

Status of Turkey's top publications in cardiovascular medicine, revisited after 4 years

Dört yıl arayla üst düzey kardiyovasküler tıp yayınlarımızın gidişi

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ABSTRACT

Objective: The aim of the present assessment was to identify "genuine" medical papers generated by Turkey's institutions that have contributed most to cardiovascular medicine.

Methods: Based on Web of Science data, 160 papers were identified as having received 40 or more citations as of late July 2015. Papers with more than minor contribution from international authors were excluded.

Results: A total of 127 primary authors generated 160 papers, each receiving ≥ 40 (95% confidence interval 40–165) citations. These papers corresponded in quality to the global top 15% and were estimated to represent a global share of 3 per mille. Half were published between 2001 and 2006, with a median exposure period of 10.4 years. An estimated 9 of these papers have been produced in Turkey annually since around the turn of the century. Cardiology generated 120 articles, cardiovascular surgery 35, and pediatric cardiology 6. These papers originated from only 28 medical faculties, Gülhane Military Medical Academy (GATA), and 9 hospitals that are not academically affiliated. A majority of related Turkish institutions have shown disappointing performance.

Conclusion: The present assessment demonstrates that the unsatisfactory performance of Turkey's contribution to cardiovascular medicine has further regressed, if slightly, particularly since 2006. Unless a wide-scale concerted effort is made to build an environment focused on research with a potential to contribute, Turkey's gap in the field is likely to widen.

It is not only manpower, capital, and general level of education that are required to ensure the economic growth of a community; modern economies are also affected by culture. Culture and the generation of new information are thought to be the purview of a few exceptional people with creative minds who use tech-

ÖZET

Amaç: Kardiyovasküler tıp alanına Türkiye kurumlarından en fazla birikimli "halis" katkı yapmış olan yayınları belirlemek.

Yöntemler: Web of Science verilerine dayanarak, 2015 yılı Temmuz sonuna kadar Türkiye'den 40 ve üstünde atıf kazanan 160 yayın belirlendi. Uluslararası yazar katkısı cüz'ünün ötesinde olan makaleler dışlandı.

Bulgular: Her biri ≥ 40 (%95 GA 40; 165) atıf kazanan 160 kardiyovasküler tıp yayını 127 başyazar tarafından üretildi. Bu makalelerin, nitelik olarak alanında dünyada üst %15 yayınlara denk geldiği ve böylesi bin yayında 3 pay simgelediği tahmin edildi. Makalelerin yarısı 2001–2006 yıllarında yayımlandı, ortanca maruzat süresi 10.4 yıldır. Yaklaşık yüzyıl dönümünden beri ülkemizde bu düzeyde yılda ortalama dokuz yayın ortaya konmaktadır. Kardiyoloji bilim dalında 120 makale, kalp-damar cerrahisinde 35, çocuk kardiyolojisinde de altı makale yer aldı. Bu yayınlara yalnızca 28 tıp fakültesi, Gülhane Askeri Tıp Akademisi ve akademik bağlantısı bulunmayan dokuz hastane kaynak oldu. Türkiye'deki ilgili kurumların çoğunluğunun performansı hayal kırıklığına uğrattı.

Sonuç: Türkiye'nin kardiyovasküler tıp alanına doyurucu olmaktan uzak olan katkısı, bu değerlendirmede, özellikle 2006 yılından sonra, biraz daha gerilemiş görüldü. Tıbbı katkı yapabilecek araştırmalara odaklanan bir ortam şekillendirecek derin ve çok-yönlü bir çaba yaratılmadıkça, ülkemizin alanda ki geri kalmışlığının artması olasıdır.

nology and extend its applications.^[1] Since the late 2000s, it has been acknowledged that Turkey is stuck in a middle income trap. There can be no surprise that this coincides with a "middle science trap."^[2]

The appropriate assignment of national resources requires the attainment of the appropriate indica-

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tors of active scientific publication.^[3] It is generally accepted that the number of publications with “top” citations, as opposed to overall citations, is the best indicator of national or institutional scientific contribution.^[4] Progress of countries slowly emerging in terms of medical research is impeded by the increasing proportion of internationally “collaborative” papers and the citations they acquire, compared to research “genuinely” originating from native institutions. I have recently documented that, for Turkey, an overwhelming, unsustainable share of the contribution to medicine has been generated by internationally “collaborative” papers.^[5]

The first aim of the present assessment was to identify the outstanding authors and papers originating from native institutions that contribute to cardiovascular medicine, as determined by citations received. The second aim was to document whether the generation of such publications in Turkey has accelerated or slowed, compared to an evaluation conducted 4 years earlier.^[6]

METHODS

The Web of Science Core Collection database (Thomson Reuters Corp., New York City, NY, USA) was used to obtain current citations. “Turkey” and “Türkiye” were used as search terms. Publications in clinical or cardiovascular medicine were targeted. When sorted by highest to lowest number of citations, articles or reviews cited 40 or more times were selected. Papers were defined as “genuine” when the first 3 authors worked in a Turkish university or hospital. All others, defined as “collaborative,” were excluded. The following criteria were also met by included papers: Either the primary author was a cardiologist, or the main topic was cardiovascular medicine, and it was published in a periodical confined to the subject. A total of 160 papers were included.

In papers with authors from multiple institutions, the first author and his or her institution were credited. In order to prevent the omission of certain researchers, 38 primary authors known from previous research were searched for individually.^[6] When authors had produced highly-cited papers (a term used more broadly in the present assessment than by Web of Science) at multiple institutions, the citations were assigned to each institution.

The closing index period for data retrieved from Web of Science was late July 2015. Intrinsicly eli-

gible citations to references incorrectly or inadequately provided, estimated to constitute 5–10% of Web of Science citations, and to periodicals not included by Web of Science were excluded from the present assessment.

Estimates of the expected distribution of “highly cited” papers were based on the number determined in 2005 and the 10th percentile data provided by Web of Science.

Period elapsed from the index date of the median publication year (25th and 75th percentiles) was used to assess the rate of the generation of such papers and was compared with the results of a study that preceded the present by 4 years.^[6]

RESULTS

A total of 160 “genuine” papers published in the field of cardiovascular medicine in the past half-century that received 40 or more citations were identified. These papers received 10,227 overall citations. Source information is displayed in Table 1.

The temporal distribution of these publications is illustrated in Figure 1, which demonstrates that the publication of these papers had a median date (25th and 75th percentiles) of February 2005 (August 2001;

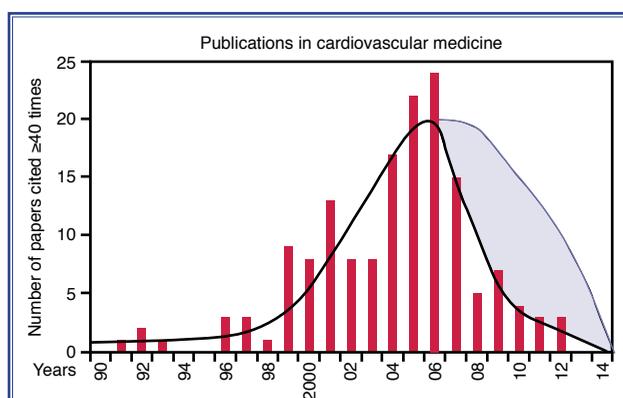


Figure 1. Distribution of the 160 papers in cardiovascular medicine that attained ≥ 40 citations, according to year of publication. Four papers that appeared in the last 2 decades have not been plotted. Just over half of the papers were published between 2001 and the end of 2006. A more rapid decline than anticipated was observed from 2006 onwards. Estimated average number of articles published in the 8 years preceding the index date is represented. Calculations made according to Web of Science data suggest that citations of a paper 3–4 years after publication are half those of a paper 8 years after publication.

Table 1. One hundred sixty-one articles with highest “genuine” contribution to cardiovascular medicine: information on field, institution, and reference

Cites	Authors	Field	Inst.	Topic	Journal	Year & reference
355	Abacı A, Oğuzhan A, Kahraman S &	Card	Erc	Coronary collaterals	Circulation	1999;99:2239-42
213	Onat A, Ceyhan K, Başar Ö &	Card	CPŞ	Metabolic syndrome	Atherosclerosis	2002;165:285-92
173	Onat A	Card	CPŞ	Cardiovascular disease	Atherosclerosis	2001;156:1-10
166	Kalay N, Başar E, Özdoğru İ &	Card-Onc	Erc	Carvedilol-cardiomyopathy	J Am Coll Cardiol	2006;48:2258-62
144	Tokgözoğlu SL, BaturMK, Topcuog MA&	Card	HT	Stroke localization	Stroke	1999;30:1307-1
139	Onat A, Şurdum-Avcı G, Barlan MM&	Card	CPŞ	Visceral adiposity	Int J Obes	2004;28:1018-25
130	Eren M, Görgülü Ş, Uslu N &	Card	Ersek	Aortic stiffness in HT, DM	Heart	2004;90:37-43
130	Aytemir K, Ozer N, Atalar E &	Card	HT	P-wave dispersion	PACE	2000;23:1109-12
113	Aytaç A, Yurdakul Y, İkizler C &	CVS	HT	Foreign body inhalation	J Thor Cardio Surg	1977;74:145-51
112	Tüzün H, Beşirli K, Sayın A &	CVS	CPŞ	Aneurysm in Behçet's	Surgery	1997;121:150-6
109	Çelik T, İyisoy A, Kursaklıoğlu H &	Card	GATA	Effect on oxidat. stress	J Hypertension	2006;24:591-6
108	Onat A, Uyarel H, Hergenç G &	Card	CPŞ	Üric acid & metab send	Am J Hypertens	2006;19:1055-62
105	Kosecik M, Erel O, Sevinc E, et al.	Ped. C	Harran	Children & passive smoking	Int J Cardiology	2005;100:61-64
105	Taşdemir O, Vural KM, Karagöz H &	CVS	TYİH	Cardiac surgery without bypass	J Thor Cardio Surg	1998;116:68-73
104	Yaralı H, Yıldırım A, Aybar F &	Gyn-C	HT	Polycystic ovary syndr.	Fertil Steril	2001;76:511-6
103	Güvenç M, Paşaoğlu İ, Demircin M	CVS	HT	Postop hyperglycemia	Endocrine J	2002;49:531-7
101	Demirkılıç U, Kuralay E, Yenicesu M &	CVS	GATA	Postop renal failure	J Cardiac Surg	2004;19:17-20
98	Özcan EE, Güneri S, Akdeniz B &	Card	9 Eylül	Radiocontrast nephropathy	Am Heart J	2007;154:539-44
96	Özkan M, Kaymaz C, Kırmacı C &	Card	Koşuy	Valvular thrombosis	J Am Coll Cardiol	2000;35:1881-9
94	Onat A, Uyarel H, Hergenç G &	Card	CPŞ	Abdominal obesity	Atherosclerosis	2007;191:182-90
89	Aras D, Tüfekçioğlu, Kumral E &	Card	TYİH	Ventric. noncompaction	J Card Fail	2006;12:726-33
89	Okutan H, Özçelik N, Yılmaz HR, et al.	CVS	Demirel	Caffeic acid & lipid peroxidation	Clin Biochem	2005;38:191-196
87	Farsak B, Yıldırım A, Akyön Y &	CVS	HT	Bacterial DNA in plaques	J Clin Microbiol	2000;38:4408-11
86	Özaydın M, Varol E, Aslan SM &	Card	Demirel	Statin- atr.fibrillation	Am J Cardiol	2006;97:1490-3
84	Eroğlu S, Sade LE, Yıldırım A &	Card	HT/Bk	Epicardial fat - CAD	Nutr Met Cardio Dis	2009;19:211-7
84	Erdoğan D, Güllü H, Yıldırım E &	Card	Demir	Low bilirubin; carotid IMT	Atherosclerosis	2006;184:431-7
81	Demirkılıç U, Kuralay E, Yenicesu M &	CVS	GATA	Acute renal failure after cardiac surgery	J Card Surg	2004;19:17-20
80	Bilge AK, Özben B, Demircan S et al.	Card	Çapa	Depression & defibrillator	PACE	2006;29:619-26
79	Erdoğan D, Güllü H, Çalıışkan M &	Card	Demir	Uric acid; endothel functn	Int J Clin Pract	2005;59:1276-82
79	Onat A, Avcı GŞ, Şenocak M &	Card	CPŞ	Lipids in Turkey	J Epid Commun Hlth	1992;46:470-6
74	Dursunoğlu D, Evrengül H, Polat B &	Card	Pamukk.	Lp(a) and lipids in rheumatoid arthritis	Rheumatol Int	2005;25:241-5
74	Özer N, Özer N, Yavuz B, Can İ &	Card	HT	Doppler; T-wave dispersion	J Am Soc Echocardiogr	2005;18:945-8
73	Kucur M, İsmail FK, Karadag B, et al.	Biochem	CPŞ	Serum YKL-40 levels in CAD	Coron Artery Dis	2007;18:391-6
73	Kızıltepe U, Turan NN, Han U, et al.	CVS	AnkAcil	Resveratrol, spinal cord ischemia	J Vasc Surg	2004;40:138-45
73	Onat A, Hergenç G, Sansoy V &	Card	CPŞ	ApoC-III & coronary risk	Atherosclerosis	2003;168:81-9
73	Aytaç A, Yurdakul Y, İkizler C &	CVS	HT	Pulmonary hydatid cysts	Ann Thor Surg	1977;23:145-51
72	Yazıcı S, Yazıcı M, Erer B, et al.	PhM-C	Düzce	Platelet indices in rheumatoid arthr.	Platelets	2010;21:122-125
72	Şenaran H, İleri M, Altınbaş A &	Hem-Card	Fatih	Platelet vol. - CAD	Clin Cardiol	2001;24:405-8
68	Ak K, İsbir CS, Tetik S, et al.	CVS.	Marmara	Algorithm blood product use after CABG	J Cardiac Surg	2009;24:404-410
66	Özaydın M, Peker O, Erdoğan D &	Card	Demir	Postop. Atrial fibrill. Rx	Eur Heart J	2008;29:625-31
66	Sezer M, Oflaz H, Gören T et al.	Card	Çapa	Intracoron streptokinase p. primary PCI	N Engl J Med	2007;356:1823-34
66	Yılmaz MI, Sönmez A, Çağlar K &	Card	GATA	Antihyp. Rx- adiponectin	Nephrology	2007;12:147-53
65	Kılıçkap S, Barista I, Akgül E, et al.	Onc.Card	HT	cTnT. anthracycline cardiotoxicity	Ann Oncol	2005;16:798-804
64	Erdoğan D, Yıldırım E, Çiftçi Ö &	Card	Demir	PreHT; cor.microvascular	Circulation	2007;115:593-9
63	Demirkol S, Balta Ş, Ünlü M &	Card	GATA	Mean platelet vol. Syndr. X	Clinics	2012;67:1019-22
63	Diker E, Aydoğdu S, Özdemir M &	Card	TYİH	Atrial fibrillation	Am J Cardiol	1996;77:96-8
62	Tükek T, Akkaya V, Demirel S, et al.	Card.	Çapa	Valsalva. P-dispersion in parox. AFib	Am J Cardiol	2000;85:896-899
61	Kayıkçoğlu M, Tumuklu M, Özkahya M &	Card-Neph	Ege	Salt restrict.-End-st. renal dis.	Nephrol Dial Transpl	2009;24:956-62
61	Karabulut H, Toraman F, Evrenkaya S &	CVS	Acibd	Clopidogrel in CABG	Eur J Cardiothor Surg	2004;25:419-23
61	Ömeroğlu SN, Kıralkı K, Güler M &	CVS	Koşuy	CABG without pump	Ann Thor Surg	2000;70:844-9
61	Saydam N, Kirb A, Demir O &	CVS	½9Eyl	Cancer tissue	Cancer Letters	1997;119:13-9
61	Paşaoğlu İ, Doğan R, Demircin M &	CVS	HT	Bronkoskopik extraction	Thor Cardio Surg	1991;39:95-8
60	Dede DŞ, Yavuz B, Yavuz BB &	Card	HT	Alzheimer endothel. function	J Am Geriatr Soc	2007;55:1613-7
60	Güray U, Erbay AR, Güray Y &	Card	TYİH	Adhesion molecules	Int J Cardiol	2004;96:235-40
60	Toraman F, Karabulut EH, Alhan HC &	CVS	Acb/Ersk	Post CABG atr fibrillation	Ann Thor Surg	2001;72:1256-61
60	Özer N, Aytemir K, Atalar E &	Card	HT	P-wave disperson	PACE	2000;23:1859-62
59	Yavuz B, Ertuğrul DT, Çiil H &	Card	HT	Vitamin D Rosuvastatin	Cardiov DrugsTher	2009;23:295-9

Table 1. One hundred sixty-one articles with highest “genuine” contribution to cardiovascular medicine: information on field, institution, and reference (cont.)

Cites	Authors	Field	Inst.	Topic	Journal	Year & reference
58	Çamsarı A, Pekdemir H, Çiçek D, et al.	Card.	Mersin	Endothelin-1, NO & slow coron. flow	Circ J	2003;67:1022-8
58	Sezgin AT, Siğirci A, Barutçu İ &	Card	Başkt	Slow coronary flow	Coron Artery Dis	2003;14:155-61
58	Güler M, Kirali K, Toke ME &	CVS	Koşuy	CABG method in COPD	Ann Thor Surg	2001;71:152-7
56	Ertürk S, Ertuğ AE, Ateş K &	Card-Neph	Ank	Ambulat. BP. monitoring	Nephrol Dial Transpl	1996;11:2050-4
55	Demirbağ R, Yılmaz R, Koçyiğit A.	Card-Bioch.	Harran.	DNA damage, antioxidant capacity.CAD	Mutation Res	2005;570:197-203
55	Kayıkçıoğlu M, Payzın S, Yavuzgil O &	Card	Ege	Statin in syndrome X	Eur Heart J	2003;24:1999-2005
54	Onat A, Özhan H, Esen AM &	Card	CPş	Smoking – diabetes/MetS	Atherosclerosis	2007;193:330-8
54	Özaydın M, Doğan A, Varol E, &	Card	Demirel	Postop. atr.fibrillation	Cardiology	2007;107:117-21
54	Sanisoğlu, Öktenli C, Haşimi A, SY, et al.	PbH-Card.	GATA	Preval. MetS-related disorders	BMC Publ Health	2006;6:92
54	Pamukçu B, Ofıaz H, Nişancı Y	Card	Çapa	Platelet GpIIIa polymorphism	Am Heart J	2005;149:675-80
54	Yavuzgil O, Altay B, Zoghi M &	Card	Ege	Endothel & erectile function	Int J Cardiol	2005;103:19-26
54	Tokgözoğlu S, Alikafioğlu, Ünsal I &	Card	HT	Genotype & CAD risk	Heart	1999;81:518-22
53	Pekdemir H, Cin VG, Çiçek D, et al.	Card.	Mersin	Slow coronary flow.FFR & IVUS	Acta Cardiol	2004;59:127-33
53	Ömeroğlu SN, Kirali K, Güler M, et al.	CVS	Koşuyol	Bypass grafting without bypass	Ann Thorac Surg	2000;70:844-9
53	Başaran Y, Başaran MM, Babacan KF &	Card	Koşuy	TNF α in coronary HD	Angiology	1993;44:332-7
53	Özkan M, Emel O, Özdemir M &	Card	Koşuy	Doppler echo in Behçet's	Eur Heart J	1992;13:638-41
52	Akpek M, Kaya MG, Lam YY &	Card	Erciye	Neut/Lympho- coron. flow	Am J Cardiol	2012;110:621-7
52	Ağırbaşı M	Card.	Marmara	Plasminogen-activ. Inhib.-1 in vasc.dis.	Int J Clinl Pract	2005;59:102-6
52	Turhan H, Erbay AR, Yaşar AS &	Card	İnönü-	Adhesion mol.-cor ectasia	Coron Artery Dis	2005;16:45-50
52	Yalçın F, Kaftan A, Müderrisoğ &	Card	Başk	Ventr. filling: Doppler	Heart	2002;87:336-9
52	Güler M, Kirali K, Toker ME, et al.	CVS	Koşuyol	CABG methods in COPD	Ann Thorac Surg	2001;71:152-7
52	Karagöz HY, Sönmez B, Bakkaloğlu B &	CVS	Güven	CABG without narcosis	Ann Thor Surg	2000;70:91-6
51	Kaya MG, Yarloğluş M, Günbakmaz Ö &	Card	Erciy	Platel. activ; hypertension	Atherosclerosis	2010;209:278-82
51	Altun A, Uğur-Altun B.	Card-Endo.	Trakya	Melatonin: therapeutic utilization	Int J Clinl Pract	2007;61:835-45
51	Mercanoğlu F, Ofıaz H, Öz O &	Card.	Çapa	Endothelial dysfunction & periodontitis	J Periodontol	2004;75:1694-700
51	Kurtoğlu N, Akçay A, Didar İ	Card	Koşu	Dipyridamol;slow cor. flow	Am J Cardiol	2001;87:777-
51	Vural KM, Şener E, Taşdemir O &	CVS	TYİH	Valsalva sinus aneurysm	Eur J Cardiothor Surg	2001;20:71-6
51	Çelik SK, Sağcan A, Altıntiğ A &	CVS-Card.	Atakalp	Coron.dissections in atheroscler. pts	Eur J Cardio-Thor Surg	2001;20:573-6
51	Yılmaz AT, Arslan M, Demirkılıç U &	CVS	GATA	Postop GI complications	Eur J Cardiothor Surg	1996;10:763-7
51	Onat T, Zeren E	Ped C	CPş	Abd. aortic coarctation	Cardiology	1969;54:140-
50	Gür M, Aslan M, Yıldız A, et al.	Card.	Harran	Paraoxonase & arylesterase in CAD	Eur J Clin Invest	2006;36:779-87
50	Pamukçu B, Ofıaz H, Öncül A&	Card	Çapa	Aspirin resist. & clopidogrel	J Throm Thrombolys	2006;22:103-10
50	Tarkun I, Çetinarlan B, Türemen E &	Endo-Card	Kocaeli	Rosiglitazone & polycystic ovary symdr.	Eur J Endocrinol	2005;153:115-21
50	Evrengül H, Dursunoğlu D, Çobankara V &	Card.	Pamukk	Heart rate variabil. in rheumatoid arthr.	Rheumatol Int	2004;24:198-202
50	Cin VG, Pekdemir H, Camsar A, et al.	Card.	Mersin	Coron. intimal thickening in slow cor. flow	Jap Heart J	2003;44:907-19
50	Özkutlu S, Ayabakan C, Çeliker A&	Ped C	HT	Myocard noncompaction	J Am Soc Echocard	2002;15:1523-8
49	Uyarel H, Ergelen M, Çiçek G, &	Card	B'esir	Redcell distr width, prognosis	Coron Artery Dis	2011;22:138-44
49	Özhan H, Erden I, Ordu S, et al.	Card.	Düzce.	Atorvastatin. contrast-induc. nephropathy	Angiology	2010;61:711-4
49	Sade LE, Eroğlu S, Bozbaş H &	Card	HT	Epicardial fat-coron.reserve	Atherosclerosis	2009;204:580-5
49	Kozan Ö, Oğuz A, Abacı A &	Card	Ege+	MetS prevalence	Eur J Clin Nutr	2007;61:548-53
49	Koşar F, Aksoy Y, Ozguntekin G, et al.	Card.	İnönü U.	Cytokines. chronic heart failure	Eur J Heart Fail	2006;8:270-4
49	Tanrıverdi H, Evrengül H, Kuru O &	Card.	Pamukk	Smoking oxidative stress coron. flow	Circ J	2006;70:593-9
49	Turhan H, Saydam GS, Erbay AR, &	Card	İnönü-	Adhesion mol.-slow cor flow	Int J Cardiol	2006;108:2024-30
49	Bahar I, Akçul A, Ozatik MA, et al.	CVS	TYİH	Renal failure. open heart surgery	Perfusion-Uk	2005;20:317-22
48	Acar G, Akçay A, Sokmen A, et al.	Card	K.'maraş	Diast. function in diabetes	J Am Soc Echocard	2009;22:732-8
48	Yılmaz O Eser M, Şahiner A, et al.	Card.	19 Mayıs	Syncope caused by honey poisoning	Resuscitation	2006;68:405-408
48	Dursunoğlu D, Dursunoğlu N, Evrengül H &	Card.	Pamukk	Obstr.sleep apnoea & LV mass-function	Eur Respir J	2005;26:283-8
48	Tutar E, Ekici F, Atalay S, et al.	Ped C	Ankara	Preval. bicuspid aortic valve in newborns	Am Heart J	2005;150:513-5
48	Yılmaz MB, Biyikoğlu SF, Akın Y &	Card	TYİH	Obesity-coron. collaterals	Int J Obes	2003;27:1541-5
48	Yıldırım A, Kabakçı G, Akgül E &	Card	Ht/Bk	Menses–heart rate variab.	Ann Noninv Electroc.	2002;7:60-3
48	Balbay Y, Tikiz H, Baptiste RJ, et al.	Card.	TYİH	Circulating cytokines in CHD	Angiology	2001;52:109-14
48	Kaplan M, Demirtaş M, Çimen S &	CVS	Ersek	Cardiac hydatid cysts	Ann Thor Surg	2001;71:1587-90
48	Uysal S, Kalaycı AG, Baysal K, et al.	Ped C	19 May.	Cardiac function: rickets	Ped Cardiol	1999;20:283-6
47	Sade LE, Demir Ö, Atar İ &	Card	HT	Resynchronization; LV	Am J Cardiol	2008;101:1163-8
47	İltumur K, Yavavli A, Apak I, et al.	Card.	Dicle U.	N-T natriuretic peptide in stroke	Am Heart J	2006;151:1115-22
47	Akdoğan A, Çalgüneri M, Yavuz B &	Card	HT+	FMF- Int-Med thickness	J Am Coll Cardiol	2006;48:2351-3
47	Kalko Y, Basaran M, Aydın U, et al.	CVS	Vkf Gureba	Surgery for Behçet's aneurysms	J Vasc Surg	2005;42:673-677

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Cites	Authors	Field	Inst.	Topic	Journal	Year & reference
47	Özbaran M, Omay SB, Nalbantgil S &	CVS	Ege	Stem cell transplant.	Eur J Cardiothor Surg	2004;25:342-50
47	Gürğün C, Ercan E, Ceyhan C &	Card	Ege	CV involv. in Behçet's	Jap Heart J	2002;43:389-98
47	Candan İ, Erol Ç, Sonel A &	Card	Ank	Heart in Behçet's	Eur Heart J	1986;7:999-1002
46	Çalışkan M, Erdoğan D, Güllü H &	Card	Demir	LV function-Ankyl.spodylitis	Atherosclerosis	2008;195:306-12
46	Yılmaz MB, Balbay Y, Çaldır V &	Card	TYİH	Vein graft occlus. CABG	Thrombos Res	2005;115:25-9
46	Turhan H, Erbay AR, Yaşar AS &	Card	İnönü-	CRP-cor. ectasia/CAD	Am J Cardiol	2004;94:1303-6
45	Başaran Y, Tigen H, Karaahmet T	Card	Koşuy	Fragmented QRS compl	Echocardiography	2011;28:62-8
45	Sarı I, Baltacı Y, Bağcı C, et al.	Card.	G'antep	Pistachio. lipid parameters, oxid. status:	Nutrition	2010;26:399-404
45	Onat A, Hergenç G, Yüksel H &	Card	CPŞ	Neck circ. Sleep apnea	Clin Nutr	2009;28:46-
45	Kilic T, Ural D, Ural E, et al.	Card.	Kocaeli	Cytokine ratios & prognosis.non-ST ACS	Heart	2006;92:1041-6
45	Durmaz İ, Buket S, Atay Y &	CVS	TYİH	CABG in chron renal fail.	J Thor Cardio Surg	1999;118:306-15
44	Zorlu A, Bektaşoğlu G, Güven FM &	Card.	Cumh.	Red cell distrib.width. pulm.embolism	Am J Cardiol	2012;109:128-34
44	Atar İ, Konas D, Açikel S &	Card	Başk	Atrial fibril. İn dialysis pts	Int J Cardiol	2006;106:47-51
44	Barutçu İ, Esen AM, Kaya D &	Card	Koşuy	Smoking- HR variability	Ann Noninv Electroc	2005;10:324-9
44	Çikim AS, Oflaz H, Ozbey N, et al.	Endo-Card.	İnönü-Çapa	Endothel. funct.subcl. hypo-&hyperthyroid.	Thyroid	2004;14:605-9
44	Esen AM, Barutçu İ, Acar M &	Card	Koşuyolu	Smoking- endoth funct'n	Circ J	2004;68:1123-6
44	Onat A, Sansoy, Uysal Ö	Card	CPŞ	Waist circ.,waist/hip ratio	Int J Cardiol	1999;70:43-50
43	Arslan U, Türkoğlu S, Balcıoğlu S, &	Card.	Gazi U.	Nonalcoholic fatty liver & CAD	Coron Artery Dis	2007;18:433-6
43	Akın A, Esmaoğlu A, Güler G &	Ped C	Erci	Propofol in cardiac cath.	Pediatr Cardiol	2005;26:553-7
43	Kocaman O Oflaz H, Yekeler E &	Card.-Radiol	Çapa	Carotid IMT in polycystic kidney disease	Am J Kidney Dis	2004;43:854-860
43	Özdemir K, Altunkeser BB, İçli A &	Card.	Selçuk	RV infarct & prox. right coron. lesion	Chest	2003;124:219-26
43	Gölbaşı Z, Uçar O, Keleş T &	Card	Nüm	CRP; rheum valve dis.	Eur J Heart Fail	2002;4:593-5
43	Abacı A, Oğuzhan A, Eryol NK &	Card	Erci	TIMI frame count	Circulation	1999;100:2219-23
43	Soncul H, Öz E, Kalaycıoğlu S	CVS	Gazi	Ischemic preconditioning	Chest	1999;115:1672-7
42	Yılmaz MB, Cihan G, Güray Y &	Card	TYİH	Platelet vol. - ACS	J Thromb Thrombolys	2008;26:49-54
42	Aslan M, Kosecik M, Horoz M, et al.	Bioch-Card.	Harran	Paraoxonase in iron deficiency anemia	Atherosclerosis	2007;191:397-402
42	Tuncer C, Batyraliev T, Yılmaz R, et al.	Card.	K'maraş	Anomalies of LAD in 70,850 adults:	Cath Cardio Intervent	2006;68:574-585
42	Ağırbaşı M, Kahir S, Ozme S, et al.	Card.	Marmara	MetS in Turkish children and adolescents	Metabolism	2006;55:1002-6
42	Pekdemir H, Polat G, Cin VG, et al.	Card.	Mersin	Endothelin-1.RA pacing in slow cor. flow	Int J Cardiol	2004;97:35-41
42	Oflaz H, Türkmen A, Kazancıoğlu R &	Card-Nephro.	Çapa	Calcineurin inhibitors in renal transplant	Clin Transplant	2003;17:212-216
42	Onat A, Sansoy, Yıldırım B &	Card	CPŞ	C-reactive protein	Am J Cardiol	2001;88:601-7
42	Birincioğlu CL, Bardakçı H, Küçük SA &	CVS	Koşuy	Cardiac echinococcosis	Ann Thor Surg	1999;68:1290-4
42	Yılmaz AT, Arslan M, Demirkılıç U &	CVS	GATA	Military arterial injury	Am J Surg	1997;173:110-4
41	Onat A	Card	CPŞ	MetS natural history	Exp Opin Pharmacoth	2011;12:1887-
41	Tavil Y, Kaya MG, Oktar SO, et al.	Card.	Gazi	Uric acid; carotid IMT hypertension	Atherosclerosis	2008;197:159-163
41	Yılmaz MB, Yalta K, Yontar C, et al.	Card.	Cumhur.	Levosimendan in acute heart failure:	Cardiov Drugs Ther	2007;21:431-435
41	Güllü H, Erdoğan D, Çalışkan M &	Card	Demiree	Atheroscl.,noninvas.predict.	Echocardiography	2006;23:835-42
41	Erdoğan HB, Kayalar N, Ardal H &	CVS	Koşu	Pacemaker p aortic valve replac.	J Card Surg	2006;21:211-5
40	Onat A, Can G, Hergenç G, et al.	Card.	CPŞ	Apo B. dyslipidemia, MetS & diabetes	Int J Obesity	2007;31:1119-1125
40	Oflaz H, Çuhadaroğlu C, Pamukçu B &	Card.	Çapa	Endothelial function in sleep apnea	Respiration	2006;73:751-756
40	Onat A, Hergenç G, Türkmen S &	Card.	CPŞ	Discordant insulin resist. & MetS	Metabolism	2006;55:445-452
40	Özal E, Kuralay E, Yildirim V, et al.	CVS	GATA	Methylene blue for vasoplegic	Ann Thorac Surg	2005;79:1615-9
40	Evrengül H, Tanrıverdi H, Dursunoglu D &	Card.	Pamukk.	Heart rate variability in epilepsy	Epilepsy Res	2005;63:131-139
40	Gökçe M, Kaplan S, Tekelioğlu Y, et al.	Card.	KTÜ	Platelet function in coronary slow flow	Clin Cardiol	2005;28:145-148
40	Yazıcı M, Gorgulu S, Sertaş Y &	Card.	Abant	Thyroxin. LV function in subclin. hypothyroid.	Int J Cardiol	2004;95:135-143
40	Kaplan M, Kut MS, Demirtaş MM &	CVS	S.Ersek	Prosthetic replacement of tricuspid valve	Ann Thorac Surg	2002;73:467-473
10187	160*63.5	&= et al.				

November 2006). In other words, the exposure period consisted of a median 10.4 years (interquartile range, 8.7 to 14). Only 22 papers (14%) were published after 2007.

Regarding the distribution of papers among the 3 fields of cardiovascular medicine, the overwhelming

majority, 113 papers, dealt primarily with cardiology, 34 with cardiovascular surgery, and 6 with pediatric cardiology. In 16 articles, cardiologists collaborated with specialists in endocrinology, nephrology, biochemistry, radiology, gynecology, oncology, hematology, public health, or physical medicine.

Leading institutions and scientists

Only 38 medical institutions produced the 160 papers included. Hacettepe University Faculty of Medicine, having produced 19, Cerrahpaşa Medical Faculty 17, Kartal Koşuyolu Training and Research Hospital 13, and Turkey's Yüksek İhtisas Training and Research Hospital 11, collectively generated three-eighths of the papers (Table 2). GATA and İstanbul University

İstanbul and Demirel University medical faculties followed, each with 9 or 10 papers, the medical faculties of Erciyes University and Ege University with 6, and the Pamukkale University Medical Faculty with 5. The remaining 55 papers were generated by 28 other institutions.

Nine hospitals not affiliated with academia contributed to 38 publications, nearly a quarter of the total.

Table 2. Thirty-eight source institutions of the “highly” cited papers

19	Hacettepe U. Med Fac., Ankara	2	Dokuz Eylül U. Med Fac., İzmir
17	İ.U. Cerrahpaşa Med. Fac., İstanbul	2	19 Mayıs U. Med Fac.
13	Kartal Koşuyolu Res. Hospital, İstanbul	2	Düzce U. Med Fac.
11	Turkey's Yİ Hosp., Ankara	2	Cumhuriyet U. Med Fac.
9,5	I.U. İstanbul Med. Fac.	2	Kahramanmaraş U
9	Sül. Demirel U. Med Fac., Isparta	1	Acıbadem Hosp., İstanbul
9	Gülhane Military Medical Academy, Ank.	1	Balıkesir U. Med Fac.
6	Ege U. Med Fac., İzmir	1	Fatih U. Med Fac., Ankara
6	Erciyes U. Med Fac., Kayseri	1	Trakya U. Med Fac.
5	Pamukkale U Med Fac., Denizli	1	Dicle U. Med Fac.
4,5	İnönü U. Med Fac., Malatya	1	Selçuk U. Med Fac.
4	Başkent U. Med Fac., Ankara	1	Karadeniz TU Med Fac.
4	Siyami Ersek Center for Cardiovasc. Surgery, Ist	1	Güven Hosp., Ankara
4	Harran U. Med Fac.	1	Nümune Hosp., Ankara
4	Mersin U. Med Fac.	1	Vakıf Gureba, İst.
3	Ankara U. Med Fac.	1	Gaziantep U. Med Fac.
3	Marmara U. Med Fac.	1	Atakalp H., İzmir
3	Gazi U. Med Fac., Ankara	1	Abant U. Med Fac.
2	Kocaeli U. Med Fac.	1	Acil &Traumat., Ankara
		160	

Table 3. Nineteen primary authors with multiple publications, their total citations, institutions, and periods of contribution

Pap	Cites	Investigator	Institution	Period	Pap	Cites	Investigator	Institution	Period
14	1185	Altan Onat	Cerrahpaşa	1992-'11	2	122	Dursun Dursunoğlu	Pamukkale	2005
2	398	Adnan Abacı	Gazi U	1999	2	116	Meral Kayıkçıoğlu	Ege U.	2003-'09
3	227	Doğan Erdoğan	S Demirel	2006-'08	2	108	Burak Pamukçu	Çapa	2005-'06
3	206	Mehmet Özyaydın	S Demirel	2006-'08	2	98	Yelda Başaran	Koşuyolu	1996-'11
2	198	Lale Tokgözoğlu	Hacettepe	1999	2	96	L. Elif Sade	Hacettepe	2008-'09
2	186	Aydın Aytaç	Hacettepe	1977	2	95	H Pekdemir	Mersin U	2004
2	150	Mehmet Özkan	Koşuyolu	1992-'00	2	94	Mehmet Ağırbaşlı	Marmara U	2005-'06
3	147	Hakan Turhan	İnönü	2004-'06	2	93	Ahmet T Yılmaz	GATA	1996-'97
3	136	M Birhan Yılmaz	TYİH	2003-'08	2	82	Hüseyin Oflaz	Çapa	2003-'06
2	134	Necla Özer	Hacettepe	2000-'05	53	3911	38% of total		

Nineteen scientists serving as primary authors of multiple publications are listed in Table 3, along with the total number of their citations, their affiliated institutions, and the time period of their contributions. Collectively, they produced approximately 38% of the papers and citations included.

Three-eighths of the papers included (61) were published in the following 9 journals:

Ann Thorac Surg (11 papers), Atherosclerosis and Am J Cardiol (10 each), Int J Cardiol (8 papers), Coron Artery Dis and Eur J Cardiothor Surg (5 each), and Heart, Am Heart J, and J Cardiac Surg (4 papers each).

DISCUSSION

The present study evaluated the “genuine” contribution of Turkey’s medical institutions to global knowledge in the field of cardiovascular medicine, based on data retrieved from Web of Science. Publications representing internationally “collaborative” papers were excluded, as it has been recently shown that such papers, forming over two-thirds of the country’s relatively highly-cited publications, have arguably diluted the actual performance capacity of the country.^[5] A modestly high threshold of citations, ≥ 40 , representing a slightly weaker threshold than that of ≥ 37 used in the assessment 4 years ago,^[6] was selected with the purpose of attaining a substantially larger number of papers representing a wider scope.

The main findings were as follows. The 160 papers included reflected only the global top 15% of papers in cardiovascular medicine. Median exposure time was 10.4 years. Only 10 articles published since 2010 have attained this many citations. Only 38 institutions generated the research reflected in these articles, three-quarters of which were medical faculties. This indicates that such performance was largely confined to well-established institutions. Relatively few younger researchers active in the past decade have contributed to these papers.

It is generally agreed that the number of relatively highly-cited papers is the best indicator of contribution to science,^[3,4] supported by the adoption of papers with the upper 10% of citations as a criterion in the Leiden Ranking.^[7]

Overall performance and comparison with that of 4 years prior

The acquisition of citations is a cumulative, highly time-dependent process. Therefore, the median exposure period must be taken strictly into account. Slightly more than half the papers included in the present study, 92, were published between 2001 and 2006. During this period, a mean of 15 were generated annually. Given the existence of 80 medical faculties and the number of Ministry of Health research hospitals, this performance falls short of anticipated national potential.

There are 3 indications that current performance is lower than that of 4 years earlier.^[6] First, the interquartile range exposure period (7.8 to 14 years) has broadened slightly to 8.7 to 14 years, indicating that a longer period was needed to reach a threshold of citations. Second, the cutoff used in the present assessment was, moreover, a relatively lower threshold, as explained above. Indeed, the former criterion of ≥ 37 citations corresponds to an estimated 52–53 citations in the present analysis. Third, the decline in citations attained since 2006 is concerning. The estimated average number of articles that met the current criteria in the 8 years preceding the index date is diagrammatically represented in Figure 1. Calculations made according to Web of Science data suggest that citations attained within 3–4 years of publication amount to no less than half of those attained within 8 years of publication. Therefore, it is estimated that only a third of the expected number of papers have been generated by Turkey’s institutions since around 2006, judging from the momentum of research generation at the time.

Estimating that the average number of papers published in the top 15th percentile in cardiovascular medicine over the past two decades is approximately 3000 per year, the generation of an annual mean of 9 papers in Turkey since 1999 roughly represents a global share of 3 per mille. This is hardly satisfactory for the potential of Turkey.

Institutions and researchers

It is noteworthy that roughly 1 in 3 medical faculties or major hospitals with departments of cardiology have not, in the past quarter century, produced a paper that would meet inclusion criteria. These include the Akdeniz, Atatürk, Çukurova, Osmangazi, Uludağ, and Yüzüncü Yıl university medical faculties, as

well as the Şişli Florence Nightingale and Bayındır medical centers, all of which have been established throughout the period of study, while numerous newer cardiology centers may have the excuse of limited experience.

On the positive side, the Hacettepe and Cerrahpaşa medical faculties, and the Kartal Koşuyolu Training and Research Hospital are to be commended for having generated over a dozen papers each that have met the inclusion criteria. Turkey's Yüksek İhtisas Training and Research Hospital and the İstanbul and Süleyman Demirel University medical faculties, as well as GATA, merit similar acknowledgment.

Periodicals as vehicle for successful research

A trend among journals with relatively high impact factors and papers receiving higher citations has become clear: All use as examples publications including *Circulation*, *J Am Coll Cardiol*, *Atherosclerosis*, *Stroke*, *Heart Am J Cardiol*, *J Thor Cardio Surg*, and *Int J Obes*. The converse is not a strict rule; namely, periodicals with relatively low impact factors (1–2 in the early 2000s) have also mediated to success in accumulating citations in the order of 50 to over 100. Examples are *Clin Cardiol*, *Clinics*, *Coron Artery Dis*, *Echocardiography*, *Endocrine J*, *Fertil Steril*, *Int J Clin Pract*, *PACE*, *J Cardiac Surg*, and *Thor Cardio Surg*. This observation strongly supports the view that well-designed and well-executed research may likely achieve notable impact, even when published in comparatively low-ranked journals.

Missing constituents for closing the gap in cardiology research

Cardiovascular surgery and pediatric cardiology in particular have severely lagged in contributing to the field. The share of acquired impact of the 3 fields (cardiology-cardiovascular surgery-pediatric cardiology) was 3-2-1 a decade ago,^[8] vastly differing from the current share of 20-6-1. The generation of high-quality papers in cardiovascular surgery has slowed to the extent that only 16 papers (compared to the previous 19) have met the present inclusion criteria.

It is little wonder, given the decline in the general quality of education and the stagnation in the global share of scientific papers from Turkey,^[9] that higher-quality research in cardiovascular medicine has been found to stagnate as well. A main reason is that, because

competency has been sidelined more pronouncedly, compared to 10–20 years ago, there is less incentive to academically promote thorough research. Moreover, medical faculties have been receiving increasingly less governmental support for the maintenance of suitable research environments, and have thus been increasingly less able to retain experienced academic staff, while state hospitals are increasingly turned away from research and reoriented to function primarily as outpatient clinics with heavy patient burden.

Under such conditions, zealous staff members are tempted to gain high numbers of citations by taking a shortcut and joining international trials (contributing few cases), while more experienced staff members join consensus statements, etc. It should be made clear that each citation does not reflect equal merit, but rather reflects the position of the particular author; the share in citations of the individual author and the number of highly-cited papers are of major import.

To conclude, 160 papers with 40–355 citations, received at a median 10.4 years, were identified in the present assessment of the “genuine” contribution of Turkey's medical institutions to global knowledge in the field of cardiovascular medicine. This performance is not only slightly lower than that determined in an evaluation 4 years earlier, it also reveals a dramatic reduction in the number of papers of this quality published since 2006. The number of medical faculties and hospitals generating these papers has fallen to 38, indicating disappointing performance from a majority of institutions.

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