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Interest in Telehealth for Obstetrics and Gynecology During the COVID-19 Pandemic

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Abstract

The coronavirus (COVID-19) pandemic resulted in a plethora of healthcare challenges. To adapt, many health systems implemented telehealth interventions. This retrospective study using data from March 1, 2021 to March 31, 2022 evaluates the relationship between the daily reported number of new COVID-19 cases and corresponding changes to search volume on obstetrics and gynecology telehealth visits. Google Trends™ outputs were compared to COVID-19 case data for the time period and region as provided by the World Health Organization (WHO). Spearman's correlation coefficient (ρ) was used to determine the strength of the relationship between new cases and relative search volumes (RSVs) related to obstetrics and gynecology telehealth. Globally, there was a significant positive strong correlation between public interest regarding telehealth in obstetrics and gynecology and new COVID-19 cases (ρ=0.986, p-value<0.001). However, the United States and Mexico demonstrated non-significant poor correlations. Brazil exhibited a positive fair correlation. Based on this retrospective study, there was a steady rise in public interest in telehealth usage for obstetrics and gynecology throughout the pandemic. Increased telehealth intervention in the field of obstetrics and gynecology (ob-gyn) has shown promising initial results. There are numerous considerations for utilizing telehealth for surgical specialties such as ob-gyn.

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1. Introduction

The COVID-19 pandemic had a large impact on the healthcare system globally. It prompted a shift to utilizing digital health solutions such as through telehealth or telemedicine. While some specialties were utilizing telehealth interventions prior to the pandemic, others, especially surgical specialties, had less uptake until the onset of the pandemic.[1] A recent systematic review found that telehealth interventions not only improved obstetric outcomes, but also decreased the need for high-risk obstetric monitoring office visits.[2] Considerations for surgical specialties include better patient preparedness for surgery with preoperative telehealth calls.[3] Healthcare providers are refocusing and adopting information and communication technologies (ICTs) such as telemedicine as a benefit tool for real-time, online consultations.[4] There has been a significant reduction in the prevalence of COVID-19 in North, Central, and South America because of the success in addressing vaccine hesitancy and vaccine uptake.[5] Telehealth systems played a crucial role in decreasing the spread and number of COVID-19 cases. Telemedical alternatives ensured the safety of the healthcare workers by allowing them to maintain the continuity of care to patients remotely.[6] It limited the spread of the pandemic by offering virtual visits from the comfort of a patient's home, allowing symptomatic patients to receive expert medical advice, and reducing the number of visitors to hospitals.

Telemedicine usage increased during the COVID-19 pandemic as the pandemic also triggered patient demand for virtual healthcare services.[6] Telemedicine incorporates the use of sound and video technology to allow for remote patient health visits, which were more sought out during the pandemic.[6] Even though telehealth cannot replace in–person visits, especially surgical procedures which cannot be performed remotely, it does lessen risks of unnecessary exposure and offers a secure way of providing testing and services. Telehealth interventions were notably effective in reducing the burden of healthcare systems during the pandemic.[7] While telehealth has been utilized in primary care and some specialties, telehealth uptake has not been as prevalent amongst surgical specialties. Telehealth usage for surgical specialties remains higher than pre-pandemic levels. It is important to consider this emerging dimension of healthcare delivery and the rapid adoption of new technologies in obstetrics and gynecology. A recent study found that maternal-fetal medicine obstetrical patients and providers were satisfied with telemedicine because it improved access to healthcare providers, saved time on traveling, and provided safety from any physical contact during the time of the COVID-19 pandemic.[8] For prenatal care, telehealth virtual visits consolidated the in-person visits for prenatal

screening and surveillance, alongside minimizing COVID-19 exposure and patient travel.[9]

Google Trends™ is a dynamic tool that offers insights into the popularity of search terms and topics on the world's most widely used search engine, based on data from billions of searches that Google processes every day. Its ability to display relative search volumes for a given keyword compared to the total search volume on Google over a specific period and location is one of its key features.[10] The timing of searches on Google Trends™ can be highly correlated to events such as a spike in cases of a particular disease or health condition, as individuals often rely on the internet for information about their health.[11] During the outbreak of COVID-19, there was a surge in searches for symptoms, testing, and treatment options, and the global Google Trends™ index peaked on March 12, 2020 when COVID-19 was proclaimed a pandemic. As such, it was shown that RSV indices can be used to track the spread of an outbreak like the present COVID-19 pandemic.[12] A population-based study demonstrated a strong correlation between search interests in 'COVID-19', 'COVID pneumonia', and 'COVID heart', and the COVID-19 daily new cases and new deaths. This study provided evidence that the trends in COVID-19 daily new cases and new deaths in the USA are substantially connected with search-interests relevant to COVID-19.[13] In another study, the strongest correlations were observed between 'face mask', 'Lysol', and 'COVID stimulus check' among the 10 keywords analyzed from Google Trends™ when looking at the United States as a whole, with R values of 0.88, 0.82, and 0.79, respectively.[14]

Google Trends™ is a research tool that provides information on the frequency at which specific search terms are entered into Google relative to the total search volume regionally or globally. This tool allows for data collection to provide insight into the trends related to the public interest in different healthcare subjects using keywords.[15] The output of Google Trends™, relative search volume (RSV), reflects changes in the magnitude of online public interest in a particular subject.[16] This association between RSV and public interest permits the primary objective of this study, which is to examine the association between the daily reported number of new cases during the COVID-19 pandemic and corresponding changes in RSV of topics in obstetrics and gynecology telehealth in selected North, Central and South American countries on March 1, 2020 - March 31, 2022. Countries were selected based on data availability.

2. Materials and Methods

2.1 Study Tool

Google Trends™ is a tool to analyze the public's interest via analyzing the number of web searches for a given term. Google is the most utilized search engine; therefore, the prevalence of web searches on Google represents public interest in a topic. Google Trends™ allows any user to extract data from a selected time period and selected region or country. These searches can be further localized and are indicated in order of prevalence by country and city. The selection of appropriate keywords for utilization in Google Trends™ is crucial for obtaining an accurate idea of public interest in a topic. The "+" feature allows users to search multiple related or synonymous keyword terms. This allows users to create a combination of keywords that accounts for different possible searches on the same topic.

The output of a Google Trends™ search is displayed as relative search volume (RSV), which expresses the search volume that corresponds to the number of searches for a given keyword. It is displayed on a numerical scale in a visual and downloadable data file form from 0 to 100, where 100 is the peak of the search term for the selected duration and geographic location whereas 0 indicates an almost negligible amount of searches for the term given those parameters.[17] Google Trends™ is a good approximation of searches and public interest; however, it does filter out some types of searches. These types of searches include: (1) searches made by very few people appear as "0" (2) duplicate searches from the same person in a short period of time are eliminated (3) queries with apostrophes and other special characters are filtered out from the trends.[17]

2.2 Study Design

This was a retrospective study conducted to determine the relationship between the new COVID-19 cases and the public interest towards obstetrics and gynecology telehealth. To get a longitudinal analysis, a time range was selected for the study from March 1, 2020 to March 31, 2022. Peaks in hospitalizations vary by country and region, so this study included a larger time range to provide better insight into any relationship between COVID-19 cases and public interest towards obstetrics and gynecology telehealth.

3. Selection Criteria

The World Health Organization operates a COVID-19 tracker which allows for surveillance of global COVID-19 data since the start of the pandemic. This tracker reports the official count of total confirmed cases and the number of new cases in each country. It is important to note that testing for COVID-19 has been

challenging in many countries with the strain on already struggling healthcare infrastructures. Additionally, the number of tests performed has dropped as cases have declined and the vaccine uptake has increased. As a result, there may be discrepancies between the reported number of confirmed cases at a specific time. We chose to determine the relationship between RSV from Google Trends™ and the number of new cases reported per day.

3.1 New COVID-19 Cases

Countries with the highest number of total confirmed cases of COVID-19 in North, Central and South America as of March 1, 2023 were selected to be part of the study. Based on this criterion, the following countries were included: United States of America, Mexico, and Brazil. The data for these countries and the worldwide data for new cases were extracted from reports published on the WHO website from March 1, 2020 to March 31, 2022.[18]

3.2 RSV Data from Google Trends™

The initial combination of keywords selected for our study was "ob-gyn telehealth", "telemedicina obstetricia y ginecológica", and "telemedicina obstetrícia e ginecologia" to reflect English, Spanish and Portuguese searches. These keywords were used with the "+" feature of Google Trends™. These keywords were selected on the basis that they are most utilized by the public and interchangeable with other variants that differ in the ordering of the terms. The data for these search terms were downloaded from the Google Trends™ website. The following filters were selected before extracting the data: "3/1/2020 to 3/31/2022" as time range; "all categories" for the category, and "web search" for the type of search. The parameter "region" was changed to either the United States, Mexico or Brazil respectively to obtain data for each country. The worldwide RSV for these parameters was downloaded from the site in order to compare public interest in obstetric and gynecology telehealth globally during the pandemic.

3.3 Statistical Analysis

The data extracted from the World Health Organization and Google Trends™ were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 29.0 (IBM Corp., Armonk, NY). The RSV data for each country for the search terms from 3/1/2020 to 3/31/2022 were plotted against the number of new COVID-19 cases reported for that country. The data were visually plotted as a histogram using the feature of the bell-shaped curve, and then tested by the Shapiro-

Wilk test. Given that the data was aberrantly distributed, Spearman's rank-order correlation test was performed to analyze the association between the RSV and number of new COVID-19 cases worldwide and in each of the selected countries. The Spearman's correlation coefficient which is denoted by 'ρ' was used to determine the strength and direction of the relationship between two variables. This coefficient's value lies between -1 to +1 with a "-" sign indicating an inverse relationship, a "+" sign indicating a positive correlation, and "0" demonstrating no correlation between the variables [19]. A "-1" value indicates a perfect negative association whereas a "+1" value indicates a perfect association. The value of $\rho \geq 0.8$ was used to depict a very strong relation, $\rho < 0.8$ and ≥ 0.6 for moderately strong relation, $\rho < 0.6$ and ≥ 0.3 for fair relation, and $\rho < 0.3$ for a poor relation between the variables [19]. A p-value of < 0.05 was considered statistically significant for this study.

4. Results

4.1 Relative Search Volume Data

4.1.1 Worldwide

The global interest regarding telehealth in obstetrics and gynecology was assessed during March 1, 2020 to March 1, 2022. As shown in Table 1, a mean of the global search volume regarding this type of telehealth was calculated to be 13.23 ± 22.34 . Based on the study's selection criteria, countries from North, Central and South America were selected due to their high amount of total COVID-19 cases: the United States, Mexico, and Brazil.

Table 1. *Means of Google Trends RSVs related to obgyn telehealth during the COVID-19 pandemic*

Country/Region	Mean	Standard Deviation
Worldwide	13.23	22.34
United States	21.89	14.58
Mexico	0*	0*
Brazil	0**	0**

* Searches in Spanish for ob-gyn telehealth yielded no significant Google trend results
** Searches in Portuguese for ob-gyn telehealth yielded no significant Google trend results

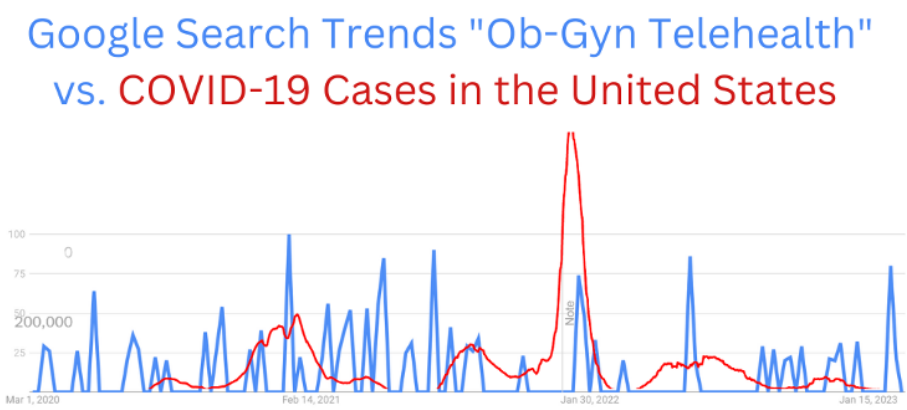
The selected time range was March 1, 2020 to March 31, 2022. During January 2022, it was observed that new COVID-19 cases rose sharply. One of the highest number of cases was the week of January 10th- January 17th, 2021 when the total number of confirmed cases rose 4,583,915 to a total of 23,309,763. Another notable peak was the week of December 19-December 26, 2022 when cases rose 29,381,144 to a total of 44,265,843 confirmed cases. The maximum RSV (RSV=100 for our search terms was recorded on January 17, 2021. Interestingly, the RSV slope illustrated a no discernable trend after January 17, 2021. It would peak several times including July 18, 2021 (RSV=90 and January 16, 2022 (RSV=74. A period from September-November 2021 showed a minimum RSV of 0.

4.1.2 United States of America

In March 2020, the mean RSV for "ob-gyn telehealth" was calculated to be 17.60 ± 17.59. In March 2021, the mean RSV was calculated to be 18.00 ± 22.33. In March 2022, the mean RSV was calculated to be 0 ± 0.

Interest in telehealth for obstetrics and gynecology during the COVID-19 pandemic was also plotted against new cases reported worldwide per day. This was illustrated for March 1, 2020-February, 2023 in Figure 1.

Figure 1.



Based on Data obtained from Google Trends and New York Times COVID-19 Dashboard

4.1.3 Mexico

Due to a lack of any Google Trends results for ob-gyn telehealth in English or Spanish, we instead monitored the RSV of the terms "telemedicina" and "obstetricia" separately. In March 2020, the mean RSV for "telemedicina" was calculated to be 5.60 ± 2.19. In March 2021, the mean RSV was calculated to be 3.00 ± 2.16. In March 2022, the mean RSV was calculated to be 6.75 ± 2.75.

In March 2020, the mean RSV for "obstetricia" was calculated to be 56.40 ± 12.62. In March 2021, the mean RSV was calculated to be 58.00 ± 5.29. In March 2022, the mean RSV was calculated to be 80.75 ± 9.21.

4.1.4 Brazil

Due to a lack of any Google Trends™ results for ob-gyn telehealth in English or Portuguese, we instead monitored the RSV of the terms "telemedicina" and "obstetricia" separately. In March 2020, the mean RSV for "telemedicina" was calculated to be 42.00 ± 31.34. In March 2021, the mean RSV was calculated to be 47.00 ± 6.78. In March 2022, the mean RSV was calculated to be 26.75 ± 2.99.

In March 2020, the mean RSV for "obstetricia" was calculated to be 21.50 ± 6.95. In March 2021, the mean RSV was calculated to be 17.25 ± 1.50. In March 2022, the mean RSV was calculated to be 24.25 ± 0.50.

4.2 Spearman's Correlation Analysis Between Google Trends™ and New COVID-19 Cases

The Spearman's correlation coefficient which is denoted by 'ρ' was used to determine the strength and direction of the relationship between RSV and new COVID-19 cases during the selected time frame. This coefficient's value lies between -1 to +1 with a "-" sign indicating an inverse relationship, a "+" sign indicating a positive correlation, and "0" demonstrating no correlation between the variables.[19] A "-1" value indicates a perfect negative association whereas a "+1" value indicates a perfect association. The value of $\rho \geq 0.8$ was used to depict a very strong relation, $\rho < 0.8$ and ≥ 0.6 for moderately strong relation, $\rho < 0.6$ and ≥ 0.3 for fair relation, and $\rho < 0.3$ for a poor relation between the variables.[19] A p-value of < 0.05 was considered statistically significant for this study.

Table 2. *Spearman's Correlation of RSVs and new COVID-19 cases*

Region/Country	**Spearman's correlation coefficient (ρ)**	**P-Value**
Worldwide	0.986[c]	<0.001[a]
United States	0.181[c]	0.533
Mexico*	"Telemedicina": -0.231[b]	0.426
	"Obstetrica": -0.227[b]	0.435
Brazil*	"Telemedicina": 0.330[d]	0.249
	"Obstetrica": -0.205[b]	0.482

*Mexico and Brazil Spearman's Correlation was performed between "telemedicina" and "obstetrica" RSV separately with new COVID-19 cases

[a] indicates p-value < 0.05 which was considered statistically significant; [b] indicates negative poor correlation; [c] indicates positive poor correlation ; [d] indicates positive fair correlation [e] indicates a positive strong correlation

Based on these standards and the calculated Spearman's correlation coefficient, a few interesting findings emerged. Worldwide there was a significant positive strong correlation between RSV for "obgyn telehealth" and new COVID-19 cases March 1, 2020-March 31,2022. In the United States, there was a non-significant positive poor correlation between RSV and new cases for the same keyword and timeframe. In Mexico, there were non-significant negative poor correlations between RSV for "telemedicina" or "obstetrica" and new COVID-19 cases March 1, 2020- March 31, 2022. In Brazil, there was a non-significant negative poor correlation between RSV for "obstetrica" and new COVID-19 cases whereas there was a non-significant positive fair correlation between RSV for "telemedicina" and new COVID-19 cases March 1, 2020- March 31, 2022.

5. Discussion

As our previous findings have indicated, telehealth interventions have brought forth advantages during the COVID-19 pandemic that shifted the viewpoint on telehealth as the prominent care delivery mode. However, there were certain barriers for telehealth uptake for surgical specialties. Not all health care providers are interested in utilizing telehealth interventions or are equipped with the technological infrastructure to do so.[20] During the COVID-19 pandemic, there was a rise in the utilization of telehealth in various countries due to the multiple advantages it provided compared to in-person visits.[21] With the help of telehealth care, patients could still consult with doctors even during self-quarantine; patients with either suspected or confirmed symptoms could be closely telemonitored using a telehealth cloud-based form, allowing for the maintenance of minimal patient and care-provider exposure.[22] Additionally, physicians quarantined due to exposure to COVID-19 could still deliver healthcare services to non-exposed patients using tele-intake and care for patients remotely.[23] Furthermore, implementing telemedicine during the pandemic decreased the likelihood of the further spread of COVID-19 through remote care of patients; it also reduced the rate of emergency room visits.[24] Several categories of patients benefited from telehealth during the COVID-19 pandemic, including elderly patients and patients with chronic conditions such as diabetes mellitus and hypertension.[25] For example, a cross-sectional study conducted in Ontario before and during the pandemic found a significant increase

in telemedicine visits in patients with chronic disease conditions and patients of older age groups in rural areas during the pandemic.[25] Telemedicine would be particularly helpful to these groups of people, especially in rural regions, due to a decrease in the cost of traveling and time spent traveling. Other benefits include reduced hospital readmission and increased availability of inpatient beds for patients requiring critical care.[25] Several measures were put in place to facilitate the integration of telehealth care during the pandemic; for example, due to the increasing patient load during the pandemic, several countries expanded access to telehealth using various methods such as relaxing previously strict laws regarding telehealth, which had been put in place due to ethical concerns, concerns about patient data privacy, and concerns about accountability.[21] Similarly, the lack of insurance coverage for telehealth is another factor that initially limited the incorporation of telehealth into healthcare systems before the pandemic; however, insurance companies have begun reimbursing patients' costs incurred due to telehealth care delivery.[21]

It is evident that COVID-19 has caused a global crisis. This subsequently resulted in a paradigm shift within the healthcare and public health systems, the loss of millions of lives, and economic disruption. Healthcare systems across the world developed a new framework encompassing public health functions such as testing, contract tracing, disease surveillance, telehealth, and non-pharmaceutical public health interventions.[26] Despite differences in healthcare infrastructure across North, Central and South America, these regions all actively considered telehealth to meet the increased health needs of their populations. In North America, there is a focus on providing the public with a mix of public and private programs. In the United States, there is Medicaid, a public program, offered for those who fall within the category of being low-income and Medicare is a public program for older patients, and some younger individuals with disabilities. Within the United States, however, private insurance costs are often exorbitant. Canada, on the other hand, has a decentralized, universal and publicly funded health system called Canadian Medicare.[27] Private insurance is held by ⅔ of Canadians and covers services excluded under universal health coverage such as vision and dental care, rehabilitation services and outpatient prescription drugs.[27] Mexico also has both public and private healthcare sectors. The private sector has increased in prevalence over time, however, only 7% of Mexicans have private insurance.[27] Due to this, private insurance to cover out-of-pocket expenses is considered to be linked to Mexicans with higher socioeconomic status.[27] Public healthcare is fully or partially subsidized by the federal government through INSABI for individuals without employment, IMSS for those employed, and the ISSSTE for public employees.[28] Brazil utilizes a national health system, Sistema Único de Saúde, providing its citizens with

decentralized, universal health coverage which is delivered at the state and municipal levels.[28] North American nations utilize a mix of public and private programs, while Central and South America primarily concentrate on public programs that are fitted to meet the health needs of their populations.

The COVID-19 pandemic has distributed all fields of healthcare. This has led to the postponement or cancellation of elective procedures such as cervical cancer screenings and clinic closures for reproductive healthcare. Telehealth has emerged as a crucial tool for accessing reproductive healthcare, particularly in areas where clinics have closed or reduced services.[21] The pandemic has also intersected with political and social issues correlated to reproductive healthcare,[21] namely stigmas surrounding ob-gyn procedures that continue to hinder women's access to critical services. i.e., reproductive surgeries such as termination of pregnancy or surgical sterilization were not initially prioritized by many national organizations, excluded from insurance coverage, and not permitted by healthcare institutions due to socio-political views and stigma surrounding unintended pregnancy and termination.[29] A study indicates that society associates reproductive healthcare with sexual relations, shaping stigmas that place limitations on unmarried women for using such services. Stigma regarding abortion is seen as a negative attribute that marks individuals as inferior to ideal womanhood and is based on a shared understanding that abortion is morally wrong or socially unacceptable.[29] Additionally, there emerges the potential for internalized stigma as women report self-blaming and feeling shame for their HPV and/or cervical cancer diagnosis.[29] In the United States, abortion continues to be stigmatized and has led to state-level restrictions. Moreover, Mexico's population's religious values have led to a similar stigmatization as traditional beliefs about women's role and sexuality render it difficult to access contraception or seek reproductive healthcare. However, as of September 2021, Mexico's Supreme Court ruled that it is unconstitutional to punish abortion as a crime, a watershed ruling that clears the way for the legalization of abortion across the country.[27] Conversely, Brazil maintains that abortion is illegal except for certain legal exceptions. The country enforces comprehensive sexual and reproductive health policies according to national laws. Exacerbated by political polarization and push for restrictions, Brazil's reproductive health systems have been further made difficult due to the inaccessibility of critical services.

While Google Trends™ is a helpful tool to determine relative interest in a topic over a period in a region, there are intrinsic limitations to its usage. It does not accurately represent the entirety of internet search traffic for a topic because it is only harvesting data from Google searches. Furthermore, relative search volume (RSV) which is measured on a scale from 0 to 100 only demonstrates relative interest in a

topic. There is also potential for bias since not everyone can access technology or stable internet to make searches. Specifically, these individuals may also not be searching about telehealth at all due to this lack of access. Another consideration is that different countries may utilize different search languages and subsequently different terminology and communication channels. This makes it difficult to directly compare relative interest in a topic in different countries across different regions.

The implementation of telehealth in obstetrics and gynecology is promising. It introduces new avenues to increase patient education before procedures, follow-up visits, and other opportunities. The incorporation of telemedicine for pregnant women has been associated with numerous advantages compared to exclusively in-person care. For example, a retrospective observational cohort study on pregnant women who received exclusive in-person and alternate (telemedicine and in-person) care showed that women who received alternated care had similar maternal and perinatal outcomes to women who had received exclusively in-person care.[30] Interestingly, these women were also more likely to be admitted into antenatal follow-up programs earlier and obtain a more significant number of evaluations resulting in increased maternal satisfaction and decreased adverse outcomes such as perinatal mortality.[30] In addition, they also experienced reduced unnecessary exposure to the hospital environment during pregnancy.[30] The incorporation of telehealthcare also allows for increased utilization of web-based informational programs, an effective tool for patient education. These web-based programs empower patients to participate more effectively in medical decision-making, resulting in a higher likelihood of adherence to treatment plans. Increased preoperative knowledge can help to reduce anxiety levels before surgery. Furthermore, telehealth reduces several barriers which pregnant women might face as it may make care more affordable and a convenient method of healthcare delivery. Telehealth care allows patients to interact with physicians remotely regardless of time and day thereby increasing access.[22]

With the promising nature of telehealth, addressing barriers regarding the integration of telehealth as a prominent part of healthcare systems in countries is essential. Such barriers include concerns about the lack of data privacy and security and the lack of rules and regulations concerning telehealth utilization.[22] Addressing these issues by improving data privacy and security, outlining clear rules and regulations by the government concerning the use of telehealth and upgrading the infrastructure of telemedicine in hospitals and clinics will go a long way in advancing the capacity for integration of telehealth care.[22] Another strategy that can facilitate telehealth incorporation is the reformation of medical school curricula to include

telehealth and telehealth care delivery components. Current medical practitioners can also be encouraged to participate in continuing medical education and continuing professional development to improve their knowledge and level of comfort in delivering Telehealth to patients; This would keep them abreast of the rapid advancement in this system.[21]

6. Conclusion

Telehealth has been of increased interest during the COVID-19 pandemic due to its role in helping the ill and immunocompromised receive care without concerns of further spreading the virus. This is a novel way to enable high-quality supportive care for a variety of patient populations. Using Google Trends™, our study found a significant rise in worldwide interest in obstetrics and gynecology and telehealth. Despite this, many physicians and patients have concerns due to regulatory, legal, reimbursement and privacy barriers. This has largely hindered the widespread adoption of telehealth. Previous studies have shown that there are many barriers to telehealth uptake specifically for surgical specialties and generally due to the lack of adequate healthcare infrastructure in many countries. Telehealth in surgical specialties also varies from other specialties as its primary use would likely be for preoperative assessment as well as evaluation and follow-ups post-surgery. This study strongly highlights the interest in telehealth for obstetrics and gynecology and potential of telehealth applications for surgical specialties globally.

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