



# Turkey's contribution to medicine: Main institutions, fields and publications

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**Objective:** To identify and disclose publications from Turkey with the greatest "genuine" contributions to medicine in the past 50 years.

**Material and Methods:** Based on the data of *Web of Science*, publications originating from Turkey's institutions that were received by May, 2013,  $\geq 72$  citations were identified, after excluding papers having more than a minor share by international authors.

**Results:** Primary authors numbering 223 generated 271 medical papers, each receiving  $\geq 72$  (95% CI 72; 263) citations. The articles cited herein were of a level of top global 8-10% papers. Half of the articles were published in 1997-2004. Compared with about 25-28 papers annually 10 years previously, it is estimated that currently only 20 papers are generated in Turkey annually, representing a global share of only 1.5 per thousand. The rate of rise registered in the period 1995-2004 may be anticipated to attenuate. Internal medicine, led by rheumatology, cardiology and hematology, and neurosciences were represented at 1.8-fold odds higher than the overall average. Led by Behçet's disease, health issues encountered more widely than in other populations, formed frequent topics of contribution. Led by the Medical Faculties of Istanbul, Hacettepe, Ankara Universities and the Military Medical Academy, only 33 medical faculties and 14 public and private hospitals constituted sources.

**Conclusion:** Since the elicited results are unsatisfactory, compared with Turkey's potential, much more concerted efforts should be directed to rebuild a milieu favorable to promote research likely to contribute to medicine.

**Key Words:** Contribution to medicine, history of medicine, medical research in Turkey

## INTRODUCTION

Health, the most vital aspect of life, represents the basis for development and welfare. Progress in medicine is indispensable for both protecting health and treating its impairment. Hence, it is highly desirable for communities to track the contributions to medicine closely. Among various indicators of scientific contributions, the total number of publications, number of papers in periodicals of exceptionally high impact, or the total number of citations to an article have been used. In view of high heterogeneity in both the quality of a given scientific paper, and the factors associated with the overall number of citations received, it is generally held that highly-cited papers, such as the top 1% of all articles in a field receiving the highest cites, better reflect the contribution (1). Indeed, a criterion of 10% of papers with highest citations have been utilized in the Leiden Ranking of world universities (2). The real contribution of the individual author or institution is diluted among the growing proportion of publications with international collaboration, such as clinical trials, meta-analyses, guidelines or scientific statements that receive high numbers of citations, and necessitates the consideration of a second aspect for this task. The "genuine" contribution of the native researcher in such papers may be near-negligible.

These considerations suggest that a method previously proposed by this author, namely, the generation of research attaining citations above a relatively high threshold in institutions of a native country may be most appropriate to evaluate, especially for countries not in a leading position in science (3, 4). The present paper aims to investigate the contribution to medicine of research generated in Turkey by its scientists in the past half-century, utilizing a method of highly-cited articles that correspond to about 7-10% of global papers in their fields. The magnitude, period and rate of change over time, distribution across medical institutions and fields, the individual publication references and scientists are herein evaluated.

## MATERIAL AND METHODS

Citation data were derived from Thomson Reuters Web of Science, using "Turkey" as the address. Publications in science and technology in the past half-century were listed by the number of attained citations. Over 2100

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items, found to have been cited 72 or more times, have been screened for the field of medicine. The criterion was further to be met of having more than a minor international share, which was specifically indicated by having all of the first three authors of the paper work in a Turkish university or hospital.

In co-authored papers with multiple institutions, the first author and his/her institution were credited and listed. With the purpose of precluding omission of some researchers in the address "Turkey", some scientists known to me from previous work were individually searched (4). For those authors who produced highly-cited papers in two different institutions, citations received were assigned to the two institutions.

Reported data of Web of Science in the current study pertain to those available in early May, 2013. It is known that these Web of Science data exclude intrinsically eligible citations to references incorrectly or inadequately provided and to periodicals not covered by the Web of Science. These excluded citations may be estimated to form a share of 5% to 10% of the Web of Science citations.

## RESULTS

A total of 271 medical papers were identified generated in Turkey's institutions that received 72 or more cited. The total number of citations received by these papers was 29,212. Publication year of the papers ranged from 1971 to 2009, had a median of May, 2001 (interquartile range August, 1997 and September, 2004). This indicated an exposure period of a median of 12 (IQR 7½ to 15) years. Source information to these articles are presented in Table 1.

### Distribution by fields in medicine

Table 2 lists publications and citations categorized to the medical fields. The share of citations was 43% for internal medicine, 18% for neurosciences; these represented above-average performance when compared with the global mean share. Instead of an expected share of 21% and 36% for surgery and basic sciences, respectively, these major fields attained a performance slightly below average, attaining shares of 16% and 21%, respectively. With a production of 8 papers alone, pediatrics displayed a performance clearly below-average.

Among internal medical sciences, rheumatology with 25 papers, cardiology and hematology each with 14, endocrine and metabolism with 10 papers were placed in the lead. Neurology (25) and psychiatry (21 articles) also exhibited successful performance. Biochemistry led with 22 papers in basic sciences.

### Journals of preference

Though evaluated papers were published in approximately 160 different journals, a dozen journals were the ones to attract most of these highly-cited papers. *Clin Biochem* with 7, *Ann Rheum Dis* with 6, *Clin Chim Acta*, *Fertil Steril*, *Hum Reprod*, *J Clin Endocrinol Metab*, *J Rheumatol*, *J Urol*, *Stroke*, *Thorax* each with 5, and *Arthritis Rheum* and *Rheumatol Int* each with 4 papers, ranked foremost. Noteworthy is that the great majority of the stated journals belong to periodicals with intermediate (2 ila 7) rather than high impact factors.

### Sources confined to 48 institutions

Only 33 medical faculties, Gülhane Military Academy (GATA) and 14 public and private hospitals generated the herein studied papers (Table 3). The majority of citations were received by the Medical Faculties of the Universities of Hacettepe, Istanbul (Cerrahpaşa and İstanbul faculties), Ankara and GATA. These were followed by the Aegean, Harran, Erciyes, Dokuz Eylül, Akdeniz and İnönü University medical faculties, each with 7-13 publications. Researchers working in hospitals outside the medical faculties shared 5.7% of total citations.

## DISCUSSION

The current study incorporates 2½ to 3-fold the number of papers and citations than a previous report of mine (3), due both to including two more recent years and selecting a lower threshold by 10 citations. Hence, the significance of the analyses is higher, and it is also more updated. A total of 271 papers originating from Turkey and half of them published in the period 1997 to 2004, has each succeeded in receiving 72 to 348 cites. Since, in the stated period, worldwide published annual medical papers of an equivalent level can be estimated to range around 15-18,000, the generation in Turkey of 25-28 articles each year (Figure 1) corresponds to a global share of 1.5 per thousand. Such a performance cannot be considered satisfactory, given Turkey's potential.

### The majority of best research originates from established faculties

Nine out of 10 highly-cited medical publications derived from only 19 medical faculties, GATA and a hospital affiliated with the Health Ministry, indicating that the distribution of fundamental research is highly concentrated in Turkey. As anticipated, the medical faculties of established universities were leading this list. Beyond them, GATA, Harran, İnönü, Kocaeli, Süleyman Demirel, Mersin, Gaziantep, Trakya Universities. Medical Faculties were notable for contributions and surpassed certain more ancient faculties. Nonetheless, it should be questioned why criteria stipulated in this study were not met by a faculty founded in the past 20 years.

### Topics and areas suited to have attained success

Obviously, topics of the research papers were highly diverse. Interested readers may be inspired by the information contained in Table 1. Highly-cited papers tend to be concentrated in certain areas led by Behçet's disease (with 36 papers), a finding not surprising but deserving appreciation. Topics related to oxidation and antioxidants followed with 20 papers. Hydatid cysts, depression, familial Mediterranean fever, chronic benzene toxicity, polycystic ovary syndrome and schizophrenia constituted areas with 5 to 10 contributing papers each.

With the purpose of attaining a high number of citations, it should be underlined here that, apart from the impact factor of the journal, the incremental value added by the investigation published is of great relevance. Indeed, numerous papers published in upper-mid category of journals have succeeded in being highly-cited, specifically twice as much as the impact factor of the related journals.

Table 1. Data on authors, medical fields and references for 271 publications with greatest "genuine" contribution to medicine (total 29,212 cites as of early May, 2013)

Cites	Authors	Field	Area	Journal	Year & reference
348	Koç Y, Güllü İ, Akpek P, &	Oncology	Behçet's disease	J Rheumatol	1992; 19: 402-10
333	Erel Ö	Biochem.	Antioxid. capacity	Clin Biochem	2004; 37: 277-85
305	Erel Ö	Biochem.	Antioxid. capacity	Clin Biochem	2004; 37: 112-9
288	Akman-Demir G, Serdaroğlu P, Taşer B	Neurology	Behçet's disease	Brain	1999; 122: 2171-81
287	Abacı A, Oğuzhan A, Kahraman S &	Cardiology	Coronary collaterals	Circulation	1999; 99: 2239-42
280	Erel Ö	Biochem.	Antioxid. capacity	Clin Biochem	2005; 38: 1103-11
263	Emre M	Neurology	Dementia	Lancet Neurol	2003; 2: 229-37 R
231	Ergönül Ö	Infections	C-C hemorrhagic fever	Lancet Inf Dis	2006; 6: 203-14
231	Hamuryudan V, Mat C, Saip S &	Rheumat.	Behçet: thalidomid	Ann Intern Med	1998; 128: 443-
228	Altınbaş M, Coşkun HI, Er O &	Oncology	Low-mol-wt heparin	J Thromb Haemost	2004; 2: 1266-71
205	Öğüş AC, Yoldaş B, Özdemir T &	Pneumol.	Gene in tuberculosis	Eur Respirat J	2004; 23: 219-23
205	Bilici M, Efe H, Köroğlu MA &	Psychiatry	Depression	J Affect Disord	2001; 64: 43-51
204	Tunca M, Akar S, Onen F &	Intern med.	Fam. Medit. fever	Medicine	2005; 84: 1-11
203	Kural-Seyahi E, Fresko İ, Seyahi N &	Rheumat.	Behçet's dis. mortality	Medicine	2003; 82: 60-76
199	İmeryüz N, Yeğen BC, Bozkurt A &	Gastroent.	Stomach emptying	Am J Physiology	1997; 273: G920-7
198	Ateş K, Nergizoğlu G, Keven K &	Nephrol.	Peritoneal dialysis	Kidney Int	2001; 60: 767-76
198	Yazıcı H, Tüzün Y, Pazarlı H &	Rheumat.	Behçet's disease	Ann Rheum Dis	1984; 43: 783-9
191	Onat A, Ceyhan K, Başar Ö &	Cardiology	Metabolic syndrome	Atherosclerosis	2002; 165: 285-92
172	Uygun A, Kadayıfçı A, Işık AT &	Gastroent.	Fatty liver, metformin	Alim Pharma Ther	2004; 19: 537-44
172	Aktolun C, Bayhan H, Kır M	Nucl. med.	TL-201 imaging	Clin Nucl Med	1992; 17: 171-6
169	Aksoy M, Erdem S, Dinçol G	Hematol	Chr. benzene poisoning	Blood	1974; 44: 837-41
163	Vahaboğlu H, Öztürk R, Aygün G &	Microbiol	Beta-lactamases	Antimicrob Ag Chemoth	1997; 41: 2265-9
158	Serdaroğlu P, Yazıcı H, Özdemir C	Neurology	Behçet: neurology	Arch Neurol	1989; 46: 265-9
157	Coşkun Ö, Kanter M, Korkmaz A &	Infections	Antioxid. quercetin	Pharmacol Res	2005; 51: 117-123
156	Ökten A, Kalyoncu M, Yariş N	Pediatrics	Adrenal hyperplasia	Early Hum Develop	2002; 70: 47-50
155	Çelik T, Sungur M, Ceyhan B &	Pneumol.	Acute resp. failure	Chest	1998; 114: 1636-42
153	Karahüseyinoğlu S, Çınar Ö, Kılıç E &	Hist & Biol	Chord stem cell	Stem Cells	2007; 25: 319-31
153	Sayek İ, Yalın R, Sanaç Y	Gen surg.	Hydatid cyst	Arch Surg	1980; 115: 847-50
148	Gönül AS, Akdeniz F, Taneli F &	Psychiatry	Depressive patient	Eur Arch Psych Clin Sci	2005; 255: 381-6
148	Tahaoglu K, Torun T, Sevim T &	Thor. surg.	Resistant tbc.	N Engl J Med	2001; 345: 170-4
147	Hamuryudan V, Yurdakul S, Moral F &	Rheumat.	Behçet's disease	Br J Rheumatol	1994; 33: 48-51
145	Aydın A, Orhan H, Sayal A &	Pharma-Tox.	Diabetes & oxidation	Clin Biochem	2001; 34: 65-70
144	Onat A	Cardiology	Cardiovasc. disease	Atherosclerosis	2001; 156: 1-10 R
144	Başaranoğlu M, Açıbay Ö, Sonsuz A	Hepatol.	Gemfibrozil steatohepa.	J Hepatol	1999; 31: 384 letter
143	Serdaroğlu P	Neurology	Behçet: neurology	J Neurol	1998; 245: 197-205
141	Caner B, Kitapçı M, Ünlü M &	Nucl. med.	Technetium-99m	J Nucl Med	1992; 33: 319-24
140	Özben T	Farmakol	Oxidative stress	J Pharmaceut Sci	2007; 96: 2181-96 R
140	Satman İ, Yılmaz T, Şengül A &	Metabol.	Diabetes epidemiology	Diabetes Care	2002; 25: 1551-6
139	Kanpolat Y, Savaş A, Bakar A &	Neurosurg	N. trigeminus rhizotomy	Neurosurg	2001; 48: 524- PP
139	Aykaç G, Uysal M, Yalçın AS &	Biochem.	Alcohol & oxidation	Toxicology	1985; 36: 71-6
137	Barış Yİ, Şahin AA, Özemesi M &	Pneumol.	Pleural mesothelioma	Thorax	1978; 33: 181-92
136	Kasapoğlu M, Özben T	Biochem.	Free radical theory	Exp Gerontol	2001; 36: 209-20 PP
134	Arıcan Ö, Aral M, Şaşmaz S &	Dermatol	Psoriasis: TNF-α	Mediators Inflamm	2005; 14: 273-9
134	Akyol Ö, Herken H, Uz E &	Biochem.	Schizophrenia	Prog Neurops'phar	2002; 26: 995-1005 R
134	Akhan O, Özmen MN, Dinçer A &	Radiology	Liver hydatid cyst	Radiology	1996; 198: 259-64
133	Direskeneli H	Rheumat.	Behçet's disease	Ann Rheumat Dis	2001; 60: 996-1002
131	Şentürk M, Özcan PE, Talu GK &	Anesthes	Analgia techniques	Anesthesiol	2002; 94: 11-5
129	Tuğal-Tutkun İ, Önal S, A-Yaycıoğlu M &	Rheumat.	Behçet's uveitis	Am J Ophthalmol	2004; 138: 373-80
128	Kaptan K, Beyan C, Cetin T &	Hematol	Helicobacter pylori	Arch Intern Med	2000; 160: 1349-53
128	Akpınar S	Neurology	Restless leg syndrome	Arch Neurol	1982; 39: 739 letter
127	Tarkun İ, Arslan BC, Cantürk Z &	Endocrin	Polycyst. ovar. syndr.	J Clin Endocr Met	2004; 89: 5592-6
126	Hamuryudan V, Özyazgan Y, Hızlı N &	Rheumat.	Behçet: azathioprine	Arthr Rheumatism	1997; 40: 769-74

126	Tan Ü	Physiolog	Hand preference	Int J Neurosci	1988; 41: 35-55
124	Vardar-Ünlü G, Candan F, Sökmen A &	Microbiol	Antimicrobial activity	J Agr Food Chem	2003; 51: 63-7
124	Uygun A, Kadayıfçı A, Yeşilova Z&	Gastroent.	Fatty liver, leptin	Am J Gastroenter	2000; 95: 3584-9
123	Gültekin F, Öztürk M, Akdoğan M &	Biochem.	Insecticide-lipid oxidat.	Arch Toxicol	2000; 74: 533-8
123	Uslu R, Sanlı UA, Sezgin C &	Oncology	Carcinoma cell lines	Clin Cancer Res	2000; 6: 4957-64
122	Can A & Karahüseyinoğlu S	Hist & Biol	Chord stem cell	Stem Cells	2007; 25: 2886-95 R
122	Doğan R, Yüksel M, Çetin G &	Thor. surg.	Pulm. hydatid cyst	Thorax	1989; 44: 192-9
121	Herken H, Uz E, Ozyurt H &	Psychiatry	Schizophrenia	Mol Psychiat	2001; 6: 66-73
120	Tuğlu C, Kara SH, Çaliyurt O &	Psychiatry	Depression: TNF-α	Psychopharmacol	2003;170: 429-33
119	Durak I, Yurtarslan I, Canbolat O &	Biochem.	Superoxide dismutase	Clin Chim Acta	1993; 214: 103-4
118	Malas MA, Doğan Ş, Evcil EH&	Anatomy	Fetus: hand developm.	Early Hum Develop	2006; 82: 469-75
118	Onat A, Şurdum-AvcıG, Barlan MM&	Cardiology	Visceral adiposity	Int J Obes	2004; 28: 1018-25
118	İlhan A, Koltuksuz U, Ozen S	Neurology	caffeic acid ph ester	Eur J C-thor Surg	1999; 16: 458-63
117	TokgozoglusuL, BaturMK, TopcuogluMA&	Cardiology	Stroke localization	Stroke	1999; 30: 1307-1
114	Göker H, Haznedaroğlu IC, Erçetin S &	Hematol	Ankaferd & hemostasis	J Int Mrd Res	2008; 36: 163-70
114	Özkahya M, Ok E, Cirit M &	Nephrol.	Hemodialisis	Nephr Bial Transpl	1998; 13: 1489-93
114	Gedik O, Akalın S	Metabol.	D vit deficiency	Diabetologia	1986; 29: 142-5
114	Erol OO	Plast surg.	Free skin-graft	Plast Reconst Surg	1976; 58: 470-7
113	Tuğal-Tutkun İ, Mudun A, UrgançioğluM&	Rheumat.	Behçet's uveitis	Arthr Rheumatism	2005; 52: 2478-84
113	Evereklioglu C	Ophthalm.	Behçet's dis. management	Survey Ophthalmol	2005; 50: 297-350 R
113	Koçer N, Islak C, Siva A, &	Radiology	Neuro-Behçet	Am J Neuroradiol	1999; 20: 1015-24
112	Kuloğlu M, Üstündağ B, Atmaca M &	Biochem.	Schizophren. & oxidation	Cell Bioche Funct	2002; 20: 171-5
112	Gültekin F, Delibaş N, Yaşar S&	Biyokimya	Eritrosit oxid. damage	Arch Toxicol	2001; 75: 88-96
112	Yılmaz S, Sindel T, Arslan G &	Radiology	BTomo analysis	Eur Radiol	1998; 8: 212-7
112	Uzel N, Sivas A, Uysal M, Öz H	Biochem.	Lipid peroxidation	Hormon Met Res	1987; 19: 89-90
111	Özcan ME, Güleç M, Özerol E &	Psychiatry	Oxidative stress	Int Clin Psychopharm	2004; 19: 89-95
111	Yılmaz E, Özen S, Balcı B, &	Med. biol.	FMF genetics	Eur J Hum Genet	2001; 9: 553-5
111	Günel Al, Duman S, Özkahya M &	Nephrol.	Peritoneal dialysis	Am J Kidney Dis	2001; 37: 588-93
111	İnal MB, Kanbak G, Sunal S	Geriatrics	Oxidation in elderly	Clin Chim Acta	2001; 305: 75-80
111	Aytemir K, Ozer N, Atalar E &	Cardiology	P-wave dispersion	PACE	2000; 23: 1109-12
110	Açbay Ö, Gündoğdu S	Endocrin	Polycyst.ovar. syndr.	Fertil Steril	1996; 65: 946-9
110	Sayınalp N, ÖzcebeOI, ÖzdemirO&	Hematol	Behçet's disease	J Rheumatol	1996; 23: 321-322
108	Öztürk M	Genetics	Carcinogenesis	Sem Liver Dis	1999; 19: 235-42
108	Yurdakul S, Günaydın I, TüzünY&	Rheumat.	Behçet syndrome	J Rheumatol	1988; 15: 820-2
108	Yurdakul S, Yazıcı H; Tüzün Y	Rheumat.	Behçet arthritis	Ann Rheumat Dis	1983; 42: 505-15
108	Aytaç A, Yurdakul Y, İkizler C &	Thor. surg.	Foreign body inhal.	J Thor Cardio Surg	1977; 74: 145-51
107	Gürsoy S, Erdal E, Herken H &	Rheumat.	Fibromialgia syndrome	Rheumatol Int	2003; 23: 104-7
106	Yıldız BO, Yaralı H, Oğuz H &	Metabol.	Polycyst.ovar. syndr.	J Clin Endocr Metab	2003; 88: 2031-6
106	Kara H, Aydın S, Ağargün MY &	Psychiatry	Premature ejaculation	J Urol	1996; 156: 1631-2
106	Aksoy M, Dinçol G, Akgün	Hematol	Chr.benzene poisoning	Br J Ind Med	1971; 28: 296-?
105	Göktaş S, Yılmaz Mİ, ÇağlarK&	Urology	Adiponectin in cancer	Urology	2005; 65: 1168-72
105	Güler N, Kırerleri E, Öneş Ü &	Allergy	Leptin and asthma	J Allerg Cl Immunol	2004; 114: 254-9
105	Koçak M, Çalıskan E, Şimşir C &	Gynecol.	PcOvS: metformin	Fertil Steril	2002; 77: 101-6
105	Aksoy M	Hematol	Chr. benzene poison.	Am J Ind Med	1985; 7: 395-402
104	Siva A, Kantarcı OH, Saip S &	Neurology	Behçet nörol.musabiyet	J Neurol	2001; 248: 95-103
103	Öner AF, Bay A, Arslan Ş &	Pediatrics	Asian flu	N Engl J Med	2006; 355: 2179-85
103	Kılıç T, Pamir MN, Kullu S &	Neurosurg	Cerebrovas. angiogenic	Neurosurgery	2000; 46: 1179-91
103	Taşdemir O, Vural KM, KaragözH&	Card. surg..	Heart surg without by-pass	J Thor Cardiovas Surg	1998; 116: 68-73
102	Aydemir O, Deveci A, Taneli F	Psychiatry	Depression treatm.	Prog Neuropsychoph	2005; 29: 261-5
102	Saatçi İ, ÇekirgeHS, ÖztürkMA&	Radiology	Carotid art aneurysm	Am J Neuroradiol	2004; 25: 1742-9
102	Durak I, Canbolat O, KavutcuM&	Biochem.	Superoxide dismutase	J Clin Lab Analys	1996; 10: 17-20
102	Akpınar S	Neurology	Restless leg syndrome	Clin Neuropharma	1987; 10: 69-79
101	Önen F	Intern med.	Fam. Medit. fever	Rheumatol Int	2006; 26: 489-96 R
101	Melikoğlu M, Fresko İ, Mat C &	Rheumat.	Behçet: etanecerp	J Rheumatol	2005; 32: 98-105
101	Evereklioglu C, Er H, Türköz Y&	Ophthalm.	Behçet's disease	Mediators Inflamm	2002;11: 87-93

101	Yurdakul S, Mat C, Tüzün Y &	Rheumat.	Behçet: colchicine	Arthr Rheumatism	2001; 44: 2886-92
101	Tüzün H, Beşirli K, Sayın A &	Card. surg..	Behçet's aneurysm	Surgery	1997; 121: 150-6 PP
100	Ateş O, Hakküder G, Olguner M&	Ped. surg	Laparo. appendecto.	J Ped Surg	2007; 42: 1071-4
100	Ilhan A, Gürel A, Armutçu F &	Neurology	Oxidative stress	Clin Chim Acta	2004; 340: 153-62
100	Gul A	Rheumat.	Behçet's disease	Clin Exp Rheumat	2001; 19: S6-S12 R
100	Gürsoy-ÖzdemirY,Bolay H, SaribasO&	Neurology	Focal cerebr ischemia	Stroke	2000; 31: 974-80
100	Kostakoğlu L, Elahi N, Kıratlı P &	Nucl. med.	Technetium-99m	J Nucl Med	1997; 38: 1003-8
99	Bulakbaşı N, Kocaoğlu M, Örs F&	Radiology	Proton MR spectroscopy	Am J Neuroradiol	2003; 24: 225-33
99	Şavlı H, Karadenizli A, Kolaylı F&	Microbiol	Pseudomon. aerug. gene	J Med Microbiol	2003; 52: 403-8
99	Akman MA, Erden HF, Tosun SB &	Gynecol.	Ovarian stimulation	Hum Reproduct	2001; 16: 858-70
98	Doğru T, Sönmez A, Taşçı İ &	Metabol	Prediabetes: visfatin	Diabet Res Clin Pr	2007; 76: 24-9
98	Fıçıcıoğ Ç, Kutlu T, Bağlam E&	Gynecol.	Ovarian reserve	Fertil Steril	2006; 85: 592-6
97	Ersöz G, Tekesin O, Özütemiz AO &	Gastroent.	Biliary tract stone	Gastroint Endosc	2003; 57: 156-9
97	Kıyıcı M, Gülten M, Gürel S &	Gastroent	Nonalcoh. steatohepatitis	Canad J Gastroent	2003; 17: 713-8
97	Alpsoy E, Durusoy C, Yılmaz E &	Dermatol	Behçet: interferon-α	Arch Dermatol	2002; 138: 457-71
97	Sungur M, Güven M	Intern med.	Insekticide poisoning	Critical Care	2001; 5: 211-5
97	Yıldırım R; Aras C; Ozdamar A&	Ophthalm.	Cornea flap	J Cataract Refr Surg	2000; 26: 1729-32
97	Mercan S, Seven R, Özarmağan S&	Gen surg.	Endosc. adrenalect.	Surgery	1995; 118: 1071-6
97	Aksoy M	Hematol	Benzen carcinogenecity	Envir Hlth Perspect	1989; 82: 193-7 R
97	Yazıcıoğlu S, Ilcayto R, Balcı K&	Pneumol.	Pleural mesothelioma	Thorax	1980; 35: 564-9
96	Gürsoy-Özdemir Y, Can A, Dalkara T	Neurology	Focal cerebr ischemia	Stroke	2004; 35: 1449-53
96	Erol OO	Plast surg.	Rhinoplasty graft	Plast Reconst Surg	2000; 105: 2229-41
96	Demirci S, Eraslan S, Anadol E&	Gen surg.	Liver hydat. cyst surgery	World J Surg	1989; 13: 89-91
95	Çimen M, Burak Y	Biochem.	Free radicals	Clin Chim Acta	2008; 390: 1-11
95	Kalay N, Başar E, Özdoğru İ &	Cardiology	Cm'pathy: carvedilol	J Am Coll Cardiol	2006; 48: 2258-62
95	Eren M, Görgülü Ş, Uslu N &	Cardiology	Aort stiffn.; LV diast funct	Heart	2004; 90: 37-43
95	Zoroğlu SS, Tüzün U, Sar V &	Psychiatry	Suicidal attempt: students	Psych Clin Neurosci	2003; 57: 119-26
95	Fenççi V, Fenççi S, Yılmaz M&	Gynecol.	Polyc.ovar s. CV risk	Fertil Steril	2003; 80: 123-7
95	Durak I, Akyol O, Başesme E	Biochem.	Renal failure	Nephron	1994; 66: 76-80
94	Kanbay M, Özkar A, Selçoki Y &	Nephrol.	Hyperuricemia tretment	Int Urol Nephrol	2007; 39: 1227-33
94	Çelik T, İyisoy A, KursaklıoğH&	Kardiyol	Nebivolol & metoprolol	J Hypertens	2006; 24: 591-6
94	Atmaca M, Kuloğlu M, Tezcan E &	Psychiatry	Drug, leptin, triglyceride	J Clin Psychiat	2003; 64: 598-604
93	Yılmaz Mİ, Sağlam M, Çağlar K&	Nephrol.	Oxid. stress & ADMA	Am J Kidney Dis	2006; 47: 42-50
93	Yılmaz E, Batislam E, Başar MM	Urology	Ureteral calculus	J Urol	2005; 173: 2010-2
93	Doğu O, Sevim S, Çamdeviren H&	Neurology	Essential tremor	Neurology	2003; 61: 1804-6
93	Azizlerli G, Köse AA,,Sarica R &	Dermatol	Behçet d. prevalence	Int J Dermatol	2003; 42: 803-6
93	Tunca M, Kırkalli G, Soytürk M&	Intern med.	FMF & acute phase resp.	Lancet	1999; 353: 1415-5
92	Irmak MK, Fadiloğlu E, Güleç M &	Biochem.	Cell. tel. & oxidation	Cell Biochem Funct	2002; 20: 279-83
91	Aksoy S, Harputluo H, Kılıçkap S&	Hematol	Lymphoma	Leukem Lymphoma	2007; 48: 1307-12
91	Söğüt S, Zoroğlu SS, Özyurt H &	Biochem.	Autism pathophysiol.	Clin Chim Acta	2003; 331: 111-7
91	Harma M, Harma M, Erel Ö	Biochem.	Ox-stress & hydatid cyst	Swiss Med Weekly	2003; 133: 41-2
90	Tamer L, Çalıkoğlu M, Ateş NA&	Pneumol.	Genetics in asthma	Respirology	2004; 9: 493-8
89	Gök H, Ergin S, Yavuzer G	Orthoped.	Knee arthrosis	Acta Orthop Scand	2002; 73: 647-52
89	Yıldız O, Doğanay M, Aygen B &	Intern med.	Sepsis: steroid Rx	Critical Care	2002; 6: 251-8
89	Özata M, Mergen M, Öktenli C &	Metabol	Obesity &oxid. stress	Clin Biochem	2002; 35: 627-31
89	Taysi S, Polat F, Gül M &	Rheumat.	Rheum. arthritis antioxiid.	Rheumatol Int	2002; 21: 200-4
89	Sennaroğlu L, Saatçi İ	Ear-Nose-T	Cochlea malformation	Laryngoscope	2002; 112: 2230-41
89	Yıldırım R, Aras C, Özdamar A &	Ophthalm.	Microkeratom usage	J Cataract Refr Surg	2001; 26: 1729-32
89	Kahraman S, Bahçe M, Şamlı H,&	Gynecol.	Pregnancy & delivery	Hum Reproduct	2000; 15: 2003-7
89	Durak I,Karabacak HI, BuyukkocakS &	Biochem.	Cyclosporin	Nephron	1998; 78: 207-11
88	Anıl-Yağcıoğlu AE,AkdedeBBK,Turgut TI&	Psychiatry	Schizophren: risperidon	J Clin Psychiat	2005; 66: 63-72
88	Kara İ, Sazcı A, Ergül E &	Neuropsych.	Migraine genetics	Mol Brain Res	2003; 111: 84-90
88	Atmaca M, Kuloğlu M, Tezcan E &	Psychiatry	Obsess. compulsive	Int Clin Psychopha	2002; 17: 115-9
88	Çokuğraş H, Akçakaya N, Seçkin İ &	Pneumol.	Bronch. biopsy in asthma	Thorax	2001; 56: 25-9
88	Sabuncu T, Vural H, Harma M &	Biochem.	Polyc.ovar s. CV risk	Clin Biochem	2001; 34: 407-13

88	Irmak MK, Koltuksuz U, Kutlu NO &	Biochem.	Exper. rat kidney	Urol Res	2001; 29: 190-3
88	Yalçınkaya F, Çakar N, Mısıroğlu M &	Rheumat.	FMF amyloidosis gene	Rheumatology	2000; 39: 67-72
88	Kılıç E, Özdemir YG, Bolay H &	Neurology	Focal ischemia: melatonin	J Cerebr BI Fl Metab	1999; 19: 511-6
88	Üstünsöz B, Akhan O, Kamiloğlu MA	Radiology	Liver hydatid cyst Rx	Am J Roentgenol	1999; 172: 91-6
88	Ağargün MY, Kara H, Solmaz M	Psychiatry	Depression & sleep	J Clin Psychiat	1997; 58: 249-51
88	Özdoğan H, Arısoy N, Kasaçapur A&	Rheumat.	FMF: vasculitis	J Rheumatol	1997; 24: 323-7
88	Saatçi U, Özen S, Özdemir S &	Pediatrics	FMF & amyloidosis	Eur J Pediat	1997; 156: 619-23
88	Gül A, Özbek U, İnanç M &	Rheumat.	Behçet: factor V	Br J Rheumatol	1996; 35: 1178-80
88	Kuzu MA, Özaslan C, Köksoy C&	Gen surg.	Behçet: vessel involvem't	World J Surg	1994; 18: 948-54
88	Burak Z, Argon M, Memiş A &	Nucl. med.	Tc-99M-MIBI	Nucl Med Commun	1994; 15: 604-12
88	Aktulga E, Altaç M, Müftüoğlu A&	Hematol.	Behçet: colchicine	Haematologica	1980; 65: 399-402
88	Aksoy M, Erdem Ş, Dinçol G	Hematol	Chr.benzene exposure	Am J Med	1972; 52: 160-?
87	Tura B, Tura SM	Psychiatry	Antidepressants	Brain Res	1990; 518: 19-22
87	Aksoy M, Erdem S, Dinçol G	Hematol	Benzene & leukemia	Acta Haematol	1976; 55: 65-72
86	Bora E, Vahip S, Gönül AS &	Psychiatry	Mental defects	Acta Psych Scand	2005; 112: 110-6
85	Ergenoğlu T, Demiralp T, Bayraktaro Z&	Neurology	Visual detection	Cognit Brain Res	2004; 20: 376-83
85	Turan A, Karamanlıoğ B, Memiş D&	Anesthes	Gabapentin: effect	Anesthesiol	2004; 100: 935-8
85	Gül A, Esin S, Dişlen N &	Rheumat.	Behçet: factor V	Br J Dermatol	1995; 132: 901-7
85	Özyazgan Y, Yurdakul S, Yazıcı H&	Ophthalm.	Behçet's uveitis Rx	Br J Ophthalmol	1992; 76: 241-3
85	Yalaz K, Anlar B, Öktem F &	Ped nörol.	Panencephalitis Rx	Neurology	1992; 42: 488-91
84	Yazıcı H, Fresko İ, Yurdakul S &	Rheumat.	Behçet's disease	Nature Cl Pr Rheum	2007; 3: 148-55
84	Sarmer S, Ergin S, Yavuzer G	Rheumat.	Fibromialgia questionnai.	Rheumatol Int	2000; 203: 9-12
84	Kocagöz T, Yılmaz E, Özkara S &	Microbiol	Tbc bacteria detection	J Clin Microbiol	1993; 31: 1435-8
83	Ergönül O, Çelikbaş A, Dokuzgöz B&	Infections	Crimean-Congo fever	Clin Infectious Dis	2004; 39: 284-7
83	Özaslan C, Kuru B	Gen surg.	Breast Ca lymphedema	Am J Surg	2004; 187: 69-72
83	Ertekin C, Aydoğdu İ	Neurology	Swallowing: physiology	Clin Neurophysiol	2003; 114: 2226-44
83	Akova M, Akalın HE, Uzun O &	Infections	Candidiasis & fluconazole	Eur J Cl Microb Inf Dis	1991; 10: 598-9
82	Polat P, Kantarcı M, Alper F &	Radiology	Hydatid cyst	Radiographics	2003; 23: 475-94
82	Elpek GO, Gelen T, Aksoy NH &	Pathology	Esophagus Ca.	J Clin Pathol	2001; 54: 940-4
82	Farsak B, Yıldırım A, Akyön Y &	Gen surg.	Atheroma & chlamydia	J Clin Microbiol	2000; 38: 4408-11
82	Özkan M, Kaymaz C, Kıрма C &	Cardiology	Echo: valve thrombosis	J Am Coll Cardiol	2000; 35: 1881-9
82	Mungan D, Mısırlıgil Z, Gürbüz L	İmmunol.	Rhinitis & asthma Rx	Ann Allerg Asthm &Im	1999; 82: 485-90
81	Ünal-Çevik İ, Kılınç M, Gürsoy-Özd. Y&	Neurology	Cerebral ischemia	Brain Res	2004; 1015: 169-74
81	Siva A	Neurology	Nervous syst. vasculitis	J Neurol	2001; 248: 451-68
81	Yıldız F, Erden BF, Ulak G &	Psychiatry	Depression treatm.	Psychopharmacol	2000; 149: 41-4
81	Erdem A, Gündoğan NU, Usubütün A&	Nephrol.	Tubular necrosis	Nephrol Dialys Tra	2000; 15: 1175-82
81	Yılmaz M, Karataş O, Barutçu A	Plast surg.	Sural artery flap	Plast Reconst Surg	1998; 102: 2358-67
80	Nazıroğlu M	Biyofizik	TRPM2 channel activat.	Neurochem Res	2007; 32: 1990-2001
80	Özbalkan Z, Bağışlar S, Kiraz S&	Rheumat.	Scleroderma	Arthr Rheumatism	2005; 52: 1564-70
80	Kadioğlu A, Tefekli A, Erol B &	Urology	Peyronie disease	J Urol	2002; 168: 1075-9
80	Mergen M, Mergen H, Özata M&	Metabol	Morbid obesity gene	J Clin Endocr Metab	2001; 86: 3448-51
80	Bahçeciler NN, Işık U, Barlan IB&	Ped pulm.	Asthma & rhinitis	Ped Pulmonol	2001; 32: 49-55
80	Kumral E, Evyapan D, Balkır K	Neurology	Caudat vasc. lesion	Stroke	1999; 30: 100-8
80	Erşahin Y, Mutluer S, Çağlı S&	Neurosurg	Cerebellar mutism	Neurosurgery	1996; 38: 60-6
80	Caner B, Kitapçı M, Aras T &	Nucl. med.	Osteosarcoma	J Nucl Med	1991; 32: 1977-8
79	Tarçın Ö, Yavuz DG, Özben B	Metabol	Endothel funct. Vit D	J Clin Endocrin Metab	2009; 94: 4023-30
79	Tanrıverdi F, Şenyürek H, Ünlühizarcı K&	Endocrin	Hypopituitarism	J Clin Endocr Metab	2006; 91: 2105-11
79	Kumral A, Uysal N, Tuğyan K&	Neurology	Brain ischemia	Behav Brain Res	2004; 153: 77-86
79	Güvener M, Paşaoğlu İ, Demircin M	Card. surg..	Bypass & diabetes	Endocrine J	2002; 49: 531-7
79	Akkuş E, Kadioğlu A, Esen A &	Urology	Erectile dysfunction	Eur Urol	2002; 41: 289-304
79	Kantarcı O, Siva A, Eraksoy M &	Neurology	Multiple sclerosis	Neurology	1998; 51: 765-72
79	Artvinli M, Barış Yİ	Pneumol.	Mesothelioma	J Nat Cancer Inst	1979; 63: 17-22
78	Demircan N, Safran BG, Soylu M&	Ophthalm.	Diabetic retinopathy	Eye	2006; 20: 1366-9
78	Onat A, Uyarel H, Hergenç G &	Cardiology	MetS: uric acid	Am J Hypertens	2006; 19: 1055-62
78	Soysal S, Soysal ME, Özer S &	Gynecol.	Endometriosis	Hum Reproduct	2004; 19: 160-7

78	Sağlam K, Aydur E, Yılmaz Mİ&	Intern med.	Prostate Ca: leptin	J Urol	2003; 169: 1308-11
78	Sayek İ, Onat D	Gen surg.	Liver hydatid cyst	World J Surg	2001; 25: 21-7
78	Kirazlı Y, Yağız A, Kismalı B &	Phys. med.	Spastic foot	Am J Phys Med Rehab	1998; 77: 510-5
77	Bora E, Eryavuz A, Kayahan B &	Psychiatry	Schizophrenia: social	Psych Res	2006; 145: 95-103
77	Çoban E, Özdoğan M, Yazıcıoğlu G&	Intern med.	Obesity & platelets	Int J Clin Pract	2005; 59: 981-2
77	Köseçik M, Erel Ö, Sevinç E &	Ped. card.	Passive smoking	Int J Cardiol	2005; 100: 61-4
77	Çayan S, Akbay E, Bozlu M &	Urology	Sexual dysfunction	Urol Internat	2004; 72: 52-7
77	Siva A, Altıntaş A, Saip S	Neurology	Behçet ve sinir sistemi	Curr Opin Neurol	2004; 17: 347-57
77	Karnak İ, Şenocak ME, Çiftçi AO &	Ped.surg.	Myofibroblastic tumor	J Pediat Surg	2001; 36: 908-12
77	Helvacı S, Gedikoğlu S, Akalın H &	Infections	Tularemia	Eur J Epidemiol	2000; 16: 271-6
77	Akar N, Akar E, Dalgın G &	Ped hematol	Faktör V mutation	Thromb Haemost	1997; 78: 1527-8
77	Gürkan T, Kışınç H, Yaralı H&	Gynecol.	Polic.ovar. s: laparaskopi	Fertil Steril	1991; 56: 1176-8
76	Onat A, Uyarel H, Hergenç G &	Cardiology	Male abdom. obesity	Atherosclerosis	2007; 191: 182-90
76	Ereymiş S, Çetin N, Tamar M &	Psychiatry	Obesity & psyche	Pediatr Int	2004; 46: 296-301
76	Ünal-Çevik İ, Kılınç M, Can A &	Neurology	Cerebral ischemia	Stroke	2004; 35: 2189-94
76	Kaptanoğlu E, Solaroğlu I, Okutan O&	Neurosurg	Neuroprotection	Neurosurg Rev	2004; 27: 113-20
76	Müftüoğlu M, Elibol B, Dalmızrak O &	Biochem.	Parkin mutasyonu	Movement Disord	2004; 19: 544-8
76	Kılıçkap S, Solaroğlu I, Okutan O&	Oncology	Bevacizumab	J Clin Oncol	2003; 21: 3542-2 L
76	Yerdel MA, Akın EB, Dölalan S &	Gen surg.	Hernia repair- drug	Ann Surg	2001; 233: 26-33
76	Portakal O, Ozkaya O, İnal ME, &	Biochem.	Breast Ca antioxidant	Clin Biochem	2000; 33: 279-84
76	Yılmaz C, Selek HY, Gürkan İ&	Orthoped.	Vertebral tbc.	J Bone Joint Surg	1999; 81A: 1261-7
76	Yurdakul S, Tüzüner N, Yurdakul I &	Rheumat.	Behçet: GE involvem.	Ann Rheum Dis	1996; 55: 208-10
76	Acunaş B, Rozanes İ, Akpınar S &	Radiology	Esophagus narrowing	Radiology	1996; 199: 648-62
76	Akgür FM, Kılınç K, Aktuğ T	Urology	Testis torsion	Urol Res	1993; 21: 395-8
75	Arslan H, Azap GK, Ergönül O&	Urol: infect.	Ciprofloxacin resistance	J Antimicrob Ther	2006; 56: 914-8
75	Yaralı H, Yıldız BO, Demirel A&	Gynecol.	P'c ovary s. metformin	Hum Reproduct	2002; 17: 289-94
75	Gül A, İnanç M, Öcal L &	Rheumat.	Behçet: alewitism	Ann Rheum Dis	2000; 59: 632-5
75	Men S, Hekimoğlu B, Yücesoy D &	Radiology	Hydatid cyst treatm.	Am J Roentgenol	1999; 172: 83-9
75	Yazıcı H, Başaran G, HamuryudanV&	Rheumat.	Behçet's dis. mortality	Br J Rheumatol	1996; 35: 139-41
75	Onel D, Sarı H, Dönmez C	Phys. med.	Lumbar spine stenosis	Spine	1995; 18: 291-8
75	Onat A, Şurdum-Avcı G, Şenocak M&	Cardiology	Lipid prevalence	J Cl Epid Comm Health	1992; 46: 470-6
75	İnceman Ş, Tangün Y	Hematol	Defibrination syndrome	Am J Med	1969; 46: 997
74	Genç Ş, Köroğlu TF, Genç K	Neurology	Nerv. syst. erythropoietin	Brain Res	2004; 1000: 19-31
74	Emre M	Neurology	Parkinson: mental disorder	Movement Disord	2003; 18: 563-571
74	Doğanay S, Evereklioglu C, Er H &	Ophthalm.	Diabetic retinopathy	Eye	2002; 16: 163-70
74	Pata C, Erdal ME, Derici E &	Gastroent.	Irritable bowel syndr.	Am J Gastroenter	2002; 87: 1780-4
74	Devrimci-ÖzgüvenH, Kundakçın, KumbkassarH &	Dermatol	Psoriasis & depression	J Eur Acad Derm Vener	2000; 14: 267-71
74	Biber B, Aklin T	Psychiatry	Panic state	Am J Psychiatry	1999; 156: 739-44
74	Uzbay IT, Erden BF, Tapanyığıt EE &	Pharmaco	NOS inhibition	Life Sci	1997; 61: 2197-209
74	Karna GY, Özen H, Seçmeer G &	Pediatrics	Meningitis dexamethas'n	Ped Infect Dis J	1995; 14: 490-4
73	Özaydın M, Varol E, Aslan SM&	Cardiology	Atrial fib. & statin	Am J Cardiol	2006; 97: 1490-3
73	Aydemir Ç, Yalçın ES, Aksaray S&	Psychiatry	Depress. & neutrophils	Prog Npsych Biol Psych	2006; 30: 1256-60
73	Divrik RT, Yıldırım U, Zorlu F	Urology	Bladder tumor	J Urol	2006; 175: 1641-4
73	Sayar K, Aksu G, Ak İ &	Psychiatry	Fibromialgia: medication	Ann Pharmacother	2003; 37: 1561-5
73	Erkan F, Gül A, Tasalı E	Pneumol.	Behçet's lung	Thorax	2001; 56: 572-8
73	Koltuksuz U, Özen S, Uz E &	Ped. surg.	Bowel reperfusion	J Ped Surg	1999; 34: 1458-62
73	Balaban B, Urman B, Sertaç A&	Gynecol.	Sperm injection	Hum Reproduct	1998; 13: 3431-3
73	İçli F, Karaoğuz H, Dinçol D &	Oncology	Chemother: vasc.toxicity	Cancer	1993; 72: 587-93
73	Aksoy M	Hematol	Benzene & leukemia	Am J Industr Med	1985; 8: 9-20
72	Şar V, Akyüz G, Kundakçı T &	Psychiatry	Conversion disease	Am J Psychiat	2004; 161: 2271-6
72	Engin G, Acunaş B, Acunaş G &	Radiology	Imaging extra-pulm tbc	Radiographics	2000; 20: 471-88
72	Özkahya M, Töz H, Ünsal A &	Nephrol.	Dialysis & hypertension	Am J Kidney Dis	1999; 34: 218-21
72	Şahin S, Akoğlu T, Direskeneli H&	Hematol	Neutrophil adhesion	Ann Rheum Dis	1998; 55: 128-33
72	Kaya U, Özden B, Türker K &	Neurosurg	Hydatid cyst	J Neurosurg	1975; 42: 580-4

Table 2. Relative performance in 5 major medical fields and 40 branches

Field	Publication	Cites	% share Turkey World		Relative performance
Internal medicine	111	12542	42.9	22.2	193
Rheumatology	25	2823			
Cardiology	14	1645			
Hematology	14	1404			
Endocrine & metab.	10	1022			
Pneumology	8	924			
Gastro-hepatol.	7	907			
Oncology	5	848			
Nephrology	7	763			
Internal medicine.	7	726			
Infection	5	631			
Dermatol.	4	398			
Physical medicine	2	153			
Geriatrics	1	111			
Allergy	1	105			
Immunology	1	82			
Neurosciences	51	5258	18	11.3	159
Neurology	25	2719			
Psychiatry	21	2069			
Neurosurgery	5	470			
Basic sciences	52	6152	21	35.8	59
Biochemistry	22	2914			
Radiology	10	948			
Nuclear medicine	5	581			
Microbiology	4	450			
Pharmacology	3	359			
Anatomy & Histol.	3	393			
Med. biol.& genetics	2	219			
Genetik					
Physiology	1	126			
Pathology	1	82			
Biophysics	1	80			
Surgical sciences	49	4511	15.5	21.1	73
Gynecology	9	789			
General surgery	8	753			
Urology	8	660			
Ophthalmology	7	637			
Cardiovasc. surgery	4	391			
Plastic surgery.	3	291			
Thoracic surgery	2	270			
Pediatric surgery	3	250			
Anesthesiology	2	216			
Orthopedics	2	165			
Ear-nose-throat	1	89			
Pediatrics	8	740	2.5	9.6	26
	271	29203	100	100	100

### Leading individual scientists

Table 4 lists 28 primary authors who, with a total of 76 papers, have generated more than one highly-cited paper. Two of these scientists are deceased, namely, hematologists Muzaffer Aksoy with 8 and the neuropsychiatrist S. Akpınar with 2 papers. Biochemists Özcan Erel and İlker Durak, cardiologist Altan Onat, rheumatologist Hasan Yazıcı and Vedat Hamuryudan and Sabahattin Yurdakul from his group; rheumatologist

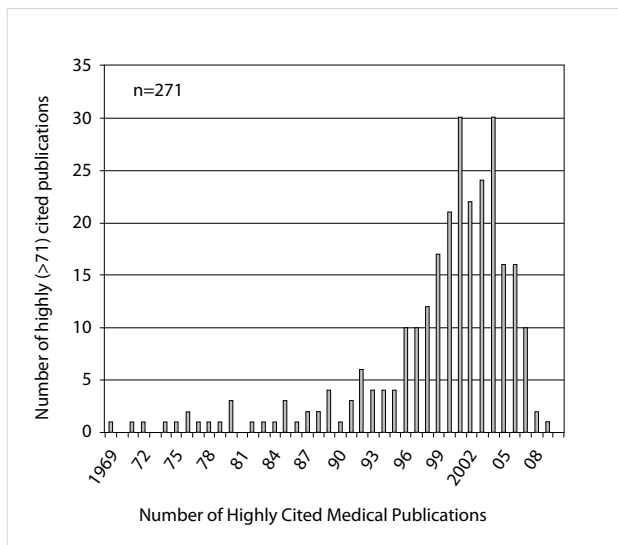


Figure 1. Graph depicts the distribution over the past 50 years of 271 medical papers receiving  $\geq 72$  cites and originating from Turkey's institutions. Data suggest that the rapid increase in performance achieved in the period of 1998-2004 will not be maintained in the near future

Ahmet Gül, neurologists Murat Emre and Piraye Serdaroğlu, as well as the infection specialist Ömer Ergönül have each collected over 300 high-citations with their publications. Furthermore, oncologists Yener Koç and M. Altınbaş, neurologist Gülşen Akman-Demir, cardiologist Adnan Abacı, pneumologist A. C. Öğüş, psychiatrist M. Bilici and rheumatologist Emire Kural-Seyahi have attained over 200 cites each by a single publication.

Extrapolating data provided by the Scientific Paper Indicators ULAKBİM (5), it may be estimated that, in the course of 30 years following 1981, approximately 80,000 publications were produced in medicine in Turkey that received roughly 300,000 cites. Highly-cited papers referred to in this study, whilst representing 1 of every 300 overall papers generated, received one-tenth of overall citations in medicine.

### Are we experiencing stagnation recently?

It may be predicted that no more than an annual average of 20 articles will be produced after 2004, although a yearly mean of 25-28 articles made this cut in the period 1998-2004. I base this estimate on data of the SCI indicating that, of all the cites to be received by a paper, one-quarter will be received in the 3 years following publication and half of them in the first 6-7 years. This implies that stagnation or even a decline may be observed with respect to generating research contributing to medicine; overlooking this development may have serious consequences.

Considering that the majority of the numerous recently-founded medical faculties are not at a level to produce papers contributing to medicine, it is mandatory that new regulations and incentives should be made in the education and science policy nationwide. Currently, the great majority of Turkey's international publications appear in journals with a low impact factor (6). While eliminating the current tedious



Table 3. Number of highly-cited articles and citations generated by 48 institutions

	Cites	Items		Cites	Items
Hacettepe U	4220	41	Osmangazi U	187	2
IU Istanbul MF	3839	35	Uludağ U	174	2
IU Cerrahpaşa MF	3643	33	Süreyyapaşa Hosp.	148	1
Ankara U	2139	22	Sütçü İmam U	134	1
GATA	1962	19	Cumhuriyet U	124	1
Ege U	1307	13	Atatürk Thor.Surg. C.	122	1
Harran U	1174	6	Bilkent U	108	1
Erciyes U	1089	8	SSK Ankara (Ana-Çocuk)	105	1
Dokuz Eylul U	883	9	T Yüksek İhtisas H.	103	1
Akdeniz U	850	7	C. Bayar U	102	1
İnönü U	834	8	German Hosp., Istanbul	98	1
Marmara U	718	6	Siyami Ersek Sug. Ctr.	95	1
Kocaeli U	629	5	Kırıkkale U	93	1
S Demirel U	508	5	Ankara Sevgi Hosp.	92	1
Ankara Nümune H.	464	4	Zeynep Kamil Hosp.	88	1
Karadeniz TU	434	3	Dicle U	87	1
Mersin U	356	4	Fatih U	87	1
Gaziantep U	320	3	Ankara Res. Hosp.	83	1
Atatürk U	297	3	Koşuyolu Res. Hosp.	82	1
Fırat U	295	3	Pamukkale U	78	1
Trakya U	205	2	Çukurova U	78	1
Yüzüncü Yıl U	193	2	SSK Ankara Hosp.	75	1
Kocatepe U	192	2	American Hosp., Istanbul	73	1
Başkent U	187	2	İzmir Tepecik Res. Hosp.	72	1
				29207	271

Table 4. Turkish scientists contributing to medicine with more than one highly-cited paper

Cites	Paper	Scientist	Period	Cites	Paper	Scientist	Period
918	3	Özcan Erel	'04-'05	242	2	İlknur Tuğal-Tutkun	'04-'05
810	8	Muzaffer Aksoy	'71-'89	235	2	Fatih Gültekin	'00-'01
674	6	Altan Onat	'01-'06	231	2	İskender Sayek	'80-'01
504	3	Vedat Hamuryudan	'94-'98	230	2	S. Akpınar	'82-'87
405	4	İlker Durak	'93-'98	221	2	Biray Caner	'91-'92
393	4	Sabahattin Yurdakul	'88-'01	218	2	Atilla İlhan	'99-'04
357	3	Hasan Yazıcı	'96-'07	214	2	Cem Evreklioğlu	'02-'05
337	2	Murat Emre	2003	210	2	O. O. Erol	'76-'00
328	4	Ahmet Gül	'95-'01	196	2	Yasemin Gürsoy-Özdemir	'00-'04
314	2	Ömer Ergönül	'04-'06	186	2	Mehmet Özkahya	'98-'01
301	2	Piraye Serdaroğlu	'98-'99	182	2	Murat Atmaca	'02-'03
297	2	Mehmet Tunca	'99-'05	180	2	M Kemal Irmak	'01-'02
262	3	Aksel Siva	'01-'04	163	2	Emre Bora	'05-'06
257	2	Ahmet Uygun	'00-'04	157	2	Işın Ünal-Çevik	2004
		9019/78	Total				

formalities associated with funding research, elaborate administrative incentives need to be created, both materially and in spirit, to promote in-depth research having the potential of contributing to medicine.

#### CONCLUSION

In summary, only 271 publications have been generated in Turkey in the past half-century that had the potential to contribute to medicine. The annual production capacity of 25-30 papers appears to have declined to 20 papers in recent years. This is a considerably lower-than-satisfactory performance for Turkish medical faculties which incorporate nearly 40,000 academic personnel and a teaching staff of around 16,000. The opinion should be expressed, in conclusion, that an environment needs to be urgently constructed by authorities that focuses on promoting research of a level contributing to medicine.

#### Conflict of Interest

No conflict of interest was declared by the author.

**Peer-review:** Externally peer-reviewed.

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