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## Original article

# A Scopus-Based Bibliometric Review of Dental Research Productivity of Universities in North East of England: Policy Implications

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## Abstract

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**Introduction:** The knowledge of dental research productivity helps to provide oversight on current dental research capacity and gaps. Hence, this study aims to evaluate the dental research productivity of the universities in the North East of England (NEE).

**Methods:** This is a bibliometric review collecting data on the dental publications of the five NEE universities from SCOPUS. Collected data were analysed using the Microsoft Excel 2021 software.

**Results:** Dentistry was the health science subject area with the lowest volume of research productivity in two-fifth of the NEE universities. The NEE universities contributed <4% of the total dental research publications in the UK. Newcastle University was the NEE university with the highest volume of dental research productivity. The level of inter-institutional dental research collaborations among the NEE universities was very low. The USA-based institutions were the most productive foreign institutions collaborating with NEE universities. The study identified the five most published dental researchers at the NEE universities. Accordingly, each NEE universities had at least 15.8% of its total dental research publications in the British Dental Journal.

**Conclusion:** The findings from this study reflect the dental research productivity of NEE universities. The dental research capacity of universities in the NEE needs to be strengthened.

## Introduction

Dentistry, according to the American Dental Association House of Delegates, is a branch of medicine that deals with “the evaluation, diagnosis, prevention and/or treatment (nonsurgical, surgical or related procedures) of diseases, disorders and/or conditions of the oral cavity, maxillofacial area and/or

the adjacent and associated structures and their impact on the human body provided by a dentist, within the scope of his/her education, training and experience, under the ethics of the profession and applicable law” (1,2). The history of dentistry can be traced as far back as 1530 AD when the first book written solely



on dentistry was published (3). Since then, several scholarly works have been written in different parts of the world on various aspects of dentistry (3-5). Globally, universities are the leading hubs of scholarly dental research works, and through their research findings, several advancements have been brought to the academics and practice of dentistry (6-7).

Accordingly, evaluating the productivity and capacity of research institutions is paramount for appropriate documentation, which could expose the state of knowledge and concerns in the field within a particular space. Some previous studies have documented regional variation in dental research productivity (8-10). Knowledge trends and productivity show the effectiveness of the state of dental education, dental education, and research opportunities within the learning centers. Gil-Montoya et al., in 2006, examined a geographic world map of scientific production in dentistry by analyzing published papers, with the UK (including USA and Japan) as one of the most productive countries (8). This study has the potential to reveal regional inequalities in dental research productivity within the UK by focusing on one of the regions. Pulgar et al., 2013, revealed that dental health research had shifted drastically within three decades, with an overall increase in productivity

but with geographical disparities. According to the study, Prosthodontics, Orthodontics, Dental Materials, and General Dentistry formed the four broad thematic areas in global dental research productivity. Understanding the critical shifts in publication trends, in terms of volume, subject, writers, and where published, are paramount in medical professional practice, both in medicine and library sciences, for scientific information retrieval (10).

There are five universities in the North East of England (NEE): Newcastle University (NU); Durham University (DU); University of Northumbria (UN); University of Sunderland (US); and Teesside University (TU) (11). These five universities are among the UK institutions contributing to dental research productivity in the UK. However, since the inception of these universities, no known study has reviewed the level of their productivity in dental research. The knowledge of their level of dental research productivity helps to provide oversight on the current dental research capacity of the NEE universities. These findings will provide appropriate recommendations that can be instrumental in developing dental research capacity in the NEE. Therefore, this study aims to review the dental research productivity of the NEE universities through a bibliometric analysis approach.

Methods

This study was a bibliometric analysis of the dental research productivity of the five universities in the NEE. The research design was guided by the research guideline of Donthu et al. (12) for bibliometric analysis. This study used the SCOPUS database to scoop bibliometric data on the existing dental research outputs of NEE universities. SCOPUS was used because it was the most comprehensive and widely used database for bibliometric analyses (13).

On May 24, 2022, the researchers searched and collected bibliometric data of all publication types (books, chapters, and the like) affiliated with the United Kingdom. After that, and on the same day, the

researchers visited the profile pages of each of the five universities in NEE (Table 1) to collect the following bibliometric data:

- The total number of publications in all health-related subject areas (Medicine, Dentistry, Health Professions, Neuroscience, and the like).
- Total number of publications in the Dentistry subject area per year, publication type (books, chapters, and the like), author, institution, and collaborating country.
- Names of authors of dental research publications and their institutional and country affiliations.
- Journal names and their CiteScore 2020.

Table 1. List of universities in NEE

University	Identity Number on SCOPUS
Teesside University (TU)	60025655
Newcastle University (NU)	60006222
Durham University (DU)	60022175
University of Northumbria (UN)	60004636
University of Sunderland (US)	60032789

These bibliometric data were exported from SCOPUS in a CSV (comma-separated value) format and

analyzed using the Microsoft Excel 2021 software.

## Results

### Research Productivity in the Dentistry and other Health Science Subject Areas

Table 2 shows the productivity volume, per health science subject area, in the UK and the five NEE universities. Medicine was the subject area with the highest output volume in the UK and NEE universities.

However, Dentistry, after Veterinary, had the second-lowest volume of research publications in the UK.

University of Northumbria (n = 17) and the University of Sunderland (n = 19) were the two NEE universities with the least research productivity in Dentistry. Comparing the research productivity level per subject area within each university, Durham University and the University of Northumbria had the least health science research productivities in the Dentistry subject area (Table 2).

**Table 2.** Volume of research productivity among NEE universities

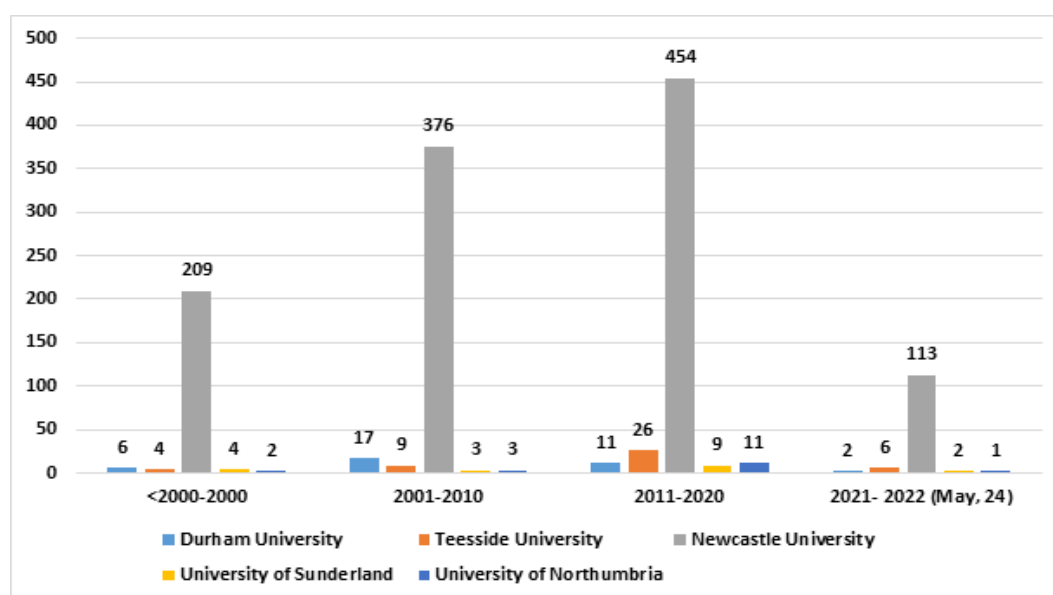
Subject Area	University	UK	NU	DU	UN	US	TU
Medicine		1933923	30374	4958	3204	968	1719
Health Professions		83956	890	299	618	181	463
Psychology		192195	2497	2289	1159	297	406
Biochemistry, Genetics and Molecular Biology		754737	16016	4846	1101	515	353
Nursing		134539	2079	403	928	105	289
Environmental Science		282305	6294	3609	1197	328	279
Neuroscience		194696	4436	1348	496	155	105
Immunology and Microbiology		211676	3886	562	341	116	70
Pharmacology, Toxicology and Pharmaceutics		179214	2415	589	261	582	59
Dentistry		38128	1152	36	17	19	45
Veterinary		57022	503	53	31	13	4

### Trend Analysis of Research Productivity in Dentistry

Figure 1 shows the trend analysis, of dental research productivity of NEE universities from inception till May 24, 2022. Newcastle University had the highest productivity across the years. Excluding the current decade, which needs to be completed, the volume of

outputs of Newcastle University, Teesside University, and the University of Northumbria had been growing consistently, while that of Durham University and the University of Sunderland were inconsistent.

In this decade (2021 to date) alone, Newcastle University and Teesside University have had the most significant output volumes.



**Figure 1.** Trend analysis, of dental research productivity of universities in NEE

### Distribution of Publication Types in Dentistry

Table 3 shows the distribution of publication types sourced by the NEE universities. Newcastle University had the highest volume of publications per type.

Articles were the publication type, per university, with the highest volume. Only Newcastle University and Teesside University had sourced books in dentistry.

**Table 3.** Distribution of publication types sourced by the universities in NEE

Publication Type	NU	DU	UN	US	TU
Article	875	24	11	16	35
Review	141	2	2	0	3
Note	41	0	1	1	1
Book chapter	40	9	2	1	4
Conference paper	17	0	1	0	0
Editorial	16	1	0	1	1
Letter	14	0	0	0	0
Short survey	5	0	0	0	0
Book	2	0	0	0	1
Erratum	1	0	0	0	0
Total	1152	36	17	19	45

### Dental Research Productivity from Inter-Institutional Collaboration among NEE Universities

The dental research collaboration between Newcastle University and Teesside University was the most productive, with 31 publications. However, the level of local collaboration between these two universities was very low because out of the 1152 dental publications authored by researchers from

Newcastle University, only 31 (2.7%, 31/1152) was co-authored by Teesside University researchers.

Dental researchers from Newcastle University had dental co-researchers from all other NEE universities in at least three publications. The dental researchers from Teesside University and Durham University had never co-authored with their counterparts in any other NEE university except Newcastle University.

**Table 4.** Productivity from dental research inter-institutional collaboration among NEE universities

University	TPUD	NU	DU	UN	US	TU
NU	1152		4	8	3	31
DU	36	4		0	0	0
UN	17	8	0		1	0
US	19	3	0	1		0
TU	45	31	0	0	0	

TPD – Total publications of the university in Dentistry

In dental research, the total number of foreign collaborating institutions of a NEE university outnumbered the total number of locally collaborating NEE universities (Tables 4 and 5).

### The Top-three Most Productive Foreign Institutions and Countries Collaborating with NEE Universities in Dental Research

Most of the top three productive foreign institutions were hospitals and universities. The most productive international collaboration was between Newcastle

University and the Università degli Studi di Torino (Italy), which produced 20 publications. Notably, the Università degli Studi di Torino was the only European institution ranked as the most productive (1st rank) foreign collaborating institution. In contrast, only one African institution Cairo University made the list of the top-three foreign collaborating institutions (Table 5).

Table 6 shows the top three countries with the highest cumulative productivity in dental research involving NEE universities. The United States of



America (USA) was the most productive country: the researchers from USA-based institutions co-authored the researchers from Newcastle University, Durham University, Teesside University, and the University of Northumbria in 109, 10, 4, and 2 publications in Dentistry, respectively. Most remarkably, no European country made the list of these top-three countries. Also, the University of Sunderland had the least cumulative productivity among institutions based in foreign countries.

**Table 5.** Top international institutions collaborating with NEE universities in dental research

Rank	NU*	DU*	UN*	US*	TU*
1 <sup>st</sup>	Università degli Studi di Torino (20)	Michigan Medicine (7) CS Mott Children's Hospital (7)	Dubai School of Medicine (2)	National University of Singapore (1) St John of God Subaco Hospital (1)	Universidade Estadual de Campinas (3)
2 <sup>nd</sup>	University of Minnesota (19)	University of Sydney (3)	Ottawa Hospital Research Institute (1) Westmead Centre for Oral Health (1) National University of Singapore (1) Carolinas Medical Center (1) New York University (1) Saveetha Dental College and Hospitals (1) Saveetha Institute of Medical and Technical Sciences (1) Saveetha Institute of Medical and Technical Sciences (1)	NOCII	Universidade de São Paulo (2) Cairo University (2) Universidad de Chile (2) Dalhousie University (2) University of Iowa (2) Indiana University (2) Jordan University of Science and Technology (2) University of Baghdad (2) University of Tripoli (2) Majmaah University (2)
3 <sup>rd</sup>	Cork University (17) McGill University (17)	National Innovation Centre [Australia] (2) Tanta University (2)		NOCII	Roche Diagnostics [Spain] (1) School of Dental Sciences [Ireland] (1) University of Iowa (1) Universidade Federal da Paraíba (1) Thammasat University (1) SRM Institute of Science and Technology (1)



**Table 5.** Top international institutions ... (continued)

Rank	NU*	DU*	UN*	US*	TU*
3 <sup>rd</sup>					University of Washington (1) Oregon Health and Science University (1) Children's Hospital and Medical Center (1) West Virginia University (1) Medical College of Georgia (1) Indiana University-Purdue University Indianapolis (1) University of Queensland (1) Universidad de Antioquia (1) Université Djillali Liabes de Sidi Bel Abbes (1) Université Mustapha Stambouli de Mascara (1) New York University (1) Loma Linda University (1) Niigata University (1)

\*Number of outputs with universities in NEE are in parentheses; UAE – United Arab Emirates; USA – United States of America; NOCII - No other collaborating international institution

**Table 6.** The top three foreign countries with the highest cumulative productivity on dental research involving NEE universities

Rank	NU*	DU*	UN*	US*	TU*
1 <sup>st</sup>	USA (109)	USA (10)	Australia (2) Singapore (2) UAE (2) USA (2)	Australia (1) Singapore (1)	Brazil (5)
2 <sup>nd</sup>	Ireland (50)	Australia (3)	Canada (1) India (1)	NOCC	USA (4)
3 <sup>rd</sup>	Japan (48)	Egypt (2)	NOCC	NOCC	Canada (2) Chile (2) Egypt (2) Iraq (2) Jordan (2) Libya (2) Saudi Arabia (2)

\*Number of outputs with universities in NE are in parentheses; UAE – United Arab Emirates; USA – United States of America; NOCC - No other collaborating country



### The Top Three Most Productive Researchers in NEE Universities

Table 7 shows the top-three most productive researchers in NEE universities. Overall, the top three most productive dental researchers in the NEE universities were from Newcastle University, and Durham J was the most productive having 89

publications affiliated with this university. Zohoori FV (n = 26), Sturrock A (n = 5), Neave N (n = 3), and Jardine C (n = 4) were the most productive dental researchers at Teesside University, University of Sunderland, University of Northumbria, and Durham University, respectively.

**Table 7.** The top three most productive dental researchers in NEE universities

University	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
NU	Durham J (89)	Meechan JG (67)	Thomas JM (64)
DU	Jardine C (4)	Hyland RM (2)	Banks RW (1) Bowen L (1) Bradlaw RV (1) Gupta S (1) Hunt P (1) Hyland RM (1) Montgomery J (1) Roberts CA (1) Steel J (1)
UN	Neave N (3)	Finch TL (2) Rapley TJ (2)	Cook C (1) Emmett CA (1) Wilson JA (1) Wightman EL (1) Rotterham NA (1) O'Keefe P (1) Moss MC (1) Girling M (1) Gray J (1) Harding J (1) Heather N (1) Heyman B (1) Hildreth AJ (1) Kennedy DO (1) McConkey K (1)
US	Sturrock A (5)	Herron JBT (4)	Ling J (2)
TU	Zohoori FV (26)	Omid N (9)	Duckworth RM (6)





### The Top Three Most Productive Journals Publishing Dental Research Papers from NEE Universities

Table 8 shows the top-three most productive journals publishing dental research from NEE universities. The single journal with the highest number of dental research publications from NEE universities was the British Dental Journal (CiteScore 2020 = 1.4). Each NEE university had at least 15.8% of its entire dental

research publications in the British Dental Journal, with the University of Northumbria having the highest proportion (47.1%) of its publications in the journal. Importantly, the top-three journals publishing dental research outputs from NEE universities had a minimum CiteScore 2020 of 1.4. Also, the Journal of Clinical Periodontology was the journal with the highest CiteScore 2020 (= 10.7) of these top-three journals.

**Table 8.** The top-three journals publishing dental research papers from NEE universities

Institution	Rank*	JN	C2020	TP	of TDPPU%
NU (TDP = 1152)	1 <sup>st</sup>	British Dental Journal	1.4	186	16.1
	2 <sup>nd</sup>	Journal of Clinical Periodontology	10.7	66	5.7
	3 <sup>rd</sup>	Journal of Dental Research	9.9	63	5.5
DU (TDP = 36)	1 <sup>st</sup>	British Dental Journal	1.4	8	22.2
	2 <sup>nd</sup>	Archives of Oral Biology	3.9	4	11.1
		Journal of Dentistry	6.2	4	11.1
	3 <sup>rd</sup>	International Journal of Prosthodontics	2.7	3	8.3
UN (TDP = 17)	1 <sup>st</sup>	British Dental Journal	1.4	8	47.1
	2 <sup>nd</sup>	Community Dentistry and Oral Epidemiology	4.4	1	5.9
		European Journal of Dental Education	2.5	1	5.9
		International Journal of Dental Hygiene	3.6	1	5.9
		JDR Clinical and Translational Research	3.2	1	5.9
		Journal of Dental Education	2.3	1	5.9
		Oral Oncology	6.8	1	5.9
		Oral Surgery Oral Medicine Oral Pathology and Oral Radiology	3.1	1	5.9
	3 <sup>rd</sup>	Nil	NA	NA	
US (TDP = 19)	1 <sup>st</sup>	British Journal of Oral and Maxillofacial Surgery	2.0	8	42.1
	2 <sup>nd</sup>	Fluoride Quarterly Reports	1.8	4	21.1
	3 <sup>rd</sup>	British Dental Journal	1.4	3	15.8
TU (TDP = 45)	1 <sup>st</sup>	Caries Research	5.2	10	22.2
	2 <sup>nd</sup>	British Dental Journal	1.4	9	20.0
	3 <sup>rd</sup>	Community Dentistry and Oral Epidemiology	4.4	5	11.1

JN – Journal name; TP – Total publications; C2020 – CiteScore 2020; NA – Not applicable; TDP – Total dental publications; TDPPU – Total dental publications per university; \*Ranking was based on total publications (TP)





## Discussion

The findings obtained in this study are noteworthy and of policy relevance. The total volume of Scopus-indexed research publications in Dentistry in the UK ( $n = 38128$ ) compared to several other health science subject areas, it is very low. This finding is not too surprising as similar findings had also been reported in bibliometric reviews (14, 15). This shows that, globally, dental research capacity is generally low compared to other health science subject areas.

In the NEE, Newcastle University was the most productive university in dental research, and their outputs constitute only 3.0% ( $1152/38128$ ) of the total dental research outputs in the UK. It is also noteworthy that the remaining four NEE universities contributed  $\leq 0.1\%$  each. Overall, this shows that the volume of dental research contributions of NEE universities to the entire volume of dental research outputs in the UK is very low. The NEE is known to be among the most socioeconomically deprived regions in the UK (16), and this deprivation might have, in a way, contributed to the low dental research productivity.

The level of inter-institutional dental research collaborations among the universities in NEE was very low, based on the current volume of productivity from such collaborations. This shows that local dental research partnership among these universities needs to be stronger. Meanwhile, foreign research partnership is different. The total volume of research publications co-authored by researchers from these universities with foreign researchers was much more. Overall, the USA-based institutions were the most frequent foreign institutional collaborators of NEE universities. This may not be surprising because the UK and the USA are English-speaking countries, and globally, the USA is the most productive country in research and innovation (17-23). However, only a few dental researchers from European and African institutions have collaborated with those in NEE universities. This promising partnership needs to be explored by NEE universities to develop a globally reaching research productivity in dental research.

A few dental researchers in the NEE universities had authored  $> 50$  SCOPUS-indexed publications in Dentistry. Accordingly, dental research productivity in these universities is low. Furthermore, we observed that the volume of dental research productivity of quite a proportion of these universities has been rising and falling across decades. This may suggest

strengthening these universities' dental research capacity and productivity.

Despite the low volume of dental research productivity of NEE universities, notably, a significant proportion of dental research outputs from these institutions were published in highly prestigious dental journals. This demonstrates that the quality of dental research from these universities is very sound.

However, this study has its limitations. Firstly, only one database was used to source the publications included in the analysis. Since no single database is all-encompassing, the publications of some researchers, institutions, and countries might not have been included in the analysis, which might have undermined their position/ranking in the productivity analysis. However, using multiple databases can minimise the accuracy and the opportunity to generate robust findings in bibliometric analyses (12). Therefore, this study picked the SCOPUS database to do a comprehensive and accurate bibliometric analysis, as well as minimize the number of unincluded publications (13). Secondly, this study did not identify the factors responsible for the low productivity and local collaborations among the NEE universities. This necessitates the need for further studies to explore this identified research gap.

Regardless of this limitation, this study has its strengths. To the best of the authors' knowledge, this study is the first known to examine the dental research productivity of NEE universities. Also, the findings obtained in this study are highly insightful and policy-relevant. Besides, they will be instrumental in developing strategies to develop the dental research productivities of NEE universities.

Based on the findings obtained in this study, the following recommendations are provided:

- All NEE universities should develop and implement tailored student-teacher mentorship programs that will encourage research scholarship in the field of dentistry
- Learning from Newcastle University's productivity rate, we advise that all NEE universities should expand the scope of their dental education programs to cover different dental professions and different academic levels (undergraduate and postgraduate levels)
- All NEE universities should jointly develop a sustainable dental research collaboration network that will serve the NEE region
- All NEE universities should provide more funding

for dental research through postgraduate research studentships, grants, and other essential funds

If the above recommendations are adopted, there is a high chance that the dental research productivity of NEE universities will significantly improve.

## Conclusion

All five NEE universities have engaged in dental research. However, this study reveals low dental research productivity and low local collaboration among these universities. It was also observed that local dental research collaborations among these institutions were very low compared to these universities' international dental research collaborations. These findings call for the need to strengthen the collaborative dental research capacity of NEE universities.

## Declarations

### Acknowledgement

Nil.

### Conflicts of Interests

The authors declared no conflict of interest.

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## Ethical statement

This study is a review of bibliometric data obtained from the SCOPUS database. Therefore, ethical approval is not required for this study.

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## Authors' contributions

Conceptualization, K.K.K.; methodology, K.K.K.; software, K.K.K.; validation, J.A., L.A.N. and K.K.K.; formal analysis, K.K.K.; data curation, K.K.K.; writing—original draft preparation, K.K.K. and J.A.; writing—review and editing, K.K.K., J.A. and L.A.N.; project administration, K.K.K.; funding acquisition, all authors. All authors have read and agreed to the published version of the manuscript.



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