Clinics in Surgery

Research Article
Published: 05 Dec, 2016

# Global Practice *vs*. Research on Bariatric Surgery Over the Last Decade

*Koray Bas[1]*, Serhan Derici[1], Tugba Arkan[2], Serkan Yener[2] and Koray Atila[1]*

[1]*Department of General Surgery, Dokuz Eylul University Hospital, Turkey*

[2]*Department of Internal Medicine, Dokuz Eylul University Hospital, Turkey*

## Abstract

**Background:** Publishing scientific researches should be considered as important as practice in medicine. The aim of this study is to evaluate trends of scientific productivity comparing with practice of each IFSO-member countries on bariatric surgery over the last decade.

**Methods:** The Thomson Reuters Web of Science was used to obtain numbers of bariatric surgery-related studies published by each IFSO-member countries in four certain time spans 2003-2004, 2008-2009, 2011-2012 and 2013-2014. Then each country's publication rates per bariatric procedure were calculated for these time periods due to reports of IFSO in 2003, 2008, 2011 and 2013.

**Results:** The highest number of publications and procedures on bariatric surgery were achieved by USA in all time spans. USA also has the largest volume of bariatric surgeons in 2003 and 2008. Then Brazil replaced the first rank for numbers of bariatric surgeons in 2011 and bariatric centers in 2013.

In 2003-2004, the total number of bariatric surgery-related publications was 644 published by 26 IFSO-member countries and the total estimated number of bariatric procedure was 43,301 which performed by those countries. In 2013-2014, the total number of bariatric surgery-related publications was 4,026 which published by 56 IFSO-member countries and the total estimated number of bariatric procedure was 468,609 which performed by those countries.

**Conclusion:** We can roughly claim that global scientific productivity on bariatric surgery has not been increased in parallel increasing numbers of bariatric procedures and surgeons over the last decade. Our study should be a call that research efforts must be supported by governments or private institutions. In addition, creating and maintaining national and international "registry" systems, as IFSO, is essential to obtain reliable data.

**Keywords: Bariatric surgery; Bibliometric analysis; IFSO**

**OPEN ACCESS**

***Correspondence:***
*Koray Bas, Department of General Surgery, Division of Bariatric and Upper Gastrointestinal Surgery, Dokuz Eylul University Hospital, Balcova, Turkey, Tel: 90 532 223 1560; E-mail: drkoraybas@yahoo.com*

**Received Date**: *20 Sep 2016*
**Accepted Date:** *22 Nov 2016*
**Published Date:** *05 Dec 2016*

***Citation:***
*Bas K, Derici S, Arkan T, Yener S, Atila K. Global Practice vs. Research on Bariatric Surgery Over the Last Decade. Clin Surg. 2016; 1: 1201.*



## Introduction

The morbidity and mortality associated with obesity have been known to the medical profession more than 2000 years [1]. Mean body mass index (BMI) has been increasing in prevalence in adults, adolescents, and children, and is now considered to be a global epidemic, recently with 36.9 percent of men and 38 percent of women estimated to have a BMI ≥25 kg/m$^2$ [2,3]. Therefore bariatric surgery is one of the fastest growing operative procedures performed worldwide, with an estimated >340,000 operations performed in 2011 [4]. The growth rate of bariatric surgery in Asia was 449 percent between 2005 and 2009 [5].

The first known surgical procedure aimed at reducing body weight was performed by Victor Henrikson in Sweden in 1952, was only a small bowel resection. The first real obesity surgery procedure was the jejunoileal bypass (JIB) performed by Kremen and Linner in USA in 1954 [6].

International Federation for the Surgery of Obesity and metabolic disorders (IFSO) was founded in 1995. IFSO-based worldwide surveys on bariatric surgery have been published by the federation in subsequent years. The first global survey of IFSO was reported by Scopinaro in 1998 [6]. After which Buchwald and Angrisani presented follow-up reports for 2003, 2008, 2011and 2013 [4,7-9]. While previous reports were mostly based on estimated numbers and e-mail surveys; recent reports reflect registries of IFSO-member national societies and provide more accurate information as First IFSO Global Registry Report 2014 [10].

Scientific publishing is a reliable way of sharing an experience with other researchers and

**Table 1:** IFSO member nations and their performances for 2003-2004.

| IFSO members for 2003-2004 | Number of publications | Number of procedures | Publication rates per procedure | Number of bariatric surgeons | Publication rates per bariatric surgeon |
|---|---|---|---|---|---|
| Argentina | 1 | 200 | 0,005 | 30 | 0,033 |
| Australia/ New Zealand | 30 (29/ 1) | 2750 | 0,010 | 68 | 0,441 |
| Austria | 21 | 1396 | 0,015 | 38 | 0,552 |
| Belgium/ Luxembourg | 11 | 6000 | 0,001 | 200 | 0,055 |
| Brazil | 29 | 4000 | 0,007 | 510 | 0,056 |
| Czech Republic | 2 | 400 | 0,005 | 6 | 0,333 |
| Egypt | 0 | 2750 | 0 | 12 | 0 |
| France | 19 | 12000 | 0,001 | 200 | 0,095 |
| Germany | 22 | 1100 | 0,020 | 54 | 0,407 |
| Greece | 7 | 500 | 0,014 | 8 | 0,875 |
| Hungary | 1 | 30 | 0,033 | 1 | 1,000 |
| Israel | 16 | 1000 | 0,016 | 50 | 0,320 |
| Italy | 51 | 3000 | 0,017 | 200 | 0,255 |
| Japan | 2 | 20 | 0,100 | 20 | 0,100 |
| Mexico | 7 | 2500 | 0,028 | 200 | 0,035 |
| Netherlands | 15 | 800 | 0,018 | 40 | 0,375 |
| Panama | 0 | 60 | 0 | 5 | 0 |
| Poland | 7 | 145 | 0,048 | 14 | 0,500 |
| Russia | 0 | 350 | 0 | 35 | 0 |
| Spain | 23 | 2000 | 0,011 | 160 | 0,143 |
| Sweden | 14 | 600 | 0,023 | 20 | 0,700 |
| Switzerland | 18 | 800 | 0,022 | 90 | 0,200 |
| Turkey | 6 | 150 | 0,040 | 5 | 1,200 |
| UK/ England | 10 | 600 | 0,016 | 13 | 0,769 |
| Ukraine | 0 | 150 | 0 | 10 | 0 |
| USA/ Canada | 332 (321/11) | 103000 | 0,003 | 850 | 0,380 |
| | | | | | |
| **Total** - Average | 644 | 146101 | 0,004 | 2809 | 0,215 |

practitioners. Analysis of these scientific publications is also a valuable marker of scientific activity for researchers, institutes and even countries.

Bibliometric analysis is a tool for quantitatively analyzing the characteristics of publications in any field of research. Since Garfield published first bibliometric study in the 1970s more articles have appeared in different general and specialty journals [11-14].

The Science Citation Index was introduced in 1961 as a tool for bibliographic retrieval, and it provides a large database for the analysis of journals and publications. The Thomson Reuters Web of Science™ Core Collection (WoS) is a software application that can be used for analyzing scientific papers indexed in the Science Citation Index Expanded (SCI-E) by various parameters [15].

The aim of this study is to evaluate trends of scientific productivity comparing with practice on bariatric surgery of each IFSO member societies over the last decade by using WoS bibliometric analysis.

## Materials and Methods

This study was conducted on June 25, 2015. The Thomson Reuters Web of Science™ Core Collection (WoS) was used to obtain numbers of bariatric surgery-related studies included in SCI-E in four certain time spans 2003-2004, 2008-2009, 2011-2012 and 2013-2014 using the terms "bariatric surgery", "metabolic surgery", obesity surgery" and weight loss surgery" in topic search section. By using the "analyze" function of the software, we analyzed the number of publications for each IFSO member countries in those years. Time spans selected due to years of global IFSO reports, 2003, 2008, 2011, 2013 and the following years for possible publications from those years. Then each country's publication rates per bariatric procedure (PPP) were calculated due to data provided by global reports of IFSO for each periods of time. Publication rates per bariatric surgeon (PPS) were also calculated for time spans of 2003-2004, 2008-2009, 2011-2012 and publication rates per bariatric center (PPC) for 2013-2014 due to the same reports.

## Results

Overall, the highest number of publications and procedures on bariatric surgery were achieved by USA in all time spans of this study. USA also has the largest volume of bariatric surgeons in 2003 and 2008. Then Brazil replaced the first rank for numbers of bariatric surgeons in 2011 and bariatric centers in 2013. In 2013-2014, the total number of bariatric surgery-related publications was 4,026 which were published by 56 IFSO member countries and the total

**Table 2:** IFSO member nations and their performances for 2008-2009.

| IFSO members for 2008-2009 | Number of publications | Number of procedures | Publication rates per procedure | Number of bariatric surgeons | Publication rates per bariatric surgeon |
|---|---|---|---|---|---|
| Argentina | 7 | 2400 | 0,002 | 50 | 0,140 |
| Australia/ New Zealand | 51 (48/ 3) | 11914 | 0,004 | 118 | 0,432 |
| Austria | 46 | 1741 | 0,026 | 52 | 0,884 |
| Belgium/ Luxembourg | 36 | 8700 | 0,004 | 82 | 0,439 |
| Brazil | 125 | 25000 | 0,005 | 700 | 0,178 |
| Chile | 30 | 1500 | 0,020 | 100 | 0,300 |
| Czech Republic | 13 | 900 | 0,014 | 15 | 0,866 |
| Denmark | 10 | 2004 | 0,004 | 15 | 0,666 |
| Egypt | 2 | 1500 | 0,001 | 8 | 0,250 |
| France | 87 | 13722 | 0,006 | 310 | 0,280 |
| Germany | 97 | 2117 | 0,045 | 75 | 1,293 |
| Greece | 23 | 2875 | 0,008 | 45 | 0,511 |
| Hungary | 0 | 300 | 0 | 5 | 0 |
| India | 3 | 1216 | 0,002 | 46 | 0,065 |
| Israel | 33 | 2500 | 0,013 | 50 | 0,660 |
| Italy | 133 | 4842 | 0,027 | 300 | 0,443 |
| Japan | 11 | 80 | 0,137 | 30 | 0,366 |
| Mexico | 9 | 13500 | 0,0006 | 150 | 0,060 |
| Netherlands | 36 | 3500 | 0,0102 | 45 | 0,800 |
| Norway | 15 | 1500 | 0,0100 | 25 | 0,600 |
| Paraguay | 0 | 0 | 0 | 2 | 0 |
| Peru | 0 | 600 | 0 | 15 | 0 |
| Poland | 19 | 814 | 0,023 | 20 | 0,950 |
| Portugal | 10 | 1323 | 0,007 | 25 | 0,400 |
| Romania | 3 | 837 | 0,003 | 18 | 0,166 |
| Russia | 0 | 750 | 0 | 75 | 0 |
| Serbia | 1 | 10 | 0,100 | 5 | 0,200 |
| South Africa | 1 | 400 | 0,002 | 17 | 0,058 |
| Spain | 103 | 6000 | 0,017 | 400 | 0,257 |
| Sweden | 27 | 2894 | 0,009 | 90 | 0,300 |
| Switzerland | 48 | 850 | 0,056 | 40 | 1,200 |
| Turkey | 4 | 500 | 0,008 | 20 | 0,200 |
| UK/ England | 108 | 6000 | 0,018 | 60 | 1,800 |
| Ukraine | 1 | 190 | 0,005 | 20 | 0,050 |
| USA/ Canada | 993(937/56) | 220000 | 0,004 | 1625 | 0,611 |
| Venezuela | 2 | 1242 | 0,001 | 27 | 0,074 |
| TOTAL- Average | 2087 | 344221 | 0,006 | 4680 | 0,445 |

estimated number of bariatric procedure was 468,609 performed by those countries. For PPP, Japan had been in the first place two times for 2003-2004 and 2008-2009 by rates of 1.000 and 0.137 respectively. Singapore and Spain had been in the first rank by rates of 0.115 and 0.878 in time spans of 2011-2012 and 2013-2014. For PPS, Turkey, England, Germany had been in the first place by rates of 1.200, 1.800, 2.250 in time spans of 2003-2004, 2008-2009, 2011-2012 respectively. For PPC in 2013-2014, Spain again ranked first by rate of 5.916.

### 2003-2004

The total number of bariatric surgery-related publications was 644, published by 26 IFSO member countries and the total estimated number of bariatric procedure was 43,301 performed by these countries. USA was in the first rank with 321 publications, followed by Italy (n=51), Australia (n=29) and Brazil (n=29). USA and Canada performed most procedures at 103,000. Nations declared performing 2,000 procedures or more annually were France (n=12,000), Belgium/ Luxembourg (n=6,000), Brazil (n=4,000), Italy (n=3,000), Australia/ New Zealand (n=2,750), Egypt (n=2,750), Mexico (n=2,500) and Spain (n=2,000). For PPP, Japan was in the first place with rate of 0.100, followed by Poland (0.048), Turkey (0.040), Hungary (0.033), and Mexico (0.028). The overall mean rate was 0.004 (Table 1).

**Table 3** IFSO member nations and their performances for 2011-2012.

| IFSO members for 2011-2012 | Number of publications | Number of procedures | Publication rates per procedure | Number of bariatric surgeons | Publication rates per bariatric surgeon |
|---|---|---|---|---|---|
| Argentina | 7 | 5500 | 0,001 | 120 | 0,058 |
| Australia/ New Zealand | 104 (92+12) | 12000 | 0,008 | 150 | 0,693 |
| Austria | 42 | 2081 | 0,020 | 55 | 0,763 |
| Belgium | 40 | 8500 | 0,004 | 150 | 0,266 |
| Brazil | 168 | 65000 | 0,002 | 2750 | 0,061 |
| Chile | 54 | 5554 | 0,009 | 54 | 1,000 |
| Colombia | 4 | 7000 | 0,0005 | 150 | 0,026 |
| Czech Republic | 6 | 1500 | 0,004 | 10 | 0,600 |
| Ecuador | 0 | 150 | 0 | 12 | 0 |
| Egypt | 5 | 2910 | 0,001 | 31 | 0,161 |
| Finland | 30 | 1056 | 0,028 | 32 | 0,937 |
| France | 113 | 27648 | 0,004 | 310 | 0,364 |
| Germany | 135 | 4000 | 0,033 | 60 | 2,250 |
| Greece | 29 | 1550 | 0,018 | 35 | 0,828 |
| Guatemala | 0 | 180 | 0 | 3 | 0 |
| Hungary | 0 | 227 | 0 | 4 | 0 |
| Iceland | 0 | 106 | 0 | 2 | 0 |
| India | 35 | 5000 | 0,007 | 100 | 0,350 |
| Israel | 35 | 5000 | 0,007 | 50 | 0,700 |
| Italy | 152 | 7236 | 0,021 | 272 | 0,558 |
| Japan | 16 | 170 | 0,094 | 19 | 0,842 |
| Kuwait | 4 | 4626 | 0,0008 | 55 | 0,072 |
| Lithuania | 2 | 248 | 0,008 | 6 | 0,333 |
| Mexico | 15 | 19600 | 0,0007 | 200 | 0,075 |
| Netherlands | 51 | 5000 | 0,010 | 30 | 1,700 |
| Poland | 38 | 1250 | 0,030 | 38 | 1,000 |
| Portugal | 20 | 3028 | 0,006 | 60 | 0,333 |
| Romania | 8 | 928 | 0,008 | 25 | 0,320 |
| Russia | 2 | 1100 | 0,001 | 70 | 0,028 |
| Saudi Arabia | 12 | 7000 | 0,001 | 48 | 0,250 |
| Singapore | 23 | 200 | 0,115 | 16 | 1,437 |
| Slovenia | 1 | 150 | 0,006 | 4 | 0,250 |
| South Africa | 1 | 1000 | 0,001 | 12 | 0,083 |
| Spain | 144 | 7850 | 0,018 | 259 | 0,555 |
| Sweden | 65 | 8500 | 0,007 | 44 | 1,477 |
| Switzerland | 48 | 2566 | 0,018 | 5 | 9,600 |
| Taiwan | 40 | 1300 | 0,030 | 20 | 2,000 |
| Turkey | 12 | 301 | 0,039 | 22 | 0,545 |
| UEA | 4 | 1963 | 0,002 | 19 | 0,21 |
| UK/ England | 249 | 10000 | 0,024 | 120 | 2,075 |
| Ukraine | 0 | 145 | 0 | 35 | 0 |
| USA/ Canada | 1130(1051/79) | 101645 | 0,011 | 1248 | 0,905 |
| TOTAL-Average | 2844 | 340768 | 0,008 | 6705 | 0,424 |

The 26 countries declared a total of 2,839 bariatric surgeons, 850 in USA/Canada, 510 in Belgium/Luxembourg, 200 in Brazil, 200 in Italy, 200 in France, 200 in Mexico, 160 in Spain and less than 150 for the rest of countries. For PPS, first five countries were Turkey, Hungary, Greece, England and Sweden with rates of 1.200, 1.000, 0.875, 0.769 and 0.700, respectively. The overall mean PPS was 0.215.

**Table 4:** IFSO member nations and their performances for 2013-2014.

| IFSO members for 2013-2014 | Number of publications | Number of procedures | Publication rates per procedure | Number of bariatric centers | Publication rates per bariatric center |
|---|---|---|---|---|---|
| Argentina | 12 | 30378 | 0,0003 | 23 | 0,521 |
| Australia/ New Zealand | 130 (118/ 12) | 10467 | 0,012 | n.a. | n.a. |
| Austria | 42 | 2354 | 0,017 | 32 | 1,312 |
| Azerbaijan | 0 | 11 | 0 | 1 | 0 |
| Belgium | 56 | 12000 | 0,004 | n.a. | n.a. |
| Bolivia | 0 | 321 | 0 | 10 | 0 |
| Brazil | 160 | 86840 | 0,001 | 1165 | 0,137 |
| Chile | 37 | 5936 | 0,006 | 15 | 2,466 |
| China | 93 | 4106 | 0,022 | 102 | 0,911 |
| Colombia | 2 | 9200 | 0,0002 | 120 | 0,016 |
| Costa Rica | 1 | 0 | 0 | 0 | 0 |
| Czech Republic | 17 | 1568 | 0,0108 | 12 | 1,416 |
| Dominican Rep. | 0 | 989 | 0 | 13 | 0 |
| Ecuador | 0 | 734 | 0 | 9 | 0 |
| Egypt | 19 | 5875 | 0,003 | 70 | 0,271 |
| Finland | 41 | 888 | 0,046 | 0 | 0 |
| France | 192 | 37300 | 0,005 | 380 | 0,505 |
| Germany | 172 | 7126 | 0,024 | 124 | 1,387 |
| Greece | 31 | 1499 | 0,020 | 21 | 1,476 |
| Guatemala | 0 | 253 | 0 | 4 | 0 |
| Hong Kong | 0 | 95 | 0 | 6 | 0 |
| Iceland | 2 | 87 | 0,022 | 1 | 2,000 |
| India | 56 | 10002 | 0,005 | 175 | 0,320 |
| Israel | 45 | 11452 | 0,003 | 29 | 1,551 |
| Italy | 236 | 8106 | 0,029 | 77 | 3,064 |
| Japan | 41 | 192 | 0,213 | 14 | 2,928 |
| Korea | 42 | 1684 | 0,024 | 29 | 1,448 |
| Kuwait | 11 | 0 | 0 | 0 | 0 |
| Lebanon | 14 | 0 | 0 | 0 | 0 |
| Lithuania | 4 | 240 | 0,016 | 4 | 1,000 |
| Mexico | 19 | 7850 | 0,002 | 72 | 0,263 |
| Netherlands | 88 | 6807 | 0,012 | 17 | 5,176 |
| Panama | 0 | 0 | 0 | 0 | 0 |
| Paraguay | 0 | 269 | 0 | 6 | 0 |
| Peru | 1 | 268 | 0,003 | 4 | 0,250 |
| Poland | 40 | 1658 | 0,024 | 16 | 2,500 |
| Portugal | 33 | 2421 | 0,013 | 26 | 1,269 |
| Romania | 11 | 861 | 0,012 | 6 | 1,830 |
| Russia | 10 | 1522 | 0,006 | 23 | 0,434 |
| Saudi Arabia | 16 | 13194 | 0,001 | 11 | 1,454 |
| Serbia | 4 | 30 | 0,133 | n.a. | n.a. |
| Singapore | 27 | 279 | 0,096 | 6 | 4,500 |
| Slovenia | 4 | 184 | 0,021 | 2 | 2,000 |
| South Africa | 2 | 703 | 0,002 | 13 | 0,153 |
| Spain | 213 | 2425 | 0,878 | 36 | 5,916 |
| Sweden | 96 | 7473 | 0,012 | 40 | 2,400 |

| | | | | | |
|---|---|---|---|---|---|
| Switzerland | 73 | 3427 | 0,0213 | 53 | 1,377 |
| Taiwan | 58 | 1948 | 0,029 | 21 | 2,760 |
| Turkey | 43 | 3250 | 0,013 | 50 | 0,860 |
| UEA | 12 | 4143 | 0,002 | 19 | 0,631 |
| Ukraine | 3 | 360 | 0,008 | 7 | 0,428 |
| United Kingdom | 374 | 5558 | 0,067 | 112 | 3,339 |
| USA/Canada | 1440 (1270/170) | 154276 | 0,009 | 708 | 2,033 |
| Venezuela | 3 | 0 | 0 | 0 | 0 |
| TOTAL-Average | 4026 | 468609 | 0,008 | 3684 | 1,092 |

n.a: Not Available

### 2008-2009

In that period of time, 2,087 articles were originated from 36 IFSO member countries, led by USA (n=937) and followed by Italy (n=133), Brazil (n=125) and England (n=108). Estimated total number of procedure was 344,221. USA/Canada again performed most procedures at 220,000 and followed by Brazil (n=25,000), France (n=13,722), Mexico (n=13,500), Australia/New Zealand (n=11,914) due to their declaration to IFSO in 2008. The overall mean rate of PPP was 0,006. Japan, once again, was in the first place for PPP with the rate of 0.137, followed by Serbia (0.100), Switzerland (0.056), Germany (0.045) and Italy (0.027).

Through 4,680 bariatric surgeons were declared by 36 countries, 1,625 in USA/Canada, 700 in Brazil, 400 in Spain, 310 in France, 300 in Italy. Others had less than 300 bariatric surgeons in those years (Table 2).

For PPS, the overall mean rate was 0,445 and first five ranked countries were England, Germany, Switzerland, Poland and Austria with rates of 1.800, 1.293, 1.200, 0.950 and 0.884, respectively.

### 2011-2012

The 2,844 articles were published by 42 IFSO member countries. The highest contribution was from USA with 1,130 publications followed by England (n=249), Brazil (n=168), Italy (n=152) and Spain (n=144). Reported total number of procedures was 340,768 and was dominated by USA/Canada at 101,645 followed by Brazil (n=65,000), France (n=27,648), Mexico (n=19,600), Australia/New Zealand (n=12,000) and England (n=10,000). Other countries performed less than 10,000 bariatric procedures in 2011. For PPP, Singapore was in the first place with the rate of 0,115 followed by Japan (0.094), Turkey (0.039), Germany (0.033) and Taiwan (0.030). The overall mean PPP was 0.008 (Table 3).

The total number of 6,705 bariatric surgeons was declared by these 42 countries to IFSO and Brazil settled in the first rank for 2011 with 2,750 surgeons followed by USA/Canada (n=1,248), France (n=310), Italy (n=272), Spain (n=259) and Mexico (n=200). Other countries reported having less than 200 bariatric surgeons.

According to PPS, Switzerland dominated the rank with the rate of 9.600. It was followed by Germany, England, Taiwan and Netherlands with the rates of 2.250, 2.075, 2.000 and 1.700, respectively. The overall mean PPS was 0.424.

### 2013-2014

During that time span 4,026 papers were published by 54 IFSO member nations or national groups. USA again was in the first place with 1,440 publications followed by England (n=374), Italy (n=236), Spain (n=213) and France (n=192). Through total 468,609 bariatric procedures were registered by these countries USA/Canada was in the first rank with numbers of 154,276 followed by countries performed more than 10,000 procedures in 2013 such as Brazil (n=86,840), France (n=37,300), Argentina (n=30,378), Saudi Arabia (n=13,194), Belgium (n=12,000), Israel (n=11,452), Australia/New Zealand (n=10,467) and India (n=10,002). Overall mean PPP was 0.008 and Spain had the maximum PPP at 0.878 followed by Japan (0.213), Serbia (0.133), Singapore (0.096) and England (0.067).

There were total 3,684 bariatric centers registered in these IFSO members' countries. The most of them located in Brazil with numbers of 1,165 followed USA/Canada (n=708), France (n=380), India (n=175), Germany (n=124), Colombia (n=120), England (n=112) and China (n=102). Others reported less than 100 bariatric centers (Table 4).

The overall mean PPC was 1,092 and Spain was in the first rank with the rate of 5,916 followed by Netherlands, Singapore, England and Italy with the rates of 5.176, 4.500, 3.339 and 3.064 respectively.

## Discussion

Afterwards IFSO was founded in 1995, the first global survey of bariatric surgery related data from IFSO-member countries was published in 1998 by the federation and then followed by reports in 2003, 2009, 2011, 2013, 2014. Over the years numbers of member societies of the federation had been increasing continuously, from 26 in 2003 to 60 in 2014.

This study has shown an increase in the number of publications on bariatric surgery research over the last decade. We retrieved 644 papers for 2003-2004 and 4,026 papers for 2013-2014. Such increasing on obesity-related publications in the literature was showed earlier [16]. The highest number of publications on bariatric surgery was achieved by USA in all time spans of this that study and followed generally by the other developed countries. At the same time, numbers of bariatric procedures, surgeons and centers have increased much more rapidly than scientific productivity. In 2003-2004, 43,301 procedures performed by 1,989 surgeons and 340,768 procedures performed by 6,705 surgeons in 2011-2012. There was reported numbers of bariatric centers instead of numbers of bariatric surgeons in IFSO report for 2013, so we were not able to compare the numbers of surgeons for that year. USA, again, dominated lists of numbers of procedures all the time and shared top places with Brazil for lists of bariatric surgeons and centers in last years. But, surprisingly these countries cannot keep their positions on the lists of PPP, PPS and PPC. Here it is not easy to discuss about the real reason for that due to lack of information where procedures mostly done, in private

hospitals or non-profit organizations such as university hospitals or training hospitals where making scientific publications would be more important. Unfortunately those numbers mostly depend on estimations provided by IFSO member countries. Although North and South America and Europe are the World's leading areas in practice and scientific production on bariatric surgery according to IFSO reports.

Besides, most of the data provided in those reports were based on "survey" systems at the beginning; recently it had been started using "registries" as published in Bariatric Surgery Worldwide-2013 and First IFSO Global Registry Report-2014 [9,10].

There are several limitations regarding to WoS software and numbers are provided by IFSO in this study. The first is that WoS includes publications only indexed by SCI-E. It is not possible to evaluate other bariatric surgery related papers enclosed by other index systems and as the list is updated regularly, the numerical changes in results should be taken into consideration. Another handicap of WoS is the uncertainty of countries where papers originated from. Because of some studies are multicentric from different countries, these publications may be counted more than one time. Papers was not separated into WoS-categories, research areas, document types or languages in this study for the purpose of giving a general information instead of detailed and complicated one. The limitation of IFSO data is that it is mostly based on survey methodology for estimated numbers by countries' bariatric procedures, surgeons or centers instead of exact numbers due to their registry reports.

## Conclusion

We can roughly claim that global scientific productivity on bariatric surgery has not been increased in parallel increasing numbers of bariatric procedures and surgeons over the last decade. Publishing researches and experiences is the one of the most effective ways to resolve scientific controversial issues specially on developing medical areas as bariatric surgery. Our study should be a call that research efforts must be supported by governments or private institutions. Additionally, creating national registry systems is essential to collect more accurate data and improve the quality of researches.

## References


1. Bray GA. The Battle of the Bulge: A History of Obesity Research. Dorrance, Pittsburgh. 2007.
2. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014; 384: 766-781.
3. Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, et al. The global obesity pandemic: shaped by global drivers and local environments. Lancet. 2011; 378: 804-814.
4. Buchwald H, Oien DM. Metabolic/bariatric surgery worldwide 2011. Obes Surg. 2013; 23: 427-436.
5. Lomanto D, Lee WJ, Goel R, Lee JJ, Shabbir A, So JB, et al. Bariatric surgery in Asia in the last 5 years (2005-2009). Obes Surg. 2012; 22: 502-506.
6. Scopinaro N. The IFSO and obesity surgery throughout the world. Obes Surg. 1998; 8: 3–8.
7. Buchwald H, Williams SE. Bariatric surgery worldwide 2003. Obes Surg. 2004; 14: 1157–1164.
8. Buchwald H, Oien DM. Metabolic/bariatric surgery worldwide 2008. Obes Surg. 2009; 19: 1605-1611.
9. Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric Surgery Worldwide 2013. Obes Surg. 2015; 25: 1822-1832.
10. First IFSO Global Registry Report. International federation for the surgery of obesity and metabolic disorders. Dendrite Clinical Systems Ltd. 2014.
11. Garfield E. Citation analysis as a tool in journal evaluation. Science. 1972; 178: 471-479.
12. Garfield E. 100 citation classics from the Journal of the American Medical Association. JAMA. 1987; 257: 52-59.
13. Ahmad SS, Ahmad SS, Kohl S, Ahmad S, Ahmed AR. The hundred most cited articles in bariatric surgery. Obes Surg. 2015; 25: 900-909.
14. Bas K, Dayangac M, Yaprak O, Yuzer Y, Tokat Y. International collaboration of Turkey in liver transplantation research: a bibliometric analysis. Transplant Proc. 2011; 43: 3796-3801.
15. Bas KK, Gunay LM, Besim H. Turkey's evaluation in kidney transplantation research. Exp Clin Transplant. 2011; 9: 319-322.
16. Vioque J, Ramos JM, Navarrete-Muñoz EM, García-de-la-Hera M. A bibliometric study of scientific literature on obesity research in PubMed (1988-2007). Obes Rev. 2010; 11: 603-611.