Available online at www.medicinescience.org

ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2023;12(4):1145-53

A new approach to biochemistry: Bibliometric and altmetric analyses in the ketogenic diet

Busra Yusufoglu[1], Gokay Vardar[2], Gozde Sultan Kaya[3], Huseyin Cahit Yalcin[4]

[1]Gottfried Wilhelm Leibniz University, Institute of Food Science and Human Nutrition, Department of Food Development and Food Quality, Hanover, Germany
[2]İstanbul Health and Technology University, Vocational School of Health Services Faculty, Department of Medical Laboratory Techniques, İstanbul, Türkiye
[3]İstanbul Health and Technology University, Faculty of Health Sciences, Nutrition and Dietetic Department, İstanbul, Türkiye
[4]Gaziantep Islam Science and Technology University, Faculty of Medicine, Department of General Surgery, Gaziantep, Türkiye

Received 20 August 2023; Accepted 26 September 2023
Available online 09.10.2023 with doi: 10.5455/medscience.2023.07.108

Abstract

Recently, as doctors and researchers investigate into to the possible benefits of daily diets, ketogenic diets (KD) have started to gain popularity. As the growing up popularity of KD in social media, researchers had the chance to show their academic studies to the public more easily. Therefore, in this study, KD is discussed in terms of the recently popular "altmetric analysis" by scientists. The aim of study is to highlight the role of the ketogenic diet, figure out the mechanism of ketone bodies and the pivotal role of altmetric studies in health sciences. In order to investigate the novel aspects of the top 100 (T100) most cited scientific research paper in academia, 100 most discussed research paper was selected on social media platforms about KD from 1992 to 2019 and it was compared in terms of bibliometrics in web of science and in terms of social media impact in altmetric.com. While the total citations of the top 100 articles ranged from 143–109, altmetric values of T100 are 0–1269. According to the top social media platforms where the articles are mentioned, Twitter, Facebook, and Patent are the most popular social media platforms, respectively. It was not always coherent how altmetric data related to traditional bibliometric analysis. Thus, it might be suggested that bibliometric and altmetric assessments be viewed as complementary to one another. And by far the most important result of this study is that the articles with the highest citation may not receive much attention on social media due to their subject content.

Keywords: Ketogenic diet, altmetric score, Web of Science, bibliometric analysis, social media

Introduction

Despite increasing advancements in medicine, obesity continues to be a major hazard to world health, with adult mortality approaching 2.8 million per year. Obesity is closely linked to the majority of chronic diseases like diabetes, hypertension, and heart disease. Obesity is often the result of a sedentary lifestyle and poor eating habits. [1]. There are therefore numerous diets that can aid in reducing the emergence or unfavorable development of symptoms. One of these potential diets is the ketogenic diet (KD), and there is presently a lot of data to support its use in treating or preventing the symptoms of obesity and comorbidities. Overall, the majority of research has demonstrated that KD has a considerable impact on weight loss. There are no major side effects, but some results such as %8.95 Body Mass Index (BMI), glucose levels at 70%, insulin levels at 70%, Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) at 80%, haemoglobin A1c (HbA1c) at 100%, total cholesterol at 66% triglyceride (TG), 86% aspartat transaminaz (AST), and Alanin Aminotransferaz (ALT) at 60% The KD, a high fat, low carbohydrate, and non-caloric restrictive diet, is a popular weight loss intervention, but its beneficial effects are controversial. KD has been used in the treatment of refractory epilepsy; however, it became widely popular, and more and more authors are now interested in KD's beneficial effects in obesity treatment [2]. The

CITATION
Yusufoglu B, Vardar G, Kaya GS, Yalcin HC. A new approach to biochemistry: Bibliometric and altmetric analyses in the ketogenic diet. Med Science. 2023;12(4):1145-53.

Corresponding Author: Gokay Vardar, İstanbul Health and Technology University, Vocational School of Health Services Faculty, Department of Medical Laboratory Techniques, İstanbul, Türkiye
Email: vardargokay@gmail.com

DOI: 10.5455/medscience.2023.07.108

possible benefits of extremely low-carb diets have drawn a lot of attention in recent years. It has been proposed that KD can help promote weight loss and enhance health outcomes in 540 a variety of illnesses, such as diabetes and cardiovascular disease. (CVD) [3].

The KD is named after the discovery that people following this diet produce ketone molecules such as acetoacetate, b-hydroxybutyrate, and acetone. The two main ketones released are acetoacetate and b-hydroxybutyrate. Acetoacetate's metabolite, acetone, is the other primary ketone that patients on the ketogenic diet experience an increase in. According to certain theories, these compounds help the body's anti-convulsant and anti-epileptic properties. [4]. In a study investigating the relationship between a ketogenic diet and diabetes, when the ketone bodies of diabetic, non-diabetic and control volunteers were compared, the amount of ketone bodies in diabetic volunteers was found to be high and the levels of ketone bodies were controlled with KD. [5]. Additionally, multiple studies have shown that a KD impacts a variety of physiological functions, including the immune system, neurological system, and circadian clock. [6].

The current study is aimed at gathering every relevant study utilizing KD for treatment of metabolic disease in order to identify its benefits and evaluate the relationship between altmetrics and other characteristics of published trials. Nowadays, bibliometric assessment is frequently used by academicians and researchers in different disciplines to identify impactful studies in their research area [7].

There are various approaches to assessing a research article's impact. The classic bibliometric indicators employed by bibliometrics to assess an article's impact on academics were journal impact factors and citation counts. Through citation analysis of the following factors: papers produced per researcher, citations per paper, journal of publication, and location of production, bibliometrics precisely captures research productivity and impact. Bibliometrics places a strong emphasis on the academic impact of papers rather than their influence outside of the scholarly community. A lack of evaluation of the societal impact of research was highlighted by the editor of the British Medical Journal in 2001, who also noted issues with current impact measurements like bibliometrics. Altmetrics were developed to complement bibliometrics and illustrate the immediate impact on society of scientific publications [8].

A quantifiable informatics method known as bibliometrics examines the knowledge structure and emerging patterns within a certain topic to produce quantifiable, repeatable, and impartial data. Bibliometric analysis fosters interdisciplinary collaboration and offers researchers and relevant stakeholders the chance to get a thorough understanding of the topic of study. The current study seeks to provide a comprehensive overview of the ketogenic diet and future research objectives. To our knowledge, this database research study is the first to assess and compare the altmetric and bibliometric attention that articles published in the area of ketogenic diet received from 100 scientific papers.

Material and Methods

The Web of Science (WoS) Core Collection database and PubMed were utilized to gather the information for this bibliometric citation analysis. We entered the keyword "ketogenic diet" to access the WoS database. The initial 100 papers (T100) that acquired the most citations out of these 15.503 total articles were examined. Additionally, we used PubMed to acquire more information about the study. The "Altmetric it" tool from the Altmetric.com website was downloaded to obtain Altmetric attention scores (AASs) [9]. The weighted total of all the attention a research product receives is used as the basis for an algorithm that automatically calculates the AAS.

We investigated the correlations among total citations and altmetric scores. Pearson's correlation coefficients were calculated to figure out the linear relationship between times cited and Altmetric scores. Statistical analysis was performed by means of SPSS for Windows version 23.0. $p<0.05$ was considered statistically significant.

Results

In order to investigate the novel aspects of the top 100 (T100) most cited scientific research papers in academia, 100 most discussed research papers were selected on social media platforms about KD from March 1992 to March 2019 and they were compared in terms of bibliometrics in web of science and in terms of social media impact in altmetric.com. All articles are published in English. We found the average citation of the top 100 articles to be 272.45±32.134 (143–1099). According to Table 1, the average altmetric value of T100 is 173.65±49.9 (0–1269). The list of 100 articles is ranked by the number of citations. All articles were published in English. One of the scientific papers that received the most cited "Hepatic fibroblast growth factor 21 is regulated by PPARalpha and is a key mediator of hepatic lipid metabolism in ketotic states" scientific paper named was published by Michael K. Badman et al. 2020 and received 1.099 citations. Ketogenic diet studies carried out in the United States and the United Kingdom made up the first three publications with more than 1000 citations. The article with the highest Altmetric value is the 33rd article with the highest citation value. When T100 articles are examined according to the distribution of research areas, 'Neurosciences- Neurology' constitute the subject of 41 of 100 articles. When T100 articles are examined according to the distribution of document type, most articles were published as research articles and review articles (n: 95).

According to the top social media platforms where the articles are mentioned, twitter (n=10824), Facebook (n=1254), and patent (n=219) are the most popular social media platforms, respectively.

DOI: 10.5455/medscience.2023.07.108

Table 1. Top 100 article by metrics (T100 list)

Rank	Title	Year	First author	Total citation	Average citations	Altmetric score
1	Hepatic fibroblast growth factor 21 is regulated by PPARalpha and is a key mediator of hepatic lipid metabolism in ketotic states	2007	Michael K Badman	1,099	68.69	17
2	The ketone metabolite β-hydroxybutyrate blocks NLRP3 inflammasome-mediated inflammatory disease	2015	Yun-Hee Youm	871	108.88	617
3	Targeting metabolic transformation for cancer therapy	2010	Daniel A Tennant	810	62.31	9
4	Fuel metabolism in starvation	2006	George F Cahill Jr	648	38.12	108
5	Sugar for the brain: the role of glucose in physiological and pathological brain function	2013	Philipp Mergenthaler	646	64.6	404
6	The ketogenic diet for the treatment of childhood epilepsy: a randomised controlled trial	2008	Elizabeth G Neal	643	42.87	171
7	A low-carbohydrate, ketogenic diet versus a low-fat diet to treat obesity and hyperlipidemia: a randomized, controlled trial	2004	William S Yancy Jr	569	29.95	325
8	Short-chain fatty acids and ketones directly regulate sympathetic nervous system via G protein-coupled receptor 41 (GPR41)	2011	Ikuo Kimura	529	44.08	40
9	Ketone bodies as signaling metabolites	2014	John C Newman	481	53.44	53
10	The therapeutic implications of ketone bodies: the effects of ketone bodies in pathological conditions: ketosis, ketogenic diet, redox states, insulin resistance, and mitochondrial metabolism	2004	Richard L Veech	456	24	80
11	Mitochondrial energetics and therapeutics	2010	Douglas C Wallace	446	34.31	30
12	The efficacy of the ketogenic diet-1998: a prospective evaluation of intervention in 150 children	1998	J M Freeman	420	16.8	34
13	Increased fibroblast growth factor 21 in obesity and nonalcoholic fatty liver disease	2010	Jody Dushay	407	31.31	4
14	Optimal clinical management of children receiving the ketogenic diet: recommendations of the International Ketogenic Diet Study Group	2009	Eric H Kossoff	381	27.21	26
15	The circulating metabolic regulator FGF21 is induced by prolonged fasting and PPARalpha activation in man	2008	Cecilia Gälman	381	25.4	13
16	Extremely limited synthesis of long chain polyunsaturates in adults: implications for their dietary essentiality and use as supplements	2007	Mélanie Plourde	373	23.31	75
17	Beyond weight loss: a review of the therapeutic uses of very-low-carbohydrate (ketogenic) diets	2013	A Paoli	368	36.8	803
18	Tumor-derived lactate modifies antitumor immune response: effect on myeloid-derived suppressor cells and NK cells	2013	Zaheed Husain	364	36.4	8
19	Efficacy and safety of low-carbohydrate diets: a systematic review	2003	Dena M Bravata	362	18.1	98
20	Very-low-carbohydrate ketogenic diet v. low-fat diet for long-term weight loss: a meta-analysis of randomised controlled trials	2013	Nassib Bezerra Bueno	360	36	732
21	Mitochondrial biogenesis in the anticonvulsant mechanism of the ketogenic diet	2006	Kristopher J Bough	359	21.12	55
22	The neuroprotective properties of calorie restriction, the ketogenic diet, and ketone bodies	2009	Marwan Maalouf	358	25.57	84
23	FGF21 is an endocrine signal of protein restriction	2014	Thomas Laeger	334	37.11	15
24	Study of the ketogenic agent AC-1202 in mild to moderate Alzheimer's disease: a randomized, double-blind, placebo-controlled, multicenter trial	2009	Samuel T Henderson	323	23.07	292
25	The gut microbiota mediates the anti-seizure effects of the ketogenic diet	2018	Christine A Olson	318	63.6	941
26	2-Deoxy-D-glucose reduces epilepsy progression by NRSF-CtBP-dependent metabolic regulation of chromatin structure	2006	Mireia Garriga Canut	316	18.59	17
27	Anticonvulsant mechanisms of the ketogenic diet	2007	Kristopher J Bough	302	18.88	30

DOI: 10.5455/medscience.2023.07.108

Table 1. Top 100 article by metrics (T100 list)

28	A multicenter study of the efficacy of the ketogenic diet	1998	E P Vining	290	11.6	69
29	Fibroblast growth factor 21-deficient mice demonstrate impaired adaptation to ketosis	2009	Michael K Badman	281	20.07	35
30	A high-fat, ketogenic diet induces a unique metabolic state in mice	2007	Adam R Kennedy	281	17.56	64
31	Neuroprotective and disease-modifying effects of the ketogenic diet	2006	Maciej Gasior	279	16.41	502
32	Ketones inhibit mitochondrial production of reactive oxygen species production following glutamate excitotoxicity by increasing NADH oxidation	2007	M Maalouf	278	17.38	27
33	Suppression of insulin feedback enhances the efficacy of PI3K inhibitors	2018	Benjamin D Hopkins	275	55	1269
34	The ketogenic diet increases mitochondrial uncoupling protein levels and activity	2004	Patrick G Sullivan	268	14.11	17
35	Atkins and other low-carbohydrate diets: hoax or an effective tool for weight loss?	2004	Arne Astrup	265	13.95	118
36	The outcome of therapies in refractory and super-refractory convulsive status epilepticus and recommendations for therapy	2012	Monica Ferlisi	264	24	16
37	Systematic review of randomized controlled trials of low-carbohydrate vs. low-fat/low-calorie diets in the management of obesity and its comorbidities	2009	M Hession	259	18.5	180
38	Fibroblast growth factor 21 regulates lipolysis in white adipose tissue but is not required for ketogenesis and triglyceride clearance in liver	2009	Yuhei Hotta	255	18.21	4
39	The ketogenic diet as a treatment paradigm for diverse neurological disorders	2012	Carl E Stafstrom	251	22.82	256
40	Drug screening in Scn1a zebrafish mutant identifies clemizole as a potential Dravet syndrome treatment	2013	Scott C Baraban	243	24.3	89
41	A randomized trial of classical and medium-chain triglyceride ketogenic diets in the treatment of childhood epilepsy	2009	Elizabeth G Neal	243	17.36	43
42	Glucose transporter-1 deficiency syndrome: the expanding clinical and genetic spectrum of a treatable disorder	2010	Wilhelmina G Leen	235	18.08	3
43	Early- and late-onset complications of the ketogenic diet for intractable epilepsy	2004	Hoon Chul Kang	235	12.37	101
44	Paroxysmal exercise-induced dyskinesia and epilepsy is due to mutations in SLC2A1, encoding the glucose transporter GLUT1	2008	Arvid Suls	234	15.6	4
45	The ketogenic diet: one decade later	2007	John M Freeman	229	14.31	153
46	Effects of a high-protein ketogenic diet on hunger, appetite, and weight loss in obese men feeding ad libitum	2008	Alexandra M Johnstone	218	14.53	351
47	Efficacy of the ketogenic diet for intractable seizure disorders: review of 58 cases	1992	S L Kinsman	212	6.84	12
48	Low carbohydrate, high fat diet impairs exercise economy and negates the performance benefit from intensified training in elite race walkers	2017	Louise M Burke	205	34.17	978
49	Cerebral ketone body metabolism	2005	A A M Morris	205	11.39	17
50	Summary of recommendations for the management of infantile seizures: Task Force Report for the ILAE Commission of Pediatrics	2015	Jo M Wilmshurst	202	25.25	22
51	Comparison of low fat and low carbohydrate diets on circulating fatty acid composition and markers of inflammation	2008	Cassandra E Forsythe	202	13.47	253
52	Low-carbohydrate nutrition and metabolism	2007	Eric C Westman	199	12.44	225
53	The neuropharmacology of the ketogenic diet	2007	Adam L Hartman	199	12.44	46
54	Ketogenic diet reduces midlife mortality and improves memory in aging mice	2017	John C Newman	197	32.83	804
55	A modified Atkins diet is effective for the treatment of intractable pediatric epilepsy	2006	Eric H Kossoff	197	11.59	11
56	A ketogenic diet extends longevity and healthspan in adult mice	2017	Megan N Roberts	196	32.67	831

DOI: 10.5455/medscience.2023.07.108

Table 1. Top 100 article by metrics (T100 list)

57	Ketogenic diet for the treatment of refractory epilepsy in children: A systematic review of efficacy	2000	F Lefevre	196	8.52	60
58	A ketogenic diet as a potential novel therapeutic intervention in amyotrophic lateral sclerosis	2006	Zhong Zhao	193	11.35	45
59	Effects of a ketogenic diet on tumor metabolism and nutritional status in pediatric oncology patients: two case reports	1995	L C Nebeling	193	6.89	104
60	The calorically restricted ketogenic diet, an effective alternative therapy for malignant brain cancer	2007	Weihua Zhou	190	11.88	128
61	Efficacy of ketogenic diet in severe refractory status epilepticus initiating fever induced refractory epileptic encephalopathy in school age children (FIRES)	2010	Rima Nabbout	187	14.38	9
62	Effect of a high-fat ketogenic diet on plasma levels of lipids, lipoproteins, and apolipoproteins in children	2003	Peter O Kwiterovich Jr	186	9.3	88
63	Ketogenic diet metabolites reduce firing in central neurons by opening K(ATP) channels	2007	Weiyuan Ma	185	11.56	10
64	Regulation of myocardial ketone body metabolism by the gut microbiota during nutrient deprivation	2009	Peter A Crawford	183	13.07	22
65	Early-onset absence epilepsy caused by mutations in the glucose transporter GLUT1	2009	Arvid Suls	182	13	0
66	Low-glycemic-index treatment: a liberalized ketogenic diet for treatment of intractable epilepsy	2005	Heidi HPfeifer	182	10.11	13
67	Effects of a low-carbohydrate diet on weight loss and cardiovascular risk factor in overweight adolescents	2003	Stephen B Sondike	182	9.1	110
68	Mechanisms of action for the medium-chain triglyceride ketogenic diet in neurological and metabolic disorders	2018	Katrin Augustin	181	36.2	123
69	FGF21 regulates sweet and alcohol preference	2016	Saswata Talukdar	179	25.57	359
70	The ketogenic diet: metabolic influences on brain excitability and epilepsy	2013	Andrew Lutas	179	17.9	58
71	Integrated regulation of hepatic metabolism by fibroblast growth factor 21 (FGF21) in vivo	2011	Ffolliott M Fisher	177	14.75	7
72	Dietary ketosis enhances memory in mild cognitive impairment	2012	Robert Krikorian	176	16	385
73	A ketogenic diet suppresses seizures in mice through adenosine A_1 receptors	2011	Susan A Masino	174	14.5	8
74	Experience with the ketogenic diet in infants	2001	D R Nordli Jr	174	7.91	6
75	Systematic review and meta-analysis of clinical trials of the effects of low carbohydrate diets on cardiovascular risk factors	2012	F L Santos	172	15.64	460
76	History of the ketogenic diet	2008	James W Wheless	172	11.47	401
77	Treatment of Parkinson disease with diet-induced hyperketonemia: a feasibility study	2005	T B Vanitallie	172	9.56	126
78	Do ketogenic diets really suppress appetite? A systematic review and meta-analysis	2015	A A Gibson	169	21.13	715
79	Long-term effects of a very-low-carbohydrate weight loss diet compared with an isocaloric low-fat diet after 12 mo	2009	Grant D Brinkworth	169	12.07	127
80	Febrile infection-related epilepsy syndrome (FIRES): pathogenesis, treatment, and outcome: a multicenter study on 77 children	2011	Uri Kramer	166	13.83	19
81	Outcome of pyruvate dehydrogenase deficiency treated with ketogenic diets. Studies in patients with identical mutations	1997	I D Wexler	164	6.31	1
82	The ketogenic diet inhibits the mammalian target of rapamycin (mTOR) pathway	2011	Sharon S McDaniel	163	13.58	83
83	Role of glucose and ketone bodies in the metabolic control of experimental brain cancer	2003	T N Seyfried	163	8.15	25
84	GLUT1 deficiency syndrome--2007 update	2007	Joerg Klepper	162	10.13	6

DOI: 10.5455/medscience.2023.07.108

Table 1. Top 100 article by metrics (T100 list)

85	A ketogenic diet favorably affects serum biomarkers for cardiovascular disease in normal-weight men	2002	Matthew J Sharman	162	7.71	161
86	The expanding phenotype of GLUT1-deficiency syndrome	2009	Knut Brockmann	161	11.5	93
87	The hidden genetics of epilepsy-a clinically important new paradigm	2014	Rhys H Thomas	160	17.78	19
88	The ketogenic diet is an effective adjuvant to radiation therapy for the treatment of malignant glioma	2012	Mohammed G Abdelwahab	160	14.55	105
89	Metabolic management of glioblastoma multiforme using standard therapy together with a restricted ketogenic diet: case report	2010	Giulio Zuccoli	160	12.31	109
90	Energy expenditure and body composition changes after an isocaloric ketogenic diet in overweight and obese men	2016	Kevin D Hall	159	22.71	680
91	β-Hydroxybutyrate Deactivates Neutrophil NLRP3 inflammasome to relieve gout flares	2017	Emily L Goldberg	157	26.17	263
92	Diet-induced ketosis increases monocarboxylate transporter (MCT1) levels in rat brain	2001	R L Leino	156	7.09	3
93	Ketogenic diets as an adjuvant cancer therapy: History and potential mechanism	2014	Bryan G Allen	151	16.78	369
94	Efficacy of the ketogenic diet as a treatment option for epilepsy: meta-analysis	2006	C Beth Henderson	150	8.82	16
95	ERGO: a pilot study of ketogenic diet in recurrent glioblastoma	2014	Johannes Rieger	149	16.56	27
96	Effects of a ketogenic diet on the quality of life in 16 patients with advanced cancer: A pilot trial	2011	Melanie Schmidt	148	12.33	135
97	Clinical aspects of the ketogenic diet	2007	Adam L Hartman	146	9.13	68
98	The ketogenic diet: from molecular mechanisms to clinical effects	2006	John Freeman	146	8.59	17
99	Modified Mediterranean-ketogenic diet modulates gut microbiome and short-chain fatty acids in association with Alzheimer's disease markers in subjects with mild cognitive impairment	2019	Ravinder Nagpal	145	36.25	155
100	Ketogenic diets, mitochondria, and neurological diseases	2014	Lindsey B Gano	143	15.89	66

Twitter geographical and demographic breakdown datas were collected from the profiles of Twitter users who shared these scientific papers and were categorized as the number of shares on Twitter. Our results demonstrate that the United States (n=2397) is the country where most of the social media posts have been done in the World. The United States is followed by the United Kingdom (n=792) and India (n=248). According to the twitter demographic breakdown for which most tweets were made by members of the public (%96), is followed by practitioners (doctors and other healthcare professionals) (%1.98), scientists (%1.71) and science communicators (journalists, bloggers, and editors) (%0.26). When we analyzed the research categories of the T100 articles from the altmetric database, they were found to be most published in the categories of "Medical and Health Science (n=93)", "Neurosciences (n=33)" and "Clinical Sciences (n=31)".

In the top 60 journals that published T100 articles, one or more scientific publications were published. Most articles published in Epilepsia, the number of articles published was 12. The majority of the articles were published in Epilepsy and Cell Metabolism, with 12 and 5 articles published, respectively. The average H-index of 60 journals with two or more ketogenic diet-related publications is 290.65±13.15 (79-1276). When we compared our results in Table 2 in terms of quartile (Q) scores of the journals, 40 of them were in Q1, 11 of them were in Q2, 7 of them were in Q3, and 1 of them was in Q4. In the list of countries where T100 articles are published most, with USA (n: 75) dominates in the first place, followed by England (n: 11) and Germany (n: 11) (Table 3).

Twenty-five universities with 3 or more publications were included in the list of universities with the highest number of T100 articles. The universities where the most articles were published were Harvard University (n=14, USA), University of California System (n=12, USA), and John Hopkins University (n=11, USA) (Table 4).

We found that the most prominent authors in T100 articles were Rho JM. with 8 publications, Vining EPG. with 7 publications and Cross JH with 5 publications.

DOI: 10.5455/medscience.2023.07.108

Table 2. Journals with top-100 articles, ranked according to the citations

Journal name	Number of articles	IF*	Q category**	H index**
Epilepsia	12	6.74	Q1	202
Cell Metabolism	5	31.373	Q1	292
American Journal of Clinical Nutrition	4	8.472	Q1	351
Nutrition and Metabolism	4	5.443	Q1	89
Pediatrics	4	5.94	Q1	361
Annals Of Neurology	3	11.274	Q1	308
Brain	3	13.501	Q1	351
Endocrinology	3	5.051	Q1	267
Neurology	3	9.901	Q1	378
Obesity Reviews	3	10.867	Q1	172
Jama Journal of the American Medical Association	2	157.3	Q1	709
Journal of Clinical Investigation	2	19.456	Q1	505
Lancet Neurology	2	59.935	Q1	315
Proceedings of the National Academy of Sciences of the United States of America	2	12.779	Q1	805
Trends in Neurosciences	2	16.978	Q1	301
American Journal of Physiology Endocrinology and Metabolism	1	5.9	Q1	211
Annals of Internal Medicine	1	51.598	Q1	403
Annual Review of Nutrition	1	9.323	Q1	166
Annual Review of Pathology Mechanisms of Disease	1	32.350	Q1	132
Applied Physiology Nutrition and Metabolism	1	3.016	Q3	95
Archives of Neurology	1	7.419	Q1	243
Behavioural Pharmacology	1	2.277	Q4	83
BMC Neuroscience	1	3.264	Q3	101
Brain and Development	1	2.272	Q4	89
Brain Research Reviews	1	5.93	Q1	202
British Journal of Cancer	1	9.075	Q1	248
British Journal of Nutrition	1	4.125	Q3	198
Cell	1	41.582	Q1	814
Cell Reports	1	9.995	Q1	177
Developmental Medicine and Child Neurology	1	4.864	Q2	151
EBioMedicine	1	11.205	Q1	79
Epilepsy Research	1	2.991	Q3	117
European Journal of Clinical Nutrition	1	4.884	Q2	165
Frontiers in Pharmacology	1	5.988	Q1	104
Gastroenterology	1	33.883	Q1	423
International Journal of Oncology	1	5.884	Q2	128
Journal of Child Neurology	1	2.363	Q3	109
Journal of Immunology	1	5.426	Q2	387
Journal of Inherited Metabolic Disease	1	4.75	Q2	108
Journal of Lipid Research	1	6.676	Q1	202
Journal of Neuroscience	1	6.709	Q1	471
Journal of Nutrition	1	4.687	Q2	276
Journal of Pediatrics	1	6.314	Q1	216
Journal of Physiology London	1	6.228	Q1	249
Journal of The American College of Nutrition	1	3.571	Q2	126
Lancet	1	202.731	Q1	807
Lipids	1	1.646	Q4	125
Nature	1	69.504	Q1	1276
Nature Communications	1	17.694	Q1	410
Nature Medicine	1	87.241	Q1	576
Nature Neuroscience	1	28.771	Q1	437
Nature Reviews Cancer	1	69.800	Q1	462
Nature Reviews Neurology	1	44.711	Q1	169
Neurobiology of Aging	1	5.133	Q2	196
Neurochemistry International	1	4.297	Q2	125
Neuroscience	1	3.708	Q3	471
Pediatric Neurology	1	4.21	Q2	96
Plos One	1	3.752	Q2	367
Prostaglandins Leukotrienes and Essential Fatty Acids	1	23.015	Q3	110
Redox Biology	1	10.787	Q1	105
Trends in Endocrinology and Metabolism	1	10.586	Q1	178

DOI: 10.5455/medscience.2023.07.108

Table 3. Geographic of origin of top 100 articles

Countries/Region	Numbers
USA	75
England	11
Germany	11
Australia	8
Canada	7
Italy	7
France	5
Sweden	5
Switzerland	5
Belgium	4
Scotland	3
Spain	3
Argentina	2
Austria	2
Denmark	2
Greece	2
Israel	2
Japan	2
Netherlands	2
Norway	2
Portugal	2
South Korea	2
Brazil	1
Colombia	1
India	1

Table 4. Institutions of origin with 4 or more of the top 100 cited articles

Institutions	Numbers
Harvard University	14
University of California System	12
Johns Hopkins University	11
Johns Hopkins Medicine	10
University of London	8
Beth Israel Deaconess Medical Center	7
National Institutes of Health NIH USA	7
University College London	7
Barrow Neurological Institute	5
Great Ormond Street Hospital For Children Nhs Foundation Trust	5
Assistance Publique Hopitaux Paris Aphp	4
Hopital Universitaire Necker Enfants Malades Aphp	4
Udice French Research Universities	4
Universite De Paris	4
University of California Davis	4
University of Connecticut	4

There was no correlation between number of citations and altmetric scores (r = 0.035; p = 0.729) (Figure 1). This may be because not all ketogenic articles are shared on social media because they don't get enough attention from scientists and other researchers.

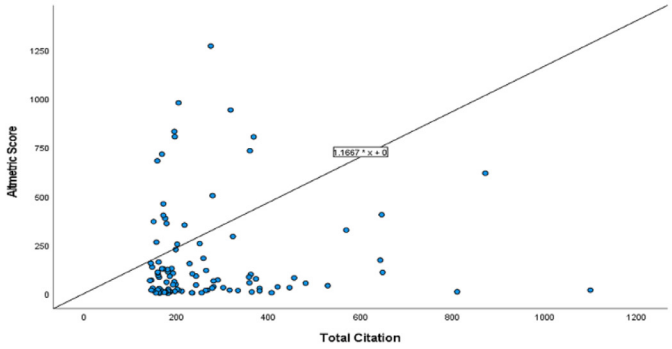

Figure 1. Between number of citations and altmetric scores

Discussion

It is argued that social media platforms could serve as an alternative to conventional power structures in science and research [10]. Studies by Renmeng Cao et al. on social media, which enables the rapid and widespread dissemination of scientific research, have produced results that are reflected in their other discoveries. According to the results of both studies, the rise of social media has significantly changed academic communication [11]. An altmetric study by Vardar et al. on oxidative stress and cancer showed that twitter and facebook were the second and third most popular social media platforms, respectively. Facebook and twitter both have millions of daily active users. As a result, discussing T100 articles on various social networking sites is common [12]. To better understand social media attention, authors have classified studies into three distinct types; ranked according to the citations, geographic and institutional origins, twitter demographic breakdowns in the top 100 articles. This investigation provides a new approach to explaining how scientific papers spread and contributes to a deeper comprehension of this process.

This comparative investigation reveals important differences between the most mentioned and most cited "ketogenic diet" papers, highlighting the distinct utility of AAS and citation count when evaluating research impact. While Patel et al.2023, using the Web of Science database, 7097 craniofacial surgery publications were identified in the 50 most mentioned publications, and we studied 100 most mentioned publications [13]. Furthermore, this comprehensive study was successful in terms of ketogenic approaches' publication. In fact, there are still many unanswered questions about online attention [10]. But arguably, the most important aspect of this study is that many outstanding publications, institutes, academics, and countries on the ketogenic diet can be accessed with a single study follow-up. In this respect, our study is quite original and will be able to guide the public and scientists. The fact that innumerable outstanding works, institutions, academics, and regions on the

ketogenic diet may be accessed with a particular research follow-up is possibly the most significant component of this study. Our research is highly unique in this regard and will be beneficial for both the general public and scientists According to a study, social media is encouraged as a replacement for established hierarchies of authority. The study looked into the consequences of antioxidant and cancer research on society, medicine, and academia. Authors have shown that antioxidants significantly affect several critical disorders. In line with the perspective of our study, inform the public about personal disease management and present to researchers datas, because they could reach 100 articles using our study [14].

Conclusion

Herein, this study has shown that KD helps patients who have diabetes reduce inflammation, increase brain functions, and supplement cancer treatments. When analyzing an article's impact on the field of research, bibliometric and altmetric analysis provide significant but distinct points of view. It was not always coherent how altmetric data related to traditional bibliometric analysis. Thus, it might be suggested that bibliometric and altmetric assessments be viewed as complementary to one another. And by far the most important result of this study is that the articles with the highest citations may not receive much attention on social media due to their subject content.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
This study has not required ethical approval because it is a bibliometric and altmetric analysis of currently published classical studies.

References

1. Masood W, Annamaraju P, Uppaluri, KR. Ketogenic diet. In StatPearls [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK499830/ access date 10.04.2023
2. Charlot A, Zoll J. Beneficial effects of the ketogenic diet in metabolic syndrome: a systematic review. Diabetology. 2022;3:292-309.
3. Burkitt MJ. An overlooked danger of ketogenic diets: making the case that ketone bodies induce vasculardamage by the same mechanisms as glucose. Nutrition. 2020;75-76:110763.
4. McNally MA, Hartman AL. Ketone bodies in epilepsy. J Neurochem. 2012;121:28-35.
5. Saasa V, Beukes M, Lemmer Y, Mwakikunga B. Blood ketone bodies and breath acetone analysis and their correlations in type 2 diabetes mellitus. Diagnostics. 2019;9:224.
6. Murakami M, Tognini P. Molecular mechanisms underlying the bioactive properties of a ketogenic diet. Nutrients. 2022;14:782.
7. Bektan Kanat B, Yavuzer H. Top 100 articles on vitamin D: Bibliometric versus altmetric analysis. Bratisl Lek Listy. 2022;123:160-71.
8. Retrouvey H, Webster F, Zhong T, et al. Cross-sectional analysis of bibliometrics and altmetrics: comparing the impact of qualitative and quantitative articles in the British Medical Journal. BMJ Open. 2020;10:e040950.
9. Altmetric: Discover the attention surrounding your research. https://www.altmetric.com access date 17.07.2022.
10. Wetsman N. How Twitter is changing medical research. Nat Med. 2020;26:11-4.
11. Cao R, Liu XF, Fang Z, et al. How do scientific papers from different journal tiers gain attention on social media?. Information Processing & Management. 2023; 60(1), 103152.
12. Hanikoğlu F, Vardar, G, Özben T, et al. A social attention with altmetric score analysis on the relationship between oxidative stress and cancer. Med Science. 2022;11:699-707.
13. Patel PA, Boyd CJ. Altmetric analysis of the most-mentioned articles online in plastic surgery. Aesthet Surg J. 2023;43:NP466-NP473.
14. Vardar G, Hanikoğlu F, Güney T, et all. Evaluation of the relationship between cancer and antioxidants from an altmetric perspective. EJMI. 2022;6:128-39.