Risk factors for infertility treatment-associated harassment among working women: A Japan-Female Employment and Mental health in Assisted reproductive technology (J-FEMA) Study

Author names and affiliations

Yuito Ueda,[1] y.ueda.vy@juntendo.ac.jp

Motoki Endo,[1] mo-endo@juntendo.ac.jp

Keiji Kuroda,[2, 3] arthur@juntendo.ac.jp

Kiyohide Tomooka,[1] k-tomoka@juntendo.ac.jp

Yuya Imai,[1] yu-imai@juntendo.ac.jp

Yuko Ikemoto,[1] camomile1013@hotmail.co.jp

Kiyomi Mitsui,[4] k-mitsui@juntendo.ac.jp

Setsuko Sato,[1] st-sato@juntendo.ac.jp

Atsushi Tanaka,[5] incho@stmother.com

Rikikazu Sugiyama,[3] riki@sugiyama.or.jp

Koji Nakagawa,[3] nakagawa-jiko@spice.ocn.ne.jp

Yuichi Sato,[6] u-1@sato-hospital.gr.jp

Yasushi Kuribayashi,[7] kuri@sugiyama.or.jp

Mari Kitade,[2] kitade@juntendo.ac.jp

Atsuo Itakura,[2] a-itakur@juntendo.ac.jp

Satoru Takeda,[2] stakeda@juntendo.ac.jp

Takeshi Tanigawa[1] tataniga@juntendo.ac.jp

[1]Department of Public Health, Juntendo University Graduate School of Medicine, Tokyo 113-0033, Japan

[2]Department of Obstetrics and Gynecology, Juntendo University Faculty of Medicine, Tokyo 113-8421, Japan

[3]Center for Reproductive Medicine and Implantation Research, Sugiyama Clinic Shinjuku, Tokyo 116-0023, Japan

[4]Department of Hygiene, Public Health, and Preventive Medicine, Showa University, Tokyo 142-8555, Japan

[5]Saint Mother Hospital Infertility Clinic, Fukuoka 807-0825, Japan

[6] Takasaki ART Clinic, Gunma 370-0831, Japan

[7] Center for Reproductive Medicine and Endoscopy Sugiyama Clinic Marunouchi, Tokyo 100-0065, Japan

*Corresponding author

Takeshi Tanigawa

Department of Public Health, Juntendo University Graduate School of Medicine

2-1-1 Hongo, Bunkyo-Ku, Tokyo 113-8421, Japan

TEL: + 81-3-5802-1049; E-mail: tataniga@juntendo.ac.jp

Abstract

Purpose: This study aims to elucidate the risk factors of infertility treatment-associated harassment (I-harassment) among Japanese working women.

Methods: The study participants were 1,103 female patients who enrolled in the Japan-Female Employment and Mental Health in artificial reproductive technology (J-FEMA) study. Of the 1,727 female patients, 1,103 female patients were working during the initiation of infertility treatment and were still working during the survey. Risk factors for I-harassment were analyzed using a multivariable logistic regression model.

Results: In this study, 82 female patients (7.4%) experienced I-harassment. The risk was significantly higher in those who had more In vitro fertilization (IVF) cycles than those who had fewer IVF cycles (OR, 1.06; 95% CI, 1.01–1.10). Similarly, those who disclosed their infertility treatment to their workplace were at significantly higher risk for I-harassment than those who did not (OR, 1.80; 95% CI, 1.03–3.15).

Conclusion: This study found that 7.4% of female patients experienced I-harassment after infertility treatment initiation. Those female patients who “experienced more IVF cycles,” and “disclosed their infertility treatment in their workplace” should be carefully followed up by healthcare professionals to prevent I-harassment.

Key Words: Infertility treatment, work, harassment, IVF

Introduction

In Japan, a remarkable decline to about half of the number of births in the last 50 years has been noted with 1,934,239 babies born in 1970 compared with 840,835 babies in 2020 (Ministry of Health 2021a). While increasingly more women have been accessing higher education, their employment rates in their 20s and 30s have increased over the past half-century, their age of first marriage and first childbirth has risen (first marriage; from 24.7 years old in 1970 to 29.4 years old in 2020, first childbirth; from 25.6 years old in 1970 to 30.7 years old in 2020) (Cabinet Office 2018). In fact, the demographic with the most births has shifted from mothers in their 20s to mothers in their 30s (the number of births when the mother was in her 20s and 30s changed from 1,464,418 and 358,394 in 1970, respectively, to 293,025 and 513,592 in 2019) (Cabinet Office 2018). The trend of increasing childbearing age has been observed in other developed countries as well (U.S.: from 24.9 years old in 2000, to 27.0 years old in 2019, France: from 28.0 years old in 2001 to 28.8 years old in 2019, Germany: 28.7 years old in 2009 to 29.8 years old 2019) (Eurostat 2021; Mathews and Hamilton 2016; Ministry of Health 2021a; Martin 2021). However, Japan's out-of-wedlock birth rate was extremely low compared to other developed countries (Japan: 2.3% in 2019, U.S.: 40.0% in 2019, France: 61.0% in 2019, Germany: 33.3% in 2019) (Eurostat 2021; Ministry of Health 2021a; Martin 2021). As a result of this trend toward late marriage and childbirth, the number of couples undergoing infertility treatments has increased (Ministry of Health 2017; Speroff 1994). Fertility peaks in a woman’s early 20s and declines at age 32, followed by a rapid decline in ovarian reserves between the ages of 35 and 38 (Fritz and Jindal 2018). In the last decades, in vitro fertilization (IVF) has made remarkable progress (Ishihara et al. 2021). With social changes, changes in women’s fertility, and advances in IVF, it can be seen why the number of IVF cycles in Japan has gradually increased dramatically (Ishihara et al. 2021). Japan currently has the highest number of IVF cases worldwide with 454,893 cycles and 56,979 neonates—

about one in 16.7 neonates born in 2018 was conceived via IVF (Adamson et al. 2020).

It is estimated that approximately 80% of women (based on employment rates of women in their 30s and 40s) are working at beginning the of infertility treatment in Japan; however, maintaining employment while undergoing infertility treatment can be challenging (Imai et al. 2020). Working women undergoing IVF often suffer from various clinical symptoms due to ovulation-inducing drugs (OID), psychological distress, economic burdens, and conflicts in overwork (e.g., harassment experience) (Aleyamma et al. 2011; Bouwmans et al. 2008; Massarotti et al. 2019; Nomura et al. 2019). Especially, infertility treatment-associated harassment (I-harassment) in employees has been focused on as an emerging issue in Japan.

As for harassment in Japan, an ISSP survey in 2015 reported that, of 37 countries, Japan was the third country where harassment by superiors and colleagues was the most common in 2015 (Volk and Hadler 2018). Japan's Ministry of Health, Labor and Welfare's 2020 Survey reported that Japanese employees felt harassed by power harassment (31.4%), and sexual harassment (10.2%) in their workforces (Ministry of Health 2021b). A higher percentage of female workers (12.8%) had experienced sexual harassment than males (7.9%), while Japanese men were more likely to have experienced power harassment (33.3%) than Japanese women (29.1%) (Ministry of Health 2021b). After the International Labour Organization (ILO) Violence and Harassment Convention 2019 (International Labour Office 2018), Japanese employers are obliged in 2020 to take necessary measures against harassment in the workplace, by the Act for Partial Revision of the Act on Advancement of Women in Employment and Other Related Act (Ministry of Health 2019). I-harassment was added in this amendment, with the word "including negative words and actions against fertility treatment" (Ministry of Health 2019).

To the best of our knowledge, there have been no epidemiological studies to date investigating I-

harassment in the Japanese workforce. This study aims to elucidate the risk factors associated with the I-harassment experience in the workplace of Japanese women. This study may help companies to establish and improve their work support systems for women.

Subjects and Methods

The Japan-Female Employment and Mental Health in artificial reproductive technology (J-FEMA) study is a cross-sectional, multicenter survey of female patients aged 22–54 years old who attended four fertility clinics in Japan, as previously published (Ikemoto et al. 2021; Imai et al. 2020). (1) Sugiyama Clinic Shinjuku in Tokyo (located on Honshu mainland, capital of Japan, with a population of 14 million residents); (2) Sugiyama Clinic Marunouchi in Tokyo; (3) Saint Mother Hospital Infertility Clinic in Fukuoka prefecture (located on Kyushu island, an urban-suburban area 650 miles southwest of Tokyo, with a population of 5 million residents) and (4) Takasaki ART Clinic in Gunma prefecture (located on Honshu mainland, a suburban-rural area 76 miles north of Tokyo, with a population of 2 million residents). In total, 1,727 female patients participated in the J-FEMA study between August and December 2018.

As illustrated in Figure 1, the subjects for this study were the 1,103 female patients who were working during infertility treatment initiation and were still working during the survey. These criteria meant that the study population did not include female patients who were not working at the infertility treatment initiation, female patients who were not working at the time of the survey, and female patients who came to the fertility clinic for the first time. The study protocol was reviewed and approved by the Ethics Review Committee of Juntendo University Faculty of Medicine (no. 18-008, Tokyo, Japan).

Questionnaires and Variables

The present study developed an anonymous self-administered questionnaire including age, educational background, region, infertility treatment (duration of infertility and IVF experience); and work conditions such as workplace size (<50 and ≥50 employees), employment type (permanent worker, nonpermanent worker, and self-employed worker), I-harassment after infertility treatment initiation (yes or no), and disclosure of infertility treatment to the workplace (yes or no). Variables were classified into the following categories: educational background (a university degree or more advanced [higher educational background] versus other [lower educational background]) and region (living outside the 23 wards of Tokyo [rural] versus living in the 23 wards of Tokyo [urban], the regions were categorized by their answers to questions about where they live).

Statistical Analyses

Mann-Whitney U-test was used to determine the patient's age, duration of infertility, IVF cycles, and Pearson's chi-square test was used to determine the patient's educational background, region, size of a workplace at the start of infertility treatment, employment status, and disclosure of infertility treatment to the workplace at the start of infertility treatment association between potential risk factors and I-harassment was described. A total of 126 of the 1,103 female patients (11.4%) included missing values in their answers. We used multiple imputation to create and analyze 20 multiply imputed datasets. Incomplete variables were imputed under fully conditional specification, using the default settings of the SPSS Missing Values. In the imputation process, the following covariates were used to create 20 complete data sets: age, educational background, region, duration of infertility, IVF cycles, work conditions such as workplace size, employment status, I-harassment after infertility treatment initiation, and disclosure of infertility treatment

to the workplace. We also performed the analysis on the subset of complete cases.

Multivariable logistic regression analysis was conducted to calculate the odds ratio (OR) of I-harassment experience after adjustment for patient age, educational background, region, infertility duration, IVF cycles, workplace size at the initiation of infertility treatment, employment type, and disclosure of infertility treatment to the workplace at the initiation of infertility treatment. All statistical analyses were conducted using IBM SPSS for Windows (version 25.0; IBM Corp, Armonk, NY, USA). All probability values for statistical tests were two-tailed, and $p < 0.05$ values were regarded as statistically significant.

Results

The mean and standard deviation (SD) of age at study, age at marriage, and age at infertility treatment initiation was 37.4 (4.7), 32.1 (4.9), and 36.8 (4.3) years, respectively. The mean (SD) of infertility duration was 3.1 (2.6) years. Table 1 described the demographic characteristics of the study population according to patient I-harassment experience status. There was a total of 82 female patients (7.4%) who experienced I-harassment after infertility treatment initiation. I-harassment among female patients undergoing infertility treatment differed greatly depending on the duration of infertility ($p = 0.03$) and disclosure of infertility treatment to the workplace ($p = 0.02$).

Table 1. I-Harassment rates after infertility treatment in those who were working during infertility treatment initiation

Variables	Categories	Total	I-Harassment experience Yes	No	I-Harassment rate (%)	*p* value
N		1,103	82	1021	7.4%	
Age (years) (min-max)		1,094	37 (26–48)	38 (23–51)		0.58[d]
	missing values	9				
Educational background[a]						
	Higher	595	44	551	7.4%	0.96[e]
	Lower	508	38	470	7.5%	
	missing values	0				
Region[b]						
	Urban	406	32	374	7.9%	0.67[e]
	Rural	697	50	647	7.2%	
	missing values	0				
Duration of infertility (years) (min-max)		1060	3 (0–15)	2 (0–25)		0.03[d]
	missing values	43				
IVF cycles (cycles) (min-max)		1,103	2 (0–20)	1 (0–60)		0.14[d]
	missing values	0				
Workplace size at the initiation of infertility treatment (employees)						
	≥50	580	47	533	8.1%	0.37[e]
	<50	523	35	488	6.7%	
	missing values	0				
Employment type at the initiation of infertility treatment						
	Permanent worker[c]	723	53	670	7.3%	0.93[e]
	Nonpermanent worker[c]	283	21	262	7.4%	
	Self-employed[c]	70	6	64	8.6%	
	missing values	27				
Disclosure of fertility treatment to the workplace						
	No	401	20	381	4.9%	0.03[e]
	Yes	647	55	592	8.5%	
	missing values	55				

∗ Age, Duration of infertility, and IVF cycles: Indicated by median (min-max)

[a]Educational background: university and graduate school (higher educational background); junior high school, high school, and junior college/technical school/university dropout (lower educational background), [b]Region: Living outside the 23 wards of rural Tokyo versus living in the 23 wards of urban Tokyo, [c]A permanent worker is defined as having no fixed end date of employment; a nonpermanent worker is defined as being a contract and part-time worker; self-employed, [d]Mann–Whitney U-test, [e]Pearson χ^2 test

Table 2 presents the results of the multivariable analysis of risk factors for I-harassment experience after infertility treatment initiation after the multiple imputation. The multivariable-adjusted OR and 95% confidence intervals (CI) were calculated. It was found that the risk of experiencing I-harassment was significantly higher with more IVF cycles (OR, 1.06; 95% CI, 1.01–1.10). Similarly, those who disclosed their infertility treatment to their workplace were at significantly higher risk for I-harassment than those who did not (OR, 1.80; 95% CI, 1.03–3.15).

Table 3 presents the results of the multivariable analysis of risk factors for I-harassment experience after infertility treatment initiation in the complete case analysis. The multivariable-adjusted OR and 95% confidence intervals (CI) were calculated. It was found that the risk of experiencing I-harassment was significantly lower for older ages (OR, 0.94; 95% CI, 0.89–1.00) and the risk was significantly higher with more IVF cycles (OR, 1.06; 95% CI, 1.01–1.11). Similarly, those who disclosed their infertility treatment to their workplace were at significantly higher risk for I-harassment than those who did not (OR, 1.79; 95% CI, 1.01–3.19).

Table 2. Associations with I-harassment experience after infertility treatment for those working during infertility treatment initiation (multiple imputation)

Variables			
	Categories	Multivariable OR[d] (95% CI[e])	*p* value
N = 1,103			
Age (years)		0.96 (0.91–1.01)	0.14
Educational background[a]			
	Higher	1.00	
	Lower	0.93 (0.57–1.53)	0.77
Region[b]			
	Urban	1.00	
	Rural	0.80 (0.49–1.31)	0.38
Duration of infertility (years)		1.06 (0.98–1.16)	0.16
IVF cycles (cycles)		1.06 (1.01–1.10)	0.02
Workplace size at the initiation of infertility treatment (employees)			
	≥50	1.00	
	<50	0.74 (0.45–1.23)	0.25
Employment type at the initiation of infertility treatment			
	Permanent worker[c]	1.00	
	Nonpermanent worker[c]	1.07 (0.61–1.86)	0.81
	Self-employed[c]	1.36 (0.50–3.68)	0.55
Disclosure of fertility treatment to the workplace			
	No	1.00	
	Yes	1.80 (1.03–3.15)	0.04

[a]Educational background: university and graduate school as higher educational background; junior high school, high school, and junior college/technical school/university dropout as lower educational background
[b]Region: Living outside the 23 wards of rural Tokyo versus living in the 23 wards of urban Tokyo
[c]A permanent worker is defined as having no fixed end date of employment; a nonpermanent worker is defined as being a contract and part-time worker; self-employed
[d]Odds ratio; each OR was adjusted for all other variables in the table
[e]Confidence interval

Table 3. Associations with I-harassment experience after infertility treatment for those working during infertility treatment initiation (complete case analysis)

Variables	Categories	Multivariable OR[d] (95% CI[e])	*p* value
N = 977			
Age (years)		0.94 (0.89–1.00)	0.04
Educational background[a]			
	Higher	1.00	
	Lower	0.90 (0.52–1.54)	0.69
Region[b]			
	Urban	1.00	
	Rural	0.65 (0.38–1.12)	0.12
Duration of infertility (years)		1.09 (0.99–1.19)	0.07
IVF cycles (cycles)		1.06 (1.01–1.11)	0.02
Workplace size at the initiation of infertility treatment (employees)			
	≥50	1.00	
	<50	0.89 (0.52–1.53)	0.67
Employment type at the initiation of infertility treatment			
	Permanent worker[c]	1.00	
	Nonpermanent worker[c]	0.99 (0.54–1.79)	0.97
	Self-employed[c]	0.66 (0.17–2.48)	0.53
Disclosure of fertility treatment to the workplace			
	No	1.00	
	Yes	1.79 (1.01–3.19)	0.05

[a]Educational background: university and graduate school as higher educational background; junior high school, high school, and junior college/technical school/university dropout as lower educational background
[b]Region: Living outside the 23 wards of rural Tokyo versus living in the 23 wards of urban Tokyo
[c]A permanent worker is defined as having no fixed end date of employment; a nonpermanent worker is defined as being a contract and part-time worker; self-employed
[d]Odds ratio; each OR was adjusted for all other variables in the table
[e]Confidence interval

Discussion

As far as we know, this study seems to be the first large-scale study in Asia to investigate the risk of I-harassment in working women during infertility treatment initiation. The present study revealed that two factors were significantly associated with the experience of I-harassment: a higher number of IVF cycles and disclosing to the workplace that one is undergoing infertility treatment. The present study revealed that 82 female patients (7.4%) experienced I-harassment after infertility treatment initiation. This result was lower among working Japanese women than power harassment (29.1%), and sexual harassment (12.8%) in Japan's Ministry of Health, Labor and Welfare's 2020 Survey (Ministry of Health 2021b). To our knowledge, there was no study investigating I-harassment except this study.

This study showed that “Undergoing more IVF cycles” was statistically significant for I-harassment experience. Firstly, the association between the number of IVF cycles and I-harassment can be explained by the high number of treatment-associated sick leave. IVF requires frequent outpatient visits for clinical examinations (blood hormone test, transvaginal ultrasonography, etc.) and numerous procedures (OID, oocyte retrieval, etc.) (Ikemoto et al. 2021; Massarotti et al. 2019). The standard number of IVF visits in Japan varies from person to person, but it is estimated to be 4–10 (1–3h of treatment per visit) and 1–2 (half- to full-day treatment) days (Ministry of Health 2020). A previous study has shown that women in the UK took 8.74 days off work during an infertility treatment cycle (Payne et al. 2019). Thus, absenteeism due to IVF may lead to social alienation in the workplace, contradicting expectations regarding workplace presence (Nielsen et al. 2019). They are likely to be negatively evaluated by the group and subjected to harassment and exclusion (Pickett and Brewer 2005). Second, this can be explained by the physical burden associated with IVF causing presenteeism. The severity of treatment symptoms peaked at the time of egg retrieval, with prominent symptoms (e.g., abdominal distension, abdominal pain and cramps, and fatigue)

(Suthersan et al. 2011). Previous studies have shown that infertility treatments, pain, and fatigue are associated with presenteeism (Aboagye et al. 2019; Lee et al. 2021). As presenteeism is significantly correlated with poor job performance (Aboagye et al. 2019), these women may be considered hostile by the group, and their status in the group may be questioned (Steffens et al. 2017). Women undergoing IVF might be more likely to experience harassment (Conway et al. 2016).

Regarding disclosing to the workplace that one is undergoing infertility treatment, the association between disclosure and I-harassment can be explained by the influence of stigma. One of the major problems with infertility is stigma, which is the result of attitudes and prejudices in society (Çapık et al. 2019). Fu et al, reported that 69.2% of infertile women in China felt stigmatized (Fu et al. 2015), as reported elsewhere (Donkor and Sandall 2007; Missmer et al. 2011). Bos et al, referred to the stigma and disclosure dilemma as discussed (Bos et al. 2009). This means that disclosure might lead to stigmatization and a negative impact on psychological well-being (Verhaeghe et al. 2008). One way to solve this dilemma is for people in the workplace to acquire the right knowledge and build a support system for infertility patients. Particularly, knowledge about reproductive health in Japan was much lower than that in other developed countries (Bunting et al. 2013; Maeda et al. 2015). In order to eradicate I-harassment in the workplace, it might be necessary to actively provide fertility education in schools and workplaces and increase the support system for infertility patients in the workplace (for example, infertility treatment leave, flextime system, etc.).

In this study, we found the significant association between age and I-harassment in the complete case analysis but did not find it after the multiple imputation. This discrepancy can be explained by the reported tendency for bias to occur when the percentage of missing values exceeds 10% (Bennett 2001) and of the 1,103 female patients in the study, 126 female patients (11.4%) had missing values in their responses.

Additionally, we conducted the sensitivity analysis and found that the mean age was older in female patients with missing values of infertility duration (39.3 years old) than those with observed values (37.3 years old), and the I-harassment rates were higher in female patients with missing values of infertility duration (9.3%) than those with observed values (7.4%). Thus, the association between age and I-harassment was weakened by the imputation of missing data of infertility duration. Although the significant association between age and I-harassment was not observed in this study, age may be an important factor. Several previous studies have suggested that worker age may be significantly associated with sexual harassment (Jackson and Newman 2004; McGinley et al. 2011), and pregnancy discrimination (Ministry of Health 2021b). Further studies are needed to elucidate whether the younger age is a risk factor for I-harassment among female patients who are working during infertility treatment.

Strengths and Limitations

The strength of this study investigating factors of I-harassment was its comprehensive survey design that was widely conducted on female patients attending fertility clinics in Japan. The large sample size allowed us to robustly examine the associations of infertility- and work-related factors concerning I-harassment experience after adjustment for multiple clinically and socially relevant confounders. However, this study has several limitations that warrant discussion. Firstly, it is susceptible to information bias; the possibility that female patients may misunderstand the meaning of the questions or may not remember the answers cannot be completely ruled out. Secondly, while reasons for I-harassment are likely complex and multifactorial and not solely due to infertility treatment, the possibility of other confounding factors (e.g., percentage of women in the workplace, tenure) affecting I-harassment cannot be ruled out. For future studies, more structured questions using other tools, such as dynamic-response surveys, may further clarify

these essential questions.

Conclusion

In conclusion, 7.4% of female patients experienced I-harassment after infertility treatment initiation. Risk factors related to “experienced more IVF cycles,” and “disclosed their infertility treatment in their workplace” were identified as significantly associated with the experience of I-harassment. It might be necessary for companies and occupational health professionals to actively provide fertility education in schools and workplaces and establish a support system in the workplace for infertility patients to eradicate I-harassment.

Acknowledgments

The authors are grateful to the staff and patients of the J-FEMA study for their valuable contributions.

Author’s Roles

Yuito Ueda provided an analysis of data and drafting of the manuscript. Motoki Endo contributed to the substantial design of the work, acquisition of data, drafting of the manuscript, and critical revisions and obtained the funding for the study. Keiji Kuroda contributed to the design of the work and made critical revisions. Kiyohide Tomooka contributed to the analysis of data and also participated in the critical revisions in the paper. Yuya Imai helped in the interpretation of data and critical revision. Yuko Ikemoto helped in the analysis of data and made critical revisions. Kiyomi Mitsui contributed to the interpretation

of data and critical revision. Setsuko Sato helped in the interpretation of the data and critical revision. Atsushi Tanaka contributed to the acquisition of data and critical revision. Rikikazu Sugiyama contributed to the acquisition of data and critical revision. Koji Nakagawa helped in the acquisition of data and critical revision of the paper. Yuichi Sato helped in the acquisition of data and critical revision of the paper. Yasushi Kuribayashi contributed to the acquisition of data and critical revisions. Mari Kitade helped in the interpretation of data and critical revision. Atsuo Itakura helped in the interpretation of data and critical revision. Satoru Takeda helped in the interpretation of data and critical revision. Takeshi Tanigawa helped in the interpretation of data and critical revision.

Funding

This study was supported by a Grant-in-Aid for Scientific Research from KAKENHI (grant number: 18K17395).

Conflict of interest

All authors declare no conflict of interest.

References

Aboagye E, Björklund C, Gustafsson K, Hagberg J, Aronsson G, Marklund S, Leineweber C, Bergström G (2019) Exhaustion and Impaired Work Performance in the Workplace: Associations With Presenteeism and Absenteeism. J Occup Environ Med 61(11):e438-e444. https://doi.org/10.1097/jom.0000000000001701

Adamson GD, de Mouzon J, Chambers G, Zegers-Hochschild F, Mansour R, Ishihara O, Banker M, Dyer S, Kupka M (2020) International Committee for Monitoring Assisted Reproductive Technology: world report on assisted reproductive technology, 2016. https://www.icmartivf.org/wp-content/uploads/ICMART-ESHRE-WR2016-FINAL-20200901.pdf. Accessed 3 April 2022

Aleyamma TK, Kamath MS, Muthukumar K, Mangalaraj AM, George K (2011) Affordable ART: a different perspective. Hum Reprod 26(12):3312-3318. https://doi.org/10.1093/humrep/der323

Bennett DA (2001) How can I deal with missing data in my study?. Aust N Z J Public Health 25(5):464-469. https://doi.org/10.1111/j.1467-842X.2001.tb00294.x

Bos AE, Kanner D, Muris P, Janssen B, Mayer B (2009) Mental illness stigma and disclosure: consequences of coming out of the closet. Issues Ment Health Nurs 30(8):509-513. https://doi.org/10.1080/01612840802601382

Bouwmans CA, Lintsen BA, Al M, Verhaak CM, Eijkemans RJ, Habbema JD, Braat DD, Hakkaart-Van Roijen L (2008) Absence from work and emotional stress in women undergoing IVF or ICSI: an analysis of IVF-related absence from work in women and the contribution of general and emotional factors. Acta Obstet Gynecol Scand 87(11):1169-1175. https://doi.org/10.1080/00016340802460305

Bunting L, Tsibulsky I, Boivin J (2013) Fertility knowledge and beliefs about fertility treatment: findings from the International Fertility Decision-making Study. Hum Reprod 28(2):385-397. https://doi.org/10.1093/humrep/des402

Cabinet Office, Government of Japan (2019) 2018 Declining Birthrate White Paper Retrieved Part 1 Current Status of Countermeasures against Declining Birthrate (Summary). Cabinet Office Web. https://www8.cao.go.jp/shoushi/shoushika/whitepaper/measures/english/w-2018/pdf/part1-1.pdf. Accessed 18 March 2021

Çapık A, Aksoy M, Yılmaz E, Yılmaz F (2019) Infertility Stigma Scale: A psychometric study in a Turkish sample. Perspect Psychiatr Care 55(2):328-335. https://doi.org/10.1111/ppc.12360

Conway PM, Clausen T, Hansen ÅM, Hogh A (2016) Workplace bullying and sickness presenteeism: cross-sectional and prospective associations in a 2-year follow-up study. Int Arch Occup Environ Health 89(1):103-114. https://doi.org/10.1007/s00420-015-1055-9

Donkor ES, Sandall J (2007) The impact of perceived stigma and mediating social factors on infertility-related stress among women seeking infertility treatment in Southern Ghana. Soc Sci Med 65(8):1683-1694. https://doi.org/10.1016/j.socscimed.2007.06.003

Eurostat (2021) Demography of Europe STATISTICS VISUALISED – 2021 EDITION. Eurostat web page. https://ec.europa.eu/eurostat/cache/digpub/demography/. Accessed 18 March 2021

Fritz R, Jindal S (2018) Reproductive aging and elective fertility preservation. J Ovarian Res 11(1):66. https://doi.org/10.1186/s13048-018-0438-4

Fu B, Qin N, Cheng L, Tang G, Cao Y, Yan C, Huang X, Yan P, Zhu S, Lei J (2015) Development and validation of an Infertility Stigma Scale for Chinese women. J Psychosom Res 79(1):69-75. https://doi.org/10.1016/j.jpsychores.2014.11.014

Ishihara O, Jwa SC, Kuwahara A, Ishikawa T, Kugu K, Sawa R, Banno K, Irahara M, Saito H (2021) Assisted reproductive technology in Japan: A summary report for 2018 by the Ethics Committee of the Japan Society of Obstetrics and Gynecology. Reprod Med Biol 20:3-12. https://doi.org/10.1002/rmb2.12358

Ikemoto Y, Kuroda K, Endo M, Tanaka A, Sugiyama R, Nakagawa K, Sato Y, Kuribayashi Y, Tomooka K, Imai Y, Deshpande GA, Tanigawa T, Itakura A, Takeda S (2021) Analysis of severe psychological stressors in women during fertility treatment: Japan-Female Employment and Mental health in Assisted reproductive technology (J-FEMA) study. Arch Gynecol Obstet 304(1):253-261. https://doi.org/10.1007/s00404-020-05923-6

Imai Y, Endo M, Kuroda K, Tomooka K, Ikemoto Y, Sato S, Mitsui K, Ueda Y, Deshpande GA, Tanaka A, Sugiyama R, Nakagawa K, Sato Y, Kuribayashi Y, Itakura A, Takeda S, Tanigawa T (2020) Risk factors for resignation from work after starting infertility treatment among Japanese women: Japan-Female Employment and Mental health in Assisted reproductive technology (J-FEMA) study. Occup Environ Med 78(6):426-432. https://doi.org/10.1136/oemed-2020-106745

International Labour Office, International Labour Conference (107th: 2018: Geneva, Switzerland) (2018) Ending violence and harassment in the world of work. Geneva: ILO. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_721160.pdf. Accessed 3 April 2022

Jackson RA, Newman MA (2004) Sexual Harassment in the Federal Workplace Revisited: Influences on Sexual Harassment by Gender. Public Adm Rev 64(6):705-717. https://doi.org/10.1111/j.1540-6210.2004.00417.x

Lee DW, Lee J, Kim HR, Kang MY (2021) Health-Related Productivity Loss According to Health Conditions among Workers in South Korea. Int J Environ Res Public Health 18(14):7589. https://doi.org/10.3390/ijerph18147589

Maeda E, Sugimori H, Nakamura F, Kobayashi Y, Green J, Suka M, Okamoto M, Boivin J, Saito H (2015) A cross sectional study on fertility knowledge in Japan, measured with the Japanese version of Cardiff Fertility Knowledge Scale (CFKS-J). Reprod Health 12:10. https://doi.org/10.1186/1742-4755-12-10

Martin JA, Hamilton BE, Osterman MJK, Driscoll AK (2021) Births: Final Data for 2019. Natl Vital Stat Rep 70(2):1-51. http://doi.org/10.15620/cdc:100472

Massarotti C, Gentile G, Ferreccio C, Scaruffi P, Remorgida V, Anserini P (2019) Impact of infertility and infertility treatments on quality of life and levels of anxiety and depression in women undergoing in vitro fertilization. Gynecol Endocrinol 35(6):485-489. https://doi.org/10.1080/09513590.2018.1540575

Mathews TJ, Hamilton BE (2016) Mean Age of Mothers is on the Rise: United States, 2000-2014. NCHS Data Brief. https://www.cdc.gov/nchs/data/databriefs/db232.pdf. Accessed 6 April 2022

McGinley M, Richman JA, Rospenda KM (2011) Duration of sexual harassment and generalized harassment in the workplace over ten years: effects on deleterious drinking outcomes. J Addict Dis 30(3):229-242. https://doi.org/10.1080/10550887.2011.581988

Ministry of Health, Labour and Welfare (2017) Comprehensive Survey and Research Project on Issues Related to Balancing Infertility Treatment and Work, Report of Survey. Ministry of Health, Labor and Welfare Web. https://www.mhlw.go.jp/bunya/koyoukintou/pamphlet/dl/30d.pdf. Accessed 3 April 2022

Ministry of Health, Labour and Welfare (2019) Outline of the Act for Partial Revision of the Act on Advancement of Women in Employment and Other Related Acts. Ministry of Health, Labor and Welfare Web. https://www.mhlw.go.jp/content/11900000/000584588.pdf. Accessed 20 March 2021

Ministry of Health, Labour and Welfare (2020) A manual for creating a workplace where people can continue to work while undergoing infertility treatment. Ministry of Health, Labor and Welfare Web. https://www.mhlw.go.jp/bunya/koyoukintou/pamphlet/dl/30k.pdf. Accessed 11 May 2021

Ministry of Health, Labour and Welfare (2021a) Summary of Vital Statistics. Ministry of Health, Labor and Welfare Web. https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/tokusyu/syussyo07/dl/gaikyou.pdf. Accessed 20 March 2021

Ministry of Health, Labour and Welfare (2021b) Survey on harassment in the workplace. Ministry of Health, Labor and Welfare Web. https://www.mhlw.go.jp/content/11200000/000783140.pdf. Accessed 20 March 2021

Missmer SA, Seifer DB, Jain T (2011) Cultural factors contributing to health care disparities among patients with infertility in Midwestern United States. Fertil Steril 95(6):1943-1949. https://doi.org/10.1016/j.fertnstert.2011.02.039

Nielsen MB, Indregard AR, Krane L, Knardahl S (2019) Workplace Bullying and Medically Certified Sickness Absence: Direction of Associations and the Moderating Role of Leader Behavior. Front Psychol 10:767. https://doi.org/10.3389/fpsyg.2019.00767

Nomura K, Karita K, Araki A, Nishioka E, Muto G, Iwai-Shimada M, Nishikitani M, Inoue M, Tsurugano S, Kitano N, Tsuji M, Iijima S, Ueda K, Kamijima M, Yamagata Z, Sakata K, Iki M, Yanagisawa H, Kato M, Inadera H, Kokubo Y, Yokoyama K, Koizumi A, Otsuki T (2019) For making a declaration of countermeasures against the falling birth rate from the Japanese Society for Hygiene: summary of discussion in the working group on academic research strategy against an aging society with low birth rate. Environ Health Prev Med 24(1):14. https://doi.org/10.1186/s12199-019-0768-x

Payne N, Seenan S, van den Akker O (2019) Experiences and psychological distress of fertility treatment and employment. J Psychosom Obstet Gynaecol 40(2):156-165. https://doi.org/10.1080/0167482X.2018.1460351

Pickett CL, Brewer MB (2005) The role of exclusion in maintaining Ingroup inclusion. In: The social psychology of inclusion and exclusion. Psychology Press, New York, pp 89–111.

Speroff L (1994) The effect of aging on fertility. Curr Opin Obstet Gynecol 6(2):115-120.

Steffens MC, Reese G, Ehrke F, Jonas KJ (2017) When does activating diversity alleviate, when does it increase intergroup bias? An ingroup projection perspective. PLoS One 12(6):e0178738. https://doi.org/10.1371/journal.pone.0178738

Suthersan D, Kennedy S, Chapman M (2011) Physical symptoms throughout IVF cycles. Hum Fertil (Camb) 14(2):122-128. https://doi.org/10.3109/14647273.2011.571748

Verhaeghe M, Bracke P, Bruynooghe K (2008) Stigmatization and self-esteem of persons in recovery from mental illness: the role of peer support. Int J Soc Psychiatry 54(3):206-218. https://doi.org/10.1177/0020764008090422

Volk H, M Hadler (2018) Work Orientations and Perceived Working Conditions across Countries: Results from the 2015 ISSP Survey, Int J Sociol 48(2):103-123. https://doi.org/10.1080/00207659.2018.1446116

Figures

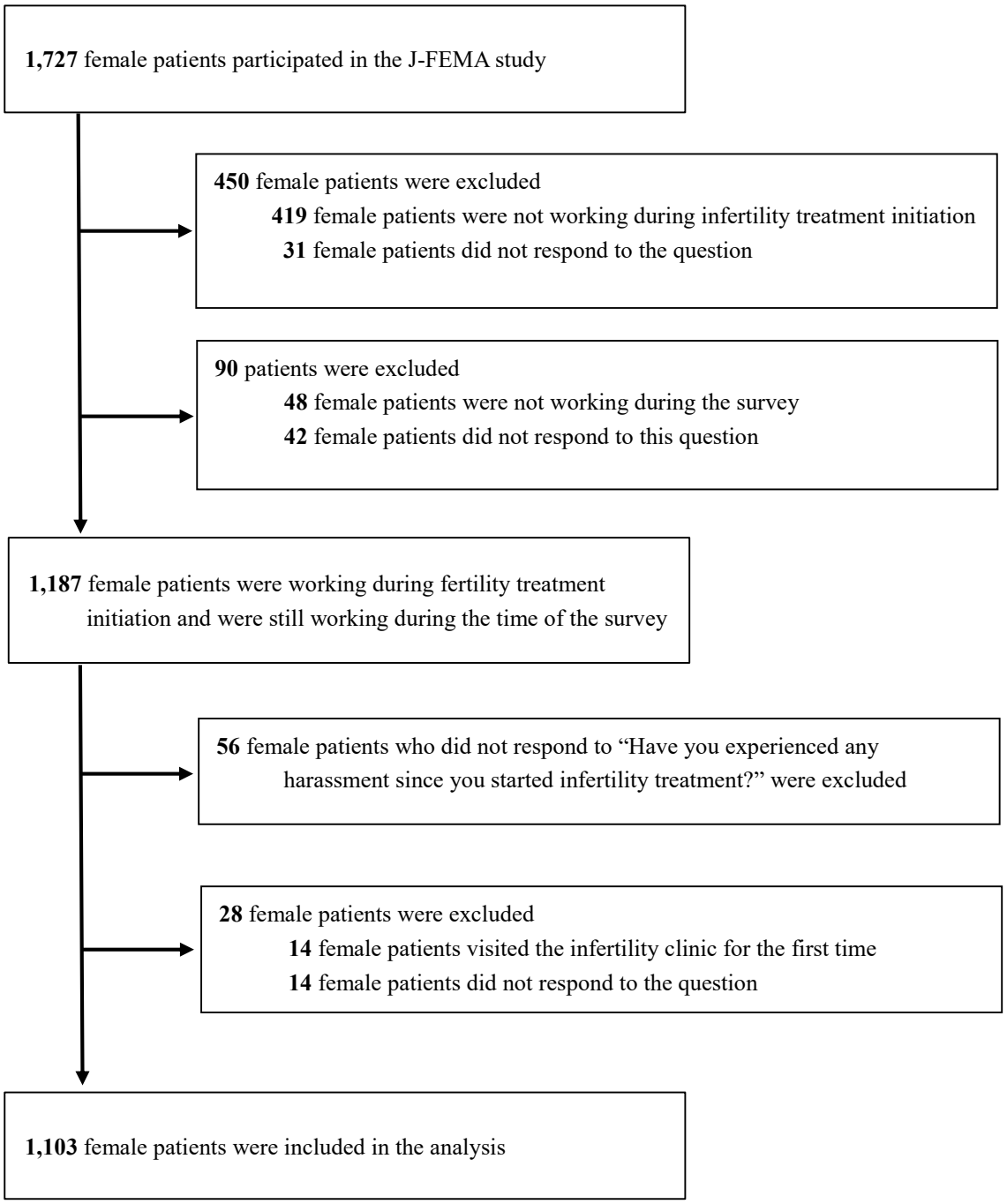

Figure 1. Flowchart of study population included in the analysis (*n* = 1,103)