

## Turkey's recent collaborative and genuine contributors to medicine

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The overemphasis of economic growth globally and, particularly, in Turkey in the past quarter of a century has not only exposed its limitations regarding the environment, resources, and global warming but also led to the neglect of sound policies in education and scientific research. A main consequence that emerged has been the so-called "middle-income country trap" that Turkey has been experiencing in the past 6 years. Scientific research is indispensable for human development, as well as export-led economic growth. The UN Development Program recently published its traditional index for 2013, which uses three basic dimensions: longevity in conjunction with a healthy life, access to knowledge, and a life standard appropriate to human beings. Thus, two of the three dimensions are intimately woven into knowledge, science, and medicine. Among 187 countries ranked in the Human Development Index, Turkey is placed no better than 69<sup>th</sup>, behind Libya, Malaysia, Lebanon, Belarus, and Venezuela.

Assessment of the international position of a nation is vital for the decision of scientific priorities and support by the government, business circles, and foundations (1), and indicators of scientific activity shed light on the appropriate disposition of national resources (2). As the most reliable indicator of scientific contributions, highly cited papers, such as the top 1% of all articles with the highest citations in a given field, are generally held to better reflect the contribution (1). The real contribution of the individual author, institution, or country is diluted among the growing proportion of publications with international collaboration, which include clinical trials, meta-analyses, guidelines, or scientific statements. These internationally "collaborative" papers receive high numbers of citations, thus requiring separate consideration, while the "genuine" contribution of the native researcher in such papers may be near-negligible. A method previously proposed by this author—namely, assessing research that attains citations above a relatively high threshold

in institutions of a native country (3, 4)—may be most appropriate to evaluate, especially for countries that are inferior to a leading position in science.

It is unclear what the share of citations to the two types of "collaborative" or "genuine" publications is in such countries, specifically in Turkey. Recognition of the share of "genuine" papers is relevant, because this type of research product represents the true capacity of research generated in a country that is intermediate in science. This author evaluated the contribution of research produced in the past decade by scientists in Turkey to medicine, utilizing a method of "relatively highly cited" articles in medicine (5). The magnitude, temporal trend, distribution across medical fields, and the scientists are herein assessed.

Citation data were derived from the Web of Science (Core Collection), using "Turkey or Türkiye" as the address. Publications in science and technology in the period onwards from 2004 were searched in clinical medicine, biochemistry, microbiology, immunology, pharmacology, genetics, neuroscience, and psychiatry. When sorted by highest to lowest citations, articles or reviews that were cited 74 or more times were selected, and those not related to the field of medicine (biology, pharmacy, etc.) were excluded. The 394 papers that were identified were further categorized as to whether or not they met the criterion of more than a minor international share among authors. "Genuine" contributions were defined when all three first authors of the paper worked in a Turkish university or hospital. All remaining articles were grouped as "collaborative" papers.

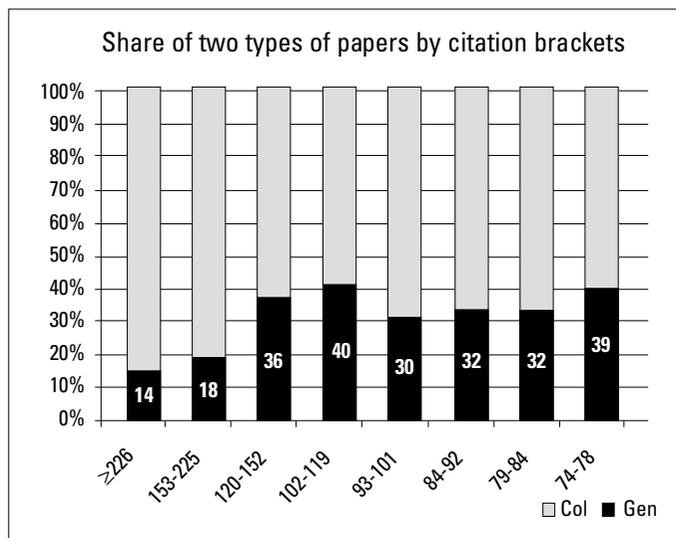
In co-authored papers with multiple institutions, the first author and his/her institution were credited and listed. To preclude omissions, 26 scientists known to me from previous works (3, 4) were individually searched. It should be clarified that the term "highly cited" denotes a wider meaning than the same term used in the Web of Science. The Web of Science data



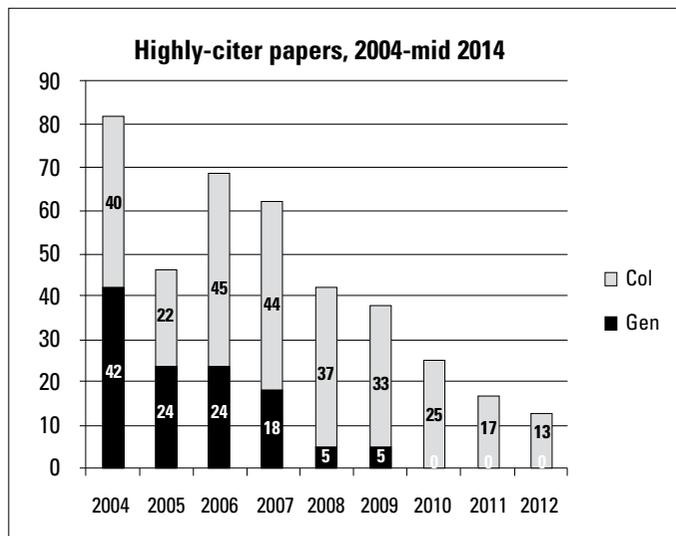
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**Figure 1.** Graph depicts the distribution of 394 top genuine and collaborative medical papers having an address “Turkey” and receiving  $\geq 74$  citations over the past decade. Stratified presentation of each of the 50 papers shows that collaborative publications form percentages, increasing from roughly 65% to 84%, as the threshold of citations exceeds 150



**Figure 2.** Graph shows the annual distribution of top medical papers (118 “genuine” and 276 internationally collaborative) over the past decade. The number of the “genuine” contributions drops precipitously after 2007 to one-quarter of the anticipated number

reported herein pertain to those available at end of August 2014. Estimates of the expected distribution of “highly cited” papers for each studied year were based on the number of papers observed in 2004 and on the 1<sup>st</sup> and 10<sup>th</sup> percentile data provided for these years by Essential Science Indicators (Field Baselines, Clinical Medicine) of the Web of Science.

The present commentary differs from a previous report of mine (4) in various aspects. First, the annual distribution across the study period and number of citation categories of “collaborative” papers were included herein as targets. Second, the targeted period was the recent decade, rather than the past

half-century, which excluded over three-quarters of the authors and papers in the previous report. Third, the closing date was later by 1.4 years, and finally, a slightly higher threshold of citations was selected.

I identified a total of 394 medical papers that were published in the period from 2004 to August 2014 with an address “Turkey” and 74 or more citations. Collaborative articles numbered 273, and “genuine” articles numbered 121. Overall citations received by these papers were 60,800. The exposure period for the genuine papers had a median of 8.9 (IQR 7.6 to 10) years, compared with 7.0 (IQR 5.2 to 8) years for collaborative articles (source information to the “genuine” articles are presented in Appendix 1. <http://dx.doi.org/10.5152/akd.2015.5977>).

The distribution of the top medical papers over the past decade is graphically illustrated in Fig. 1. The stratified presentation of each of the 50 papers shows that collaborative publications form percentages, increasing from 52% to 88% as the threshold of citations rises. The annual distribution of top 121 “genuine” and 273 internationally “collaborative” medical papers over the past decade is depicted in Figure 2. The number of the genuine contributions dropped precipitously after 2007 to one-quarter of the anticipated number.

#### Distribution by fields in medicine

I listed in Appendix 2. <http://dx.doi.org/10.5152/akd.2015.5977> publications and citations grouped into medical fields. Above-average performance was attained in neurosciences (with a share of one-fifth) and internal medicine (with 39%) relative to the global mean share, thus ranking them in front in relative strength of the main medical fields. The stated two fields displayed 1.62-fold citations as the mean of the medical fields. Basic sciences, surgery, and pediatrics disclosed a performance by about one-third below the average.

Neurosciences showed the best relative performance, whereby psychiatry (14 articles) was the flagship. Among internal medical sciences, cardiology (with 10), rheumatology (with 6), and endocrine and metabolism (with 5 papers) were leading. Biochemistry (with 7 papers) was in front in basic sciences, while urology and gynecology (5 articles each) were the front-runners in surgical sciences. Pediatrics, enlisting 5 papers in this study, appeared to fare with the lowest strength.

#### Contributing institutions

Supplementary Appendix 3. <http://dx.doi.org/10.5152/akd.2015.5977> lists the 20 primary authors receiving  $\geq 170$  citations in one or more than one highly cited “genuine” paper in the past decade, rendering over two-fifths of the impact by the highly cited papers. The distribution across medical subspecialties was fairly even, though embryology, pharmacology, and psychiatry were the fields represented by multiple primary authors. These primary authors, affiliated with 13 university medical faculties, the Gülhane Military Academy, and Ankara Numune Hospital, generated the top papers studied herein.

More than one primary author worked only at the İstanbul (Cerrahpaşa and İstanbul faculties), Akdeniz, Erciyes, Ege, and Ankara University medical faculties. These authors were the biochemist Özcan Erel, the infection specialist Ömer Ergönül, the biochemist Tomris Özben, the cardiologist Altan Onat, the rheumatologist İknur Tuğal-Tutkun, the pediatrician M. Keskin, and the oncologist Mustafa Altınbaş. Though marginally lower in relative strength than the mean in the internal medicine branches, cardiology had superior performance compared with the overall mean and seemed to be more vigilant via its young scientists (Ö. Tarçın, N. Kalay, M. Eren, T. Çelik, E. E. Özcan, M. Özaydın, D. Aras).

As an emerging salient finding, a total of 394 papers originating from Turkey succeeded in the past decade in receiving  $\geq 74$  citations. "Collaborative" papers constituted 7 out of 10 such articles and 77% of all citations acquired. The selection herein of a comparatively high threshold of impact should not be considered inappropriate. Indeed, a criterion of 10% of papers with the highest citations is being utilized in the Leiden Ranking of world universities (5).

The total of highly cited papers referred to in this study represented 1 of every 210 papers overall in medicine generated in Turkey in the given period yet received 40% of overall citations in medicine, corresponding to an 84-fold odds. Compared to an 8% share of global papers, forming about 250,000 papers in medicine in the decade under study, the share of the 394 articles from Turkey may be estimated as 1.6 per mille of papers in the world, and the share of comparable impact may be half as much at best. It should be underlined that even the provided share is driven little by highly citable "genuine" research but mainly by research with international collaboration. Such a performance is unsatisfactory relative to Turkey's potential. Branches that were standard bearers in Turkey in medical research a few decades ago, such as hematology and pediatrics, seem to be less productive at this level.

The methodology (categorization) used herein does not disfavor the inter-institutional collaboration within the country, or even papers with a minor contribution from abroad, but only the predominant collaboration with international authors.

### The trend of citations in recent years

It is, admittedly, difficult to predict what impact, in terms of citations, articles published in 2010 or later will receive. Despite this, the 1st and 10th percentile data, provided for such exposure duration by Essential Science Indicators of the Web of Science, may help estimate future additions to citations. A yearly mean of 20 "genuine" articles have been estimated to be produced in the past decade. An annual average of 25-28 such articles was esti-

mated to make a cutoff of  $\geq 72$  citation in the period from 1998-2004 (4), at a time when global citations overall were substantially lower than in the period studied herein. This suggests a decline observed with respect to generating research contributing to medicine genuinely originating from this country's institutions. A recent concerning trend toward stagnation or a mild decline has been noted, even in scientific publications of Turkey (6). A preference of relying mainly on international collaboration with little or minute contribution by our potential appears to become a trend for our medical community. This development should not be overlooked, lest one intends to avoid serious stagnation in medical research.

In the nationwide education and science policy, new regulations and incentives should be put in order. Current tedious formalities associated with funding research need to be eliminated, and material and moral incentives by administrative bodies should be created to promote in-depth research, potentially contributing to medicine. Regrettably, such overtures are unlikely to be attained in the near future on conjectural grounds.

In summary, using a selected threshold of citations, the contribution of Turkey to medicine in the past decade consisted of 394 articles or reviews that received just over 60,000 citations. Of these, 118 "genuine" papers attained slightly less than one-quarter of the citations, while the overwhelming proportion of the impact belonged to internationally "collaborative" papers. The annual production of roughly 20 papers in recent years is a considerably lower-than-satisfactory capacity for Turkish medical faculties and institutions. In conclusion, unless we are indifferent to public health being threatened, authorities should urgently focus on creating an environment that is favorable to promoting research at a level contributing to medicine.

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