Original Article

The Impact of Coronavirus Disease 2019 Pandemic on Female Patients Seeking or Undergoing Fertility Treatment in a Single *In vitro* Fertilisation Clinic in Greece: An International, Cross-sectional Study

Konstantina Pappa[1], Emmanouil M. Xydias[1,2], Apostolos C. Ziogas[2], Kanelina Bimba[1], Elias Tsakos[1], Efstratios Kolibianakis[3]

[1]Embryo Clinic IVF, Thessaloniki, Greece, [3]First Department of Obstetrics and Gynecology, Unit of Human Reproduction, Medical School, Faculty of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, [2]Department of Medicine, School of Health Sciences, University of Thessaly, Larissa, Greece

Abstract

Background: The temporary delay in fertility treatments due to the coronavirus disease 2019 (COVID-19) pandemic, in combination with the imposed lockdowns, has created psychological distress and anxiety amongst infertile patients. **Aims:** The aim of this study was to evaluate how the pandemic has influenced assisted reproduction technology (ART) patients in Greece, during the second wave of the pandemic. An additional aim was to examine the effects of the pandemic on cross-border patients in particular, compared to national ones. **Settings and Design:** This study was a cross-sectional, questionnaire-based study, distributed to 409 patients of a single *in vitro* fertilisation (IVF) clinic in Greece, during the period between January until the end of April 2021. **Materials and Methods:** The survey was conducted online via E-mail and was distributed to national and international female patients of a single IVF clinic in Greece, who were undergoing ART treatment during the second wave of the COVID-19 pandemic. Patient participation was anonymous, and participants provided informed consent for collection and publication of data. **Statistical Analysis Used:** The mean values of baseline characteristics, along with answer percentages per questionnaire item, were calculated. Collected data were cross-tabulated, and the Chi-square test was used as a measurement of the differences between national and cross-border patients. A *P* value lower than 0.05 was considered statistically significant. All analyses were conducted using the SPSS Statistics software. **Results:** From 409 initial candidates, 106 women, with a mean age of 41.2 years, completed the questionnaire (26% response rate). The majority of national patients did not experience any delays in their fertility plans (62%), while cross-border patients experienced over 6 months of delays (54.7%). The main reason for fertility postponement was travel restrictions due to COVID-19 for cross-border patients (62.5%), while national patients cited additional reasons. The majority of patients experienced a degree of stress (65.2%) due to the delays, however were not fearful of COVID-19 infection (54.7%). Most patients were aware of the protective measures taken by IVF clinics (80.2%), and this was a determinant factor (71.7%) for their decision to restart their fertility treatment. **Conclusion:** The COVID-19 pandemic lockdowns had a significant

Address for correspondence: Mrs. Konstantina Pappa, Andrianoupoleos 6, 55133 Thessaloniki, Greece.
E-mail: konstantina.pappa@embryoclinic.eu

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emotional impact on patient receiving or undergoing ART treatment in Greece. This impact was more pronounced on cross-border patients. This highlights the need for continuation of ART care, with the appropriate protective measures, during the pandemic, as well as during similar times of crisis in the future.

Keywords: *Assisted reproductive technology, coronavirus disease 2019 pandemic, cross-border reproductive care patients, suspension of fertility treatments*

Introduction

Infertility has been repeatedly shown to exert a severe psychological impact on affected couples, leading to distress, anxiety, depression and feelings of inadequacy or inferiority.[1] Assisted reproduction technology (ART) treatments represent a significant source of stress for couples, impacting most aspects of their life.[2] During national or global crises, medical services other than ART might be prioritised, thus further exacerbating the impact of infertility on couples' lives.

The most recent example of such a crisis is the coronavirus disease 2019 (COVID-19) pandemic, as well as the impact of lockdowns and closure of fertility clinics that followed. Nationwide lockdowns were implemented since March 2020 to combat the spread of the virus in most countries. Fertility clinics were recommended to cease all activities, both to limit the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), as well as to reallocate healthcare resources.[3] The present study aimed to assess the impact of the second wave of the pandemic on national as well as international (or cross-border) patients, seeking or already undergoing fertility treatment in Greece. With this study, we aimed to report on the findings and observations from our clinic and compare those to relevant data from the available literature. This could contribute to the formation of a more effective strategy regarding fertility treatment, should another national or international crisis appear.

Materials and Methods

This was a cross-sectional, anonymous, online survey conducted by a single, private *in vitro* fertilisation (IVF) clinic in Greece. No ethics committee approval was requested, as the anonymous and observational nature of our study ensured that no clinical decision-making was based on the design or results of the present study, thus not affecting the participants. However, our methodology was based on and defined by the Helsinki Declaration principles for ethical medical research. The survey was based on 17 multiple-choice questions, which were optional. Four questions concerned the access to fertility treatment, six assessed the psychological impact of COVID-19, four were about their future fertility plans and three questions regarded communication with fertility service. Patient demographic information, namely country of residence and age of the female partner, was collected and its disclosure was mandatory for participation to the survey.

The questionnaire was translated into three languages (Greek, Italian and Serbian). The survey was designed using the NEX-Forms platform, uploaded to the IVF clinic's website. Patients were asked to participate via E-mail during the period between 18 January and 24 February 2021. Eligibility criteria included couples of the clinic who were undergoing or intended to undergo ART treatment during the second wave of the COVID-19 pandemic. Upon clicking the survey link, information relevant to the study, research policy and the questionnaire was presented to the participants. Data were collected over a 3-month period. In total, 409 couples were invited to participate via E-mail.

No sample size calculation (statistical power analysis) was conducted, as all available patients who fulfilled the established eligibility criteria were invited to participate. The collected data were analysed per question and correlations between the answers given and the patients' demographic characteristics were sought, in particular country of origin. Given the travel restriction and the multiple risks and complicated procedures regarding cross-border travel during the time period of the study, patients were categorised into two groups, national and cross-border patients, in order to more accurately assess this effect. Data were cross-tabulated and assessed using the Chi-square test, with a significance level below 0.05 ($P < 0.05$) being considered statistically significant. SPSS Statistics for Macintosh, Version 27.0. Armonk, NY, USA: IBM Corp. Software was used to conduct data collection and to perform all analyses.

Results

From the 409 couples who were invited to participate, 106 completed the survey (response rate of 26%). In particular, 42 out of 169 sent Greek questionnaires were answered (response rate for Greek-speaking participants: 24.9%), 31 out of 101 sent Serbian questionnaires were answered (response rate for Serbian-speaking participants: 30.7%), 22 out of 93 sent English questionnaires were answered (response rate for English-speaking participants: 23.7%) and 11 out of 46 Italian questionnaires were answered (response rate for Italian-speaking participants: 23.9%).

The demographic characteristics of the participants are presented in Table 1. The female mean age was 41.2 years (standard deviation ± 5.2). The majority of participants (62.2%) were in the age group of 36–45 years. Overall, 39.6% of the participants were from Greece, 26.4% from Serbia, 11.3% from the United Kingdom, 10.4% from Italy and the remaining 12.3% were responders from other countries [Table 2].

A total of 40 couples with infertility (37.7%) had their treatment cancelled for more than 6 months due to the COVID-19 pandemic, 13.3% of participants got their treatment cancelled for 3–6 months and 11.3% for <3 months, while 37.7% did not experience any delay. There was a statistically significant difference between national and cross-border patients, with 62% of the former reporting no postponement, whereas 54.7% of the latter reporting a delay of at least 6 months ($P < 0.001$) [Figure 1].

Table 1: Demographic characteristics of the survey participants

Parameter	Result
Participants, *n*	106
Age (years), mean±SD	41.22±5.201
Age group, *n* (%)	
25–35	18 (17)
36–45	66 (62.2)
46–50	22 (20.8)
Country of residence, *n* (%)	
Greece	42 (39.6)
Serbia	28 (26.4)
UK	12 (11.3)
Italy	11 (10.4)
Others*	13 (12.3)

*Others include Australia (*n*=1, 0.9%), Chile (*n*=1, 0.9%), Estonia (*n*=1, 0.9%), France (*n*=1, 0.9%), Germany (*n*=2, 2%), Ireland (*n*=1, 0.9%), Kosovo (*n*=1, 0.9%), the Republic of North Macedonia (*n*=1, 0.9%) and the USA (*n*=4, 4%). SD=Standard deviation

The main reason cited for treatment postponement was access restrictions (44.3%) while financial reasons, health conditions and psychological reasons were significantly less frequently cited. A number of patients (13.2%) cited multiple reasons. Once more, there was a statistically significant difference amongst national and cross-border patients, with the latter citing access restrictions, as the main reason significantly more frequently ($P < 0.001$) than national patients, whose answers were more evenly distributed [Figure 2].

Regarding patient experience during the COVID-19 pandemic, the desire to have a child remained unaffected for the majority (67%), while 11.3% were extremely adversely affected and 19.8% were mildly adversely affected. Additionally, the majority of survey participants (54.7%) reported no fear of undergoing assisted reproduction treatment during the COVID-19 era, with only 5.7% reporting extreme fear and 35.8% experiencing fear to a lesser degree. Regarding stress due to treatment postponement, 33.2% of female patients were extremely stressed that the delays could potentially decrease their fertility potential, 32% were less stressed, while also 32% answered that the delay did not concern them. This answer distribution is significantly different when country of origin is considered, as the majority of cross-border patients were significantly more prone to stress, while most of the national patients reported no stress whatsoever ($P = 0.016$). With regard to the potential effects of SARS-CoV-2 infection on the foetus after successful fertility treatment, 31.1% of participants were not concerned, 34% were mildly concerned and 11.3% were extremely concerned.

With regard to COVID-19 vaccination, 21.7% of participants were concerned that the vaccination would lead to additional postponement of their fertility treatment,

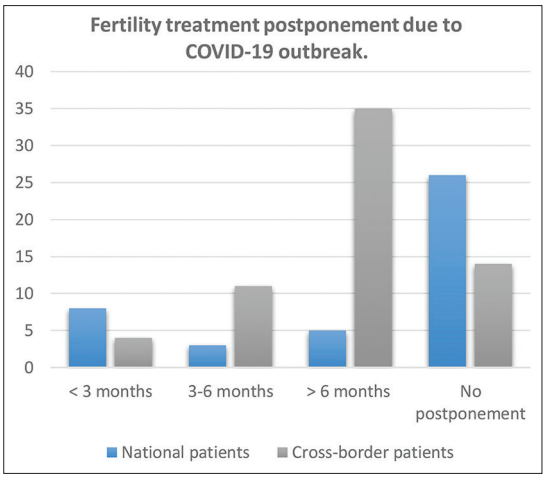

Figure 1: Bar chart of the duration of fertility treatment postponement in national and cross-border patients

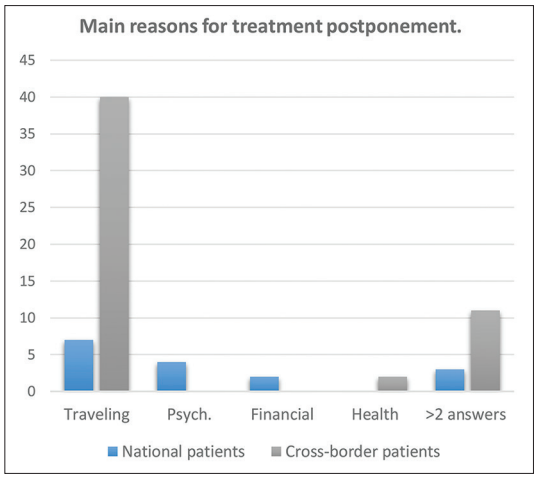

Figure 2: Bar chart of the main reasons for treatment postponement in national and cross-border patients

Table 2: Results of Chi-square test per question, in relation to country of origin and age group

Parameters	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Correlation with Country								
χ^2	28.674	22.319	35.387	5.028	5.821	0.260	8.322	4.879
df	3	4	6	4	2	2	2	2
P	<0.001*	<0.001*	<0.001*	0.284	0.054	0.878	0.016*	0.087
Parameters	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**
Correlation with Country								
χ^2	13.231	0.308	7.949	2.746	59.241	18.400	0.653	0.006
df	3	1	1	1	3	5	1	1
P	0.004*	0.579	0.005*	0.097	<0.001*	0.002*	0.419	0.939

*Statistically significant. χ^2=Pearson's Chi-square value, df=Degrees of freedom

while 39.6% were concerned about the safety of the vaccine during pregnancy. Some responders (23.6%) mentioned no concerns regarding the vaccination. Safety concerns were more prominent for national patients ($P = 0.004$), whereas for cross-border patients, the further delays were also important in addition to safety concerns. The vast majority of participants (80.2%) were aware of the protective measures taken by IVF centres during the COVID-19 era, and the majority (71.7%) also stated that a strict COVID-19 policy was a positive determinant of their decision to undergo IVF treatment [Figure 3].

Regarding the participants' future fertility plans, 16% were not considering treatment in the future, 36.9% hoped to travel abroad despite the COVID-19 pandemic in order to undergo fertility treatment, while 29.2% would remain in their home country for treatment. 11.3% of the survey participants were willing to wait until the crisis is over and then restart treatment. The majority of patients (45.3%) were informed through E-mails and phone calls from the IVF centre regarding fertility treatments during COVID-19 pandemic. When the answers were stratified by country, this trend remained consistent, however there was a statistically significant difference ($P < 0.002$), with cross-border patients being more likely to use the internet to contact the IVF clinic.

All collected answers and questions, stratified by country of origin (national or cross-border), as well as the questions themselves are presented in Supplementary Table 1.

Discussion

The results of this study validate our initial hypothesis with regard to the significance of the impact that the COVID-19 pandemic had on IVF patients, cross-border ones in particular. We showed that cross-border patients were significantly more prone to prolonged delays in their fertility care plan, with the most significant underlying cause being travel restrictions. On the contrary, the majority of national patients experienced no delays and those that did,

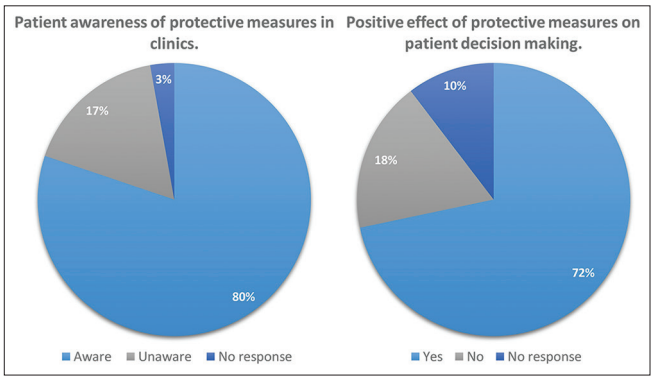

Figure 3: Pie chart summary of the awareness of protective measures in clinics and the positive effect of protective measures on patient decision-making

cited various other reasons apart from travel restrictions. The effect of added stress due to COVID-19-related delays was significantly more pronounced in cross-border patients compared to national ones, highlighting the significance of fertility care, especially when the patients are travelling abroad to receive it, while the majority of patients regardless of nationality were not fearful of COVID-19 infection itself as much as the delays. These observations make apparent the significance of ART treatment for patients and that maybe they should be considered a part of essential healthcare services due to their time-sensitive nature and emotional impact on patients.

The rapid spread of the COVID-19 pandemic around the globe, combined with the inadequacy of most healthcare systems to hospitalise all patients in need, led to the suspension of all non-urgent medical services in early 2020.[2,4] This included fertility treatments at the start of the pandemic and at different times during the 2 years since, both for reallocation of resources and to protect fertility patients from the effects of SARS-CoV-2 on gamete quality and function.[5] Both the pandemic and associated protective measures had a significant psychological impact on fertility patients worldwide, as shown by multiple studies, with opinions on several aspects of the situation being recorded.

A consistent finding in most studies was that the majority of patients, up to 90% in some cases, disagreed with clinic closure and wished to continue treatment regardless of the pandemic.[6-10] The same held true in our study, with the majority of patients (54.7%) not fearing the effects of the pandemic and wishing to continue regardless. This consistent trend indicates that ageing and reduction of fertility potential, is a more important factor for IVF patients, thus leading to many advocating for the continuation of clinic operation and prioritisation of cases in similar times of crisis.[11] However, patient safety is paramount as well, and in this regard, proper patient education of the risks and the necessity of protective measures was shown to significantly affect patient opinion in comparison to the control group.[10] Proper information was valued by our patients as well, since the majority (69.5%) wished to be provided with information and education by the clinic, highlighting the guiding role that IVF clinics should play for their patients in such times of crisis.

Significant changes were noted in the emotional outlook and behaviour of the general population during the pandemic,[12,13] with changes noticed in fertility patients as well. Based on observations from the available studies, there was a consistent trend of negative feelings prevalence in IVF patients due to clinic closure; feelings of stress and depression in particular,[2,9,10,14-19] with a couple of studies reporting even more severe effects, such as sleep disturbances.[7,20] These observations highlighted the role of mental health support and provision of mental health services to patients.[8] A similar trend was present on our patients as well, with the majority (65.1%) experiencing stress to some degree due to clinic closure, while also finding contact with the clinic useful, thus indicating the supportive role that the clinic could play in challenging times in the future. The data from the available literature is summarised in Table 3.

The present study has several strengths. In particular, this survey is amongst the few studies that assessed cross-border patients and their differences compared to national patients during the pandemic, highlighting a need for particular attention and care to this group,

Table 3: Summary of the main characteristics of the available studies in the literature

Study	Country	Participants	Response rate (%)	Mean age (years)	Disagreement with closure (%)	Wish to continue regardless/ no fear (%)	Negative feelings (stress, etc.) (%)	Main stressor	Need for measures (social support, etc.)
Ben-Kimhy *et al*.[2]	Israel	168	57	37	50	72	N/R	N/A	Yes
Boivin *et al*.[14]	UK	446	48	33.4	N/A	N/A	N/A	Clinic closure	N/A
Cirillo *et al*.[15]	Italy	140	44.5	39.4	N/A	N/A	>50	Fertility plan	N/A
Gordon and Balsom[20]	Canada	92	N/A	34.2	N/A	N/A	86	Clinic closure	Yes
Gupta *et al*.[6]	India	170	N/A	30.23	N/A	100	90	Clinic closure	Yes (mainly prioritisation)
Marom Haham *et al*.[9]	Canada	181	40	37.7	43	82	66	Clinic closure	Yes
Kaur *et al*.[7]	India	86	86	Majority: 25–35	52	49	>70	Clinic closure	Yes
Lawson *et al*.[10]	USA (control group)	787	42.6	37.2	<50 (greater agreement in intervention group)	>50 (both groups, no difference)	>70 (both groups, no difference)	N/A	Yes
Seifer *et al*.[8]	USA	214	29.2	35.5	N/A	40.2	N/A	Mental health	Yes
Tippett[16]	UK	124	96	Majority: 26–39	N/A	N/A	N/A	N/A	Yes
Tokgoz *et al*.[17]	Turkey	101	55.6	33.3	>50	N/A	71.3	Effects on pregnancy	Yes
Vaughan *et al*.[18]	USA	2202	34	35.4	>90	N/A	N/A	Infertility	N/A
Esposito *et al*.[19]	Italy	627	41.9	Majority: 31–39	N/A	N/A	64	Effects on pregnancy	Yes
Current study	Greece	106	26	41.22	N/A	54.7	65.1	Clinic closure	Yes (mainly information-education)

N/A=Not assessed

especially since cross-border fertility care is on the rise.[21] Additionally, our study assessed patient experience during the second wave of the pandemic, thus providing insight to the way opinions formed and shifted 1 year after the initial shock and with more information available. Finally, our study was able to assess the views of fertility patients regarding COVID-19 vaccination, a useful insight into a vulnerable group with multiple other contributing factors.

However, our study was not without certain limitations. The most notable one was the low response rate and small sample size. However, this limitation was unavoidable, since our survey's target group was limited to the patients of a single IVF clinic in Greece, during a specific time period; while similar response rates were recorded in other studies as well.[8] Additionally, not all responders answered every question, therefore not all of their opinions and experiences were included in the final data, carrying a risk of misrepresentation of certain opinions. Finally, as is with every cross-sectional study, we cannot completely eliminate the possibility of survey error, response bias and the fact that participants' perceptions might have changed since then, limitations intrinsic in every questionnaire survey.

Fertility tourism is steadily on the rise in Greece. This fact renders understanding cross-border patient perspectives, views and needs vital for the provision of proper IVF services. For this reason, there are plans to further follow up on the observations and conclusions made in the present study in the future; with the aim to better understand patient needs and explore ways to effectively support patients, improve provided services and simplify the process of cross-border fertility care.

Conclusion

IVF clinic shutdown during the COVID-19 pandemic significantly affected fertility patients. We showed, in concordance with other studies, that the majority of patients were actually more fearful of delays than of COVID-19 infection and that the clinic shutdown was a significant source of stress and feelings of depression. These findings are indicative of the importance of IVF clinics for couples facing infertility and that they maybe should be considered amongst essential healthcare services and continue operation during future times of crisis as well. Preparation of patient protection protocols, provision of patient mental health support and continuous vigilance should be a priority for ART institutions. This will facilitate improved management and support of fertility patients in future times of crisis, similar to the COVID-19 pandemic, should they occur.

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Conflicts of interest

There are no conflicts of interest.

Data availability and sharing statement

All primary data are available for disclosure by the corresponding author upon reasonable request.

References

1. Seibel MM, Taymor ML. Emotional aspects of infertility. Fertil Steril 1982;37:137-45.
2. Ben-Kimhy R, Youngster M, Medina-Artom TR, Avraham S, Gat I, Marom Haham L, *et al.* Fertility patients under COVID-19: Attitudes, perceptions and psychological reactions. Hum Reprod 2020;35:2774-83.
3. COVID-19 and Assisted Reproduction 2020-2022. Available from: https://www.eshre.eu/Guidelines-and-Legal/Position-statements/COVID19. [Last accessed on 2023 Jan 16].
4. Madjunkov M, Dviri M, Librach C. A comprehensive review of the impact of COVID-19 on human reproductive biology, assisted reproduction care and pregnancy: A Canadian perspective. J Ovarian Res 2020;13:140.
5. Anifandis G, Messini CI, Daponte A, Messinis IE. COVID-19 and fertility: A virtual reality. Reprod Biomed Online 2020;41:157-9.
6. Gupta M, Jaiswal P, Bansiwal R, Sethi A, Vanamail P, Kachhawa G, *et al*. Anxieties and apprehensions among women waiting for fertility treatments during the COVID-19 pandemic. Int J Gynaecol Obstet 2021;152:441-3.
7. Kaur H, Pranesh GT, Rao KA. Emotional impact of delay in fertility treatment due to COVID-19 pandemic. J Hum Reprod Sci 2020;13:317-22.
8. Seifer DB, Petok WD, Agrawal A, Glenn TL, Bayer AH, Witt BR, *et al*. Psychological experience and coping strategies of patients in the Northeast US delaying care for infertility during the COVID-19 pandemic. Reprod Biol Endocrinol 2021;19:28.
9. Marom Haham L, Youngster M, Kuperman Shani A, Yee S, Ben-Kimhy R, Medina-Artom TR, *et al.* Suspension of fertility treatment during the COVID-19 pandemic: Views, emotional reactions and psychological distress among women undergoing fertility treatment. Reprod Biomed Online 2021;42:849-58.
10. Lawson AK, McQueen DB, Swanson AC, Confino R, Feinberg EC, Pavone ME. Psychological distress and postponed fertility care during the COVID-19 pandemic. J Assist Reprod Genet 2021;38:333-41.
11. Alviggi C, Esteves SC, Orvieto R, Conforti A, La Marca A, Fischer R, *et al.* COVID-19 and assisted reproductive technology services: Repercussions for patients and proposal for individualized clinical management. Reprod Biol Endocrinol 2020;18:45.
12. Ugbolue UC, Duclos M, Urzeala C, Berthon M, Kulik K, Bota A, *et al.* An assessment of the novel COVISTRESS Questionnaire:

COVID-19 impact on physical activity, sedentary action and psychological emotion. J Clin Med 2020;9:3352.
13. Akkaya-Kalayci T, Kothgassner OD, Wenzel T, Goreis A, Chen A, Ceri V, *et al.* The impact of the COVID-19 pandemic on mental health and psychological well-being of young people living in Austria and Turkey: A multicenter study. Int J Environ Res Public Health 2020;17:9111.
14. Boivin J, Harrison C, Mathur R, Burns G, Pericleous-Smith A, Gameiro S. Patient experiences of fertility clinic closure during the COVID-19 pandemic: Appraisals, coping and emotions. Hum Reprod 2020;35:2556-66.
15. Cirillo M, Rizzello F, Badolato L, De Angelis D, Evangelisti P, Coccia ME, *et al.* The effects of COVID-19 lockdown on lifestyle and emotional state in women undergoing assisted reproductive technology: Results of an Italian survey. J Gynecol Obstet Hum Reprod 2021;50:102079.
16. Tippett A. Life on pause: An analysis of UK fertility patients' coping mechanisms after the cancellation of fertility treatment due to COVID-19. J Health Psychol 2022;27:1583-600.
17. Tokgoz VY, Kaya Y, Tekin AB. The level of anxiety in infertile women whose ART cycles are postponed due to the COVID-19 outbreak. J Psychosom Obstet Gynaecol 2022;43:114-21.
18. Vaughan DA, Shah JS, Penzias AS, Domar AD, Toth TL. Infertility remains a top stressor despite the COVID-19 pandemic. Reprod Biomed Online 2020;41:425-7.
19. Esposito V, Rania E, Lico D, Pedri S, Fiorenza A, Strati MF, *et al.* Influence of COVID-19 pandemic on the psychological status of infertile couples. Eur J Obstet Gynecol Reprod Biol 2020;253:148-53.
20. Gordon JL, Balsom AA. The psychological impact of fertility treatment suspensions during the COVID-19 pandemic. PLoS One 2020;15:e0239253.
21. Salama M, Isachenko V, Isachenko E, Rahimi G, Mallmann P, Westphal LM, *et al.* Cross border reproductive care (CBRC): A growing global phenomenon with multidimensional implications (a systematic and critical review). J Assist Reprod Genet 2018;35:1277-88.

Supplementary Table 1: The study questionnaire, along with answers stratified based on country of origin and age group

Questions and answers	Patient origin		Total (answers)
	National *n*, (%)	Cross-border *n*, (%)	*n*, (%)
Q1. Fertility treatment postponement due to COVID-19 outbreak			
<3 months	8 (19)	4 (6.2)	12 (11.3)
3–6 months	3 (7.1)	11 (17.2)	14 (13.3)
>6 months	5 (11.9)	35 (54.7)	40 (37.7)
No postponement	26 (62)	14 (21.9)	40 (37.7)
No response given	0	0	0
Q2. If you have postponed your treatment which are the main reasons?			
Access restrictions	7 (17)	40 (62.5)	47 (44.3)
Financial reasons	4 (9.5)	0	4 (3.8)
Health condition	2 (4.7)	0	2 (1.9)
Psychological reasons	0	2 (3.1)	2 (1.9)
>2 answers	3 (7.1)	11 (17.2)	14 (13.2)
No response given	26 (61.7)	11 (17.2)	37 (34.9)
Q3. Which of the following access restrictions have you experienced as a result of the COVID-19 outbreak in your fertility treatment?			
My healthcare provider cancelled my IVF treatment	5 (12)	1 (1.6)	6 (5.7)
My healthcare provider suggests to freeze my embryos/sperm	1 (2.4)	0	1 (0.9)
My visits (consultation) changed from in-person to phone or telemedicine/video	1 (2.4)	1 (1.6)	2 (1.9)
Nothing changed in my IVF care or birth plan	16 (38)	6 (9.4)	22 (20.7)
Limited travelling options	6 (14.3)	40 (67.3)	46 (43.6)
I (or my partner) was tested positive for SARS-CoV-2	4 (9.5)	1 (1.6)	5 (4.7)
>2 and/or other answers	4 (9.5)	12 (18.8)	16 (15)
No response given	5 (11.9)	3 (4.7)	8 (7.5)
Q4. Type of fertility treatment that was postponed			
Fertility consultation	1 (2.4)	5 (7.8)	6 (5.6)
IVF	1 (2.4)	1 (1.6)	2 (1.9)
Intrauterine insemination	11 (26.2)	23 (36)	34 (32)
Frozen embryo transfer	1 (2.4)	0	1 (0.9)
Reproductive surgery	5 (11.9)	22 (34.3)	27 (25.5)
No response given	23 (54.7)	13 (20.3)	36 (34.1)
Q5. How has the COVID-19 outbreak affected your desire to have a child?			
My desire was extremely adversely affected	1 (2.4)	11 (17.2)	12 (11.3)
My desire was mildly adversely affected	9 (21.4)	12 (18.8)	21 (19.8)
My desire has not been affected at all	32 (76.2)	39 (60.9)	71 (67)
No response given	0	2 (3.1)	2 (1.9)
Q6. Did you experience fear to undergo an assisted reproduction treatment during COVID-19 pandemic crisis?			
Extremely	2 (4.8)	4 (6.3)	6 (5.7)
Mildly	16 (38)	22 (34.4)	38 (35.8)
Not at all	22 (52.3)	36 (56.2)	58 (54.7)
No response given	2 (4.9)	2 (3.1)	4 (3.8)
Q7. Did you experience stress of a decrease in fertility potential due to the postponement of your fertility treatment for an undefined period of time?			
Extremely	9 (21.4)	26 (40.6)	35 (33.2)
Mildly	12 (28.6)	22 (34.4)	34 (32)
Not at all	20 (47.6)	14 (21.9)	34 (32)
No response given	1 (2.4)	2 (3.1)	3 (2.8)
Q8. In case you had a successful fertility treatment, have you experienced added stress or fear due to potential effects of COVID-19 pandemic in your health and your foetus?			
Extremely	8 (19)	4 (6.3)	12 (11.3)
Mildly	14 (33.3)	22 (34.4)	36 (34)
Not at all	10 (23.8)	23 (35.9)	33 (31.1)

Contd...

Supplementary Table 1: Contd...

Questions and answers	Patient origin		Total (answers)
	National *n*, (%)	Cross-border *n*, (%)	*n*, (%)
No response given	10 (23.9)	15 (23.4)	25 (23.6)
Q9. What are your thoughts and feelings regarding the COVID-19 vaccination?			
I am concerned that my fertility potential will decrease further due to additional postponement of my fertility treatment	2 (4.8)	21 (32.8)	23 (21.7)
I am worried about the safety of the COVID-19 vaccine during pregnancy	22 (40.5)	20 (31.3)	42 (39.6)
I do not have any concerns regarding the COVID-19 vaccine	12 (28.6)	13 (20.3)	25 (23.6)
I am planning to do the COVID-19 vaccine and wait until it is safe to start my fertility treatment	3 (7.1)	7 (10.9)	10 (9.4)
No response given	3 (7.1)	3 (4.7)	6 (5.7)
Q10. Are you trying to achieve pregnancy by natural conception during COVID-19 pandemic?			
Yes	18 (42.9)	30 (46.9)	48 (45.3)
No	24 (52.3)	32 (50)	56 (52.8)
No response given	0	2 (3.1)	2 (1.9)
Q11. Are you aware of the protective measures taken by IVF centre to guarantee your safety during COVID-19?			
Yes	40 (95.2)	45 (70.3)	85 (80.2)
No	2 (4.8)	16 (25)	18 (17)
No response given	0	3 (4.7)	3 (2.8)
Q12. Did the implementation of a strict COVID-19 policy by your IVF centre affect positively your decision to undergo treatment?			
Yes	36 (85.6)	40 (60.9)	76 (62.2)
No	5 (12)	14 (21.9)	29 (27.4)
No response given	1 (2.4)	10 (17.2)	11 (10.4)
Q13. What are your future fertility plans?			
I will perform fertility treatment in my home country to avoid travelling restrictions	27 (64.3)	4 (6.3)	31 (29.2)
I will travel abroad seeking for fertility treatment in the following months despite the COVID-19 pandemic	1 (2.4)	38 (59.3)	39 (36.9)
I will wait until COVID-19 crisis is over	1 (2.4)	11 (17.2)	12 (11.3)
I am not currently thinking about future fertility plans	10 (23.8)	7 (10.9)	17 (16)
No response given	3 (7.1)	4 (6.3)	7 (6.6)
Q14. What sources of information regarding COVID-19 and infertility treatment do you use during the COVID-19 pandemic?			
Internet	9 (21.4)	24 (37.5)	33 (31.1)
TV	0	9 (14)	9 (8.5)
Webinars	1 (2.4)	5 (7.8)	6 (5.7)
Social media	0	2 (3.1)	2 (1.9)
E-mails and phone calls from your IVF centre	26 (61.9)	22 (34.4)	48 (45.3)
Others	4 (9.5)	1 (1.6)	5 (4.7)
No response given	2 (4.8)	1 (1.6)	3 (2.8)
Q15. Have you communicated with your IVF centre to talk about the reasons (access, physiological, medical and financial) of your treatment postponement due to COVID-19 outbreak?			
Yes, our communication helped to find solutions	24 (57.2)	42 (65.7)	66 (62.3)
No, I don't find useful	8 (19)	9 (14)	17 (16)
No response given	10 (23.8)	13 (20.3)	23 (21.7)
Q16. Would you like to receive more information from the IVF centre about COVID-19 and its implications on IVF treatment/pregnancy?			
Yes, I would like to receive professional guidance instead of other sources	29 (69)	45 (70.3)	74 (69.8)
No, I don't think it is necessary	12 (28.6)	18 (28.1)	30 (28.3)
No response given	1 (2.4)	1 (1.6)	2 (1.9)
Total (categories)	42 (39.6)	64 (60.4)	106 (100)

IVF=*In vitro* fertilisation, COVID-19=Coronavirus disease 2019, SARS-CoV-2=Severe acute respiratory syndrome coronavirus 2