Research Article

A Comparative Systematic Search of Literature: A Basic and Simple Approach.

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Article Info

Abstract

Background: Literature is the mainstay of research. It provides all the essential information which is a prerequisite for performing research. Literature can be retrieved by systematic or non-systematic approach. The systematic approach provides a more robust method for obtaining the literature. There are many databases that can be used to gather the literature, some are free while most of them are subscription based.

Methods: We developed a research question"Does tamoxifen improve breast cancer outcomes" and extracted the literature from all possible free of access databases and one subscription-based database using the PICOT driven keywords. We did not change keywords for any database. We used the help of truncation, quotation, field tags, and Boolean parenthesis for extracting the literature as per the database guidance.

Results: We observed more literature retrieval with Google search, but the outcome was a collection of articles, news, blogs, images, and forums. Other databases extracted only articles.

Conclusion: Google search is not advised for collecting literature owing to the variability of its outcome. Google Scholar gives reasonably fair outcomes if used within its character limitation and less complex search. PubMed, Cochrane Central, and EBSCOhost allow complex searches with minimal variability. PubMed does not need a quotation search if using a filtered search as the results are alike.

INTRODUCTION

Literature is an essential and significant component of conducting research in any field. Creating a research question is the initial and most important step. It requires a lot of planning and brainstorming. A literature review is frequently necessary to frame an interesting and challenging research question(Cañón & Buitrago-Gómez, 2018). Once a research question has been decided, a further literature search is required to plan a method to address the research question. After finishing the research methodology, a final result is obtained, which needs to be discussed with previously done relevant studies. So, there is again a requirement to collect information from earlier studies. This helps in a critical evaluation of former and current studies(Gelling,

2015; Korstjens & Moser, 2017; Moser & Korstjens , 2017, 2018). The above-discussed points are qualifications for performing research in any field. Usually, a literature search is non-systematic. So, no guidelines are followed to extract the literature. The literature is generally accessed to find the answer to any research stages. The rationale of the study was to comparatively study various search engine for the literature search.

Google is a search engine commonly used by academicians, non-academicians, professionals, and non-professionals. It allows a simple text word search. The information can be extracted by searching with a few descriptive words(Google search help, 2022). Simple text word searches can also be done on other available databases. A simple text word search is a convenient

method and extracts a large number of literatures, but many of them are irrelevant and may contain sensitive data. The disadvantage of simple text word search is the huge time consumption and waste of effort. Thus, the literature retrieved lacks quality. However, reviews and systematic reviews rely profoundly on literature reviews. No systematic technique is used when conducting reviews, but a systematic review needs a methodical search for the article. The advantage of systematic review is the qualitative retrieval of literature with minimum variability, but this process may skip some valuable literature based on inclusion and exclusion criteria(Donato & Donato, 2019; Linares- Espinós et al., 2018; Muka et al., 2020; Siddaway et al., 2019).

There are many databases available and frequently used to retrieve scientific literature. Most commonly, the database used for literature extraction is Google Scholar, PubMed, and Cochrane Central, as they are free of access to other databases. Common subscription based database include Scopus, EBSCOhost, Web of Science, Ovid, ScienceDirect, CINAHL etc.

Most of the database provide literature retrieval guidance. However, different databases may use different search strategies. As a result, a researcher can become perplexed, which could compromise the research outcome. Thus, there is a need for a comparative study that can explain the basic guidelines for retrieving the literature. Therefore, we developed a research topic, used various databases with permissible changes to the keywords, and recommended a suitable approach for the literature review.

MATERIALS AND METHODS

In this study, we examined the instructions for retrieving literature searches. We found a large number of databases available, but unfortunately, all are not freely available. Therefore, we explored the databases which have free access and a paid database to which we have organizational access. We explored Google, Google Scholar, PubMed, Cochrane, and EBSCOhost in our study to retrieve the literature. We observed variability in the keyword search for literature extraction in different databases. All provide text word and Boolean operation search facility. Additionally, some databases provide truncation, quotation, title and abstract, and MeSH search. Truncation is the utilization of the asterisk "*" for the variability of keywords. Based on database allowance, the keywords can be forward or backward truncated. Quotation provides the option of exact keyword search, so quotation (") can be applied at the beginning and end of the keyword. Title and abstract search extract the literature with keywords available under that category and not in the complete article. The MeSH search is a special search provided by some databases with many high-probability intrinsic keywords (Table 1 and 2).

We considered a research question "Does tamoxifen improve breast cancer outcomes?". Subsequently, a PICOT framework was employed to outline all possible keywords for a systematic literature search. We fixed our literature search upto 20 November 2022. Boolean operations and other methods of search (truncation, quotes, and field tags) were followed as per the recommendation of each database to observe the behavior of the search. We dropped the MeSH search as it is inherent to the database and there is no possibility of the introduction of variability. We did a simple keyword search with a Boolean operation in Google. Additionally, we used with and without quotations to observe the key difference in the outcome. In Google Scholar, under the advanced search, we used two options, one with "anywhere in the article" and the other with "title and abstract" both searches were done with and without quotations. PubMed provides an extensive search option. Here we did "text word" and "title and abstract" keyword searches with and without quotations. We also used truncation and MeSH search. We used the same method in the Cochrane database, like PubMed. EBSCOhost is a subscription based database where we did a keyword search with "text word", "title", and "abstract" separately with and without quotes, including the truncation. The outcomes were studied and compared to understand the best method for retrieving literature from each database and prevent waste of time and effort(Linares- Espinós et al., 2018; Muka et al., 2020; Siddaway et al., 2019).

RESULTS

In the current study, we extracted the literature from Google, Google Scholar, PubMed, Cochrane, and EBSCOhost. We outlined all possible keywords for each PICOT term and searched them individually with the help of truncation, quotes, and field tags. Afterward, a Boolean operation of "OR" and "AND" was used to combine the PICOT keywords and find the literature. We used the same keywords in all databases for literature retrieval. We observed that Google without quotes provided more literature than those with quotes. Less literature was accessed without quotes keywords combined with OR parenthesis, but it increased with quotes. The union with OR having quotation furnished markedly more literature than without quotes. An amalgamation of AND parenthesis fetched less literature for both with and without quotes, but quotations gave appreciably substantial literature in comparison to those without quotes in combination with AND. (Table 3).

Additionally, we found that google searches provide literature in the form of blogs, news, images, comments, and articles.

We used keyword search anywhere in the article or title and abstract using with and without quotes in Google Scholar. We observed that individual keywords with quotes gave less literature compared to those with-

Table 1: Tools of search for keywords in the five databases

	Google	**Google Scholar**	**PubMed**	**Cochrane central**	**EBSCOhost**
TW	ü	ü	ü	ü	ü
Title	X	X	X	X	ü
Ab	X	X	X	X	ü
T/A	X	ü	ü	ü	X
Trun (*)	X	X	End of the root word	Beginning or mid or end of the root word	Mid or end of the root word
Quot("")	ü	ü	ü	ü	ü
MeSH	X	X	ü	ü	X
BO	ü	ü	ü	ü	ü

*TW- Text word, Ab- abstract, T/A- Title and abstract, Trun- Truncation, Quot- Quotation, BO- Boolean operation

Table 2: Description of tools characteristics in the database

Text word	**Searches the keyword at any place in the article**
Title	Searches the keyword at any place on the title
Abstract	Searches the keyword at any place in the abstract
Title and abstract	Searches the keyword at any place of the title and abstract
Truncation	Searches the keyword with variation either to the right or left
Quotation	Searches the exact keyword under the quotation
MeSH	Searches keywords that are categorized under the MeSH
Boolean operation	Searches the keywords with OR, AND, and NOT functions

Table 3: Systematic and comparative Google search

S. No.	**Keywords**	**All text**		
		Without quotes	**With quotes**	**% Decrease**
1	Breast Neoplasm	16600000	81400	99.51
2	Breast Tumor	240000000	3770000	98.43
3	Breast Cancer	1650000000	478000000	71.03
4	Mammary Cancer	27000000	662000	97.63
5	Mammary Carcinoma	19000000	949000	95.01
6	Mammary Neoplasm	8300000	7170	99.91
7	Breast Carcinoma	146000000	128000000	12.33
8	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7	125000000	478000000	-282.40
9	Tamoxifen	26600000	14000000	47.37
10	Tamoxifen citrate	2430000	373000	84.65
11	9 OR 10 OR 11	1710000	14400000	-742.11
12	placebo	293000000	268000000	8.53
13	Double dummy	66000000	666000	98.99
14	Sham	353000000	72200000	79.55
15	12 OR 13 OR 14	131000000	304000000	-132.06
16	estrogen receptor	66600000	17800000	73.27
17	progesterone receptor	18200000	2580000	85.82
18	human epidermal growth factor receptor 2	41500000	1350000	96.75
19	HER2	83500000	21000000	74.85
20	8 OR 11 OR 15 OR 20	36000000	50100000	-39.17
21	12 AND 20 AND 26 AND 33	18300	276000	-1408.20

out quotes, except HER2 which drew more literature with quotes anywhere in the article, title, and abstract search. Additionally, the estrogen receptor keyword gave higher literature with quotes under anywhere in the article search. Union of PICOT keywords with OR produced less literature for any field tags. Combining the PICOT keywords with OR gave a higher number of pieces of literature with the quotes than without quotes, except a combination with OR for the population keywords in anywhere in the article searches. The title and abstract search provided less literature than anywhere in the article. We could not access the literature by combining AND operator (Table 4).

In PubMed, we used truncation in some of the probable keywords, text words, or title/abstract search with and without quotes search. We observed keyword searches in either text words or title/abstract, and there was no difference in the literature with or without quotes. Also, we found that searches with title/abstract produced less literature than text words except tamoxifen citrate, dou-

Table 4: Systematic and comparative Google Scholar search

S. No.	Keyword	Anywhere in the article			Title and abstract		
		Without quotes	With quotes	% Difference	Without quotes	With quotes	% Difference
1	Breast Neoplasm	536000	9550	98.22	370	191	48.38
2	Breast Tumor	2390000	633000	73.51	46600	12900	72.32
3	Breast Cancer	3200000	2730000	14.69	606000	594000	1.98
4	Mammary Cancer	1460000	104000	92.88	7460	3780	49.33
5	Mammary Carcinoma	1380000	280000	79.71	7340	6050	17.57
6	Mammary Neoplasm	106000	1310	98.76	91	43	52.75
7	Breast Carcinoma	2820000	1830000	35.11	69200	44000	36.42
8	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7	2430000	17900	99.26	3200	22100	-590.63
9	Tamoxifen	627000	632000	-0.80	26500	26300	0.75
10	Tamoxifen citrate	37200	8230	77.88	316	271	14.24
11	9 OR 10	37500	531000	-1316.00	25600	24300	5.08
12	placebo	3490000	3490000	0.00	172000	171000	0.58
13	Double dummy	504000	40700	91.92	797	764	4.14
14	Sham	2030000	2030000	0.00	10400	10400	0.00
15	12 OR 13 OR 14	1170000	3190000	-172.65	1980	138000	-6869.70
16	estrogen receptor	1560000	1650000	-5.77	58800	53700	8.67
17	progesterone receptor	1160000	468000	59.66	9060	8340	7.95
18	human epidermal growth factor receptor 2	3220000	92600	97.12	2790	2540	8.96
19	HER2	902000	910000	-0.89	57000	57300	-0.53
20	16 OR 17 OR 18 OR 19	625000	1290000	-106.40	330	77900	-23506.06
21	8 AND 11 AND 15 AND 20	No result					

ble dummy and sham, which gave the same literature with text word or title/abstract. Joining keywords with OR yielded more literature than individual keywords and connecting keywords with AND produced the minimum number of literature (Table 5).

In Cochrane, we used all text or titles and abstracts for our keyword search with and without quotes using truncation at relevant keywords. We observed a decrease in the literature with quotes than without quotes. Additionally, literature was less with title and abstract compared to all text searches. Connecting keywords with OR generated more literature than individual keywords and linking keywords with AND produced the least literature. Keywords tamoxifen, sham, and HER2 returned with the same works of literature, respectively, with or without quotes [Table 6].

In EBSCOhost, we applied truncation in a few keywords, text words, or titles, or abstract searches with and without quotes. We discovered a decrease in literature with quotes than without quotes except placebo* and HER2 keywords which generated equal number of literatures with or without quotes. Furthermore, keywords with title search gave us the least literature, whereas text words gave the maximum literature. Assembling keywords with OR yielded more literature than individual keywords and connecting keywords

with AND produced the lowest literature. We did not find any result on combining all keywords with AND for title search (table 7)

DISCUSSION

A literature search is an indispensable element of research. Its importance is even greater in studies that are based on reviews or systematic reviews. In the current study, we explored different databases using a research question and creating keywords based on the PICOT framework. We followed the instructions or guidelines available for extracting literature and compared the outcome. We comparatively analyzed Google, Google Scholar, PubMed, Cochrane Central, and EBSCOhost databases to understand the behavior of the outcome. We observed that the stem should be cautiously written to avoid technical errors and take care of its grammar. Results are not influenced with or without capitalizations.

In Google, we did a simple all-text keyword search with OR and AND Boolean operations. We found the use of quotation significantly decreased (average 75% decrease) the literature for single keyword searches. Surprisingly when we combined the keywords with OR, without quotes gave less literatures while quotes gave

Table 5: Systematic and comparative PubMed search

S. No.	Keywords	Keywords with text word	Keywords with title/abstract
		With or without quotes	With or without quotes
1	Breast Neoplasm*	336674	11908
2	Breast Tumor*	22805	22804
3	Breast Cancer*	329707	329521
4	Mammary Cancer*	3651	3651
5	Mammary Carcinoma*	8614	8607
6	Mammary Neoplasm*	23452	685
7	Breast Carcinoma*	32687	32413
8	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7	454332	365535
9	Tamoxifen	29812	24945
10	Tamoxifen citrate	333	333
11	9 OR 10	29812	24945
12	placebo*	255848	242331
13	Double dummy	2450	2450
14	Sham	97741	97741
15	12 OR 13 OR 14	350640	337438
16	estrogen receptor*	64990	58776
17	progesterone receptor*	23914	23882
18	human epidermal growth factor receptor 2	10107	10107
19	HER2	37528	37513
20	16 OR 17 OR 18 OR 19	108952	103194
21	8 AND 11 AND 15 AND 20	242	170

Table 6: Systematic and comparative Cochrane Central search

S. No.	Keywords	All text			Title/abstract		
		Without quote	With quote	% diff	Without quote	With quote	% diff
1	Breast Neoplasm*	19391	15459	20.28	19086	15427	19.17
2	Breast Tumor*	11587	1833	84.18	10899	1738	84.05
3	Breast Cancer*	43510	39907	8.28	41716	39116	6.23
4	Mammary Cancer*	654	61	90.67	551	60	89.11
5	Mammary Carcinoma*	234	103	55.98	196	95	51.53
6	Mammary Neoplasm*	384	23	94.01	344	12	96.51
7	Breast Carcinoma*	4741	1891	60.11	4337	1644	62.09
8	1 OR 2 OR 3 OR 4 OR 5	44898	40836	9.05	43828	41767	4.70
9	Tamoxifen	5285	5285	0.00	5172	5172	0.00
10	Tamoxifen citrate	150	99	34.00	131	90	31.30
11	9 OR 10	5269	5269	0.00	5172	5172	0.00
12	Placebo*	372159	371758	0.11	354979	354593	0.11
13	Double dummy	7082	5952	15.96	5137	4750	7.53
14	Sham	25988	25988	0.00	23830	23830	0.00
15	12 OR 13 OR 14	393963	385031	2.27	376491	375980	0.14
16	Estrogen receptor*	5548	4459	19.63	5273	4068	22.85
17	Progesterone receptor*	2277	1495	34.34	2072	1396	32.63
18	uman epidermal growth factor receptor 2	4115	1947	52.69	3882	1908	50.85
19	HER2	6985	6985	0.00	6872	6872	0.00
20	8 OR 11 OR 15 OR 20	13046	10656	18.32	12888	10643	17.42
21	12 AND 20 AND 26 AND 33	356	308	13.48	85	85	0.00

a higher number of literatures. This observation is just opposite to the expectation. Typically, keywords

Table 7: Systematic and comparative EBSCOhost search

S. No.	Keywords	Keywords with text word			Keywords with title			Keywords with abstract		
		Without quotes	With quotes	%	Without quotes	With quotes	%	Without quotes	With quotes	%
1	Breast Neoplasm*	65756	4430	93	98	32	67	1712	230	87
2	Breast Tumor*	319038	50753	84	3978	955	76	31863	4367	86
3	Breast Cancer*	496718	406007	18	52271	50338	4	91691	80877	12
4	Mammary Cancer*	74753	6340	92	561	187	67	5046	522	90
5	Mammary Carcinoma*	53112	12205	77	463	317	32	2158	982	54
6	Mammary Neoplasm*	14067	424	97	24	15	38	334	56	83
7	Breast Carcinoma*	233254	57758	75	4310	2203	49	14383	5179	64
8	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7	526998	425104	19	58367	53989	8	100231	85767	14
9	Tamoxifen	40381	40350	0.08	1828	1810	1	4723	4719	0.08
10	Tamoxifen citrate	3729	790	79	24	20	17	90	70	22
11	9 OR 10	40381	40350	0.08	1828	1810	1	4723	4719	0.08
12	Placebo*	324578	324568	0.00	9670	9670	0	51611	51609	0.00
13	Double dummy	21369	3526	83	66	64	3	498	446	10
14	Sham	143767	111243	23	959	853	11	21147	20207	4
15	12 OR 13 OR 14	468823	421757	10	10663	10555	1	72186	71231	1
16	Estrogen receptor*	125663	72399	42	3557	2637	26	14470	10029	31
17	Progesterone receptor*	58033	31823	45	773	682	12	5558	4205	24
18	Human epidermal growth factor receptor 2	109463	14237	87	223	201	10	3146	2006	36
19	HER2	44560	44560	0.00	1517	1517	0	6239	6239	0.00
20	16 OR 17 OR 18 OR 19	235843	110554	53	5644	4847	14	21861	17423	20
21	8 AND 11 AND 15 AND 20	4094	3194	22	-	-	-	39	32	18

with quotations should give less literature because it searches for the exact word. We found that google has a limitation of 32-word searches; when we combined keywords with OR, we were within limits; still, we observed more outcomes with quotations. The combination of keywords with AND has the same behavior as OR. It produced less literature without quotes and more with quotes. Addition of keywords with AND reached a maximum of 48 words, including the Boolean terms. So, breaching the limits of 32 words may have caused errors in the search and returned more outcomes with quotations than without. But when we combined keywords with OR, we were within limits; still, we observed more outcomes with quotations(Donato & Donato, 2019; Google guide, 2022; Google search help, 2022; Linares- Espinós et al., 2018; Muka et al., 2020; Siddaway et al., 2019). This indicates that google can give a variable result if the search becomes complex. Additionally, the literature obtained were very large in number and consisted of blogs, news, image, comments, and articles. It shows that it lacks specificity. Therefore, Google may be helpful in the general search, but for doing research, it is unreliable due to ambiguous and variable outcomes.

Excluding Google search, all other databases returned the outcome in the form of articles. Finding an article is a must for doing research because an article is a document that experts review in that field, and therefore the authenticity of the information is more compared to blogs, news, or comments.

Google Scholar provides an advanced search option where we can find articles with all of the words, with the exact phrase (using quotation), with at least one of

the words, without the words, anywhere in the article, in the title of the article, articles authored by articles published in (journals), and articles dated between (time period). We have searched anywhere in the article or title and abstract using with and without quotations using the keywords. The title and abstract search provided less literature than anywhere in the article. It was an expected result since the probability of the availability of keywords in the title is less than in the whole article. Keywords with quotations brought fewer articles than quotations, excluding the keywords tamoxifen, estrogen receptor, and HER2 for anywhere in the article search. Boolean combination with OR unexpectedly gave fewer outcomes than individual keywords except title and abstract search for the outcome, and this combination with quotes gave a large number of literature than without quotes excluding population keyword with quotes. This indicates that there is some variability in the outcomes. The combination of keywords with AND was unable to give any result. This is due to the fact that Google Scholar limits the keywords search up to 256 characters, and our keywords had 305 characters, more than the allowed limits. Therefore, our results suggest that google scholar can be used to access the literature if our keywords are fewer. A more complex or large search decreases reliability, and results may be variable(Bramer et al., 2018).

In PubMed, we discovered that keyword searches are not affected by quotations. PubMed suggests using quotes to find an exact phrase, and if the phrase is unavailable, the quotes will be overlooked and treated using automatic term mapping with the message "Quoted phrase not found in phrase index." But we did not observe any message during the search, which shows that quoted keywords were considered. However, finding the same outcome irrespective of the quotation indicate there is no influence of the quotation. We observed that PubMed automatically applies quotations to keyword search with text word or title/abstract. Due to this we find same outcome using quotes or not using it. However, we searched keywords with all text using quotes or no quotes we observed a decrease in the literature with quotes. This is due to the fact that using quotation searches only the exact keyword whereas no quotation searches for all possible keywords including the MeSH search. Keyword search with title/abstract generated less literature than text word search, which is consistent with our understanding. However, there were three exceptional keywords tamoxifen citrate, double dummy and Sham, which produced the same outcomes in title/abstract search than text word. Assembling keywords with parenthesis OR generated more literature than specific keywords and linking keywords with AND generated the minimum number of literatures. This finding follows the principles of the Boolean method(National library of Medicine, 2022). We also did a MeSH search which is intrinsically built as a compilation of keywords, but due to a lack of comparison with other keywords we dropped it from our analysis.

In Cochrane Central, we explored all text or titles and abstracts for our keyword search with a quotation and without utilizing truncation. We observed no variation in the outcome using field tags or quotations. The title and abstract returned with less literature than all text, and the quotation gave less result than no quotes. Moreover, Boolean parenthesis of OR increased the outcome compared to individual keywords, whereas AND produced the smallest amount of literature that agrees with its concept. This shows that it is a reliable database with the least variability. However, we find keyword tamoxifen, placebo, sham, and HER2 brought the same outcome, respectively, with or without quotes. This indicates using a quotation for a single word is useless as it brings the same outcome without the quotes(Wiley, 2022).

In EBSCOhost, we find less literature with quotes than without quotes. Besides, keywords with title search gave us the minimum literature, whereas text words gave the largest literature. Assembling keywords with parenthesis OR yielded more literature than individual keywords and connecting keywords with AND produced the lowest literature. This implies that there is the least variation in this database, and it follows all principles of the literature search. However, we could not collect any results on joining all keywords with AND for a title search. We also observed that quotation has almost no effect on single keyword tamoxifen, placebo, and HER2. Additionally, there is marked variation with single keyword sham using text word search between quotation and no quotation whereas this variation decreases with title search and minimal with abstract search. This observation suggests that there is no need to use quotations for a single keyword search, however, there still can be few variations but that may not impact the outcome(EBSCOhost, 2022).

Limitations: We could not search other popular databases like web of science, Scopus, Ovid, Science direct, CINAHL etc. as they require a subscription. Our literature search was limited to freely available databases and only one subscription database. This limited us for an extensive comparative analysis which would have helped on building a general perception for a better literature search

CONCLUSION AND RECOMMENDATION

Our study suggests that google search is not recommended for carrying out research work as the literature obtained are capricious and includes blogs, news, image, and comments in addition to the article. Moreover, complex searches make its outcome unreliable. However, it may be useful for general searches. Excluding google search, all databases accessed in our study extracted articles only. Google Scholar has some vari-

ability in the outcomes which increases more with intricate search with more keywords and decreases its reliability. Though it can reasonably provide results with less variability if keywords are within the limits of the allowed characters. PubMed gave the articles according to its rule with minimal variability. There is no requirement to use quotation for either single of more words keywords as the outcomes observed were identical if we use the filter like text word or title/abstract search . However the quotation works for the all text search. Cochrane central behaved as per the guidance and extracted articles with the least variability. There is no requirement to use quotations for a single keyword search. EBSCOhost brought literature with minimum variability, although there were some variations with single keyword searches using quotations as compared to no quotations but that was reasonably less and may not impact the outcome.

AUTHOR CONTRIBUTION

Conception and design, M.T.I.; Methodology, M.T.I; Data collection, M.T.I. Statistical analysis, M.T.I. Data interpretation, M.T.I.; Writing-original draft: M.T.I. Writing review and editing and M.T.I.

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