

# A Bibliometric Analysis of PubMed-Published Jordanian Literature in the Twentieth Century

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## Abstract

**Aims:** To identify the quantitative and qualitative characteristics of research published by Jordanian institutions in the medical and paramedical fields in the twentieth century.

**Methods:** PubMed database was searched to identify relevant articles. Abstracts, full text, and or the 2003 Journal Citation Report were used to retrieve investigated characteristics.

**Results:** Jordanian medical institutions published 833 Pubmed-indexed articles in the twentieth century. Most of these articles (81%) were published in the last decade of the twentieth century.

Articles published in Pharmacology Journals represented the largest proportion among other disciplines (12%), followed by dental, general medicine, infectious diseases, and obstetric journals, respectively. 72% of the articles were published in journals with assigned impact factors. However, the bulk of these articles (60%) were published in journals with impact factors of only 2 or less.

It is worth nothing that only 16% of the published articles reflected experimental trials and only 3% were randomized and controlled, while 55% of the articles reflected observational studies.

Jordan University of Science and Technolgy (JUST) researchers produced 44% of the total while Jordan University researchers produced 34%. Inter-institutional collaborative research was minimal and was dominated by JUST and the Ministry of Health.

**Conclusion:** It is very clear that the Jordanian medical sciences research production has increased significantly in the last decade of the twentieth century. However, the quality of this research continues to be of low value. Efforts and resources are better directed toward multi-center, interventional, and more controlled research.

**Keywords:** Jordan, Medical Literature, Impact Factor, and Quality.

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## Introduction

Despite being a country with limited natural resources, Jordan had the lowest illiteracy rate

among “Economic and Social Commission for Western Asia” (ESCWA) member countries in 1999 and 2000 at 10.8% and 10.2%, respectively. In fact, the number of public and private

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universities in Jordan has increased from 17 in 1996 to 22 in 2007<sup>1</sup> ranking immediately after Egypt in Economic and Social Commission for Western Asia (ESCWA) region.

This surge of education institutions has reflected early on higher education expenditure which consumed 3.1 % of the Jordanian Gross Domestic Product in 1996, which was the highest among ESCWA countries.<sup>2</sup> In the same year, ESCWA ranked Jordan the seventh out of fourteen countries when research and development expenditure is calculated per Full-Time Equivalent researcher (FTE) and 10.2% of those researchers were involved in health-related research.<sup>3</sup>

Parallel to this, health-related schools in Jordan increased to four medical schools, two dental schools, five pharmacy schools, nine nursing schools, and four applied medical schools.

It is worldwide accepted that medical research is an important indicator of growth, development, and progress of countries. Bibliometric analysis, despite its known limitations, has grown significantly as an important tool to evaluate research in health sciences,<sup>4,5</sup> and we are using it in this study to evaluate the Jordanian medical research.

### **Aims**

In this study, we aimed to identify the research production of Jordanian institutions in the medical and paramedical fields in the twentieth century as it is represented by the published articles included in the electronic database PubMed.<sup>6</sup> Within this scope, several demographic, qualitative, and quantitative characteristics were investigated.

### **Methods**

#### ***Data Sources***

PubMed database was searched to identify articles related to our study. The search included articles published between January 1900 to December 1999 using text words that included

names of all universities; names of all major Jordanian cities; and names of university, public, private and military hospitals. No gender, language, subset, type of article, or age restrictions were applied.

#### ***Search Procedure***

Journals retrieved by searching Pubmed were first checked for Jordanian authenticity by cross-examining each article. Articles produced by Jordanians working in foreign institutes were excluded. The articles' institutional origin was assigned by searching the address of the first author of each article at the time of articles' submission. In cases of multi-center publications, all participating centers were considered originating institutions.

Selected articles were classified and stratified according to journals, number of authors, publication years, publication types, disciplines, originating institutions, impact factors (if available), and methodology. Publication types, disciplines, and methodology were assigned by cross-examining at least the abstracts of each article.

The report of 2003 was used to allow fair citation of articles published in the year 1999. The quality of research productivity was measured by the impact factor of the examined journals (if existing) for each published article. The 2003 Journal Citation Report (JCR) database of the Institute for Scientific Information was used for retrieving impact factors.<sup>7</sup>

Other used quality indicators were publication types (randomized versus other studies), and multi-center involvement. Research quantity was evaluated by examining the research proportions produced by different institutions and researchers.

Other examined demographic criteria were publication journals and years of publications.

## Results and Discussion

To the best of our knowledge, this is the first study that evaluates the Jordanian medical literature. In our study, we have investigated the quality and quantity of research published by medical Jordanian institutions in the twentieth century. Using the methodology described above, we managed to retrieve and categorize 833 articles that were published in the twentieth century (Table 1).

**Table (1): Distribution of published articles over the twentieth century.**

Period	Number (%)
1900-1959	0 (0)
1960-1969	1 (0)
1970-1979	5 (1)
1980-1989	154 (18)
1990-1999	673 (81)

The first article was published in 1960 in the journal "Acta Tuberc Scand" by Papanicolaou B. The title was: 'The Extra-sanatorial Drug Treatment of Pulmonary Tuberculosis in the Amman TB Centre, Jordan'. Eleven years elapsed till the second article was published in "J Neurosurg" by Hanieh A. It is very obvious and interesting to notice that there was an exponential increase in research quantity in the last decade of the twentieth century which accounted for 81% of all produced research. This scarcity of published literature before 1980 can be understood upon realization that the first medical school in Jordan was founded in 1971 (University of Jordan). Later, the first schools of nursing, pharmacy, and dentistry were founded in the years 1972, 1980, and 1984, respectively.

Articles published in Pharmacology Journals represented the largest proportion among other disciplines (12%), followed by dental, general medicine, infectious diseases, and obstetric journals, respectively (Table 2).

**Table (2): Distribution of published articles among different categories.**

Category	No. of articles (%)
Pharmacology	99 (12)
Dentistry	67 (8)
General Medicine	55 (7)
Infectious Diseases	54 (6)
Obstetrics	41 (5)
Veterinary	37 (4)
Surgery	32 (4)
Pediatrics	28 (3)
Microbiology	22 (3)
Urology	22 (3)
Health	21 (3)
Biology	20 (2)
Biomedical	20 (2)
Others	315 (38)
Total	833 (100)

If summed together, articles published in infectious diseases and microbiology journals would rank second (9%), and this is expected in a developing country where descriptive studies are predominant and infectious diseases are still endemic.

Parallel to the above-mentioned findings, four pharmacology journals ranked among the top twenty publishing journals. The highest publishing journals were *J Clin Pharm Ther* (3%), followed by "*J Prosthet Dent*", "*Ann Saudi Med*", and "*Ann Trop Med Parasitol*", respectively (Table 3).

However, four of these top 20 journals have no assigned impact factors, and only 6 have impact factors above one.

### Research Quality

Of the 833 retrieved articles, 596 (72%) were published in journals assigned impact factors which shows that Jordanian authors prefer to publish their manuscripts in a peer-reviewed and indexed journals (Table 4).

However, analysis of impact factors distribution showed that only 12 articles (1%) were published in journals with impact factors equal to or higher than 4, and only 42 articles (5%) were published

in journals with impact factors equal to or higher than 3. The bulk of articles (60%) were published in journals with impact factors of only 2 or less. The analyzed 833 articles were published in 373 journals and out of these 296 (79%) have assigned impact factors according to 2003 JCR (Table 4).

**Table (3): Distribution of articles among different journals.**

<b>Journal</b>	<b>Number</b>	<b>Impact Factor</b>
<i>J Clin Pharm Ther.</i>	23	1.157
<i>J Prosthet Dent.</i>	19	0.527
<i>Ann Saudi Med</i>	17	0.124
<i>Ann Trop Med Parasitol</i>	16	1.01
<i>Middle East J Anesthesiol.</i>	15	Not assigned
<i>J Ethnopharmacol</i>	15	1.269
<i>J Trop Pediatr</i>	15	0.514
<i>Ann Trop Paediatr.</i>	14	0.704
<i>Gen Pharmacol</i>	10	Not assigned
<i>Int J Clin Pharmacol Ther Toxicol</i>	10	0.923
<i>Trop Geogr Med.</i>	10	0.31
<i>Aviat Space Environ Med.</i>	9	0.946
<i>East Mediterr Health J.</i>	9	Not assigned
<i>Oral Surg Oral Med Oral Pathol Oral Radiol Endod.</i>	9	1.242
<i>J Obstet Gynaecol</i>	8	Not assigned
<i>Mutat Res.</i>	8	3.277
<i>Quintessence Int.</i>	7	0.572
<i>Clin Dermatol.</i>	6	0.647
<i>Cytobios.</i>	6	0.486
<i>Eur J Pediatr</i>	6	1.157
<i>J Laryngol Otol</i>	6	0.528
<i>Others</i>	595	-----
<i>Total</i>	833	-----

**Table (4): Distribution of published articles according to impact factors of publishing journals.**

<b>Impact Factor (IF)</b>	<b>No. (%)</b>
0 - <1	255 (31)
1 - <2	242 (29)
2 - <3	57 (7)
3 - <4	30 (4)
≥4	12 (1)
No Assigned IF	237 (28)
<i>Total</i>	833 (100)

The average number of authors was 2.8 authors per article and almost half of the articles have at most two authors. Again, this trend points to the descriptive pattern of published literatures which does not require relatively a high number of authors.

It has been noticed that only 16% of the published articles were clinical (or experimental)

trials and only 3% were randomized and controlled. Actually, 55% of the articles reflected observational studies and 14% were just case reports (Table 5).

**Table (5): Distribution of published articles according to methodology.**

<b>Study type</b>	<b>No. (%)</b>
<i>Observational</i>	461 (55)
<i>Clinical (Experimental) trials</i>	135 (16)
<i>Controlled and or randomized</i>	26 (3)
<i>Non-controlled and non-randomized</i>	109 (13)
<i>Case Report</i>	113 (14)
<i>Comparative Study</i>	91 (11)
<i>Review</i>	20 (2)
<i>Congress proceedings</i>	4 (<1)
<i>Letter</i>	3 (<1)
<i>Historical Articles</i>	3 (<1)
<i>Multicenter Study</i>	2 (<1)
<i>Meta-Analysis</i>	1 (<1)

Comparison of the productivity of several Jordanian institutions revealed that Jordan University of Science and Technology (JUST) researchers produced 44% of the total, while the University of Jordan researchers produced 34% despite being an older and more established university (Table 6). This relative high productivity of JUST researchers can be explained, in part, by the unique inter-institutional cooperation that JUST has established with other government and military medical institutes in North Jordan. This has resulted in tremendous opportunities of collaborative research. Indeed, we identified 16 articles that reflect collaborative research and JUST researchers were involved in 14 of these.

On the other hand, the relative contribution of researchers from the Military Medical Services and the Ministry of Health were 4% each. The Royal Scientific Society contributed only by one article.

Several limitations would apply to our study. One of these is the database used to retrieve articles (PubMed). This database retrieves articles from mostly English-language journals. Also, Pubmed does not represent all scientific and biomedical journals. Using impact factor as a quality indicator could be a limitation by itself as discussed in other articles.<sup>8,9</sup>

**Table (6): Distribution of published articles according to originating institutions.**

<i>Publishing Institutions</i>	<i>No. of articles</i>	<i>(%)</i>
<i>Jordan University of Science and Technology</i>	367	44
<i>University of Jordan</i>	284	34
<i>Yarmouk University</i>	64	8
<i>Royal Medical Services</i>	35	4
<i>Ministry of Health</i>	30	4
<i>Private Health Centers</i>	26	3
<i>All other Universities</i>	17	2
<i>National Center for Diabetes</i>	5	1
<i>United Nation agencies</i>	4	<1
<i>Royal Scientific Society</i>	1	<1

## Conclusions

Jordanian medical institutions published 833 Pubmed-indexed articles in the twentieth century. Most of these articles (81%) were published in the last decade of the twentieth century.

Articles published in Pharmacology Journals represented the largest proportion among other disciplines (12%), followed by dental, general medicine, infectious diseases, and obstetric journals, respectively. Parallel to this, four pharmacology journals ranked among the top ten publishing journals.

Of the 833 retrieved articles, 596 (72%) have assigned impact factors. However, analysis of impact factors distribution showed that the bulk of articles (60%) was published in journals with

impact factors of only 2 or less.

It has been noticed that only 16% of the published articles reflected experimental trials and only 3% were randomized and controlled. Actually, 55% of the articles reflected observational studies and 14% were just case reports.

Jordan University of Science and Technology (JUST) researchers produced 44% of the total, while the University of Jordan researchers produced 34%. Inter-institutional collaborative research was minimal and was dominated by JUST and the Ministry of Health.

It is very clear that the Jordanian medical sciences research production has increased significantly in the last decade of the twentieth

century. However, the quality of this research continues to be of low value. Efforts and resources are better directed toward multi-center, interventional, less descriptive, and more controlled research.

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## دراسة تحليلية لمقالات العلوم الطبية الأردنية المنشورة والمفهرسة في قاعدة بيانات "المكتبة الطبية الوطنية الأمريكية" خلال القرن العشرين

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### الملخص

**الأهداف:** يستهدف هذا البحث دراسة الصفات الكمية والنوعية لمقالات العلوم الطبية المنشورة من باحثين في المؤسسات الطبية الأردنية خلال القرن العشرين.

**تصميم الدراسة:** تمت الدراسة من خلال البحث في قاعدة بيانات "المكتبة الوطنية الطبية الأمريكية {ببميد}" لتحديد المقالات المستهدفة، وتم بعد ذلك مراجعة ملخصات المقالات أو النصوص الكاملة لها بالإضافة الى دراسة "تقرير اشهاد المجالات" للعام 2003 بقصد استخلاص الخصائص المبتغى دراستها.

**النتائج:** خلال القرن العشرين، نشرت المؤسسات الطبية الأردنية 833 مقالا مفهرسا في قاعدة البيانات المرجعية، ولوحظ أن غالبية المقالات (81%) تم نشرها في العقد الأخير من القرن العشرين. وبينت الدراسة أن المقالات المنشورة في مجالات علم الأدوية قد حلت في المرتبة الأولى (12%) متبوعة بمجالات علوم طب الأسنان، الطب العام، الأمراض المعدية، وأمراض النسائية بالترتيب.

وأظهرت الدراسة أيضا أن (72%) من المقالات قد نشرت في مجالات علمية مصنفة لها "معامل تأثير" معروف، ولكن الدراسة أظهرت أيضا أن غالبية هذه المقالات (60%) قد نشرت في مجالات ذات "معامل تأثير" أقل أو معادل ل (2).

وقد لاحظت الدراسة أيضا أن (16%) فقط من المقالات عكست دراسات تجريبية أو تداخلية و(3%) فقط دراسات مضبوطة، بينما عكست معظم المقالات الأخرى (55%) دراسات وصفية. كما أظهرت الدراسة أن الباحثين في "جامعة العلوم والتكنولوجيا الأردنية" قد نشروا (44%) من مجموع المقالات بينما نشر الباحثون من "الجامعة الأردنية" (34%) من مجموع المقالات العلمية المنشورة. ومن ناحية أخرى فقد كانت الدراسات المشتركة بين المؤسسات المختلفة نادرة وكان جلها لباحثين من "جامعة العلوم والتكنولوجيا الأردنية" واخرين من "مستشفيات وزارة الصحة" في شمال الأردن.

**الخلاصة:** تظهر هذه الدراسة بشكل واضح تزايد انتاج المقالات في العلوم الطبية في الأردن في العقد الأخير من القرن العشرين، ومع ذلك فان نوعية هذا الانتاج تبقى ذات قيمة علمية منخفضة، ويوصي الباحثون بتوجيه الجهود والموارد للدراسات متعددة المراكز ذات الصبغة التحريبية والتداخلية والمصممة بطرائق مضبوطة.

**الكلمات الدالة:** الصفات الكمية والنوعية، مقالات العلوم الطبية، المكتبة الوطنية الأمريكية، قاعدة البيانات.