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STATISTICAL ANALYSIS OF THE TOP 2% CITED SCIENTISTS FROM THE MIDDLE EAST

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Abstract

Elsevier BV has issued the annual datasets for 'Updated science-wide author databases of standardized citation metrics' in October 2022. The two datasets contain the top two percent of the most-cited scientists worldwide in various disciplines under two categories, "career-long" and for "single recent year impact" respectively. The statistics for the countries from the Middle East are presented. We also present a detailed statistical analysis covering factors such as the gross domestic product, expenditure on research & development considering the population of the countries with the required scaling.

Keywords and Phrases: Top 2% Scientists; Elsevier-Stanford Lists; Statistical Analysis, Middle East, Statistical Analysis, Datasets.

1 Introduction

In this article, we did a statistical analysis of the annual data-update for "Updated science-wide author databases of standardized citation indicators", published by Elsevier BV. Since 2019, John P. A. Ioannidis and collaborators from the Stanford University, Stanford, USA have been compiling a publicly available database of top-cited scientists that provides standardized information on citations, h-index, co-authorship adjusted hm-index, citations to papers in different authorship positions and a composite indicator (c-score) [1-3]. There are two distinct categories of datasets for "career-long" and for "single recent year impact" respectively. The two datasets cover metrics with and without self-citations and ratio of citations to citing papers. Scientists are classified into 22 scientific fields and 176 sub-fields. Both the datasets contain field- and subfield-specific percentiles for all scientists, who have published at least five papers. The selection is based on the top 100,000 by a composite c-score (with and without self-citations) or a percentile rank of 2% or above in the sub-fields. Hence, the top two percent scientists. The two lists are frequently referred to as the "Stanford Lists of Top 2% Scientists" as the compilation is done at Stanford University! The data used in arriving at these two lists are based on the reputed database,

Scopus run by Elsevier Publishing Group, Netherland. Scopus data are provided through ICSR Lab (International Center for the Study of Research, https://www.elsevier.com/icsr/icsrlab), which is a cloud-based computational platform, which enables the analysis of large structured datasets. The single year list is for the citations received in the year 2021 alone. Using the aforementioned criteria, the career-long dataset has 195,605 scientists and the single recent year dataset has 200,409 scientists [3]. The most recent version of the database, version 5, is based on the Scopus snapshot taken in November 2022, which has been updated to reflect the conclusion of the citation year 2021. This gives enough times to authors to have their Scopus profiles updated at the time of the comprehensive analysis. So, no author can claim to be affected by delays in indexing in Scopus by the publishers [4].

Taken together, the Single Year list and Career list reflect on the standing of individual scientists, their institutions and the countries at large. In this article, we present the data for the countries from the Middle East.

2 Data and Analysis

For the sake of nomenclature, we shall call the candidates listed in either of the 2% lists as 'stars' without going into their further classification. In Ref. [5], the stars are classified into three classes depending on being present in one or both the 2% lists. The number of stars for each country in the Middle Eastern countries was carefully curated/extracted from the Excel spreadsheets from the Elsevier dataset [3]. A total of 12,225 scientists from 16 Middle Eastern countries appear in the list of the to 2% of scientists worldwide [3]. This set of data is presented in Table-1. This table also contains the interrelated statistical data for each country, namely, population, number of researchers (per million inhabitants), number of publications (per million inhabitants), expenditure on research and development (R&D) stated as percentage of gross domestic product (GDP). The statistical data is exclusively based on the datasets generously provided by UNESCO through its website and freely available reports [6-7]. The last column in this table shows the number of scientists in the 2% lists per million inhabitants. This figure was obtained by scaling the total number of stars present in both the lists to the population of the corresponding country. The average number of scientists in the 2% lists per million inhabitants is 27 for the 16 Middle Eastern Countries. The global figures are 396,014 stars for a population of 7,837 million, which corresponds to 51 scientists in the 2% lists per million inhabitants.

3 Concluding Remarks

The Middle Eastern countries need to strengthen their scientific base. This requires scientific institutions and universities with active research programmes on a larger scale [8-9]. The path to achieving this status requires a generous government patronage and sufficient allocation in accordance with the standards followed by the 'developed countries'. The minimum standards are 5% of the GDP on health, 5% of the GDP for basic education, 2-3% of the GDP for research and development (R&D). The expenditure on the research pertaining to defence is in addition to this.

Over half the Middle Eastern countries are meeting the norms on education and health in terms of expenditure. As for the R&D, the Middle Eastern countries are short of the standard of 2-3% of the GDP [8-10]. It is time for the region of Middle East to enhance international collaborations and operate jointly built international institutions as is the case in the post-world war II Europe [10-12]. During the Golden Age of Science in Islam (eighth to thirteenth centuries CE) the Arab scholars made the highest contributions to the sciences then known [13].

S. No.	Country	Population (in millions) Year 2020	Researchers (per million Inhabitants) Year 2018	Scientific Publications (per million inhabitants) Year 2019	Expenditure on R&D (% of GDP) Year 2018	2% Lists			Number of 2% Scientists (per million Inhabitants)
						Single Year	Career Long	Total	
1	Bahrain	1.702	369	416	0.10	19	10	29	17
2	Egypt	102.334	687	231	0.72	680	358	1038	10
3	Iran	83.993	1475	730	0.83	1870	715	2585	31
4	Iraq	40.222	111	291	0.04	107	22	129	3
5	Israel	8.656	5243	2192	4.94	1493	1932	3425	396
6	Jordan	10.203	596	432	0.71	118	67	185	18
7	Kuwait	4.271	514	467	0.06	59	67	126	30
8	Lebanon	6.825	--	483	--	66	53	119	17
9	Oman	5.107	281	383	0.22	78	42	120	23
10	Palestine	5.101	575	163	0.49	24	11	35	7

11	Qatar	2.881	577	1320	0.51	200	119	319	111
12	Saudi Arabia	34.814	--	736	0.82	1013	480	1493	43
13	Syria	17.501	91	30	0.02	4	1	5	0.29
14	Turkey	84.339	1380	518	0.96	1202	897	2099	25
15	United Arab Emirates	9.890	2379	737	1.30	321	189	510	52
16	Yemen	29.826	--	21	--	7	1	8	0.27
	Middle East	**447.665**	**1065**	**470**	**0.98**	**7,261**	**4,964**	**12,225**	**27**
	World	**7,837**	**1,368**	**341**	**1.79**	**200,409**	**195,605**	**396,014**	**51**

Table 1. Statistical Data: Source: UNESCO Science Reports [6, 7].

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