Journal Of Case Reports: Clinical & Medical

Case Report

The Impact of the COVID-19 Pandemic on Assisted Reproductive Technology and Intra-uterine Insemination Volumes in Canada: A National Survey Study

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ARTICLE INFO

Received Date: July 16, 2022
Accepted Date: August 19, 2022
Published Date: August 22, 2022

KEYWORDS

Coronavirus; COVID-19
Infertility; Insemination
Reproductive Techniques Assisted; Telemedicine

Citation for this article: Jennifer Lam, Mahvash Shere, Nickan Motamedi, George Vilos, Basim Abu-Rafea, Angelos Vilos. The Impact of the COVID-19 Pandemic on Assisted Reproductive Technology and Intra-uterine Insemination Volumes in Canada: A National Survey Study. Journal Of Case Reports: Clinical & Medical. 2022; 5(1):164

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ABSTRACT

Research Question: What was the impact of the COVID-19 pandemic on assisted reproductive technology (ART), insemination, and clinic volumes across Canada?

Design: An online survey study was conducted of Canadian fertility clinics. Participants were asked to comment on their centre's procedural and clinic volumes during the COVID-19 pandemic, Including Partner or Donor Inseminations (IUI/DI), in-vitro fertilization or Intracytoplasmic Sperm Injections (IVF/ICSI), and Frozen Embryo Transfers (FET). Centres were asked to provide the percentage of expected volumes achieved in 2020 and the first half of 2021, relative to similar periods pre-COVID in 2019. They were also asked to comment on closure policies, practice adaptations, and current operations.

Results: The response rate was 42.9% (24/56). At the onset of the pandemic, clinics were closed for an average of 2.4 months (range 0-5). The most common policies were no new cycle starts for IUI/DI (58.3% of clinics) and FET (50%), and completion of current cycles for IVF/ICSI (66.7%). By the end of 2020, most centres noted annual volumes at 75-99% from the previous year (29.2% of respondents for IUI/DI, IVF/ICSI, and FET and 41.7% for clinic visits). In the first half of 2021, most centres indicated volumes that were >100% of pre-pandemic levels (41.7% of respondents for IUI/DI, IVF/ICSI and FET and 33.3% for clinic visits). At study closure, 50-74% of clinic visits were occurring virtually (43.5% of respondents).

Conclusions: The COVID-19 pandemic resulted in a transient decrease in fertility services. Adaptations, including virtual care, compensated, and helped exceed expected volumes in 2021.

INTRODUCTION

Canadian fertility services were transformed with the onset of the COVID-19 pandemic. On March 18th, 2020, the Canadian Fertility & Andrology Society (CFAS) advised clinics to effectively suspend fertility care [1]. Endorsement of a resumption of services came on June 5th, 2020, but by this time patients had lost critical time, and in some cases, opportunity to access the services required to treat their infertility [2]. The psychological impact of service suspensions was considerable and is well documented [3-5]. Some patients ranked the distress from delay or cancellation of their treatments as consistently higher than the stress of the pandemic [6], and many indicated they would like to resume services as soon as possible [3]. The objective impact that service suspensions had on access and availability of fertility services is less clear. Zhou et al. [7] reviewed fertility insurance claim data from over 8 million women in the United

States and reported a decreased use of services over the 1-month closure proposed by the American Society for Reproductive Medicine (ASRM). This was followed by a sharp recovery and increase in usage over pre-pandemic volumes that were sustained through the end of their study in December 2020 [7]. A preliminary review of the data from the Society for Assisted Reproductive Technology Clinic Outcome Reporting System (SART CORS), revealed that despite these trends, annual *In-Vitro* Fertilization (IVF) volumes in 2020 were similar to pre-pandemic levels in the year 2019 [8].

In Canada, our group reported our single centre experience, noting a decrease in annual volumes of IVF and Intracytoplasmic Sperm Injection (ICSI), Frozen Embryo Transfer (FET) and Inseminations (IUI/DI) for the year 2020 at 60-90% of average volumes from 2018 and 2019. In contrast, all procedures increased in the first quarter of 2021, up to 127-164% of baseline volumes [9]. However, the impact of the pandemic on fertility services across Canada has not yet been described. The objective of our research was to elucidate the impact of the COVID-19 pandemic on availability and access to fertility services on a Canadian national scale. We aimed to investigate the quantitative elements - 2020 annual and 2021 semi-annual procedure and clinical volumes - as well as the qualitative, examining the impact of policies established throughout the pandemic and the incorporation of virtual care.

MATERIALS AND METHODS

Survey design

An online survey was designed using the Qualtrics XM platform [10]. Questions were arranged into four sections: clinical adaptations at the onset of the pandemic; effects of the pandemic on 2020 annual volumes; ongoing volumes in the first half of 2021; and baseline total inseminations. The latter section was optional and was included in the survey as there is no national registry of inseminations for comparative analysis.

The 2020 annual and 2021 semi-annual reviews asked clinic representatives to estimate volumes of clinic visits as well as their procedures. Procedures included inseminations with partner or donor sperm (IUI/DI) as well as Assisted Reproductive Technologies (ART): in-vitro fertilization or Intracytoplasmic Sperm Injections (IVF/ICSI), and Frozen Embryo Transfers (FET). Estimates were made in the form of a percentage of baseline rates achieved over similar time intervals in 2019, the year prior to the pandemic. Respondents were asked to give a percentage of their baseline procedural volumes rather than their absolute procedural figures to avoid concerns regarding respondent privacy and to improve survey uptake. In a similar fashion, the optional question on 2019 baseline insemination volumes employed ranges rather than absolute numbers for the protection of clinic privacy. Each section also included qualitative questions regarding practice adjustments over the course of the pandemic. A copy of the survey is available under supplementary data (Appendix).

Recruitment

An internet search was conducted to compile a list of Canadian clinics, as no central database exists for fertility centres across Canada. Using the Google browser, search terms “IVF” and “fertility clinic” were used for each province and territory. Fertility centres that were not open prior to the onset of the pandemic in 2020 were excluded as respondents were required to make pre-COVID-era comparisons. Each clinic was contacted, and email addresses were obtained for the medical director or a site representative from each location after verbal consent. The study information and link to the online survey were distributed to these selected individuals. Responses were submitted anonymously. Participants were given four weeks to respond, and the survey was open between November 30th, 2021, and December 31st, 2021. Reminder emails were sent at 1 week, 3 weeks, as well as the penultimate day. The information and survey link were also made available through the Canadian Fertility & Andrology Society (CFAS) member portal.

Data analysis

Data were compiled on the Qualtrics platform. Responses were screened for duplicates. Descriptive statistics and thematic analysis were used for quantitative and qualitative data, respectively.

The Canadian Assisted Reproductive Technologies Register Plus database (CARTR) Annual reports were consulted for 2019 and 2020 [11,12], available through the Canadian Fertility & Andrology Society (CFAS) website (Available: https://cfas.ca/cartr-annual-reports.html). CARTR obtains data from 36 fertility clinics in Canada and reports on outcomes from IVF and FET cycles. The CARTR database was used to compare and validate the findings of our survey study. Total annual

volumes of IVF and FET were obtained by combining donor and autologous cycles, as well as fresh and frozen cycles for IVF. Descriptive statistics were performed to compare pre- and post-pandemic volumes.

This research was approved by Western University's Research Ethics Boards.

RESULTS

A total of 59 fertility centres met our inclusion criteria. We were unable to reach or obtain email addresses from three of the clinics so 56 were included in the analysis. Twenty-four clinics responded to the survey (24/56, 42.9% response rate). Two of the ten questions were answered by only 23 of the respondents. In March of 2020, at the onset of the pandemic, clinics were closed for an average of 2.4 months (range 0-5 months). Policymaking varied by procedure and by clinic (Figure 1). For IUI/DI, the most common policy was to have no new cycle starts (58.3% of respondents) followed by cancelling all ongoing cycles (54.2%). For IVF/ICSI, most clinics chose to complete current cycles (66.7%). Many also incorporated freeze-all policies and no new cycles starts (both 45.8% of respondents). For FET, the most common practice was to have no new cycle starts (50% of respondents) followed by the completion of current cycles (45.8%). Fertility centres noted adherence to government and CFAS directives as well as a move to virtual care.

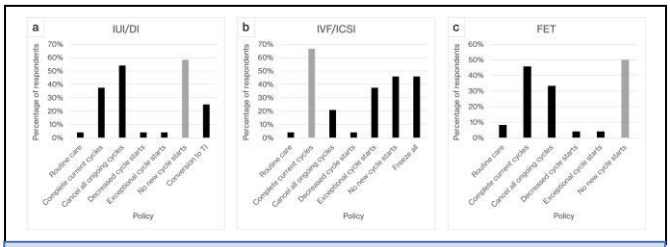

Figure 1: Procedural policies implemented in March 2020, at the onset of the COVID-19 pandemic.

DI: Donor Insemination; FET: Frozen Embryo Transfer; ICSI: Intracytoplasmic Sperm Injection; IUI: Intrauterine Insemination; IVF: In Vitro Fertilization; TI: Timed Intercourse

At the completion of the year 2020, most fertility centres indicated a decrease in their annual volumes for procedures as well as clinic visits (Figure 2). Across all categories, the most common response was 75-99% of baseline volumes compared to the previous year. For IUI/DI, IVF/ICSI and FET, the majority response represented 29.2% of the centres, and for clinic visits, 41.7%. In terms of factors that might have contributed to altered volumes, 23 of the 24 clinics provided opinions. Mandatory closures were the prevailing reason (82.6%), followed by mandatory spacing of procedures (56.5%) and decreased staffing (52.2%). Many centres also selected initial adaptation to virtual care (43.5%) and time required for additional cleaning (43.5%). Interestingly, and in contrast to these trends, three clinics remarked that they were busier than ever in 2020.

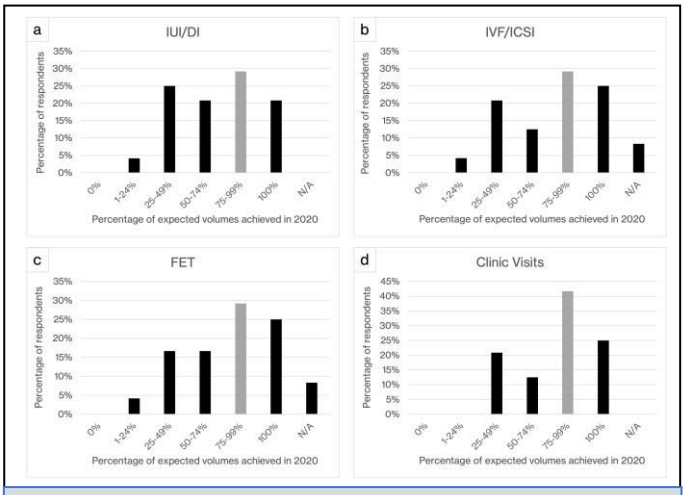

Figure 2: Percentage of expected annual procedure and clinic volumes conducted in the year 2020 relative to 2019.

DI = Donor Insemination; FET = Frozen Embryo Transfer; ICSI = Intracytoplasmic Sperm Injection; IUI = Intrauterine Insemination; IVF = In Vitro Fertilization

In the first half of 2021, most fertility centres attested to volumes that were higher than baseline rates prior to the COVID-19 pandemic (Figure 3). Compared to similar time periods in 2019, 41.7% of fertility clinics indicated volumes >100% for IUI/DI, IVF/ICSI and FET. In terms of clinic volume, an equal number of centres noted 100% and >100% of pre-COVID volumes (33.3% respondents for each). Practice adjustments made by clinics over the course of the pandemic included electronic correspondence and universal masking (both 95.8% of respondents). Many clinics also cited familiarity with virtual care (87.5%), optimized scheduling (83.3%) and online pre-screening (83.3%) as modifications that may have had an impact on their numbers.

At the time of study uptake, most centres were conducting their clinic visits virtually. While only 23 of the centres responded, the most frequent answer was 50-74% of clinic visits occurring by telephone or video (43.5%). In addition, many fertility centres

had completely switched over to virtual appointments, with 17.4% of clinics noting 100% of their visits occurring virtually. When asked what practices clinics intended to carry forward after the pandemic, almost all respondents noted the incorporation of telemedicine, with virtual clinic visits (95.8%) and electronic correspondence (95.8%). All clinics participated in the optional final question. On the other hand, only 19 provided an estimate of their 2019 baseline inseminations. In our study population, 29.2% performed <300 inseminations/year and 25% performed ≥900 inseminations/year. Fewer fertility clinics fell into the intervening ranges (20.8% had 300-599/year, 4.2% had 600-899/year). Of the clinics participating in the study, 4.2% stated the question was not applicable, and 16.7% abstained.

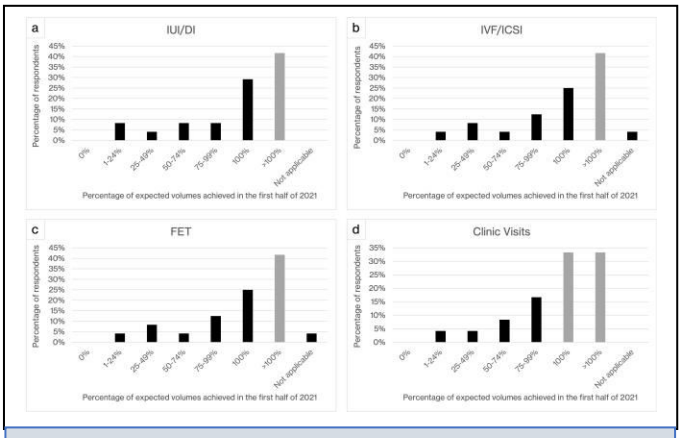

Figure 3: Percentage of expected semi-annual procedure and clinic volumes conducted in the first half of 2021 relative to the same period in 2019.

DI: Donor Insemination; FET: Frozen Embryo Transfer; ICSI: Intracytoplasmic Sperm Injection; IUI: Intrauterine Insemination; IVF: In Vitro Fertilization

DISCUSSION

Our study found that annual volumes in 2020 were reduced across all reproductive procedures (IUI/DI, IVF/ICSI, and FET) and clinical interactions to 75-99% of their 2019 volumes, followed by a rise to greater than 100% for the first half of 2021. These results are very similar to what our group observed at our local centre in London, Ontario [9]. These outcomes are also in keeping with the study by Zhou et al., showing decreased use of services in the United States over a 1-month period of closure from the pandemic, followed by a spike in utilization that was sustained through the end of the study in December 2020 [7].

Trends obtained from CARTR Annual reports validated our findings. In this Canadian database, 2020 annual volumes for IVF and FET were 84.5% (14,601/17,273) and 88.3% (15,058/17,055) of the volumes achieved in 2019, representing 2672 fewer IVF and 1997 fewer FET cycles. The same trend was not seen in preliminary data from the American SART CORS database, where annual IVF volumes from 2020 were similar to 2019 [8]. This difference between Canadian and American IVF trends may reflect the shorter duration of advised closure by the American Society for Reproductive Medicine (ASRM) compared to the CFAS [7].

Insemination responses demonstrated considerable variation, with 54.2% of respondents reporting at the extremes of available ranges, either less than 300 or more than 900 inseminations per year. This heterogeneity may reflect some respondents providing data from individual satellite clinics, while others provided data from their collective fertility group. Despite this limitation, our findings still reflect similar changes as seen in ART volumes. No national database exists to validate these novel findings. Appraising the qualitative elements of the questionnaire revealed that there was an overall adherence to CFAS recommendations [1] which notably resulted in closure of laboratories for an average of 2.4 months and a conversion to virtual care. Reproductive centres overwhelmingly indicated that this shift to virtual care improved their clinic efficiency. At the time of our study, 82.6% of responding centres were conducting 50% or more clinic visits virtually, and 95.8% responded that they intended to carry virtual visits and electronic correspondence into their post-pandemic practice. These results suggest that virtual care may remain a fundamental element of fertility care in the future.

Despite a thorough internet and telephone search, as there is no national database of fertility clinics, we were not able to confirm that we reached all eligible centres. Limitations of this study also included the retrospective study design and its associated risk of recall and respondent bias. We attempted to mitigate these biases by targeting medical directors or site representatives who would be more familiar with their clinic's numbers and asking for percentage volumes to capture an overall trend. The use of percentage volumes was in itself a limitation of our study. While gathering absolute figures would have given us a more precise view of how clinics were

impacted, we asked respondents to give percentage estimates to reduce perceived risk of participation in the survey, protect privacy, and improve response rate. Despite these limitations, data surrounding annual volumes from the national CARTR database validate our survey findings.

Our study offers an important contribution to the literature on the impact of the COVID-19 pandemic on reproductive care. It is the first study to report on ART, insemination, and clinic volumes at fertility centres across Canada. It is also the first study to quantify the adoption of virtual care among fertility practices and provide insight into how fertility centres might deliver care after the pandemic. The mixed quantitative and qualitative design of our study allowed participants to not only highlight trends in clinic and procedural volumes, but also the factors that gave rise to those trends. The final key strength of our methodology was in validating the survey findings. Our study results align with national CARTR annual volume data, supporting the external validity and the reliability of our results. Future research should focus on changes in the outcomes of fertility procedures due to the COVID-19 pandemic.

ACKNOWLEDGEMENTS

None

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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