Original Article

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Nutrigenomics Research during 1999-2018: A Scientometric Analysis

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Abstract

The study examines the Scientometric analysis of Nutrigenomicsresearch during the year 1999 to 2018. *Nutrigenomics* is a branch of nutritional genomics and is the study of the effects of foods and food constituents on gene expression.In order to carry out the research, the related data were downloaded from "Web of Science" database. The Scientometric analysis was applied to investigate and fulfill the objectives. It is found that 1060 records related to Nutrigenomics or Nutritional genomics in "Web of Science' was appeared during the periods. It is found that the author "Ordovas JM" and the country "United States" have produced the majority of records.

Keywords: Nutrigenomics; Nutritional Genomics; Scientometric; Web of Science.

Introduction

Nutrigenomics is an emerging science which investigates a certain area of nutrition that uses molecular tools to search, access and understand the several responses obtained through a certain diet applied between individual and population groups. As genetic science moves forward with lightning-fast speed, researchers have begun to understand that while certain individuals have genetic predispositions to developing certain diseases, the diseases may not actually occur. Why do some genetically-predisposed people get sick, while others do not? In many cases, some component of diet triggers, enhances, or suppresses certain gene interactions. Some dietary factors lead to increased protection from disease in susceptible individuals, while other dietary factors lead to increased risk of disease. The study of these gene-diet interactions forms the emerging science we call "nutritional genomics." This exciting field is poised to become the future of dietetics.

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Review of Literature

Research output in diabetes during 1999-2008 on several parameters including its growth, rank and global publications share, citation impact, overall share of international collaborative papers, and share of major collaborative partners. It also analyses the characteristics of most productive institutions, authors, and highly-cited papers. The publications output, impact and collaborative publication share of India is also compared with China, South Korea and Brazil [1]. Relative growth rate (RGR) was found to be fluctuating trend during the study period. The doubling time (DT) was found to be increased and decreased trend in this study. Degree of collaboration and its' mean value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, NationalCheng King University, and Anna University [2]. A total of 2360 articles were downloaded from Pubmed database using the search term" Swine*" subjected to bibliometric data analysis techniques. Findings-A number of research questions pertaining to publication frequency, country, and institution productivity and collaborative were proposed and answered. Analysis shows that majority of the scientists preferred to publish research papers in multiple authorship. It also analyses the characteristics of most productive institutions, languages and journals [3]. This bibliometric study was made using the data retrieved from the Web of

Science (WoS) through the filter of the category in Cryptography as a subject search. A total number of 6610 records which were retrieved from the Web of Science was used to assess the academic productivity and distribution of research diversity of ryptography field from four major countries-China, USA, Taiwan and Japan which contributed more papers in cryptography and allied field of researches. The highest RGR is 0.44 in 2002 and Dt is 21.656 in 2008 measured during the period [4].

Relative Growth Rate (RGR) was found to be fluctuating trend during the study period. The Doubling time (Dt) was found to be increased and decreased trend in this study. Degree of collaboration and its means value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, NationalCheng King University and Anna University [5]. The average number of papers published per year was 910.75 during the period.

The highest numbers of papers were published above thousand during the years 2009 to 2011. It is observed RGR has been increased and decreased from 2005 (0.113)to 2011 (0.057). On the other view of doubling time (D t) has fluctuating trend from 2005 (6.132). Relative Growth Rate (RGR) was found to be a decreasing trend between 2005 and 2007 the decreasing trend between 2008 and 2011 shown during the period of study. The Doubling Time (D t) has shown as fluctuating trend during the period of study [6]. Relative Growth Rate (RGR) and Doubling Time (Dt) were found to be an increasing and decreasing trend shown during the period of study. The paper reveals a study of the authorship pattern and collaborative research in the field of Cardiology. The study measures the performance based on several parameters, country annual growth rate and collaborative index [7].

The result determines the 93.02 percent of papers were published in articles, Also it reveals from the study 2.28 percent of papers contributed by Hanaoka, F. It has been found high number of papers was collaborated with United States researchers in the field of Human DNA. The study measures the performance based on several parameters, country year-wise growth rate, authorship pattern, collaborative index, collaborative coefficient, leading collaborative countries and authors have contributed publications in Human DNA research [8]. Relative Growth Rate and Doubling Time of the publications value measured from 0.03 in 2010 and 2011 to 0.087 in 1985; from 0.80 in 1985 to 23.10 in 2010 and 2011 respectively found in this study. Among the document types, journal articles were the highest numbers with 7210 papers or 99.26%. From this study, it is observed that the Journal of Biological Chemistry has published with 529 research papers and find top position which is accounted for 7.28% of the total articles [9]. There was a sudden increase noticed in 2002, 2009, and 2012 while a declining trend was observed in 1996, 2003, and 2013. The calculated values of Maximum Likelihood Estimator, n and k are 0.24, 2.66 and 0.78 respectively. The CV at 0.05 significant level for 29 degrees of freedom is 42.56 and the calculated value of Chi-Square ($\chi 2$) obtained in this case is 5309.368. After words, the performance of researchers started diminishing. It was supported by SPI that ranges between 9 and 10 only [10].

Objective of the Study

The major objectives of the present study are

1. To observe the year-wise and author wise Publications.
2. To analyse RGR and Dt of the publications.
3. To examine the publication where appeared in n various languages.
4. To observe highest author productivity and country wise publications.
5. To find the highest productivity of the institutions and Journals.

Methodology

The Scientometric analysis was used in this study to investigate publications related to "Nutrigenomics" that have been indexed by Web of Science only during the years 1999-2018. In order to satisfy the objectives, the data were collected from the Web of Science database during the month of Feb 2018. Hist Cite software was used to extract the data from the database and to analysis the data for the study.

Data Analysis and Findings

Year wise Distribution of Publications

A total of 1060 Nutrigenomics records were published in given period of study (1999 to 2018). It is found from Table 2 that most number of Publications 110 (10.4%) were produced in the year 2008. It is followed by 91 (8.6%) in 2013 and 90 (8.5 %) were produced in the year 2010. It is further found that less number of only 1 (0.1 %) publications

was produced in the year 1999 and there were no publication in the year 2002 and there were 2 (0.2%) for which the Publication year is unknown is exhibits in Figure 1.

RGR and Doubling time of the Publications

It analysed that Table 2. Relative Growth rate and Doubling time of the publication of Nutrigenomics during 1999 to 2018. It is found that highest RGR was 2.068 in 2018 and lowest RGR was 0.22 in 2010. On other hand, Dt is observed that highest to be found 1.088 in 2003 and lowest Dt was 0.031 in 2010. It could be found that the overall RGR and Dt are 10.974 and 12.754. (Figure 1).

Distribution of Publication by Author

The study was analyzed the publications of first ten authors of Nutrigenomics research which are indexed in "Web of Science" database in the given period and same is shown in Table 3. It is found from table 2 that the majority of publications is contributed by Ordovas JM, 30 (2.8%) produced by the first author during the period and the second position is by El-Sohemy A, 27 (2.5%), and the third position is by Kalput J, 24 (2.3%) and in the tenth Mutch DM with 13 paper contribution (1.2%).

Distribution of Publications by Language

The study is analyzed to find out the number of

Table 1: Year wise Distribution of Publications

S. No	Publication Year	Records	Percentage
1	1999	1	0.1
2	2001	5	0.5
3	2002	8	0.8
4	2003	17	1.6
5	2004	32	3
6	2005	45	4.2
7	2006	60	5.7
8	2007	88	8.3
9	2008	110	10.4
10	2009	88	8.3
11	2010	90	8.5
12	2011	57	5.4
13	2012	74	7
14	2013	91	8.6
15	2014	72	6.8
16	2015	53	5
17	2016	69	6.5
18	2017	87	8.2
19	2018	11	1
20	Unknown	2	0.2
	Total	1060	

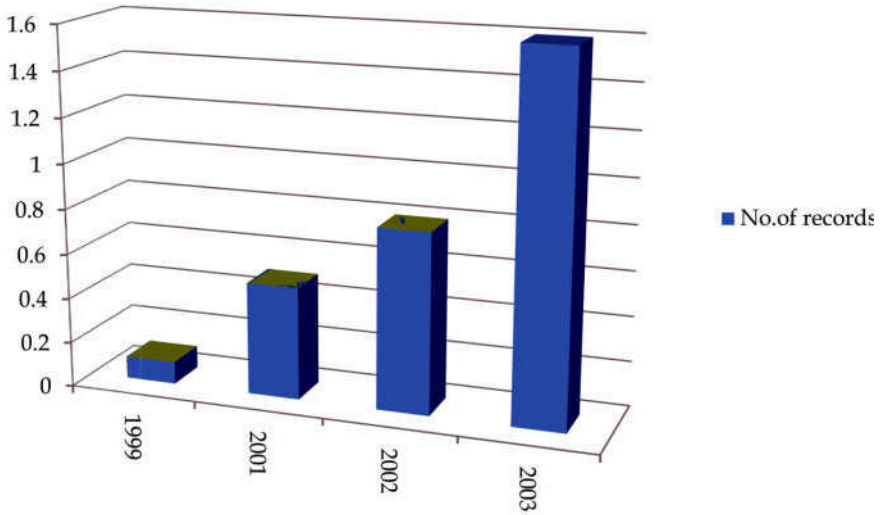

Fig. 1: Year wise Distribution of Publications

Table 2: RGR and Doubling time of the Publications

Publication Year	Records	%	W1	W2	RGR	Dt
1999	1	0.1	0	0	**0**	0
2001	5	0.5	0	1.609	1.609	2.321
2002	8	0.8	1.609	2.079	0.473	0.682
2003	17	1.6	2.079	2.833	0.754	1.088
2004	32	3	2.833	3.465	0.632	0.911
2005	45	4.2	3.465	3.806	0.341	0.492
2006	60	5.7	3.806	4.094	0.288	0.070
2007	88	8.3	4.094	4.477	0.679	0.979
2008	110	10.4	4.477	4.700	0.223	0.321
2009	88	8.3	4.700	4.477	0.223	0.321
2010	90	8.5	4.477	4.499	0.022	0.031
2011	57	5.4	4.499	4.043	0.456	0.658
2012	74	7	4.043	4.304	0.261	0.376
2013	91	8.6	4.304	4.510	0.206	0.297
2014	72	6.8	4.510	4.276	0.234	0.337
2015	53	5	4.276	3.970	0.306	0.441
2016	69	6.5	3.970	4.234	0.264	0.380
2017	87	8.2	4.234	4.465	0.231	0.333
2018	11	1	4.465	2.397	2.068	0.258
Unknown	2	0.2	2.397	0.693	1.704	2.458
Total	**1060**				**10.974**	**12.754**

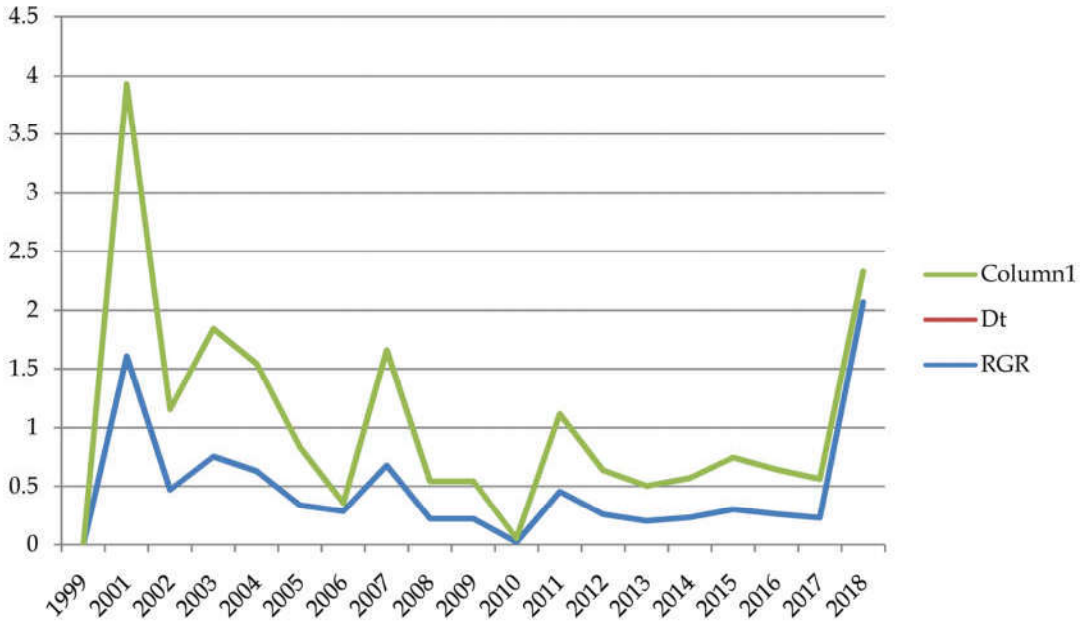

Fig. 2: RGR and Doubling time of the Publication

Table 3: Distribution of Publication by Author

S. No	Author	Records	Percentage
1	Ordovas JM	30	2.8
2	El-Sohemy A	27	2.5
3	Kaput J	24	2.3
4	van Ommen B	23	2.2
5	Muller M	21	2
6	Ferguson LR	20	1.9
7	Fenech M	19	1.8
8	Martinez JA	17	1.6
9	Milner JA	13	1.2
10	Mutch DM	13	1.2

publications produced in various languages and the same is given in Table 4.

It is found from table 3 that most number of the publications 1036 (97.7%) were produced in English language. It is further observed that only 8 (0.8%) of publications were published in Spanish and 4 (0.4%) of publication was produced in German. Portuguese language has published only 3 publications (0.3%) and Duch, Polish and slovene has got 2 (0.2%) publications each. French, Hungarian, Serbian published single record (0.1%) in their respective language.

Source-wise Publications of the Documents

The Table 4 provides the distribution of publication on nutrigenomics research by document types. It is clearly noticed from the table that the major source of publication in nutrigenomics research comes in the form of articles with 485 records (45.8 %), followed by review 264 (24.9%) and the third 109 (10.7%) Article: Proceeding paper and the leased document type are Article; Early Access, Article; Retracted and Review; Early Access (0.1%).

Table 4: Distribution of Publications by Language

S. No	Language	Records	Percentage
1	English	1036	97.7
2	Spanish	8	0.8
3	German	4	0.4
4	Portuguese	3	0.3
5	Dutch	2	0.2
6	Polish	2	0.2
7	Slovene	2	0.2
8	French	1	0.1
9	Hungarian	1	0.1
10	Serbian	1	0.1
	Total	1060	

Table 5: Source-wise Publications of the Documents

S. No	Sources	Records	Percentage
1	Article	485	45.8
2	Review	264	24.9
3	Article; Proceedings Paper	109	10.3
4	Meeting Abstract	90	8.5
5	Editorial Material	76	7.2
6	Review; Book Chapter	19	1.8
7	Article; Book Chapter	4	0.4
8	Correction	4	0.4
9	Letter	3	0.3
10	News Item	3	0.3
11	Article; Early Access	1	0.1
12	Article; Retracted Publication	1	0.1
13	Review; Early Access	1	0.1
	Total	1060	

Table 6: Distribution of the Journal wise Publications

S. No	Journals	Records	Percentage
1	Journal of Nutrigenetics and Nutrigenomics	67	6.3
2	Genes and Nutrition	51	4.8
3	British Journal of Nutrition	33	3.1
4	OMICS-A Journal of Integrative Biology	32	3
5	Annals of Nutrition and Metabolish	26	2.5
6	Journal of Nutrition	24	2.3
7	Molecular Nutrition and Food Research	23	2.2
8	Journal of the American dietetic Association	20	1.9
9	American Journal of clinical Nutrition	18	1.7
10	Nutrients	18	1.7

Distribution of the Journal wise Publications

The publication on "Nutrigenomics" in the journals is analyzed and the same is given in Table 6.It is found from Table 5 that "Journal of Nutrigenetics and Nutrigenomics" has published more number of Publications 67 (6.3%), followed by "Genes and Nutrition" published 51 (4.8%).

It is further found that 33 (3.1%) publications related to "Nutrigenomics" have been published in "British Journal of Nutrition". It is also showed that 18 (1.7%) of publications have been published in both journals "American Journal of clinical Nutrition" and "Nutrients".

Country wise Publications

This study is also focused to analyze the number of publications produced on "Nutrigenomics" by country wise and the same is given in Table 6. It is found from table 7 that USA has produced majority 297 (28 %) of publications on "Nutrigenomics", followed by UK 114 (10.8 %) and Netherland has produced 104 (9.8 %) and Australia is in 10th place on number of publication of about 45 (4.2%) in the table.

Institutions-Wise Publications

Table 8 observed that institutions wise productivity of "Nutrigenomics among the global level institutions. It can be seen that there are ten institutions ranked and one among top institution is identified that Wageningen University (37) 3.5% of the publications. It followed by Tufts University (3.2) University Toronto (3) University Calif Davis (2.9) Maastricht University (2.5) INRA NCI (2.2) University Wageningen & Research Centre University (2.2) and Wageningen & Research Centre (2.1%) of the Publications were brought out by the Institutions.

Conclusion

The present study is to highlight the research productivity in Nutrigenomics. A total of 1060 publications werepublished during the year 1999-2018. Maximum research output were found in the year 2008. The study revealed that United States is a significant country dominating in the Research and Development of Nutrigenomics research.

Nutrigenomics is the main keyword used by the researcher. In terms of source journal and language, maximum articles related to nutrigenomics literature were pulished in English language and most prolific journal is Journal of Nutrigenetics and nutrigenomics. Related to physical forms of Publications, Article constitute 47.78%, followed by Journals (42.33%). This type of study are the helping tool to analyse the emerging research areas to bridge the gap in future.

Table 7: Country wise publications

S. No	Country	Records	Percentage
1	USA	297	28
2	UK	114	10.8
3	Netherlands	104	9.8
4	Canada	101	9.5
5	Spain	93	8.8
6	Unknown	74	7
7	Italy	63	5.9
8	France	53	5
9	Germany	49	4.6
10	Australia	45	4.2

Table 8: Institutions-wise publications

S. No	Institution	Records	Percentage
1	Unknown	44	4.2
2	Wageningen University	37	3.5
3	Tufts University	34	3.2
4	University Toronto	32	3
5	University Calif Davis	31	2.9
6	Maastricht University	27	2.5
7	INRA	23	2.2
8	NCI	23	2.2
9	University Wageningen& Research Centre	23	2.2
10	Nestle Research Centre	22	2.1

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