

## Contribution of Hacettepe University Faculty of Medicine to the world's biomedical literature (1988-1997)

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The contribution of Turkish researchers to sciences is increasing. Turkish scientists published more than 6.000 articles in 1999 in scientific journals indexed by the Institute for Scientific Information's *Science Citation Index*, which puts Turkey to the 25<sup>th</sup> place in the world rankings in terms of total contribution to science. The number of biomedical publications authored by Turkish scientists is increasing faster than that of engineering and other non-medical sciences, which might be one of the main causes of the steep rise in Turkey's rankings that we have been witnessing in recent years. More specifically, researchers affiliated with Hacettepe University produce almost a quarter of all the biomedical publications of Turkey that appear in international biomedical literature. In this paper, we report the findings of the bibliometric characteristics (authors and affiliations, medical journals and their impact factors, among others) of a total of 1.434 articles published between 1988 and 1997 by scientists affiliated with Hacettepe University Faculty of Medicine and indexed in MEDLINE, a well-known biomedical bibliographic database.

### Introduction

The performance of Turkish researchers in science, engineering, medicine and social sciences has been studied by a number of authors.<sup>1-7</sup> The contribution of Turkish scientists to the world's scientific literature has increased tremendously over the last decade. According to the Institute for Scientific Information (ISI) data, Turkey has ranked 37<sup>th</sup> in 1993 in the world in terms of its contribution to the world science. Yet its rank has risen to 25<sup>th</sup> in 1998. In terms of publication output, Turkey has achieved a remarkable 11% growth rate between 1980 and 1995.<sup>8</sup> The number of publications has shown more than a four-fold growth within seven years (from about 1500 in 1993 to more than 6000 in 1999) which further reinforced Turkey's place (25<sup>th</sup>) in the world rankings.

The number of biomedical publications authored by Turkish researchers has also been increasing steadily since the mid-1980s. In fact, it was observed that the increase has been greater than that of other disciplines such as engineering. For instance, the

number of medical publications has shown 330% increase within six years prior to 1992<sup>9</sup> and 229% between 1992 and 1996.<sup>10</sup> More recently, we found that Turkish researchers have contributed, as first authors, to more than 8400 biomedical publications between 1988 and 1997. The annual output has gone up from 237 in 1988 to 1709 in 1997, which represented a most remarkable seven-fold increase in biomedical publications in 10 years.<sup>11</sup> It is believed that TÜBİTAK's (the Scientific and Technical Research Council of Turkey) support of Turkish researchers whose contributions appear in international journals has played a pivotal role in this tremendous increase.<sup>12</sup> For instance, more than half (54.5%) of all researchers who received TÜBİTAK's grants in 1996 were affiliated with health sciences.<sup>13</sup>

In an earlier research, we analyzed the bibliometric features of 8442 biomedical publications whose first authors were affiliated with a Turkish research institution.<sup>14</sup> One of the striking findings of the previous study has been that researchers affiliated with Hacettepe University have single-handedly contributed to almost a quarter (23.1%, to be exact) of all biomedical publications appeared in international journals. Founded in 1967 in Ankara, Hacettepe University has since been in the forefront of biomedical research in Turkey.<sup>15,16</sup> Hacettepe University's Faculty of Medicine has 324 faculty members (full-, associate and assistant professors) today. The total number of staff including professors is well over 1000. This paper is thus an attempt to study the bibliometric characteristics (number of authors, authors' affiliations, journals, etc.) of a total of 1434 publications whose first authors are affiliated with the Faculty of Medicine of Hacettepe University. The present analysis is based on a subset of the data used in our previous study. All articles were published between 1988-1997 and indexed in the MEDLINE database of the National Library of Medicine.

### **Data collection and analysis**

The procedure of data collection and analysis was described in detail in our previous study.<sup>17</sup> To summarize briefly, we first used Melvyl, the online catalog of the University of California, to perform comprehensive searches on the MEDLINE database of the National Library of Medicine. One of the most comprehensive biomedical databases in the world, MEDLINE contains more than 11 million bibliographic citations of articles with abstracts appearing in prestigious medical journals. Using the "address" field that is available on MEDLINE, we identified all the articles whose first authors were affiliated with a Turkish institution and were published between 1988-1997 in journals that were indexed in MEDLINE and created the raw text files including the following fields: authors, first author's address, contribution title, journal name,

language, type of contribution, and MeSH (Medical Subject Headings). We ran one of the Unix text processing programs (awk)<sup>18</sup> on those files to extract records belonging to authors affiliated with the Faculty of Medicine of Hacettepe University. We searched the address in various different forms (including abbreviations) in different languages (“Hacettepe University Faculty of Medicine”, “Hacettepe University School of Medicine”, “Hacettepe University Medical School”, “Hacettepe University Medical Faculty”, among others). We identified a total of 1434 publications whose first authors were affiliated with the Faculty of Medicine of Hacettepe University (hereafter FMHU) and then created separate files for author names, addresses and journal names.

### **Limitations of the study**

The term “publication” in this study is used to name all types of contributions (e.g., original and review articles, notes, book reviews, letters to the editor and editorials) in biomedical journals. The analysis covers a total of 1434 publications of researchers affiliated with FMHU. Those publications have all appeared in international biomedical journals and were indexed in MEDLINE. Publications whose first authors not affiliated with FMHU were not included in this study, as MEDLINE does not list the addresses of joint authors even though they may have been affiliated with FMHU. In other words, contributions of FMHU researchers as joint authors (but not first authors) were excluded. Hence, it can be safely assumed that the number of publications that FMHU researchers contributed to (either as first or joint authors) is much higher than what we report here. In addition, contributions of FMHU authors published in biomedical journals that are not indexed in MEDLINE are not included, either. Of 1434 publications, a few may have foreign researchers listed as first authors as they were based in FMHU as visiting scholars at the time of writing up their contributions. Needless to say, some of the publications that we analyzed in this study list foreign researchers as joint authors.

### **Findings**

As we indicated earlier, the total number of biomedical publications which FMHU researchers contributed to as first authors was 1434. The number of biomedical publications of Turkish universities between 1988-1997 as well as that of medical schools/faculties was given in an earlier study.<sup>19</sup> FMHU's contributions constitute almost a quarter of all biomedical publications authored by researchers based in Turkish

medical schools. Although *Onat* found that FMHU's share of all biomedical publications decreased from 25% in 1991-1994 to 18% in 1995-1996,<sup>20</sup> our findings suggest that FMHU's weight continues to be felt heavily in the biomedical field. The distribution of FMHU's 1394 publications is given in Figure 1. As it can be seen, the number of publications has shown more than a seven-fold growth over the years, thereby increasing from 37 in 1988 to 241 in 1997. This increase parallels with the overall growth in biomedical publications of Turkish researchers.

Almost all publications of the FMHU researchers were written in English. The number of publications written in another language (French) was only 6.

Table 1 lists the figures for the numbers of publications and authors per year, and the mean number of authors per publication. The mean number of contributors to a biomedical publication was 4.6. The mean number of contributors of FMHU publications has increased from 3.9 in 1988 to 5.1 in 1996 (Figure 2). The number of contributors has increased more than eight-fold between 1988 and 1996 (from 145 to 1199, respectively), which closely parallels the seven-fold increase of the number of publications.

The distribution of publications per number of contributors is given in Figure 3. MEDLINE records the names of up to 10 authors for each contribution and then adds "et al." if it has more. A total of 332 publications had four contributors, 294 had five, and 252 had three. Three-, four-, and five-author publications constituted more than 61% of all publications.

Table 1. Numbers of publications and contributors, and mean number of contributors per publication (1988-1997)

Year	Number of publications	Number of authors	Mean number of contributors per publication
1988	37	145	3.9
1989	56	239	4.3
1990	105	471	4.5
1991	137	617	4.5
1992	142	646	4.5
1993	165	723	4.4
1994	162	739	4.6
1995	152	714	4.7
1996	237	1199	5.1
1997	241	1117	4.6
Total	1434	6610	4.6

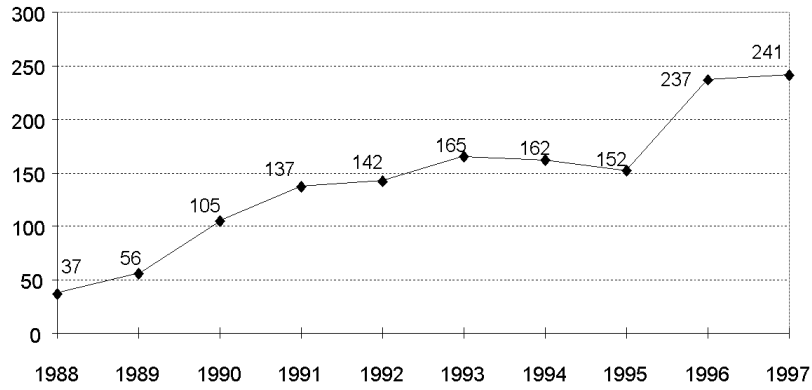


Figure 1. Number of biomedical publications by researchers affiliated with FMHU (1988-1997)

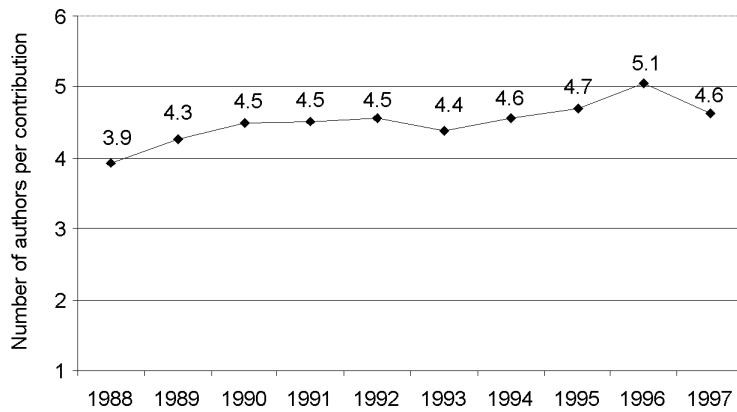


Figure 2. Mean number of authors per contribution

Some 1550 different researchers contributed to 1434 publications of FMHU. Half (775) of those researchers contributed to a single publication only.

Table 2 lists the names and numbers of publications for authors who contributed to 30 or more publications over the ten-year period. Note that the author names in the MEDLINE database are recorded as Last Name and Initial(s) only. Thus, it is impossible to distinguish different authors with the same last name and initial(s).

For instance, we found 71 contributions listed under Ayhan A. We noticed, however, that this figure contains contributions of both Ali and Ayşe Ayhan. We checked the hard copies of journals in which their contributions appeared to identify which one belonged to who. Ali Ayhan is affiliated with the Department of Obstetrics and Gynecology whereas Ayşe Ayhan worked for the Department of Pathology. Upon further analysis, we identified 59 contributions belonging to Ali Ayhan (of which 55 as first author) and 10 to Ayşe Ayhan (all as a joint author). We were unable to identify who the author was in two cases as the first name is given as initial only. In 15 cases, both Ali and Ayşe Ayhan contributed to the same papers.

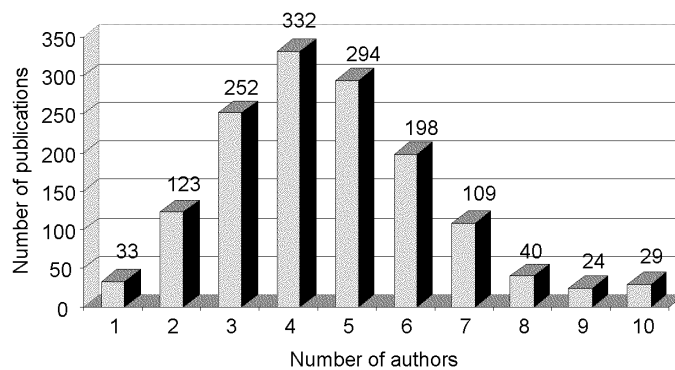


Figure 3. Distribution of publications by number of authors per contribution

Moreover, some researchers may have used their first names inconsistently in papers they authored. Hence, it is impossible to know, for instance, if “C Bekdik” and “CF Bekdik” both refer to the same person. If this is the case, papers get attributed to both names separately, thereby making the final tally for those authors fewer than what it actually is.

Figures in Table 2 represent the contributions of researchers as both first and joint authors and as total. The most prolific authors of FMHU appear to be A Hicsonmez, N Buyukpamukcu, and FC Tanyel, each contributing to 81, 73, and 67 publications, respectively. Ali Ayhan produced the highest number of publications (55) as first author, followed by T Gurgan (22), M Turgut (19), IH Tekkok, S Ozkutlu and Y Bayraktar (18 each), I Pasaoglu (16) and I Karnak (15).\*

\* Other researchers publishing 10 or more papers as first authors are as follows: AO Ciftci, MT Ercan and F Kizilcan (14 each), M Onerci, S Ozsoyulu and H Topaloglu (13 each), O Akhan (12), B Anlar and S Ozen (11 each), and, A Celiker, A Colak, A Gurgey and H Ozen (10 each).

Table 2. FMHU researchers with 30 or more publications

Author name	# of articles contributed to			Author name	# of articles contributed to		
	Total	As first author	As joint author		Total	As first author	As joint author
Hicsönmez A	81	1	80	Tuncer ZS	36	0	36
Buyukpamukcu N	73	0	73	Ozen H	35	10	25
Tanyel FC	67	4	63	Gurgey A	33	10	23
Ayhan Ali <sup>1</sup>	59	55	4	Coskun T	32	7	25
Balkanci F	46	2	44	Akhan O	31	12	19
Erbengi A	45	4	41	Ozen S	31	11	20
Ozcan OE	45	0	45	Ruacan S	31	1	30
Saatci U	44	4	40	Pasaoglu I	30	16	14
Ozkutlu S	38	18	20	Topaloglu H	30	13	17
Bakkaloglu A	37	4	33				

*Note:* 1. The MEDLINE database records the last name and initial(s) of authors, which makes it impossible to distinguish authors with the same last name and initial(s). See the text for Ayhan A. Note, also, that the MEDLINE database records the names of only the first ten authors of a publication and adds "et al." after that. There were 13 articles as such in our study. It is likely that the figures for some authors might be slightly higher if their names were simply listed as "et al." (i.e., 11<sup>th</sup>, 12<sup>th</sup>, 13<sup>th</sup> author).

Figures also show the individual productivity levels of FMHU researchers. It appears that the most prolific top three researchers contributed to seven or eight papers per year. The total number of researchers contributing to two or more papers per year (that is, 20 or more papers in 10 years) was 62. Some 190 researchers contributed as first author to an average of one paper per year (that is, 10 or more papers in 10 years).

The total number of researchers contributing to two or more papers as first author per year (that is, 20 or more papers in 10 years) was only 2 (Ali Ayhan and T Gurgan) whereas a total of 21 researchers contributed as first authors to one or more papers per year. Some 270 researchers contributed as first author to only one paper in 10 years.

As of 1996-1997 academic year, FMHU was the largest medical faculty in Turkey with a total of 1054 staff members (47 of whom worked part-time). Tenure-track faculty members constituted 30% of all the staff which included 182 full-professors, 54 associate professors, and 88 assistant professors (Table 3). Almost two-thirds (671) of the staff were made up by the research assistants. In addition, there were 19 lecturers and 40 specialists. It can be safely assumed that the great majority of all FMHU publications may have been contributed to, either as first or joint authors, by those 324 tenure-track faculty members.

Table 3. Distribution of FMHU faculty members by rank (1996-1997 academic year)

Faculty	N	% (N/1054)
Professor	182	17
Assoc. Prof.	54	5
Ass. Prof.	88	8
Lecturer	19	2
Specialist	40	4
Research assistant	671	64
Total	1054	100

*Note:* The figures for the number of FMHU staff members were taken from the Student Selection and Placement Center's annual statistics for the 1996-1997 academic year.<sup>21</sup>

Table 4 shows a steep increase in the number of publications per tenure-track FMHU faculty member over the ten-year period. The productivity per faculty member increased from 0.15 in 1988 to 0.74 in 1997, a most remarkable five-fold increase in 10 years. FMHU's average productivity level per faculty member (0.46) compares well with that of some other countries. For instance, the top Chinese medical university (Shanghai) produced 0.13 papers (in English) per scientist.<sup>22</sup>

It appears that FMHU faculty members became more productive over the years. This may well be due to a number of factors. First and foremost, performance measures put forth by the Higher Education Council to be promoted to professorships have become stricter in recent years. Each university instituted its own performance criteria for promotions. Thus, faculty members might have felt the pressure of that famous academic syndrome of "publish or perish". Second, researchers publishing papers in international journals have been encouraged, mostly in the form of monetary support, by not only their universities but also by the Scientific and Technical Research Council of Turkey.<sup>23</sup>

Table 5 shows the number of contributions each Department within the Faculty of Medicine produced within the ten-year period. Faculty members affiliated with the Department of Pediatrics produced a total of 326 papers. Moreover, faculty members affiliated with the Department of Pediatric Surgery produced some 92 papers.



Table 4. Number of publications per FMHU faculty member (1988-1997)

Academic year	# of faculty members	# of publications	# of publications per faculty member
1988-1989	249	37	0.15
1989-1990	270	56	0.21
1990-1991	277	105	0.38
1991-1992	299	137	0.46
1992-1993	310	142	0.46
1993-1994	315	165	0.52
1994-1995	316	162	0.51
1995-1996	321	152	0.47
1996-1997	324	237	0.73
1997-1998	327	241	0.74
<b>Total/Avg.</b>	<b>301</b>	<b>1434</b>	<b>0.46</b>

*Source:* Figures for the number of faculty members were taken from the Student Selection and Placement Center's annual statistics for the respective academic years (1988-1997). They reflect the number of tenure-track faculty members (professors, associate and assistant professors) only.

Added together (418), one-third of all FMHU publications was somewhat related with pediatrics. This ratio, although in line with that of Tinaztepe who found that 32% all FMHU papers appearing in international journals during 1993-1994 were in pediatrics,<sup>24</sup> should be interpreted with care as it may not necessarily reflect the topical distribution of papers of FMHU researchers appearing in international journals. The Departments of Neurosurgery, and Obstetrics and Gynecology follow the Department of Pediatrics with 107 (8%) and 96 (7%) papers, respectively.\*

Contributions by FMHU researchers appeared in 384 different biomedical journals. The number of journals that published five or more contributions authored by FMHU researchers was 96. The total number of contributions (948) that appeared in those 96 journals accounted for almost two-thirds of all publications authored by FMHU researchers. There were 31 journals publishing 10 or more contributions by FMHU researchers. Those top 31 journals published a total of 527 contributions, almost 40% of all papers authored by FMHU researchers. The names and the 1996 impact factors of the top 31 biomedical journals publishing 10 or more FMHU contributions are given in Table 6.<sup>25</sup>

\* Although no supporting data is available to that effect, researchers in some subfields (e.g., public health) may have deemed more valuable to publish their contributions primarily in Turkish biomedical journals.

Table 5. Distribution of FMHU publications by departments

Department name	# of publications	Department name	# of publications
Pediatrics	326	Infectious Diseases	16
Neurosurgery	107	Physical Therapy & Rehabilitation	17
Obstetrics and Gynecology	96	Endocrinology	14
Pediatric Surgery	92	Medical Biology	11
Radiology	64	Psychiatry	10
Nuclear Medicine	58	Anesthesiology	10
Urology	55	Nephrology	10
Internal Medicine	51	Biophysics	9
Neurology	45	Histology/Embryology	7
Anatomy	45	Microbiology	6
Otolaryngology/Otorhinolaryngology	42	Orthopaedics and Traumatology	6
Pharmacology	40	Pathology	6
Surgery/General Surgery	32	Genetics	5
Thoracic and Cardiovascular Surgery	31	Metabolism	4
Plastic and Reconstructive Surgery	30	Physiology	4
Oncology	29	Rheumatology	4
Cardiology	27	Allergy	3
Gastroenterology	24	Dermatology	2
Chest Diseases	22	Public Health	2
Eye	21	Emergency Medicine	1
Hematology	19	Nutrition and Dietetics	1
Biochemistry	16	Population Studies	1
		<b>Total</b>	<b>1421</b>

*Note:* Department names were taken from the first authors' addresses. Some 13 addresses cannot be classified for various reasons: i.e., some belonged to departments which were part of the Faculty of Medicine in the past (e.g., School of Health Administration, School of PTR), some listed the name of the Faculty only; some belonged to departments that are not under Faculty of Medicine (e.g., Brain Dynamics Research Center). No attempt has been made to track down the variations or changes of department names over the ten-year period. Some units within departments were classified under the department names (e.g., Pediatric Neurology and Pediatric Cardiology were both listed under "Pediatrics" whereas Oncology, Radiation Oncology, Medical Oncology and Institute of Oncology were under "Oncology").

Table 6 shows that contributions of FMHU researchers have primarily appeared in pediatrics journals. This is not surprising as the Department of Pediatrics of FMHU distinguished itself as the most prolific Department within FMHU. The first title, *Turkish Journal of Pediatrics (TJP)*, started its publication in 1958 and has been published by the Institute of Child Health of Hacettepe University since 1993.<sup>26</sup>

Table 6. Journals publishing 10 or more contributions by FMHU researchers

Journal	Impact factor (1996)	# of contributions by FMHU researchers
<i>Turkish Journal of Pediatrics</i>	0.130	71
<i>Journal of Pediatric Surgery</i>	1.062	41
<i>International Urology and Nephrology</i>	–	38
<i>Japanese Heart Journal</i>	0.186	26
<i>British Journal of Urology</i>	1.005	20
<i>European Journal of Pediatrics</i>	1.127	18
<i>Pediatric Radiology</i>	0.489	18
<i>European Journal of Pediatric Surgery</i>	0.326	17
<i>Acta Neurochirurgica</i>	0.498	16
<i>Acta Paediatrica Japonica</i>	0.049	16
<i>International Journal of Gynaecology and Obstetrics</i>	0.387	15
<i>Angiology</i>	0.448	14
<i>Clinical Nuclear Medicine</i>	0.437	14
<i>Journal of Neurosurgical Sciences</i>	–	14
<i>Journal of Inherited Metabolic Disease</i>	0.779	13
<i>Clinical Neurology and Neurosurgery</i>	0.619	12
<i>European Journal of Obstetrics</i>	0.537	12
<i>Hepato-Gastroenterology</i>	1.104	12
<i>International Journal of Cardiology</i>	0.513	12
<i>International Journal of Pediatric Otorhinolaryngology</i>	0.500	12
<i>Journal of Clinical Neuro-Ophthalmology</i>	–	12
<i>Pediatric Hematology and Oncology</i>	0.517	12
<i>European Journal of Gynaecological Oncology</i>	–	11
<i>Surgical and Radiologic Anatomy</i>	0.389	11
<i>Acta Paediatrica</i>	0.754	10
<i>Brain and Development</i>	0.539	10
<i>Archives Internationales de Pharmacodynamie et de Therapie</i>	0.639	10
<i>Journal of Surgical Oncology</i>	0.634	10
<i>Neuroradiology</i>	0.997	10
<i>Pediatric Cardiology</i>	0.363	10
<i>Plastic and Reconstructive Surgery</i>	1.377	10
Total		527 (37%)
Other journals		907 (63%)
<b>Grand Total</b>		<b>1434 (100%)</b>

According to the 1996 edition of the Institute for Scientific Information's (ISI) *Science Citation Index Journal Citation Reports* (SCI-JCR), *TJP*'s impact factor was 0.130 and it ranked 58<sup>th</sup> among all pediatrics journals that year.<sup>27</sup> Six out of the top 10 titles were in pediatrics.

The impact factors (IF) of top 31 journals where FMHU contributions appeared most frequently ranged between 0.130 and 1.377. Five titles (*Plastic and Reconstructive Surgery*, *European Journal of Pediatrics*, *Hepato-Gastroenterology*, *Journal of Pediatric Surgery*, *British Journal of Urology*) had impact factors over 1.000. FMHU researchers published relatively fewer papers in journals with higher impact factors: seven in *Journal of International Medical Research* (IF: 3.929), eight in *American Journal of Gastroenterology* (IF: 3.178), six in *Journal of Pediatrics* (IF: 3.011), and seven in *European Journal of Nuclear Medicine* (IF: 3.097).

It should be noted that *TJP* is the only biomedical journal that is published in Turkey that has been indexed in Index Medicus and ISI's *Science Citation Index Expanded*. Countries such as Russia, Hungary and Greece have relatively more biomedical journals indexed in Index Medicus: 56, 11, and 7, respectively.<sup>28</sup> In other words, contributions of FMHU researchers appearing in other biomedical journals than *TJP* that are published in Turkey are not reflected in MEDLINE statistics, which puts FMHU biomedical scientists in a somewhat disadvantageous position.

### Conclusion

We summarized the major findings of our research that was based on 1434 biomedical publications of FMHU researchers that were indexed in MEDLINE between 1988-1997. FMHU researchers recorded a seven-fold increase in the total number of publications within a ten-year period. The mean number of contributors per publication has increased from 3.9 to 5.1 between 1988-1997. An overwhelming majority of publications had somewhere between three and six authors. More FMHU researchers were involved in publishing activities: the total number of contributors rose from 145 in 1988 to 1199 in 1996. A. Hicsonmez, N. Buyukpamukcu, F.C. Tanyel and Ali Ayhan appeared to be the most prolific FMHU researchers in terms of total number of papers (both as first and joint authors) they contributed to. The annual publication output per FMHU researcher rose from 0.15 papers in 1988 to 0.74 in 1997. One-third of all FMHU papers listed the Department of Pediatrics and Department of Pediatric Surgery as the address of the first author. The impact factors of biomedical journals in which FMHU researchers published their papers most often ranged between 0.130 and 1.377.

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28. *Ibid.*

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