. A subanalysis of articles from developing world countries with and without English as the official language revealed similar rates of representation. Of the publications with developing world representation, 29% came from China, a country where English is neither a primary nor official language. The remarkable imbalance is evident when looking at output from Sub-Saharan Africa, where a total of 22 countries have English listed as the

official language, although only six had any representation in the 265 articles surveyed. This suggests that the requirement to publish in English was not the primary hurdle to the acceptance of manuscripts for publication. In developing world medical communities, access to and familiarity with English-language orthopaedic publications has increased through the World Wide Web. For example, JBJS offers free online access to 96 developing countries via an IP address authentication system. In addition, JBJS and JOT participate in the WHO HINARI initiative to increase access to medical literature in the developing world [11]. Second, it was not possible to determine whether the low rates of publication are related to low rates of submission, low rates of acceptance, or both. We had no information regarding numbers of submissions and rates of acceptance for articles with authors from developing world countries. Differences in editorial policies in the various journals might explain observed differences in the prevalence of published studies among them, ranging from 2.6% to 9.5%. It is likely that an analysis of deficiencies in articles not selected for publication in these journals might identify specific areas where educational input would be of benefit. Third, the narrow scope of the study does not provide insight into which underlying roadblocks in the developing world might be most responsible for limiting the production of publishable studies on musculoskeletal disease. There are several possible explanations for low output. First, there is an observed shortage of trained researchers and orthopaedic surgeons and limited funding and infrastructure for conducting and publishing clinical research [1, 31]. Assessing research capacity in the developing world is a necessary first step in addressing these limitations [10, 29]. Second, a large proportion of the existing healthcare intervention and research in the developing world focuses on diminishing the burden of infectious diseases rather than on musculoskeletal conditions [19]. Finally, the central focus of orthopaedic volunteering efforts from the developed world has been on providing service rather than in promoting research aimed at characterizing and alleviating the burden of musculoskeletal conditions [4].

Despite the fact that the largest burden of musculoskeletal disease is found in the developing world, we found the prevalence of developing world authorship to be low and greater than 90% of the publications to emanate from a few select developing countries with economies that rival those of developed countries [7, 12, 20]. This imbalance in publications is most pronounced in Sub-Saharan Africa, which accounted for only 6% of the publications from developing countries. The paucity of publications emanating from the developing world highlighted in this study parallels the observations of others who have noted, in high-impact English-language orthopaedic journals, a

paucity of studies dealing with the global trauma burden [23, 24]. Similar findings were noted in a study detailing the representation of articles from the developing world in high-impact surgical journals [15]. Publication of research from regions where the burden of disease is greatest is essential to furthering our understanding of the rising global burden of musculoskeletal conditions [1, 2]. Clinical research conducted in developing countries has the added potential of providing evidence that can drive overall health policies [8, 17, 22, 23, 25]. The benefits of performing clinical research in the developing world and disseminating the results have been reported [18]. For example, innovative interventions in trauma care have led to reductions in mortality from injuries in Mexico (from 8.2% to 4.7%), Trinidad (from 67% to 34%), and Thailand (from 6.1% to 4.4%) [19].

Strategies to stimulate clinical research in developing countries might be expected to result in more articles suitable for publication in widely circulated orthopaedic journals. Multinational and cross-institutional collaborations can reduce the global disparity in healthcare research [1, 4, 13, 22, 23]. One strategy, recently initiated at the Institute for Global Orthopaedics and Traumatology (IGOT) in San Francisco, has been to develop a course in the fundamentals of clinical research for overseas educators interested in promoting orthopaedic research in their home countries.

Our study documents the underrepresentation of developing world countries in publications from several high-impact orthopaedic journals, with those countries with the fewest resources the least represented. Initiation of educational programs in the developing world that are designed to promote well-conducted research will likely generate more studies of a quality deemed suitable for publication in high-impact journals. With such efforts, the larger global community can be reached directly, leading to more innovative and effective measures to address the burden of musculoskeletal disease where the need is greatest.

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