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An analysis of Research publication on Colorectal Cancer in Asian Countries

Dr Murugan Chinnaraj
Periyar University, muruganchinnaraj@gmail.com

Richa Narzary
Periyar University, ranteng01@gmail.com

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Abstract

This paper discusses colorectal cancer research output in Asian during 2000- 2017. The data has been downloaded from PubMed databases. A total of 2726 articles were found. Language distribution shows a majority of the papers are published in the English language 2661 (97.61%) irrespective of the native language of the country and those publications were in the form of journal articles i.e. 2225 (81.62%). The authorship pattern indicates the maximum number of papers was published by collaborative work of more than ten authors for which the mean value of Degree of Collaboration is 0.84 indicating the high ratio of collaborative research work undertaken by researchers. The Relative Growth Rate and Doubling Time of total publications show decreasing and increasing trend. The mean relative growth rate is 0.28. It is also found that the average exponential growth rate is 11.55% during the sample periods. The Geographical distribution of productivity of top 20 countries shows that Thailand has contributed 838 (30.74%) publications and ranked top among the countries in terms of publications. Among the authors engaged in CRC research, Wang J is the most productive author with 31 (1.13%) of total contributions. "Wang J' had collaborated with 82 researchers in colorectal cancer research. The most common keyword used by researcher is "human". Cluster Density view has identified 932 items with five different clusters, in which studies were grouped right from how alteration or changes take place in the cell or DNA to surgery or therapy or remedy related studies for CRC related cases.

Keywords: Scientometric, Colorectal Cancer, Colo Rectal, Cancer, Asia, PubMed Database

Introduction: As per World Health Organization factsheet Noncommunicable diseases like cardiovascular diseases, cancers, chronic respiratory diseases and diabetes kill forty million populations every year which is equal to seventy percent of death globally of which cancer accounts for 8.8 million. "Cancer is a dreaded one and the fear becomes real only when cancer touches oneself or those close to you"[1]. As per GLOBOCAN 2012 figure presented below, the estimated number of cases worldwide is 1, 40, 67,894 of which Lung, Breast, and Colorectal are in the top three cases. While comparing the estimated number of cases worldwide and Asia notice 67,63,030 cases i.e. 48.07% of the estimated number of cases is in Asia. Lung, stomach, Breast, and Colorectum are the most prevalent cases in Asia. It is one of the third most common cancers that affect men and second among the women. Pourhoseingholi (2012); J. Sung (2007) Increased burden of colorectal cancer in Asia reveals that there is an increasing rise in incidence

[1] Dr. Poonam Khetrapal Singh, Regional Director, WHO South-East Asia Region 13 January, 2016. http://www.searo.who.int/regional_director/speeches/2016/cancer_slt/en/

and mortality rate of Colorectal Cancer (CRC) in Asia which was considered previously low by Boyle & Levin (2008). Asia must take steps to prevent such emerging epidemic CRC related cases. Unlike developed countries most of the Asian countries access to health care for screening purpose is low, due to lack of awareness among the people Pourhoseingholi (2012); J. Sung, (2007); J. J. Sung et. al., (2005).

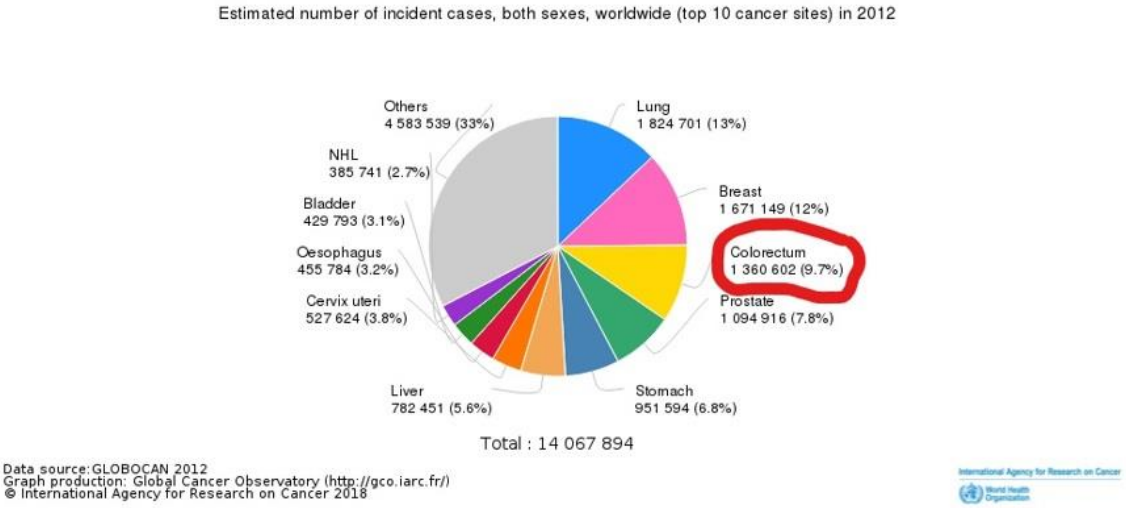

Figure-1: Estimated number of incidence cases World Wide

To reduce such impact and burden on society various agencies like world health organization, American Cancer society etc. along with several other organizations have been taking several steps. One among such steps is the 2030 agenda for sustainable development by WHO "Cancer Prevention and Control through an Integrated Approach" resolution 2017 to reduce the premature mortality from cancer[2].

[2] http://www.who.int/mediacentre/factsheets/fs297/en/

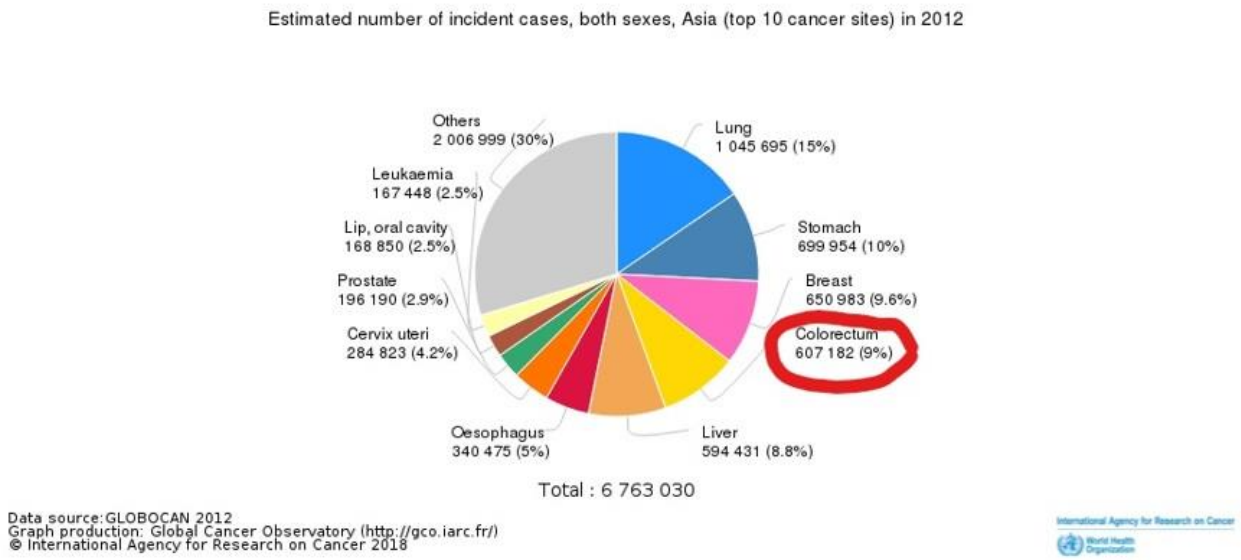

Figure-2: Estimated number of cancer incidence in Asia

AS per notifications of American Cancer society the abnormal changes in genes structure or abnormal growth of the cell in colon or rectum is known as colorectal cancer. Colorectal Cancer takes the form of a polyp (a noncancerous growth) that develops inside the colon or rectum and grows slowly, for over a period of time i.e. 10 to 20 years (Stryker et al., (1987); Winawer & Zauber, (2002). An adenomatous polyp, or adenoma, is the most commonly found among all individuals will eventually develop one or more adenomas Bond, (2000); Schatzkin et. al., (1994). Although all adenomas have the potential to become cancerous 10% are estimated to progress to invasive cancer Levine & Ahnen (2006); Risio (2010). The likelihood that an adenoma will become cancerous increases as it becomes larger Pickhardt et al., (2013). But it must be clear that adenocarcinoma accounts for approximately 96% of all CRCs Stewart et. al., (2006). Early CRC often has no symptoms, which requires screening. Screening facilities and lack of awareness are noticed among the Asian population which acts as a major hindrance from prevention of such CRC related threats; for which Asia must take immediate action to prevent and provide cost-effective screening facilities and extensive research and awareness on CRC Pourhoseingholi (2012); J. Sung (2007); J. J. Sung et al., (2005).

In line with this, from an academic point of view it is important to understand what are the steps taken by the academicians related to CRC research, i.e. exploring the types of scholarly communications available, who contribute extensively are there any collaboration in the CRC research and which countries in Asia contribute most.

There are number of studies conducted for different field of research by various authors like in the field of Oncology research by Patra & Bhattacharya (2013); Ranganathan (2014) covering different databases; based on various parameters like research growth, author productivity, authorship pattern, geographical distribution of the literature, global share of international collaborative papers and major partner countries and patterns of research communication. Similarly, in the field of cancer scholarly output like mouth cancer, lymphoma cancer, prostate

cancer and breast cancer were analyzed by several authors like and B. M. Gupta, Gupta, & Ahmed (2014); R. Gupta & Gupta (2014); Brij Mohan Gupta & Gupta (2015); Singh et. al., (2016) evaluated the literature growth, citation impact, share of international collaborative publications, publication output by geographical areas and type of research, treatment methods and geographical areas; publication productivity and citation impact of leading Indian organizations and authors.

Search results also revealed that scientific literature related to chronic diseases, virus etc. like diarrhea disease Khatun & Ahmed (2011), study on the publication of 'Osteoarthritis" research Thirumagal (2013), Ebola Virus Bhardwaj (2016), research efforts in measles Bala & Gupta (2012), Nephrology research output Murugan,C (2017), mycobacterial tuberculosis and leprosy in India Nishy & Rahul (2016), output in glaucoma research R. Gupta, Gupta, Kshitij, & Bala (2014) tuberculosis research output B. M. Gupta & Bala (2011), chronic liver disease research Naheem, Nagalingam, & Ramesha (2017), on aspects of allergy Dwivedi (2016), CVD research Saquib et. al., (2017), dental sciences studies Kaur & Gupta (2010), publication trends in food-borne disease research Kolle & Shankarappa (2017) were analyzed using Bibliometric and Scientometric by taking various databases like PubMed, Scopus, Thomson Reuters. A publication which includes growth, citation quality, format, Geographical contribution, subject-wise contribution, collaborative linkages, leading institutions, prolific authors, global publications share, citation impact, Time Series Analysis, Lotka's law, Bradford's law, Zipf Law, doubling time were analyses etc. using tools like Bibexcel, Histcite. Even in colorectal cancer output on Indian R. Gupta, Gupta, & Ahmed (2016) was found using Scopus database for a period of 2005-14. It was found that CRC research output using Scopus database for a period of 2005- 2014 concentrating on Indian publications considering aspects like i.e. international collaborative publications, publication output by geographical areas and, type of research, treatment methods and geographical areas and citation impact of leading Indian organizations and authors have been contributed in selected field of research. Since there is a vast difference between Scopus and PubMed, "Scopus is a type of "federated search interface", as it allows searchers to use a common/standardized search form to query the content found across its various sources. That means any database-specific functionality, for example the native PubMed search interface's ability to "map" to relevant Medical Subject Headings (MeSH) is not available when using the Scopus interface, nor is the ability to limit a search to the content of a single source database which is included in Scopus" Dina (2015). Now no one has made an attempt on this study will throw a light on CRC research output that is available on PubMed database.

The coining of the term by Nalimov (1969) "the application of these quantitative methods which deals with the analysis of science viewed as an information process". "The term had gained wide recognition by the foundation in 1978 of the journal Scientometric by Tibor Braun in Hungary Hood & Wilson (2001). According to Pritchard, Pritchard (1969) Scientometric is "to shed light on the processes of written communication and of the nature and course of development of a discipline by means of counting and analysing the various facets of written communication ... the application of mathematics and statistical methods to books and other media of communication". Both Bibliometric and Scientometric are related terms used to

describe part or all of this discipline. Each of these terms has a range of definitions that have been applied to them by the authors working in this field. These definitions indicate considerable overlap and they are not necessarily synonymous. Over time, the popularity (or usage) of the terms has changed, with the older term Bibliometric fairly stable and the newer terms and Scientometric gaining in usage Hood & Wilson (2001). It is one of the interdisciplinary research fields extended to almost all scientific fields. Scientometric applications are used to measure scientific publications indexed in databases. The application of Scientometric study is extremely valuable methods for evaluating research output, to know about the author productivity and citation analysis in science and technology. Scientometric tools can be used to measure and describe countries, universities, research institutes, journals, specific research topics and specific disciplines.

OBJECTIVES OF THE STUDY

1. To analyze the language distribution of Publications.
2. To study the growth pattern of publications during the period.
3. To find out the publication type and authorship pattern.
4. To find out the degree of collaboration, relative growth rate and doubling time.
5. To examine the Geographical distribution of publications.
6. To determine label and cluster analysis of colorectal cancer research.

METHODOLOGY AND DATA SOURCES

The data has been collected on research publications related to "Colorectal Cancer" from PubMed databases using the following search string retrieved on 5/04/2018: topic ("colorectal cancer") OR ("neoplasms colorectal") OR ("colorectal neoplasm") OR ("neoplasm colorectal") OR ("colorectal tumors") OR ("colorectal tumor") OR ("tumor colorectal") OR ("tumors colorectal") OR ("colorectal carcinoma") OR ("carcinoma colorectal") OR ("Carcinomas colorectal") OR ("colorectal carcinomas") OR ("cancer colorectal") OR ("cancers colorectal") OR ("colorectal cancers") AND ("Asian") Timespan: 2000-2017. A total of 2726 articles was retrieved from the database as a result of this limit, these were downloaded into text format and analyzed by using Bibexcel Software, tabulated and presented using MS Excel.

ANALYSIS AND INTERPRETATION

Language distribution

Table 1 shows the distribution of colorectal cancer literature based on language. It is found that scholarly communications are mostly in the English language in almost all the countries. It shows that the majority of the papers are published in the English language 2661 (97.61%); followed by Chinese 44 (1.62%), Japanese 13 (0.48%), Korean 5 (0.18), German 2 (0.07%) and French 1 (0.4%).

Table-1: Language wise distribution

S. No	Language	Records	%
1	English	2661	97.61
2	Chinese	44	1.62
3	Japanese	13	0.48
4	Korean	5	0.18
5	Germany	2	0.07
6	French	1	0.04
Total		**2726**	100

Growth pattern of publication on Colorectal Cancer

Table 2 shows the distribution of articles published on colorectal cancer research output in Asian Countries during 2000 - 2017 (18 years). A total of 2726 publications were published. The study reveals that the highest number of the articles was published in the year 2014 with 431 (15.81%) followed by 2015 with 358 (13.13%). The lowest number of publications was reported in the year 2001 with 18 (0.66%).

Table-2: Year wise distribution

Year	Records	%
2000	22	0.81
2001	18	0.66
2002	24	0.88
2003	36	1.32
2004	44	1.61
2005	58	2.13
2006	73	2.68
2007	89	3.26
2008	99	3.63
2009	107	3.93
2010	126	4.62
2011	174	6.38
2012	253	9.28
2013	312	11.45
2014	431	15.81
2015	358	13.13
2016	266	9.76
2017	236	8.66
Total	**2726**	**100**

Distribution by Publication Type

Table 3 reveals the share of bibliographical form among the published literature of colorectal cancer. It represents the 16 types of published documents during 2000 - 2017, such as; Journal Article, Comparative Study, Case Reports, Clinical Trial, English Abstract, Evaluation Studies, Comment letter, Letter, Historical Article, Consensus Development Conference, Controlled Clinical Trial, Review; Journal Article, News, and Lectures. Among these 2225 (81.62%) of publication were in the form of journal articles (highest contribution).

Table- 3: Publication Type

S. No	Document Type	Records	%
1	Journal Article	2225	81.62%
2	Comparative Study	252	9.24%
3	Case Reports	82	3.01%
4	Clinical Trial	64	2.35%
5	English Abstract	33	1.21%
6	Evaluation Studies	26	0.95%
7	Comment letter	13	0.48%
8	Letter	12	0.44%
9	Historical Article	5	0.18%
10	Consensus Development Conference	5	0.18%
11	Controlled Clinical Trial	3	0.11%
12	Review; Journal Article	2	0.07%
13	News	1	0.04%
14	Lectures	1	0.04%
15	Congresses	1	0.04%
16	Editorial	1	0.04%
	Total	**2726**	**100%**

Authorship Pattern

Table 4 depicts the authorship pattern of the papers based on collaborative research in the field of colorectal cancer during the period 2000- 2017. The highest number of papers i.e. 1230 had been contributed by collaborative work of more than ten authors followed by single author with 435, five authors with 180, two authors with 176, three and four authors with 108, ten authors with 160, seven authors with 98, eight authors with 96 and the least number of records were found by collaborative work of nine authors with 63 records.

Table- 4: Authorship Pattern

Year	1	2	3	4	5	6	7	8	9	10	10+	Total
2000	9	4	3	-	-	6	-	-	-	-	-	**22**
2001	3	4	3	8	-	-	-	-	-	-	-	**18**
2002	9	8	-	-	-	-	7	-	-	-	-	**24**
2003	12	10	6	8	-	-	-	-	-	-	-	**36**
2004	15	8	12	4	5	-	-	-	-	-	-	**44**
2005	22	16	3	12	5	-	-	-	-	-	-	**58**
2006	12	8	18	-	35	-	-	-	-	-	-	**73**
2007	16	14	6	16	15	6	-	16	-	-	-	**89**
2008	26	6	12	8	20	6	21	-	-	-	-	**99**
2009	14	6	3	24	30	-	7	8	-	-	15	**107**
2010	25	-	-	4	10	12	21	8	9	10	27	**126**
2011	17	4	6	4	15	12	-	8	-	-	108	**174**
2012	13	6	-	-	10	-	-	24	27	20	153	**253**
2013	43	6	3	-	-	6	7	8	9	40	190	**312**
2014	38	14	6	-	5	-	-	-	-	30	338	**431**
2015	49	14	3	4	-	6	7	-	9	20	246	**358**
2016	50	20	9	-	10	6	21	8	9	30	103	**266**
2017	62	28	15	16	20	12	7	16	-	10	50	**236**
Total	**435**	**176**	**108**	**108**	**180**	**72**	**98**	**96**	**63**	**160**	**1230**	**2726**

Degree of Collaboration

Table 5 represents the Degree of Collaboration in colorectal cancer research output. It was calculated by using the following Formula (K. Subramanyam, 1982)

$$C = \frac{NM}{NM+NS}$$

Where, C= Degree of Collaboration

NM= No. of Multi-authored papers

NS= No. of Single author papers.

The Degree of Collaboration ranges from 0.59 to 0.95 during the period of the study. The average mean value is found to be 0.84 indicate the increasing ratio of collaborative research work.

Table – 5: Degree of Collaboration

S. No	Year	Single Author(NS)	Multiple Authors(NM)	Total of (NS+ NM)	Degree of Collaboration (C)
1	2000	9	13	22	0.59
2	2001	3	15	18	0.83
3	2002	9	15	24	0.62
4	2003	12	24	36	0.66
5	2004	15	29	44	0.66
6	2005	22	36	58	0.62
7	2006	12	61	73	0.83
8	2007	16	73	89	0.82
9	2008	26	73	99	0.74
10	2009	14	93	107	0.87
11	2010	25	101	126	0.80
12	2011	17	157	174	0.90
13	2012	13	240	253	0.95
14	2013	43	269	312	0.86
15	2014	38	393	431	0.91
16	2015	49	309	358	0.86
17	2016	50	216	266	0.81
18	2017	62	174	236	0.74
Total		**435**	**2291**	**2726**	**0.84**

Relative Growth Rate and Doubling Time

Formula

$$R\,(1-2) = \frac{W2 - W1}{T2 - T1}$$

$$Dt(a) = \frac{0.693}{R(a)}$$

Where,
R (1-2) = Mean Relative Growth Rate over the Specified Period interval;
W1= log w1 (Natural log of the initial number of publications)
W2 = log w2 (Natural log of the initial number of publications)
T2-T1= the unit Difference between the initial time and final time.
R (a) = Relative Growth Rate per unit publication per unit of time (Year)

Table 6 reveals the Relative Growth Rate and Doubling Time of total publications. The Growth Rate is 0.60 in 2001 and which decreased up to 0.09 in 2017. The mean relative growth rate for the period of 2000- 2017 is 0.28, whereas the Doubling Time for different year gradually got increased from 1.15 in 2000 to 7.70 in 2017. The mean doubling time for the period of 2000-2017 is 2.85 which were increased gradually.

Table- 6: Relative Growth Rate and Doubling Time

Year	Total Articles	Total Cumulative	W_1	W_2	R(a) (W_2- W_1)	Mean R(a) (1-2)	Doubling Time Dt(a)	Mean Dt(a) (1-2)
2000	22	22	-	3.09	-		-	
2001	18	40	3.09	3.69	0.60		1.15	
2002	24	64	3.69	4.16	0.47		1.47	
2003	36	100	4.16	4.60	0.44		1.57	
2004	44	144	4.60	4.97	0.37	0.38	1.87	1.71
2005	58	202	4.97	5.31	0.34		2.04	
2006	73	275	5.31	5.62	0.31		2.23	
2007	89	364	5.62	5.89	0.27		2.56	
2008	99	463	5.89	6.14	0.25		0.77	
2009	107	570	6.14	6.34	0.20		3.46	
2010	126	696	6.34	6.54	0.20		3.46	
2011	174	870	6.54	6.77	0.23		3.01	
2012	253	1123	6.77	7.02	0.25		2.77	
2013	312	1435	7.02	7.27	0.25	0.19	2.77	3.99
2014	431	1866	7.27	7.53	0.26		2.66	
2015	358	2224	7.53	7.71	0.18		3.85	
2016	266	2490	7.71	7.82	0.11		6.30	
2017	236	2726	7.82	7.91	0.09		7.70	
Total	**2726**					**0.28**		**2.85**

Exponential Growth Rate

Table 7 indicates the exponential growth rate of publications in colorectal cancer research output during 2000 - 2017. The highest growth rate (1.50%) was found in the year 2003 with 36 records followed by 1.45% was found in the year 2012 (253 records). The least exponential growth rate was (0.74%) in the year 2016 with 226 records. It is found that the average exponential growth rate is 11.55% during the period. It shows the increasing growth from 2001 to 2014 and since the decreasing growth could be observed.

Table- 7: Exponential Growth Rate

S. No	Year	Publication	Exponential Growth Rate
1	2000	22	-
2	2001	18	0.82
3	2002	24	1.33
4	2003	36	1.50
5	2004	44	1.22
6	2005	58	1.32
7	2006	73	1.26
8	2007	89	1.22
9	2008	99	1.11
10	2009	107	1.08
11	2010	126	1.17
12	2011	174	1.38
13	2012	253	1.45
14	2013	312	1.23
15	2014	431	1.38
16	2015	358	0.83
17	2016	266	0.74
18	2017	236	0.88
Total		**2726**	**11.55**

The geographical productivity of colorectal cancer

Table 8 shows the distribution of productivity of top 20 countries during 2000-2017. It shows that Thailand has contributed 838 (30.74%) publications and ranked top among the countries in terms of publications; followed by the United States with 782 (28.69%) and England with 363 (13.32%) publications. India is also one among the top 20 countries in terms of colorectal cancer research and positioned in 11th rank with 29 (1.06%) publications

Table- 8: Performance of the Top-Twenty Countries

S. No	Country	Records	%
1	Thailand	838	30.74
2	United States	782	28.69
3	England	363	13.32
4	Netherlands	129	4.73
5	China	117	4.29
6	Japan	116	4.26
7	Germany	88	3.23
8	Australia	71	2.60
9	Greece	34	1.25
10	Korea (South)	30	1.10
11	India	29	1.06
12	Switzerland	26	0.95
13	Brazil	16	0.59
14	New Zealand	11	0.40
15	Denmark	11	0.40
16	France	10	0.37
17	Canada	8	0.29
18	Singapore	8	0.29
19	Egypt	7	0.26
20	Italy	5	0.18

Ranking the authors

The top 20 most productive authors were identified in colorectal cancer research and published 13 or more papers during 2000- 2017. Those 20 authors together contributed 359 (13.03%) papers. Among the top 20 authors, Wang J is the most productive author who contributed 31 (1.13%), followed by Zali MR with 29 (1.05%) of articles, Wang Y with 23 (0.83%) and Li J with 20 (0.73%) of articles.

Table- 9: Most prolific authors (Top 20)

S. No	Authors	Records	%
1	Wang J	31	1.13
2	Zali MR	29	1.05
3	Wang Y	23	0.83
4	Li J	20	0.73
5	Li L	20	0.73
6	Li X	19	0.69
7	Li Y	19	0.69
8	Tsugane S	17	0.62
9	Le Marchand L	17	0.62
10	Liu Y	17	0.62
11	Wang X	17	0.62
12	Wang L	16	0.58
13	Zhang X	15	0.54
14	Kono S	15	0.54
15	Sung JJ	15	0.54
16	Tajima K	15	0.54
17	Zhang Y	14	0.51
18	Liu L	14	0.51
19	Maxwell AE	13	0.47
20	Matsuo K	13	0.47
	Total	**359**	**13.03**

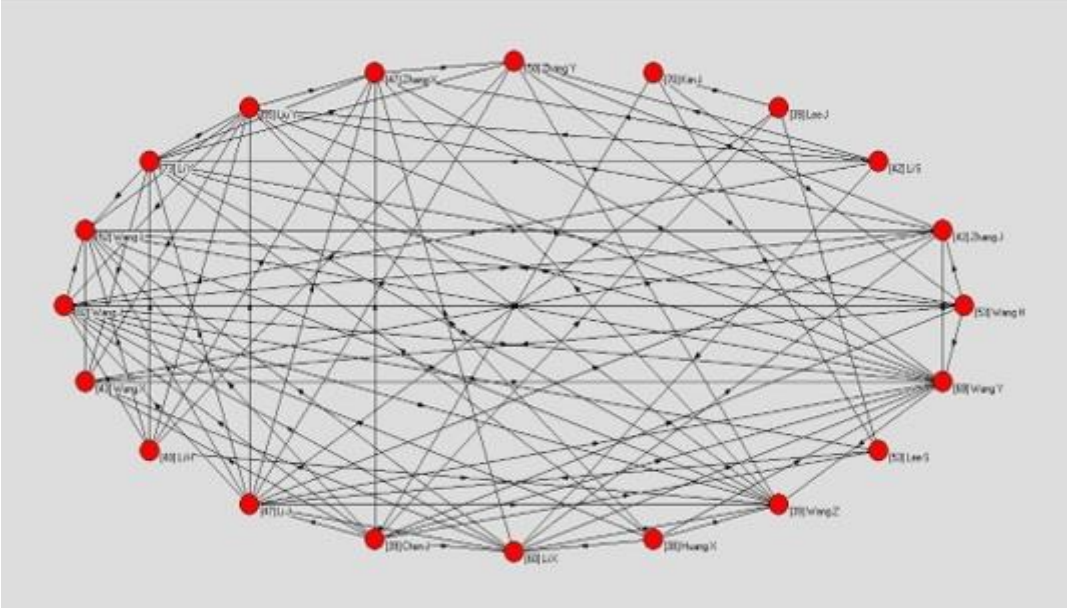

Figure- 3: Author Collaborations in Colorectal Cancer

Figure-3 shows the collaborative research work among the authors of Asian Countries in colorectal cancer. 'Wang J' had collaborated with 82 authors, followed by Li Y with 73, Kim J with 70 and Wang Y with 69.

Application of Zipf's Law in colorectal cancer research

Figure 4 reveals the type of keywords used in colorectal cancer research articles. The number of keywords used in the scientific publications can be identified using Zipf's law i.e. relation between the rank of a word and frequency of its appearance in a long text. If 'r' is a rank of a word and 'f' is its frequency the Zipf's law stated as flow: $rf = c$

For this colorectal cancer research, 25,753 keywords are used as Mesh heading. Top 20 keywords were taken for implementing Zipf's law

Table- 10: Keyword wise distribution

Year	Keywords	Records	%
1	Humans	2423	17.23%
2	Male	1761	12.52%
3	Female	1742	12.39%
4	Middle Aged	1478	10.51%
5	Aged	1221	8.68%
6	Adult	992	7.05%
7	Aged, 80 and over	493	3.51%
8	Case-Control Studies	432	3.07%
9	Prognosis	425	3.02%
10	Risk Factors	375	2.67%
11	Genetic Predisposition to Disease	367	2.61%
12	Asian Continental Ancestry Group	356	2.53%
13	Neoplasm Staging	297	2.11%
14	Follow-Up Studies	285	2.03%
15	Genotype	271	1.93%
16	Retrospective Studies	264	1.88%
17	Asian Continental Ancestry Group/ genetics	244	1.73%
18	Incidence	243	1.73%
19	Polymorphism, Single Nucleotide	209	1.49%
20	Odds Ratio	186	1.32%

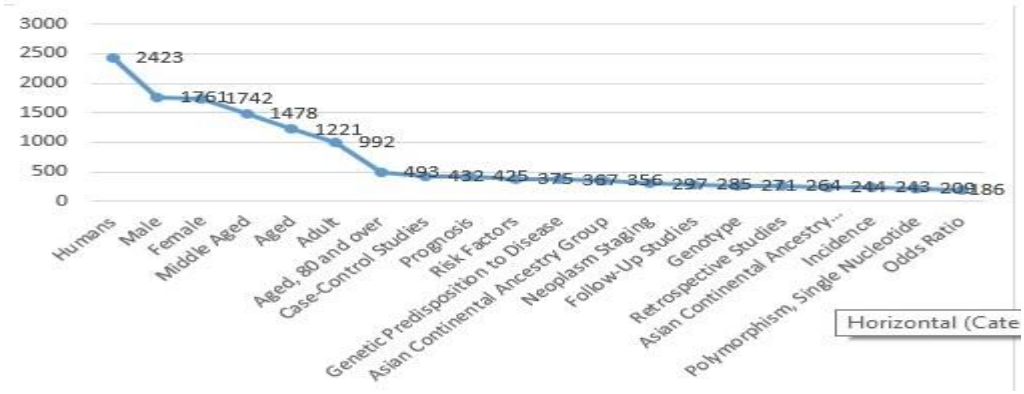

Figure- 4: Application of Zipf's Law

Label and cluster analysis of colorectal cancer research

For analyzing bibliometric network, VOS viewer is used. Maps are created by using VOS Mapping techniques and VOS Clustering techniques. The output file is created for the years 2017 on colorectal cancer research with the bib excel Software. Cluster Density view identified 932 items and cluster in five. The first cluster is given in red colour with 255 items, shows how alteration or changes takes place in the cell or DNA; Second cluster is given in green colour with 205 items related to modulation of gene expression process; third cluster is seen blue colour with 204 items, shows the study of particular genes carried by the individual groups or based on ethnicity or sequence difference. The fourth cluster is given yellow with 137 items studies related to screening related activities to detect the CRC and the fifth cluster is the purple color with 131 items related to surgery or therapy or remedy for CRC related cases.

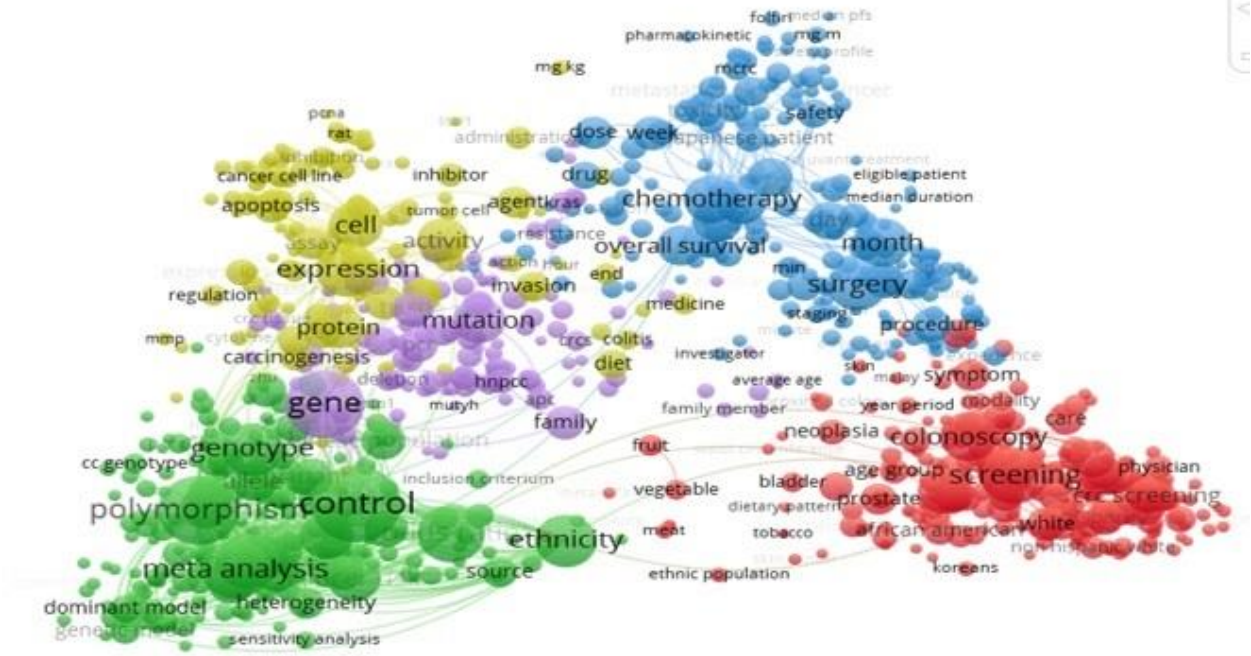

Figure- 5: Label view of Colorectal Cancer

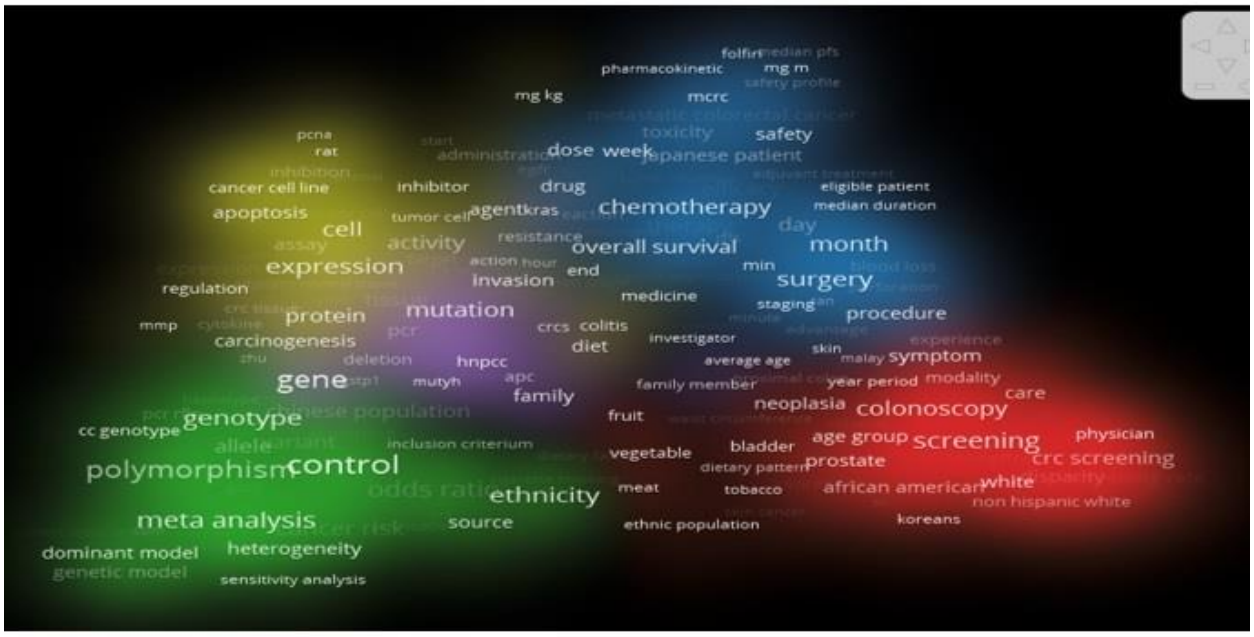

Figure- 6: Cluster view of Colorectal Cancer

Findings and conclusion

The distribution of colorectal cancer literature by language shows most common scholarly communication used is English irrespective of the native language of the country. i.e. the majority of the papers are published in the English language 2661 (97.61%).

The yearly distribution of articles published on colorectal cancer research output in Asian Countries during 2000 - 2017 (18 years). A total of 2726 publications was published. The highest number of publications 431 (15.81%) was published in the year 2014.

The source wise documents of distribution on colorectal cancer research output during the study period were in the form of journal articles i.e. 2225 (81.62%) publications were covered by Journal Articles.

The authorship pattern indicates the maximum number of papers was published by collaborative work of more than ten authors 1230. The lowest by a group of nine authors which amounts to 60.

The Degree of Collaboration ranges from 0.59 to 0.95 during the period of the study. The mean value is 0.84 indicate the high ratio of collaborative research work undertaken by researchers.

The Relative Growth Rate and Doubling Time of total publications show decreasing and increasing trend. The mean relative growth rate for the period of 2000 - 2017 is 0.28. The mean doubling time for the period of 2000 - 2017 is 2.85 which increased gradually.

It is found that the average exponential growth rate is 11.55% during the period.
The Geographical distribution of productivity, we have into top 20 countries during 2000 - 2017. It shows that Thailand has contributed 838 (30.74%) publications and ranked top among the countries in terms of publications.

The study reveals that the Wang J is the most productive author with 31 (1.13%) of total records.

The study found the “Wang J’ had collaborated with 82 researchers in colorectal cancer research. The most common keyword used by researcher is “human” i.e. used in 2423 records.

Unlike developed countries screening facilities and lack of awareness among the Asian populations acts as a major hindrance from prevention of such CRC related threats; for which Asia must take immediate action to prevent and provide cost-effective screening facilities and extensive research and awareness on CRC. The cluster-wise grouping of studies showed less concentration on screening related activities to detect the CRC and studies related to surgery or therapy or remedy for CRC related cases.

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