

## Mouth Cancer Research: A Quantitative Analysis of World Publications, 2003-12

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### ABSTRACT

The paper presents an analysis of 37049 world papers in mouth cancer, indexed in Scopus database during 2003-12, experiencing an annual average growth rate of 5.15 % and citation impact of 9.72. The 15 most productive countries account for 88.14 % share in world output, with largest share (26.79 %) coming from USA, followed by Japan (9.31 %), UK (7.58 %), Germany (5.82 %), Italy (5.60 %), China (4.98 %), India (4.94 %), etc., during 2003-12. Eight out of 20 countries have achieved relative citation index above 1—France (1.74), Australia (1.58), Netherlands (1.55), Canada (1.43), USA (1.33k), Germany (1.21), UK (1.16), Italy (1.06), and Spain (1.05) during 2003-12. Medicine contributed the largest share (82.72 %) among subjects, followed by biochemistry, genetics & molecular biology (29.33 %), dentistry (14.36 %), pharmacology, toxicology & pharmaceuticals (8.36 %), immunology & microbiology (1.90 %), etc during 2003-12. In cancer site, tongue, salivary glands and oropharynx contributed the largest share of 12.04 %, 10.02 % and 8.44 % respectively during 2003-12. Squamous cell carcinoma contributed the largest share of 27.20 % among types of mouth cancer research, followed by lymphomas (12.72 %), salivary gland carcinoma (10.02 %), and melanoma (3.36 %) etc during 2003-12. Surgery contributed the largest share (15.77 %) among treatment methods used, followed by chemotherapy (14.99 %), diagnosis (13.20 %), radiotherapy (12.86 %), pathology (12.48 %), etc. during 2003-12. Among several organisations, authors and journals, the top 20 contributed 14.1 %, 4.27 %, and 23.16 % share respectively during 2003-12.

**Keywords:** Scientometrics, mouth cancer research, SCOPUS

### 1. INTRODUCTION

Oral cancer or mouth cancer affects the oral cavity. The oral cavity is the first part of the digestive tract. It is a complex structure with nutritional respiratory and communicative functions. Bound by hard and soft tissues, it includes the upper and lower teeth, the tongue, the salivary glands, mucosal glands, the various freni, and the rugae over the hard palate. The mouth is bound interiorly by the lips, on the lateral aspect by the cheeks. Its roof is formed by the hard palate and inferiorly by the mucosa covering the superior surface of the tongue and the sheet of muscles attaching to the inner side of mandible. The oral cavity is continuous with the pharyngeal cavity, a more complex and somewhat irregular space<sup>1</sup>.

There are several types of oral cancers, some being squamous cell carcinomas, veracious carcinomas, salivary gland carcinomas, lymphomas, malignant

melanoma, and others. More than 9 of 10 cancers of the oral cavity are squamous cell carcinomas, also called squamous cell cancers. These cancers begin in early forms of squamous cells, which are flat, scale-like cells that normally form the lining of the mouth and throat. Verrucous carcinoma is a type of squamous cell carcinoma that makes up less than 5 % of all oral cancers. It is a low-grade (slow growing) cancer that rarely spreads to other parts of the body, but it can grow deeply into surrounding tissue. Minor salivary gland cancers can develop in the glands in the lining of the mouth and throat. There are several types of minor salivary gland cancers, including adenoid cystic carcinoma, mucoepidermoid carcinoma, and polymorphous low-grade adenocarcinoma. The tonsils and base of the tongue contain immune system (lymphoid) tissue, where cancers called lymphomas can start<sup>2</sup>.

Oral cancer was the 15<sup>th</sup> most common cancer in the world, with nearly 300,000 new cases in 2012,

contributing 2.1 % share of the total worldwide new cancer cases diagnosed in 2012. In men and women, oral cancer was the 11<sup>th</sup> and 17<sup>th</sup> most common cases in the world, with nearly 199,000 and 101,000 new cases diagnosed worldwide in 2012, contributing to 2.7 % and 1.5 % share of the total new cancer cases diagnosed in 2012. The male and female crude incidence rate was 5.6 and 2.9 and age standardised incidence rate 5.5 and 2.5 in mouth cancer in 2012. Oral cancer resulted in 145,328 deaths (97919 in men and 47409 in women) in 2012. The men and women crude mortality rate was 2.8 and 1.4 and age standardised mortality rate 2.7 and 1.2 in 2012. Around 62 % of the oral cancer cases arise in developing countries<sup>3</sup>.

## 2. LITERATURE REVIEW

Glynn<sup>4</sup>, *et al.* analysed the proportion, quality and relevance of oncology related articles on all 26 most common cancer publications published in 2007 and relate this output to their associated disease burden. Shao<sup>5</sup>, *et al.* studied the world cancer research output, as covered in 30 representative oncology journals during 2001 to 2010, using *Web of Science* database. It identified the primary research centers, including the top 20 institutions and countries and the four major oncology research fronts. Lewison<sup>6</sup> identified research output of 15 leading countries in cancer, using three versions of a filter, in 2005 and 2009 using *Web of Science* database. It gave different indicators of performance of leading countries. Lopez-Illescas<sup>7</sup>, *et al.* analysed the robustness of country-by-country rankings according to number of published articles and the average citation impact in the field of oncology, using both *Web of Science* and *Scopus* databases.

Ugolini & Mela<sup>8</sup> evaluated European Union (EU) research output in oncology journals from 1996-2000 and compared it with USA and the world & research trends are highlighted through the keywords. Lopez-Illescas<sup>9</sup>, *et al.* evaluated the performance of European countries in oncology during 2000-06 and identified the most important journals and academic institutions during 2000-2006, using *Web of Science*. Chitra<sup>10</sup>, *et al.* examined and compare the growth rate, collaboration and publication activity in cancer research in G7 and BRIC countries, using two relative indicators, using *Scopus* database, 2003-12

Ortiz<sup>11</sup>, *et al.* examined cancer research output in Puerto Rico and its relationship with cancer mortality. Lewison & Markusova<sup>12</sup> evaluated cancer research output in Russia, with a view to explore whether there is enough cancer research and does it reflect the health needs of the country and how does its research quality compare with world standard. Lewison<sup>13</sup>, *et al.* investigated changes in research activity (total output), relative commitment and collaborations between countries/regions (UK with

other countries) with similar healthcare, population and development parameters to assess the utility of this policy research approach and the impact of changes on research publications as a surrogate for overall research activity

Ho<sup>14</sup>, *et al.* analysed research performance of individuals, institutes and collaborating countries with Japan in lung cancer research. Glynn<sup>15</sup>, *et al.* analysed 180126 research papers appearing in 4096 journals from 155 countries in breast cancer from 1945-2008. Dursun<sup>16</sup>, *et al.* identified top ranking countries, institutions and authors in three gynecological journals, as well as degree of Turkish contribution during 2000-07. Klar<sup>17</sup>, *et al.* evaluated the quantity (6119 papers) and quality of research output in gynecological oncology during 1996-2006. Research productions of different countries are compared with national population and gross domestic product.

Ugolini<sup>18</sup>, *et al.* examined 3842 papers from 92 journals in cancer epidemiology among countries during 1995-2004 and compared number of publications and the impact factor with country population and gross domestic product. Moghimi<sup>19</sup>, *et al.* analysed 3259 articles (receiving 14894 citations) in breast reconstruction surgery published since 1990 and focused on subject analysis, geographical distribution, leading institutions and authors and highly cited papers.

There is no research paper based quantitative analysis of mouth cancer literature both at national and international level. As a result, the present study was undertaken on the global publication output in mouth cancer.

## 3. OBJECTIVES

The main objective of this study is to analyse the global research output in mouth cancer during 2003-12, with a view to study:

- (i) World research output, its growth, rank and global publications share and citation impact of top 15 countries
- (ii) Output and impact by different sub-fields, different types of research, site origin, treatment methods and by different population age groups; and
- (iii) Publications productivity and impact of 20 leading institutions.

## 4. METHODOLOGY AND SOURCE OF DATA

The world and 15 most productive countries publications in mouth cancer were extracted and downloaded from *Scopus International Database*<sup>20</sup> for 10 years (2003-12). For identifying literature on mouth cancer, a set of keywords were identified and the following search strategy (main strategy) was used to search and download data resulting

in 37049 global publication in mouth cancer.

((TITLE-ABS-KEY(oral cancer))) OR ((TITLE-ABS-KEY(mouth cancer))) or ((TITLE-ABS-KEY(mouth neoplasm))) OR ((TITLE-ABS-KEY(oral neoplasm))) or ((TITLE-ABS-KEY(tongue cancer))) OR ((TITLE-ABS-KEY(tongue neoplasm))) OR ((TITLE-ABS-KEY(gingival cancer ))) or ((TITLE-ABS-KEY(gingival neoplasm))) OR ((TITLE-ABS-KEY(lip cancer ))) or ((TITLE-ABS-KEY(lip neoplasm))) OR ((TITLE-ABS-KEY(palatal cancer))) or ((TITLE-ABS-KEY(palatal neoplasm))) OR ((TITLE-ABS-KEY(salivary gland cancer))) or ((TITLE-ABS-KEY(salivary gland neoplasm)))OR ((TITLE-ABS-KEY(oral leukoplakia)))

For output on India and other countries, the main search strategy was limited to country tag and period tag from 2003-12. The type of cancer, cancer site and research type was identified with a set of keywords, which were later converted into three separate search strategies. Each individual search strategy was combined with the main strategy to generate the desired publication output. Mouth cancer research output was classified according to population age groups based on keywords, such as child, adolescents, adults, middle aged and aged 80 & over: For analysing papers by sub-fields, classification as provided in Scopus database has been used. For analysing significant institutions, separate search strategy was developed, which later combined with the main search strategy leading to the generation of the desired output. For citations data, three years, two years and one year citation window has been used for computing average citations per paper in mouth cancer research during 2003-10, 2011 and 2012

The study uses a number of indicators, absolute and relative. They include the raw count of papers and citations, number of international collaborative papers, average citation per paper, activity index and relative citation impact. Citation per paper is measured by the ratio of total number of citations and the total number of papers for a country or an institution. Relative citation index (RCI) is defined as the ratio of country's share of world citations and country's share of world publications. The activity index is defined as a country's share of its total article output across subject field(s) relative to the global share of articles in the same subject field(s).

## 5. ANALYSIS

The world has published 37049 papers in mouth cancer during 2003-12, which increased from 2980 papers in year 2003 to 4667 papers in year 2012, registering an annual average growth rate of 5.15 %. The cumulative growth of world publication output has increased from 16294 papers during 2003-07 to 20755 papers during 2008-12, witnessing a growth rate of 27.38 % (Table 1). The average citation

impact per paper registered by world publications in mouth cancer was 9.72 during 2003-12, which decreased from 10.0 during 2003-07 to 9.49 during 2008-12. Of the total world output in mouth cancer during 2003-12, articles constituted 73.55 % share (27248), reviews (16.55 %, 6131 papers), letters (3.66 %, 1355 papers), conference papers (2.21 %, 819 papers), notes (1.57 %, 580 papers), editorial (1.31 %, 486 papers), short surveys (1.05 %, 388 papers), and others appearing as articles in press, book chapter and erratum. Of the total world output in mouth cancer, 90.77 % (33628 papers) appeared in English, followed by Chinese (1.89 %, 700 papers), Japanese (1.65 %, 611 papers), German (1.54 %, 570 papers), French (1.38 %, 511 papers), Spanish (1.16 %, 428 papers), and others in 25 other languages.

**Table 1. Growth of the World output in mouth cancer, 2003-12**

Year	No. of papers
2003	2980
2004	3214
2005	3259
2006	3372
2007	3469
2008	3794
2009	3873
2010	4013
2011	4408
2012	4667
2003-07	16294
2008-12	20755
2003-12	37049

### 5.1 Global Publication and Citation Share of Top 15 Most Productive Countries

The global publication share of top 15 most productive countries in mouth cancer research varies from 1.85 % to 26.79 % and they together contributed 88.14 % share in the world output during 2003-12 (Table 2).

The global citation share of the top 15 most productive countries in mouth cancer research varies from 1.69 % to 35.68 % during 2003-12. USA again occupied the first rank with global citation share of 35.68 %, followed by UK (8.76 %), Germany (7.06 %), France (6.66 %), Italy (5.91 %), Japan (5.62 %), Canada (4.27 %), Netherlands (4.03 %), Spain (3.25 %), Australia (3.19 %), China (2.96 %), Taiwan (2.43 %), India (2.29 %), Brazil (1.86 %), and South Korea (1.69 %) during 2003-12. The largest increase (2.59 %) in world citation share was observed in France, followed by China (2.01 %), Taiwan (1.88 %), South Korea (1.06 %), Brazil (0.99 %), Spain

**Table 2. World publication & citation share of top 15 most productive countries in mouth cancer, 2003-12**

Country	No. of papers			World share of papers (in %)			World share of citation (in %)		
	2003-07	2008-12	2003-12	2003-07	2008-12	2003-12	2003-07	2008-12	2003-12
USA	4466	5461	9927	27.41	26.31	26.79	37.76	33.96	35.68
Japan	1703	1746	3449	10.45	8.41	9.31	7.05	4.43	5.62
UK	1283	1526	2809	7.87	7.35	7.58	9.28	8.33	8.76
Germany	988	1168	2156	6.06	5.63	5.82	7.76	6.48	7.06
Italy	869	1205	2074	5.33	5.81	5.60	6.03	5.80	5.91
China	489	1357	1846	3.00	6.54	4.98	1.86	3.87	2.96
India	567	1265	1832	3.48	6.09	4.94	2.10	2.46	2.29
France	614	804	1418	3.77	3.87	3.83	5.24	7.83	6.66
Taiwan	442	821	1263	2.71	3.96	3.41	1.95	2.83	2.43
Brazil	402	831	1233	2.47	4.00	3.33	1.70	1.99	1.86
Spain	444	697	1141	2.72	3.36	3.08	3.01	3.44	3.25
Canada	477	633	1110	2.93	3.05	3.00	4.57	4.02	4.27
Netherlands	438	528	966	2.69	2.54	2.61	4.26	3.84	4.03
Australia	310	436	746	1.90	2.10	2.01	3.04	3.31	3.19
South Korea	235	450	685	1.44	2.17	1.85	1.11	2.17	1.69
<b>Total</b>	<b>16294</b>	<b>20755</b>	<b>37049</b>	<b>100</b>	<b>100</b>	<b>100</b>			

(0.43 %), India (0.36 %), and Australia (0.27 %), as against decrease in USA by 3.80 %, followed by Japan (2.62 %), Germany (1.28 %), UK (0.95 %), Canada (0.55 %), Netherlands (0.42 %), and Italy (0.23 %) from 2003-07 to 2008-12.

In terms of RCI, the first rank was occupied by France with relative citation index of 1.74, followed by Australia (1.58, 2nd rank), Netherlands (1.55), Canada (1.43), USA (1.33), Germany (1.21), UK (1.16), Italy (1.06), Spain (1.05), South Korea (0.91), Taiwan (0.71), Japan (0.60), China (0.59), Brazil (0.56), and India (0.46) during 2003-12. The increase (0.63) in RCI was observed in France and South Korea (0.33), as against decrease in Canada (0.24), India (0.20), Brazil (0.19), Japan (0.14), Germany (0.13), Italy (0.13), USA (0.09), Netherlands (0.08), Spain (0.07), UK (0.05), China (0.03), and Australia (0.03) from 2003-07 to 2008-12.

## 5.2 International Collaboration

The highest share (48.02 %) of international collaborative publications in total publications output of top 15 most productive countries in mouth cancer during 2003-12 was registered by Canada, followed by Australia (45.44 %), France (43.44 %), Netherlands (41.82 %), Germany (38.03 %), UK (35.81 %), Italy (30.67 %), Spain (30.06 %), USA (25.26 %), China (24.16 %), Brazil (18.41 %), South Korea (17.52 %), India (14.85 %), Japan (12.26 %), and Taiwan (11.88 %) (Table 3).

## 5.3 Subject-Wise Distribution of Mouth Cancer Research Output

The world's publication output in mouth cancer research during 2003-12 has been published in the

**Table 3. Number and share of international collaborative papers of top 15 most productive countries in mouth cancer, 2003-12**

Country	Total papers	International collaborative papers (%)
USA	9927	2508 (25.26 %)
Japan	3449	423 (12.26 %)
UK	2809	1006 (35.81 %)
Germany	2156	820 (38.03 %)
Italy	2074	636 (30.67 %)
China	1846	446 (24.16 %)
India	1832	272 (14.85 %)
France	1418	616 (43.44 %)
Taiwan	1263	150 (11.88 %)
Brazil	1233	227 (18.41 %)
Spain	1141	343 (30.06 %)
Canada	1110	533 (48.02 %)
Netherlands	966	404 (41.82 %)
Australia	746	339 (45.44 %)
South Korea	685	120 (17.52 %)

context of seven sub-fields (as reflected in database classification), with highest publication output coming from medicine (30647 papers, 82.72 %), followed by biochemistry, genetics & molecular biology (10866 papers, 29.33 %), dentistry (5322 papers, 14.36 %), pharmacology, toxicology & pharmaceuticals (3099 papers, 8.36 %), immunology & microbiology (705 papers, 1.90 %), health profession (697 papers, 1.88 %), and chemistry (449 papers, 1.21 %) (Table 4). The

**Table 4. Subject-wise break-up of world publications in mouth cancer, 2003-12**

Subject	No. of publications			Activity index of publications	
	2003-07	2008-12	2003-12	2003-07	2008-12
Medicine	12895	17752	30647	95.67	103.40
Biochemistry, Genetics & Molecular Biology	4493	6373	10866	94.02	104.70
Dentistry	1988	3334	5322	84.94	111.83
Pharmacology, Toxicology, and Pharmaceutics	1318	1781	3099	102.59	96.70
Immunology & Microbiology	307	398	705	100.77	99.01
Health Profession	437	260	697	66.59	142.56
Chemistry	139	310	449	123.24	70.39
<b>Total</b>	<b>16294</b>	<b>20755</b>	<b>37049</b>		

There is a duplication of output under subject tags, and as a result total output under these subject sub-fields will be higher than the actual total output of the world

research activity, as reflected in activity index, has increased in case of medicine, biochemistry, genetics & molecular biology, dentistry and health profession in contrast to decrease in pharmacology, toxicology and pharmaceutics, immunology & microbiology and chemistry from 2003-07 to 2008-12.

#### 5.4 Type of Mouth Cancer Research

Of the total world publications in mouth cancer, 27.20 % were reported in squamous cell carcinoma (10077 papers), followed by lymphomas (4711 papers, 12.72 %), salivary gland carcinoma (3713 papers, 10.02 %), melanoma (1245 papers, 3.36 %) and others (34 papers, 0.09 %) during 2003-12. The world publication share has increased in squamous cell carcinoma (from 25.42 % to 28.60 %), melanoma (from 2.95 % to 3.68 %) and others (from 0.09 % to 0.10 %), as against decrease in salivary gland carcinoma (from 10.25 % to 9.84 %) and lymphomas (from 14.87 % to 11.02 %) from 2003-07 to 2008-12.

#### 5.5 Mouth Cancer Publications by Site

Of the total world publications in mouth cancer by site, highest 12.04 % were reported in tongue (4461 papers), followed by salivary gland carcinoma (3713 papers, 10.02 %), etc. during 2003-12 (Table 5).

The publication activity has increased in tongue (from 11.60 % to 12.39 %), oropharynx or pharynx (from 7.94 % to 8.83 %), lips (from 4.78 % to 5.14 %), gingival (gums)(from 3.99 % to 4.12 %), teeth (from 3.33 % to 3.55 %), buccal mucosa (from 2.61 % to 2.71 %), maxilla (from 2.24 % to 2.35 %), tonsils (from 1.8 % to 1.60 %), hard palate (from 0.73 % to 0.90 %) and alveolar ridges (from 0.17 % to 0.20 %) in contrast to decrease in salivary glands (from 10.25 % to 9.84 %), mouth floor (from 1.77 % to 1.76 %), uvula (0.06 % to 0.05 %) and retromolar trigone (0.06 % to 0.04 %) from 2003-07 to 2008-12.

**Table 5 Topic-wise break-up of world publications in mouth cancer, 2003-12**

S. No.	Topics covered	No. of papers (%) (2003-12)
1.	Tongue	4461 (12.04 %)
2.	Salivary gland carcinoma	3713 (10.02 %)
3.	Oropharynx or Pharynx	3126 (8.44 %)
4.	Lips	1846 (4.98 %)
5.	Gingival (gums)	1505 (4.06 %)
6.	Teeth	1279 (3.45 %)
7.	Buccal mucosa	987 (2.66 %)
8.	Maxilla	852 (2.30 %)
9.	Mouth floor	654 (1.771 %)
10.	Tonsils	525 (1.42 %)
11.	Hard palate	305 (0.82 %)
12.	Soft palate	237 (0.64 %)
13.	Alveolar ridges	70 (0.19 %)
14.	Uvula	19 (0.05 %)
15.	Retromolar trigone	18 (0.05 %)
<b>Total</b>		<b>19687</b>

#### 5.6 Mouth Cancer Publications by Treatment Methods

In terms of treatment methods used as reflected in mouth cancer output during 2003-12, the largest share is occupied by surgery (15.77 %), followed by chemotherapy (14.99 %), diagnosis (13.20 %), radiotherapy (12.86 %), pathology (12.48 %), prognosis (10.51 %), genetics (9.18 %), quality of life (4.35 %), screening (4.33 %), epidemiology (2.25 %) and palliative care (1.03 %). From Table 6, it can be deduced that publication activity has increased in surgery from 2003-07 to 2008-12, radiotherapy, pathology, prognosis, genetics, screening, and epidemiology, as against decrease in chemotherapy, diagnosis, quality of life, and palliative care.

**Table 6. Distribution of world mouth cancer publications by treatment methods, 2003-12**

S. No.	Mouth cancer by treatment methods	No. of papers			% share of papers		
		2003-07	2008-12	2003-12	2003-07	2008-12	2003-12
1.	Surgery	2447	3397	5844	15.02	16.37	15.77
2.	Chemotherapy	2514	3039	5553	15.43	14.64	14.99
3.	Diagnosis	2158	2731	4889	13.24	13.16	13.20
4.	Radiotherapy	2060	2705	4765	12.64	13.03	12.86
5.	Pathology	1956	2666	4622	12.00	12.85	12.48
6.	Prognosis	1552	2341	3893	9.52	11.28	10.51
7.	Genetics	1490	1910	3400	9.14	9.20	9.18
8.	Quality of Life	713	900	1613	4.38	4.34	4.35
9.	Screening	653	952	1605	4.01	4.59	4.33
10.	Epidemiology	358	474	832	2.20	2.28	2.25
11.	Palliative Care	191	189	380	1.17	0.91	1.03
<b>Total</b>		<b>16294</b>	<b>20755</b>	<b>37049</b>	<b>100</b>	<b>100</b>	<b>100</b>

### 5.7 Mouth Cancer Research Output by Population Age Groups

On classifying mouth cancer research output by different population groups, it was observed that the largest share (46.06 % and 17064 papers) is registered by adults, followed by middle aged (37.94 %, 14056 papers), aged 80 & over (12.85 %, 4759 papers), adolescent (8.24 %, 3054 papers) and child (5.39 %, 1996 papers) during 2003-12. The publication activity has decreased in adults (from 46.53 % to 45.69 %), middle aged (from 38.40 % to 37.58 %) and adolescent (from 8.30 % to 8.20 %) as against increase in aged 80 & over (from 11.99 % to 13.51 %) and child (from 5.19 % to 5.55 %) from 2003-07 to 2008-12.

### 5.8 Profile of Top 20 Most Productive Organisations in Mouth Cancer Research

The top 20 most productive organisations have published from 179 to 695 papers and together contributed 14.10 % (5225 papers) share in the cumulative world publications output in mouth cancer during 2003-12. The scientometric profile of these 20 organisations is shown in Table 7.

#### 5.8.1 Higher Publication Output

Five organisations have published higher publications output than the group average productivity of 261.25:

- (i) University of Texas, MD Anderson Cancer Center, USA with research (695 papers)
- (ii) National Cancer Institute, USA (416 papers)
- (iii) Universidade de Sao Paulo, Brazil (402 papers)
- (iv) University of California, San Francisco, USA (284 papers), and
- (v) Memorial Sloan Kettering Cancer Center, New York, USA (265 papers).

#### 5.8.2 Average Citation Impact Per Paper (ACPP)

Average Citation Impact Per Paper (ACPP) varied from 4.69 to 39.25, with average citation impact 14.65. Eight organisations have registered more than the average citation impact all 20 organisations:

- (i) International Agency for Research on Cancer, France with ACPP of 39.25
- (ii) Brigham & Women's Hospital, Harvard Medical School, Boston, USA (22.73)
- (iii) Memorial Sloan Kettering Cancer Center, New York, USA (22.58)
- (iv) Mayo Clinic, Rochester, USA (20.64)
- (v) National Cancer Institute, USA (19.12)
- (vi) University of Texas, MD Anderson Cancer Center, USA (17.65)
- (vii) VU University Medical Center, Amsterdam, Netherlands (17.57), and
- (viii) University of California, San Francisco, USA (16.17) during 2003-12.

#### 5.8.3 *h*-index

The *h*-index of 20 most productive organisations in mouth cancer research varied from 18 to 71, with average *h*-index of 36.8 during 2003-12. Nine organisations have registered more than the average *h*-index of all organisations:

- (i) University of Texas, MD Anderson Cancer Center, USA with *h*-index of 71
- (ii) National Cancer Institute, USA (61)
- (iii) Brigham & Women's Hospital, Harvard Medical School, Boston, USA (51)
- (iv) International Agency for Research on Cancer, France (50)
- (v) Memorial Sloan Kettering Cancer Center, New York, USA (45)

**Table 7. Scientometric profile of top 20 most productive world institutions in mouth cancer, 2003-12**

S. No.	Organisation name	TP	TC	ACPP	<i>h</i> -index	ICP	% ICP	WSP	WSC	RCI
1.	University of Texas, MD Anderson Cancer Center, USA	695	12265	17.65	71	183	26.33	1.88	3.41	1.82
2.	National Cancer Institute, USA	416	7953	19.12	61	138	33.17	1.12	2.2095	1.97
3.	Universidade de Sao Paulo, Brazil	402	2216	5.51	27	64	15.92	1.08	0.61	0.57
4.	University of California, San Francisco, USA	284	4591	16.17	41	55	19.37	0.77	1.27	1.66
5.	Memorial Sloan Kettering Cancer Center, New York, USA	265	5983	22.58	45	74	27.92	0.71	1.66	2.32
6.	Universita degli studi di Milano, Italy	259	2680	10.35	38	110	42.47	0.7	0.74	1.06
7.	Brigham & Women's Hospital, Harvard Medical School, Boston, USA	250	5683	22.73	51	63	25.20	0.67	1.58	2.34
8.	University of Toronto, Canada	238	2574	10.82	33	116	48.74	0.64	0.71	1.11
9.	VA Medical Center, Ann Arbor, Michigan, USA	232	3242	13.97	36	40	17.24	0.63	0.9	1.44
10.	International Agency for Research on Cancer, Lyon, France	229	8989	39.25	50	210	91.70	0.62	2.5	4.04
11.	Mayo Clinic, Rochester, USA	223	4603	20.64	42	54	24.22	0.6	1.28	2.12
12.	Sun Yat-Sen University, Guangzhou, China	220	1932	8.78	18	38	17.27	0.59	0.54	0.9
13.	King's College, London, U.K.	200	2181	10.91	33	85	42.50	0.54	0.61	1.12
14.	National Yang-Ming University, Taiwan	197	1730	8.78	30	12	6.09	0.53	0.48	0.9
15.	Sichun University, Chengdu, China	190	974	5.13	18	26	13.68	0.51	0.27	0.53
16.	Chang Gung Memorial Hospital, Taoyuan, Taiwan	190	1492	7.85	28	12	6.32	0.51	0.41	0.81
17.	University College, London, U.K.	187	1993	10.66	33	71	37.97	0.5	0.55	1.1
18.	Chang Gung University, Taiwan	185	1394	7.54	24	15	8.11	0.5	0.39	0.77
19.	VU University Medical Center, Amsterdam, Netherlands	184	3233	17.57	39	66	35.87	0.5	0.9	1.81
20.	Tata Memorial Hospital, Mumbai, India	179	840	4.69	18	35	19.55	0.48	0.23	0.48
<b>Total of 20 organisations</b>		<b>5225</b>	<b>76548</b>	<b>14.65</b>	<b>36.8</b>	<b>1467</b>	<b>28.08</b>	<b>14.08</b>	<b>21.2495</b>	<b>1.44</b>
<b>Total of the country</b>		<b>37049</b>								
<b>Share of top 20 organisations in country total output</b>		<b>14.1</b>								

TP=Total papers; TC=Total citations; ACPP=Average citation per paper; ICP=International collaborative papers; WSP=World share of papers; WSC=world share of citations; RCI=Relative citation index

- (vi) Mayo Clinic, Rochester, USA (42)
- (vii) University of California, San Francisco, USA (41)
- (viii) VU University Medical Center, Amsterdam, Netherlands (39), and
- (ix) Universita degli studi di Milano, Italy (38)

#### 5.8.4 International collaborative papers (ICP)

The International collaborative papers (ICP) share registered by 20 most productive organisations varied from 6.09 % to 91.70 %, with average share of 28.08 %. Seven organisations have achieved more than the average share of ICP of all 20 organisations:

- (i) International Agency for Research on Cancer, France with ICP share of 91.70 %
- (ii) University of Toronto, Canada (48.74 %)
- (iii) King's College, London, UK (42.50 %)
- (iv) Universita degli studi di Milano, Italy (42.47 %)
- (v) University College, London, UK (37.97 %)
- (vi) VU University Medical Center, Amsterdam, Netherlands (35.87 %), and
- (vii) National Cancer Institute, USA (33.17 %).

#### 5.8.5 Average Relative Quality Index (RCI)

The average relative quality index (RCI) of 20 most productivity organisations varied from 0.48

to 1.82, with average value of RCI of 1.51. Eight organisations have scored higher value of RCI than the average value of all 20 organisations:

- (i) International Agency for Research on Cancer, France with RCI value of 4.04
- (ii) Brigham & Women's Hospital, Harvard Medical School, Boston, USA (2.34)
- (iii) Memorial Sloan Kettering Cancer Center, New York, USA (2.32)
- (iv) Mayo Clinic, Rochester, USA (2.12)
- (v) National Cancer Institute, USA (1.97)
- (vi) University of Texas, MD Anderson Cancer Center, USA (1.82)
- (vii) VU University Medical Center, Amsterdam, Netherlands (1.81) and
- (viii) University of California, San Francisco, USA (1.66).

## 6. SUMMARY AND CONCLUSIONS

The world has contributed 37049 papers in mouth cancer, which increased from 2980 to 4667 papers from the year 2003 to 2012, registering an annual average growth rate of 5.15 % and citation impact per paper of 9.72 during 2003-12 (decreasing from 10.00 to 9.49 from 2003-07 to 2008-12).

The global publication share of top 15 most productive countries in mouth cancer varies from 1.85 % to 26.79 %, with highest publication share (26.79 %) contributed by USA, followed by Japan (9.31 %), UK (7.58 %), Germany (5.82 %), etc.

The global publication share has increased in China, India, Brazil, Taiwan, South Korea, Spain, Italy, Australia, Canada and France, as against decrease in Japan, USA, UK, Germany and Netherlands from 2003-07 to 2008-12.

The global citation share of top 15 most productive countries in mouth cancer research varies from 1.69 % to 35.68 %, with USA's highest share of 35.68 %, followed by UK (8.76 %), Germany (7.06 %), etc. The global citation share has increased in France, China, Taiwan, South Korea, Brazil, Spain, India and Australia, as against decrease in USA, Japan, Germany, UK, Canada, Netherlands, and Italy from 2003-07 to 2008-12.

France registered the highest relative citation index (RCI) of 1.74 among the top 15 most productive countries in mouth cancer, followed by Australia (1.58), Netherlands (1.55), Canada (1.43), USA (1.33), Germany (1.21), etc. during 2003-12. The RCI has increased in France and South Korea, as against decrease in Canada, India, Brazil, Japan, Germany, Italy, USA, Netherlands, Spain, UK, China, and Australia from 2003-07 to 2008-12.

Among the top 15 most productive countries, Canada registered the highest international collaborative

publication share of 48.02 %, followed by Australia (45.44 %), France (43.44 %), Netherlands (41.82 %), Germany (38.03 %), UK (35.81 %), etc.

The largest publication share (82.72 %) comes from medicine among subjects, followed by biochemistry, genetics & molecular biology (29.33 %), dentistry (14.36 %), pharmacology, toxicology & pharmaceuticals (8.36 %), immunology & microbiology (1.90 %), health profession (1.88 %) and chemistry (1.21 %) during 2003-12.

The research activity has increased in medicine, biochemistry, genetics & molecular biology, dentistry, and health profession, in contrast to decrease in pharmacology, toxicology and pharmaceuticals, immunology & microbiology, and chemistry from 2003-07 to 2008-12.

Among different type of mouth cancer research, the largest share (27.20 %) comes from squamous cell carcinoma, followed by lymphomas (12.72 %), salivary gland carcinoma (10.02 %), melanoma (3.36 %) and others (0.09 %) during 2003-12. The publication share has increased in squamous cell carcinoma, melanoma and others, as against decrease in salivary gland carcinoma and lymphomas from 2003-07 to 2008-12.

Tongue cancer accounted for highest share of 12.04 % among mouth cancer publications by site, followed by salivary gland carcinoma (10.02 %), oropharynx or pharynx (8.44 %), lips (4.98 %), gingival (gums) (4.06 %), teeth (3.45 %), buccal mucosa (2.66 %), maxilla (2.30 %), mouth floor (1.771 %), tonsils (1.42 %), hard palate (0.82 %), soft palate (0.64 %), alveolar ridges (0.19 %), uvula (0.05 %) and retromolar trigone (0.05 %) during 2003-12.

In terms of various type of treatments, the largest share (15.77 %) is registered by surgery, chemotherapy (14.99 %), diagnosis (13.20 %), radiotherapy (12.86 %), pathology (12.48 %), prognosis (10.51 %), genetics (9.18 %), quality of life (4.35 %), screening (4.33 %), epidemiology (2.25 %), and palliative care (1.03 %).

The publication activity has increased in surgery, radiotherapy, pathology, prognosis, genetics, screening and epidemiology, as against decrease in chemotherapy, diagnosis, quality of life and palliative care from 2003-07 to 2008-12.

Among different population groups, the largest focus of world mouth cancer research (with 46.06 % share of papers) was on adults, followed by middle aged (37.94 %), aged 80 & over (12.85 %), adolescent (8.24 %) and child (5.39 %) during 2003-12.

The 20 most productive world organisations contributing to mouth cancer research has contributed 5225 papers, accounting for 14.10 % share of the country's publication output. The average productivity, average citation impact per paper, *h*-index, share of international collaborative papers and average



relative citation index of the 20 most productive organisations in mouth cancer were 262.25, 14.65, 36.8, 28.08 %, and 1.51 during 2003-12.

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