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INTRODUCTION

As a part of Gender-Affirmation surgeries, Facial Feminization Surgery (FFS) improves the patient's quality of life (1). With the increasing trend of FFS across transgender and cisgender women, growing interest in online searches causes unlimited consumption of web and social media knowledge day by day (2). Recent studies have evaluated various social media source content on FFS (3).

Google Trends (Google, Mountain View, CA) has been a helpful application for evaluating analytics of Google search popularity with relative search volume (RSV). RSV shows the popularity of keywords regarding relative quantity in the whole Google search volume for selected time intervals and locations (4). According

Facial feminization surgery: Current Google trend analysis

Abstract

Aim: This paper aims to present the most popular facial feminization-related terms and the last five years' trends for facial feminization surgery (FFS).

Materials and Methods: Relative Search Volume (RSV) data for global searches conducted between 2018 and 2022 using the search terms "Facial Feminization Surgery," "Facial Feminization," "FFS Surgery," and "Transgender Face" were collected using Google Trends. These four search terms related to facial feminization were compared based on their RSV data. Additionally, the RSV data for the past five years was analyzed to identify year-by-year trends in FFS.

Results: The 'Facial Feminization Surgery' term was found to be a more searched one than the others with an average of 28.64 ($p < 0.001$). According to our study, within the last five years, FFS terms significantly increased overall ($p < 0.001$).

Conclusion: Recent literature and our study revealed that 'Facial Feminization Surgery' is the main term of FFS-related searches. Future studies on FFS trends should use this term for Google's 'Autocomplete' function. When the RSV data and PubMed database compared, the continuously increasing trend of the FFS within the recent studies and our paper point to the attention of gender-affirmation surgery providers to present more content for facial feminization candidates to improve academic and public knowledge. Our findings also aware us of the increasing need for perioperative healthcare providers for the social preparation and management of both transgender and cisgender women. To reveal future global search behaviors for FFS and to keep marketing strategies up to date our methodology might follow periodically. Future clinical studies are needed to reveal trends between facial feminization procedures.

Keywords: Facial feminization, facial feminization surgery, gender-affirmation surgery, Google trends, transgender women

to the RSV scale, 100 is the highest value. In a time period, it accepts the highest search day for that term as 100 and evaluates the other days as a percentage of the top score (5).

Since its release in 2012, Google Trends (GT) has strengthened analytics in plastic surgery by noticing the latest trends in society and providing data on public demand for health services (6). Therewith, GT may count as a helpful tool for plastic surgeons to create presentation tactics by detecting effective marketing locations and evaluating the latest trends and public expectations (7). As a limitation of GT, Google provides deidentified data, which may cause sampling bias, since data is not harvested from homogenized society (6).

In recent years, there have been studies to evaluate the research volumes of facial feminization surgery (2,6). However, many of

these did not include the RSV which is a widely accepted and standardized GT analysis scale. In addition, there is no study in the literature covering the last and the most popular five years of FFS.

Our study aims to evaluate the volumes of the most popular search terms related to facial feminization surgery (FFS) over the last five years, while also comparing the trends observed during this period. The focus of our research is to investigate the current Google Trends analysis of FFS. The consistent upward trend in recent studies, including our own, underscores the growing interest in gender-affirmation surgery, particularly in the context of facial feminization. This increasing interest highlights the need for gender-affirmation surgery providers to provide more scientific articles and informative content for potential candidates, contributing to greater public awareness.

MATERIALS AND METHODS

Compilation of Data

Based on Google Trends global weekly average data, Facial Feminization Surgery-related Google search parameters were compiled by filtering recent studies (2). Research parameters were tracked and examined the sub-topics of the existing searches. The four most popular searches, which make up almost the entire search volume of facial feminization searches, were included in the study. Non-facial feminization gender-affirming surgeries, Top surgery, body feminization surgeries, and bottom surgery, and related queries of these searches were excluded. Since, Google provides deidentified data, the data used in this study is not harvested from homogenized society (6).

GT weekly average of the terms 'Facial Feminization Surgery, Facial Feminization, FFS Surgery, Transgender Face' searches worldwide volume between 2018-2022 years were listed. Weekly GT data were averaged for each year. RSV data were compared to evaluate yearly FFS keyword trends. Moreover, the RSV data of the four facial feminization search terms were compared among themselves.

PubMed (National Center for Biotechnology Information (NCBI) [Internet]. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; [1988]–[cited 2023 Oct 15]. Available from: <https://www.ncbi.nlm.nih.gov/>) search terms consisted of 'Facial Feminization Surgery, Facial Feminization, FFS Surgery, and Transgender Face' between 2018-2022 years. Separately for each term, annual distributions were calculated as percentages. Literature volume was compared with search terms RSV data between 2018-2022 years.

Statistical Analysis

The results were evaluated with the statistical program G*Power (current ver. 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany). RSV data of years were calculated as mean $\pm$ standard deviation (SD) and standard error of mean=SEM. To examine the mean difference between years and terms, the results

were evaluated with the ANOVA (one-way analysis of variance) test. The homogeneity of population variances was evaluated using Levene's Test. When the p-value was significant as a result of the Levene Test, it was determined that the population variances were different. When the population variances were different, Tamhane's T2 test was used to investigate the difference between groups as a post hoc test. $p < 0.05$ was considered significant.

Evidence-Based Medicine (EBM): Level V.

RESULTS

According to our findings, the overall volume of FFS searches were shown an increasing trend within the last five years. In addition, the 'Facial Feminization Surgery' term was found to be a more searched one than the others with an average of 28.64 (SD=9.97). 'Facial Feminization, FFS Surgery, Transgender Face' terms were demonstrated an average of 10.28, 7.42, and 5.3, respectively (Table 1). ANOVA revealed that the variance between these terms was statistically significant ($p < 0.001$).

Table 1. Comparison result of search volumes of terms by ANOVA

Terms	Mean	SD	SEM
Facial feminization surgery	28.64	9.971	0.618
Facial feminization	10.28	3.842	0.238
FFS surgery	7.42	6.143	0.381
Transgender face	5.3	2.146	0.133
Total	12.91	11.168	0.346

$p < 0.001$

When the search volumes of these terms are compared by years; in 2022, these terms were searched more than in other years (Average=17.07, SD=14.50). Besides, our analysis revealed that within the last five years, year by year, FFS terms were had a significantly increasing trend overall ($p < 0.001$) (Figure 1).

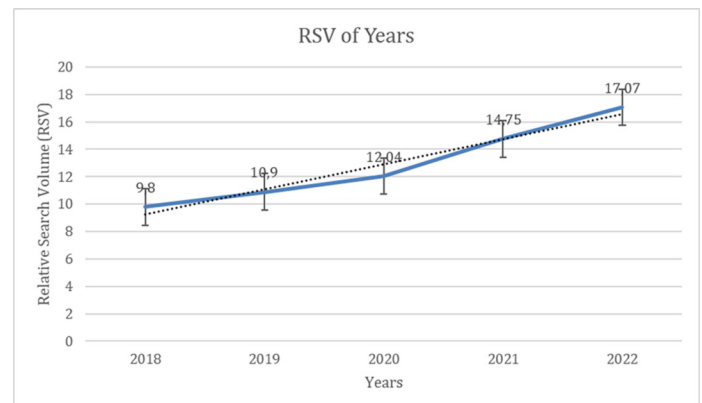
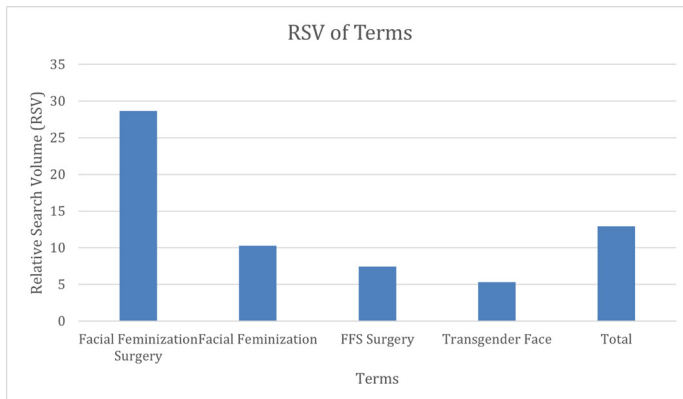
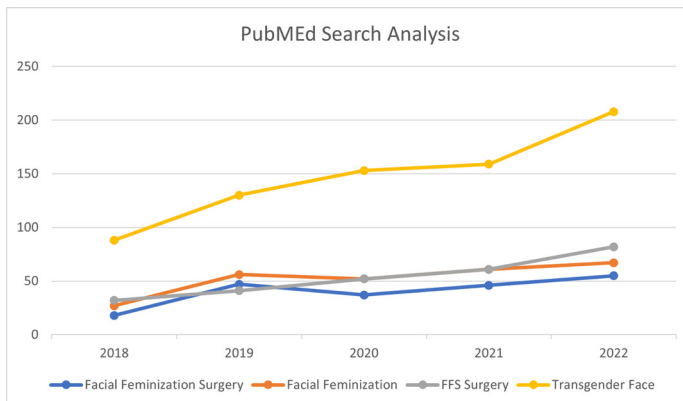


Figure 1. Comparison of overall volume of all FFS-related searches by year

PubMed search analysis revealed a limited increase in FFS-related search terms (Table 2). However, according to search terms, publication volumes were shown diverse focus when compared to RSV data (Figures 2 and 3).

Table 2. PubMed search analysis results of related search terms publication volume

Years	Facial feminization surgery	Facial feminization	FFS surgery	Transgender face
2018	18	27	32	88
2019	47	56	41	130
2020	37	52	52	153
2021	46	61	61	159
2022	55	67	82	208
Average	40.6	52.6	53.6	147.6
Total	203	263	268	738

**Figure 2.** Comparison of FFS-related terms search volume**Figure 3.** Comparison of related search terms' publication volume in years

DISCUSSION

Recent literature revealed Facial Feminization Surgery (FFS) is supportive of improving the patient's QoL (quality of life) (1). The growing interest in gender-affirming surgeries caused not only an increasing number of FFS across feminization-seeking cisgender and transgender women but also the abundant hit of FFS web and visual content (2). The search for a doctor is on the web and social media. The knowledge created in these channels is not fully based on academic knowledge and includes a significant amount of promotional and advertising purposes and guidance. It plays an active role in the selection of the patients (7).

Relative search volume (RSV) is useful data provided by Google Trends (GT) to evaluate keyword trends of Google searches for specific time periods and regions (4). GT helps plastic surgeons

through RSV data to analyze the latest trends in the market and to understand public expectations within healthcare (6). Therefore, today, GT is a useful program to create and improve marketing strategy (7).

Various studies recently evaluated search volumes of gender-affirmation surgeries in accordance with the years. According to these papers, FFS has a yearly increasing trend (2,6). As the uptrend that was popular in the past continues, the search graph is expected to rise over time. There is no study in the literature covering the last and the most popular five years of FFS. Our study was revealed an increasing trend over the last five years for FFS-related searches between 2018-2022 ($p < 0.001$). (Figure 1)

In our study, different search terms related to facial feminization were demonstrated in significantly different (Figure 2) search volumes ($p < 0.001$). When comparing recent studies' keywords, this finding shows us that searches are clustered on the main and same keywords as a result of Google's 'Autocomplete' function over time (8).

In the context of annual distribution curve comparisons with RSV curves, the existing literature is notably sparse, with inconclusive evidence of substantial growth trends. Although there has been a discernible increase in the publication of facial feminization studies over time, our investigation reveals a disproportionately high volume of publications. Furthermore, the literature exhibits a wide array of focal points when compared to global Google search trends (Figure 3).

When juxtaposed with publications employing related search terms, the apparent overrepresentation of 'transgender face' in the literature may be attributed to its possible inclusion in publications of other disciplines. Nevertheless, our study seeks to shed light on the semantic nuances of public discourse through an analysis of relative search volumes. Furthermore, it underscores the necessity for an upsurge in medical literature production and training programs, particularly due to the intricate nature of facial feminization surgery. Surgeons adept in these complexities should take a leading role in education, and the establishment of standardized quality criteria via international organizations such as the World Professional Association for Transgender Health (WPATH) is imperative (2).

As the interest in facial feminization surgery continues to burgeon, it becomes increasingly essential for fellowship programs to

incorporate comprehensive training in these procedures to meet the growing demand from patients.

Limitation

As a limitation of GT analysis, Google provides deidentified data, which may cause sampling bias, since data is not harvested from a homogenized society (6).

CONCLUSION

‘Facial Feminization Surgery’ is the main term of FFS-related searches according to the literature and our study. Since Google has an ‘Autocomplete’ function, future studies for FFS trends may focus on this term.

The continuously increasing trend of the popularity of FFS-related searches was shown by recent literature until the year 2018. In addition, within kept increasing trend from the year 2018 to 2022, our paper’s demonstration might improve awareness of treatment providers to present more explanatory scientific content to improve knowledge of facial feminization candidates. Also, this finding warns us of the increasing necessity of healthcare providers before and after surgery for the social and psychological preparation and management parts of facial feminization surgery patients.

Besides, the results of our study may help providers to create and improve their marketing strategies for gender-affirmation surgeries. Future clinical studies may need to reveal trends of subheadings of facial feminization and priorities of patients seeking feminization surgeries of the face.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

This type of studies does not required ethics committee approval. In addition, our work complies with the Helsinki Declaration.

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