REVIEW ARTICLE

Research Trend Analysis of Research Published in the *Journal of Dental Hygiene Science* from 2011 to 2020

Sun-Mi Lee[1], Mi-Gyung Seong[2], Hee-Jung Moon[3], and Jung-Hui Son[4],[†]

[1]Department of Dental Hygiene, Dongnam Health University, Suwon 16328, [2]Department of Dental Hygiene, Masan University, Masan 51217, [3]Department of Dental Hygiene, Yeoju Institute of Technology, Yeoju 12652, [4]Department of Dental Hygiene, Daewon University College, Jecheon 27135, Korea

Background: The purpose of this study was to analyze research trends in articles published in the *Journal of Dental Hygiene Science* over the past decade.

Methods: From 2011 to 2020, 653 studies were reviewed using a keyword analysis. Contents such as academic classification, research type, research method, research topic, data collection method, data analysis method, and financial support were analyzed.

Results: Analysis by school type showed 34.2% of clinical dental hygiene studies, 23.3% of educational dental hygiene studies, 22.8% of basic dental hygiene studies, 10.0% of other field studies, and 9.8% of social dental hygiene studies. By type of study, quantitative studies were the most common at 69.5%. Regarding data collection methods, 45.8% of the studies that used surveys were the most common. The subjects of the study were 20.1% experimental studies, 15.6% general adults, and 15.0% dental hygienists. Regarding the data analysis method, 49.3% of the studies that conducted frequency analysis were the most common. The total number of keywords was 2,390, with 107 (4.48%) being 'dental hygienists.' Next, oral health was the most common with 67 (2.80%) articles, followed by 31 for the elderly (1.30%), 25 for dental hygiene students (1.05%), and 24 for stress (1.00%).

Conclusion: For academic development of dental hygiene, it is necessary to explore the diversity of academic topics based on the results of this study. It is necessary to find a way to spread the research results so that the published research can be used for the academic development of dental hygiene.

Key Words: *Journal of Dental Hygiene Science*, Keyword analysis, Research trend

Introduction

1. Background

The publication of academic journals is a representative research activity of the academic society[1]. Therefore, many academic societies regularly generate academic journals to share and spread research results and consider the identity and future direction of academic society[2].

Dental hygienists must establish and develop objective and scientific knowledge to perform social functions responsibly as oral health experts. Considering that dental hygienists in clinical practice after obtaining a license need the ability to manage quickly and efficiently to provide more systematic oral health services, the curriculum generally does not include all contents[3]. Therefore, evidence-based research is also needed in the field of dental hygiene, and these studies are being conducted.

With recent changes, the topics of various research papers are diversifying and becoming more specialized. The number of related studies is gradually increasing in all disciplines to identify trends that suggest future research directions, such as what topics of interest have been conducted, how topics of interest have changed, and what patterns are currently displayed compared with other

developed countries[4]. In the field of dental hygiene, by analyzing past data to derive research problems and by measuring the level of current research, research on trend analysis to present a desirable direction for future research and take a leap to a higher level can be a very useful study[5].

As a result of previous studies in Korea, Kang et al.[6] analyzed the research trends from 2000 to April 2010 in the *Journal of the Korean Dental Hygiene Society*. Jang et al.[7] analyzed research trends from 2000 to 2015 in the *Journal of the Korean Dental Hygiene Society*. Kim[8] conducted an analysis of published articles from 2016 to 2018. Lee et al.[5] analyzed the research trends of published articles from the first issue of the *Journal of Dental Hygiene Science* to 2012. Kang et al.[9] analyzed the research trends in the *Journal of Dental Hygiene Science* using keyword network analysis from the first issue to the March 2018 issue. In addition, Goong and Seo[10] analyzed the research trends of the *Korean Journal of Oral Health Sciences* by analyzing research trends for the elderly in dental hygiene and Kim's topic modeling[11].

In the field of dental hygiene, journals such as the Korean Society of Dental Hygiene Science, Korean Society of Dental Hygiene, Korean Academy of Dental Hygiene, Korean Society of Infection Control and Prevention in Dental Hygiene, and Korean Society of Oral Health Science are actively engaged in various academic and research activities, with excellent results as candidates for Korea Citation Index registration.

The *Journal of Dental Hygiene Science*, the official journal of the Korea Dental Hygiene Science Association, was published twice a year, starting in December 2001, and has been published six times a year since 2009, and four times a year since 2019. In the field of dental hygiene in Korea, it was selected as the first candidate for the Korea Academic Promotion Foundation's journal in 2007. In 2010, it was the first time in the field of dental hygiene to be recognized as a domestic accredited journal, and it has established a foundation for academic development.

Articles published in academic journals are very important to develop the knowledge system in the academic field. In the field of dental hygiene, research on various topics has gradually increased over time.

2. Objectives

This study aimed to understand the research trends of the last 10 years (2011∼2020) published in the *Journal of Dental Hygiene Science*, a representative journal of dental hygiene research, and to seek future development directions in dental hygiene research.

Materials and Methods

1. Ethics statement

This study was conducted without IRB approval as a study using papers published in the *Journal of Dental Hygiene Science*.

2. Study design

A total of 653 articles were published. Variables were classified and coded according to academic classification, research type, research method, research subject, data collection method, data analysis method, and whether research funds were received through Excel work.

3. Sample size

This study analyzed 653 articles published in the *Journal of Dental Hygiene Science* from 2011 to 2020.

4. Intervention

The analysis of the research papers was adjusted to meet the purpose of this study based on the existing literature related to the analysis of the papers. For the specific

Table 1. Total Number of Articles

Year	n (%)	Issue
2011	76 (11.6)	6
2012	85 (13.0)	6
2013	64 (9.8)	4
2014	77 (11.8)	4
2015	111 (17.0)	6
2016	62 (9.5)	6
2017	65 (10.0)	6
2018	47 (7.2)	6
2019[a]	34 (5.2)	4
2020	32 (4.9)	4
Total	653 (100.0)	52

[a]It was published in English.

Table 2. Research Trends in Journal of Academia

Characteristic	Division	n	%
Academic classification	Basic dental hygiene	149	22.8
	Educational dental hygiene	152	23.3
	Clinical dental hygiene	223	34.2
	Social dental hygiene	64	9.8
	Etc.	65	10.0
Research type	Original article	642	98.3
	Case report	11	1.7
Research method	Clinical-quantitative research	454	69.5
	Clinical-qualitative research	39	6.0
	Experimental study	153	23.4
	Literature review	7	1.1
Research subject	Elementary school student	24	3.7
	Middle school student	4	0.6
	High school student	20	3.1
	University student (dental hygiene)	63	9.6
	University student (non-major)	18	2.8
	Adult (general)	102	15.6
	Adult (other occupation)	5	0.8
	Elderly	38	5.8
	Dental patient	6	0.9
	Experiment	131	20.1
	Dental hygienist	98	15.0
	Two groups	76	11.6
	Three groups	17	2.6
	Etc.	51	7.8
Data collection method	Clinical examination (oral examination)	25	3.8
	Clinical examination (etc.)	7	1.1
	Experimental study	140	21.4
	Questionnaire method	299	45.8
	Interview method	14	2.1
	Use of literature	112	17.2
	Etc.	56	8.6
Data analysis method (multiple responses)	Frequency analysis	322	49.3
	Cross tabulation analysis	182	27.9
	Independent t-test	258	39.5
	Paired t-test	47	7.2
	One way ANOVA	279	42.7
	ANCOVA	7	1.1
	Repeated measures ANOVA	24	3.7
	Correlation analysis	133	20.4
	Regression analysis	207	31.7
	Factor analysis	15	2.3
	Structure equation modeling	5	0.8
	Mann−Whitney U test	28	4.3
	Kruskal−wallis test	32	4.9
	Wilcoxon test	13	2.0
	Spearman correlation	5	0.8
	Etc.	236	36.1
Research funds benefit	Yes	176	27.0
	No	477	73.0
Total		653	100.0

contents of the analysis, academic classification, research type, research method, research subject, data collection method, data analysis method, and whether research funds were received were analyzed. In particular, for research topics, keyword analysis was performed based on the title and index.

5. Statistical methods

Statistical analyses of the collected data were performed using SPSS (PASW statistics) 23.0 statistical program (IBM Corp., Armonk, NY, USA). The research trends were treated as numbers and percentages for each analysis. Keyword analysis listed keywords suggested in the abstract and ranked them based on keywords repeated at least five times, and were visualized as a picture through word cloud.

Results

1. Total number of articles

The total number of research articles was 653, with the year 2015 accounting for the majority at 17.0%, followed by 2012 (13.0%), 2014 (11.8%), and 2011 (11.6%). The

average was approximately 65 articles; however, after 2018, there was a decreasing trend (Table 1).

2. Research trends in journal of academia

Table 2 presents the research trends of the research articles. As a result of analysis according to academic classification, the field of clinical dental hygiene accounted for the majority at approximately 34%, and most of the research types were original articles (98.3%). Quantitative research was the most common research method (approximately 70%), and qualitative research (6.0%) and literature reviews (1.1%) showed a relatively low frequency.

The research subject experiments accounted for the majority (20.1%), followed by general adults (15.6%), dental hygienists (15.0%), the two groups (11.6%), and dental hygiene college students (9.6%).

Regarding the data collection method, the majority accounted for the survey using the questionnaire method at 46%, and the studies using the clinical examination or interview method showed a low level. The most common methods of data analysis were frequency (49.3%), one-way ANOVA (42.7%), independent t-test (39.5%), regression (31.7%), and crosstabs (27.9%), followed by correlation

Table 3. Keyword Analysis

No	Keyword	n	%	Ranking
1	Dental hygienist	107	4.48	1
2	Orla health	67	2.80	2
3	Elderly	31	1.30	3
4	Dental hygiene students	25	1.05	4
5	Stress	24	1.00	5
6	Quality of life	20	0.84	6
7	Oral health behavior	19	0.79	7
8	Dental caries	17	0.71	8
9	Job satisfaction	17	0.71	8
10	Smoking	17	0.71	8
11	Dental hygiene	15	0.63	11
12	Tooth brushing	14	0.59	12
13	Periodontal disease	14	0.59	12
14	Periodontitis	14	0.59	12
15	Adult	14	0.59	12
16	Recognition	13	0.54	16
17	Orla health education	13	0.54	16
18	Quantitative Light-Induced Fluorescence-Digital	12	0.50	18
19	Tooth erosion	10	0.42	19
20	Infection control	10	0.42	19

Fig. 1. Word cloud keyword diagram.

(20.4%). Approximately 27% of the articles published in the last 10 years were supported by research funds.

3. Keyword analysis

The keyword rankings are listed in Table 3 and shown in Fig. 1. The total number of keywords was 2,390. 'Dental hygienist' was the highest with 107 articles (4.48%), followed by 'oral health' with 67 articles (2.80%), 'elderly' with 31 articles (1.30%), 'dental hygiene student' with 25 articles (1.05%), and 'stress' with 24 articles (1.00%). Quality of life, oral health behaviors, dental caries, job satisfaction, and smoking were among the top ten keywords.

Discussion

1. Key results

This study was conducted to explore the future development direction of dental hygiene research by analyzing research trends centered on a total of 653 articles published in the *Journal of Dental Hygiene Science* over the past 10 years.

The total number of articles in the study was 653, with the majority being published in 2015, followed by 13.0%, 11.8%, and 11.6% in 2012, 2014, and 2011, respectively, with an average of 65 articles, which tended to decrease gradually to 7.2%, 5.2%, and 4.9% in 2018, 2019, and 2020, respectively.

According to research trends, the field of clinical dental hygiene was the highest (34.2%), followed by educational dental hygiene (23.3%), basic dental hygiene (22.8%), other (10.0%), and social dental hygiene (9.8%).

Quantitative studies were the most common research method (69.5%), followed by experimental studies (23.4%), qualitative studies (6.0%), and literature reviews (1.1%). The data collection rate using the questionnaire was the highest at 45.8%.

Various data analysis methods were used, of which majority was frequency analysis (49.3%), followed by one-way ANOVA (42.7%), independent t-test (39.5%), regression analysis (31.7%), cross tabulation analysis (27.9%), and correlation analysis (20.4%), whereas other methods showed low frequency. In this study, 26.9% of the studies were conducted using research funding.

Keywords were listed and analyzed, focusing on keywords that were repeated at least five times. The analysis revealed that the total number of keywords was 2,390, with 107 being 'dental hygienist' (4.48%), followed by 67 'oral health' (2.80%), 31 'elderly' (1.30%), 25 'dental hygiene students' (1.05%), and 24 'stress' (1.00%). Quality of life, oral health behavior, dental caries, job satisfaction, and smoking were included in the top ten keywords.

2. Interpretation

Researchers have posted limited articles in journals related to dental hygiene, but recently, as convergence research has been emphasized, dental hygiene research has been published in other journals. Since 2019, the burden of posting English articles might have affected the number of articles. Since the field of dental hygiene needs to be approached from a multidisciplinary perspective, including dentistry, collaboration and knowledge exchange with other studies are necessary. Therefore, the *Journal of Dental Hygiene Science* should consider promoting exchanges with other disciplines and spreading related research through the *Journal of Dental Hygiene Science*.

This is thought to be the result of extensive research in the field of clinical dental hygiene, as the proportion of clinical dental hygiene research in the field of dental hygiene has been recently increasing. In addition, the *Journal of Dental Hygiene Science* means that research

topics are diversifying because research on basic dental hygiene, educational dental hygiene, social dental hygiene, and clinical dental hygiene are being published, and it is considered a very desirable result.

For dental hygiene targeting humans to have an in-depth understanding of humans, it is necessary to be able to explain the complex relationship between humans, society, and health problems through qualitative research. Therefore, it is necessary to consider why the number of qualitative research publications has not increased significantly compared to quantitative research. Qualitative research is more burdensome than quantitative research, and since it is a research method that focuses on subjective insight, discovery, and interpretation of researchers, it is necessary to clearly present standards for education and qualitative research evaluation for researchers.

The reason why dental hygienists are high among the study subjects is that there are many studies related to dental hygiene, and data collection is easy when researching dental hygienists.

In this study, 26.9% of research funding seems to have gradually expanded over the past 10 years, and it was found that some support was mainly provided by universities belonging to researchers and the Korea Research Foundation. To improve the quality of research and provide stable research opportunities, support for research funds is crucial. Although the rate of beneficiaries of research funds is gradually increasing, financial support for research funds provided by the government, industries, and research institutes needs to be expanded in policy. Research funding from the Korea Research Foundation has been provided to researchers at four-year universities in the form of research support for the first time in their lives, and it has been very difficult for three-year universities to receive research support from institutions other than their universities. However, the Korea Research Foundation has recently expanded its support to researchers at three-year universities, which is expected to lead to active research activities by dental hygiene researchers.

This shows that keywords such as 'elderly' and 'dental hygiene students' rank high in keywords that combine the last two years after 2018, overlapping with the period of this study, and the research subjects are diversifying.

We think this is because most of the dental hygiene students were included in recent research on social background and the development of dental hygiene in a super-aged society.

3. Comparison with previous studies

In a study conducted by Lee et al.[5], the major research topics analyzed in the *Journal of Dental Hygiene Science* in 2014 were oral health behavioral science (45.8%) and clinical dental hygiene (22.4%), which were different from this study. In a study conducted by Kang et al.[6] on the *Journal of the Korean Dental Hygiene Society*, oral health consciousness and behavior were the major topics, which were different from this study.

In this study, the majority was the data collection using the questionnaire (45.8%), which was consistent with the highest survey of 72.3% in the first issue of the *Dental Science Journal* conducted by Lee et al.[5] and 88.5% in the *Korean Dental Association Journal* published by Kang et al.[6]. The research subject experiments published in the *Journal of Dental Hygiene Science* were the highest (20.1%), followed by general adults (15.6%), dental hygienists (15.0%), the two groups (11.6%), and dental hygiene major students (9.6%). In the previous study, 23.0% and 20.7% of articles targeting dental hygienists, respectively[5,6].

In a study by Lee et al.[5], technical statistics, t-test, ANOVA, and cross-tabulation analysis were found in that order. In a study by Kang et al.[6], frequency analysis, cross-tabulation analysis, t-test, ANOVA, descriptive statistics, correlation practices, and regression analysis were shown in the order of frequency analysis. In Goong's study, descriptive statistics, t-test, ANOVA, and cross-abulation analysis were found in that order. There was a difference in the ranking of the data analysis methods; however, both journals surveyed a very low analysis of factors and qualitative research.

In a study by Lee et al.[5], 17.7%; in the study by Kang et al.[6], 17.4%; and in a study by Goong and Seo[10], 15.7% research received funding. More research funding was received for the studies conducted during this study period.

Kang et al.[9] extracted English keywords from 953 articles published from 2001 to 2018 and analyzed the

data. As a result, among the 1,454 articles, the most used words for 17 years were 'Health,' 'Dental,' 'Oral,' 'Hygiene,' 'Hygienist,' and 'Behavior.' It is known that various research keywords such as 'Quality,' 'Life,' and 'Communication' appeared from 2011 to 2018. In the last 10 years, more diverse keywords such as 'elderly' and 'dental hygiene student' have been ranked at the top, indicating that research are becoming more diverse.

4. Limitations

We have not analyzed all the journals published in the field of dental hygiene.

5. Generalizability

As this study only analyzed the Dental Hygiene Science Society in the field of dental hygiene, there is a limit to generalizing it as a research trend in the overall dental hygiene system. Nevertheless, this research is expected to be used as basic data for researchers who study dental hygiene and develop and upgrade dental hygiene by analyzing recent research trends and characteristics published in the *Journal Dental Hygiene*, which has been evaluated as having excellent academic value, quality, and special evaluation.

6. Suggestions

For the future development of the *Journal of Dental Hygiene Science*, it is necessary to continuously make efforts for the qualitative growth of articles, and expand qualitative multidisciplinary convergence research to support more in-depth and diverse research. It is also expected that the *Journal of Dental Hygiene Science* will grow into an authoritative journal that can be cited not only in Korea but also worldwide if concrete measures are taken to increase the number of English articles published, such as securing overseas researchers.

7. Conclusion

The *Journal of Dental Hygiene Science* continues to grow quantitatively and qualitatively, and these results will be used as basic data to establish the direction of future dental hygiene research.

For academic development of dental hygiene, it is necessary to explore the diversity of academic topics based on the results of this study. It is necessary to find a way to spread the research results so that the published research can be used for the academic development of dental hygiene.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

This study was conducted without IRB approval as a study using articles published in the Journal of Dental Hygiene Science.

Author contributions

Conceptualization: Sun-Mi Lee, Mi-Gyung Seong, Hee-Jung Moon, and Jung-Hui Son. Data acquisition: Jung-Hui Son. Formal analysis: Sun-Mi Lee. Funding: Sun-Mi Lee, Mi-Gyung Seong, Hee-Jung Moon, and Jung-Hui Son. Supervision: Sun-Mi Lee. Funding: Sun-Mi Lee, Mi-Gyung Seong, Hee-Jung Moon, and Jung-Hui Son. Writing–original draft: Sun-Mi Lee, Mi-Gyung Seong, Hee-Jung Moon, and Jung-Hui Son. Writing–review & editing: Sun-Mi Lee, Mi-Gyung Seong, Hee-Jung Moon, and Jung-Hui Son.

ORCID

Sun-Mi Lee, *https://orcid.org/0000-0003-3133-8912*
Mi-Gyung Seong, *https://orcid.org/0000-0002-8950-9959*
Hee-Jung Moon, *https://orcid.org/0000-0002-9613-9124*
Jung-Hui Son, *https://orcid.org/0000-0003-3339-5902*

Data availability

Raw data is provided at the request of the corresponding author for reasonable reason.

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