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ORIGINAL ARTICLE *Infertility*

Reproductive experiences of women who cryopreserved oocytes for non-medical reasons

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STUDY QUESTION: What are the reproductive experiences of women who cryopreserve oocytes for non-medical reasons?

SUMMARY ANSWER: One in three women had been pregnant at some stage in their lives and while most still wanted to have a child or another child, very few had used their stored oocytes, predominantly because they did not want to be single parents.

WHAT IS KNOWN ALREADY: The number of healthy women who freeze oocytes to avoid age-related infertility is increasing. Evidence about reproductive outcomes after oocyte cryopreservation for non-medical reasons is needed to help women make informed decisions.

STUDY DESIGN SIZE, DURATION: A cross-sectional survey was carried out. Study packs which included a self-administered questionnaire were mailed by clinic staff to 193 eligible women.

PARTICIPANTS/MATERIALS, SETTING, METHODS: Women who had stored oocytes for non-medical reasons at Melbourne IVF, a private ART clinic, between 1999 and 2014 were identified from medical records and invited to complete an anonymous questionnaire about their reproductive histories and experience of oocyte cryopreservation.

MAIN RESULTS AND THE ROLE OF CHANCE: A total of 10 survey packs were returned to the clinic marked 'address unknown'. Of the 183 potential respondents, 96 (53%) returned the questionnaire. One respondent provided only free-text comments, thus data from 95 respondents were compiled. The mean age at the time of freezing oocytes was 37.1 years (SD ± 2.6, range: 27–42) and the average number of oocytes stored was 14.2 (SD ± 7.9, range: 0–42); 2% had attempted to store oocytes but had none suitable for freezing, 24% had stored <8 oocytes, 35% had 8–15, 25% had 16–23 and 14% had stored >23 oocytes. About one-third of respondents (34%) had been pregnant at some point in their lives. Six women (6%) had used their stored oocytes and three of them had given birth as a result. The main reason for not using stored oocytes was not wanting to be a single parent. Of the 87 (91%) women who still had oocytes stored, 21% intended to use them while 69% indicated that their circumstances would determine usage. The mean number of children respondents would ideally have liked to have was significantly higher than the number of children they expected to have (2.11 versus 1.38, $P < 0.001$).

LIMITATIONS, REASONS FOR CAUTION: The limitations are inherent to any anonymously completed questionnaire: participation bias, missing data and the possibility that some questions or response alternatives may have been ambiguous.

WIDER IMPLICATIONS OF THE FINDINGS: The findings add to the very limited evidence about the reproductive outcomes experienced by women who freeze oocytes for non-medical reasons and can be used to help women make informed decisions about whether to store oocytes.

STUDY FUNDING/COMPETING INTEREST(S): The study was funded by Melbourne IVF. K.H. has received honoraria from Merck-Serono, J.M. is a clinician at Melbourne IVF, F.A. is a Melbourne IVF employee, J.F. is supported by a Monash Professorial Fellowship and the

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Key words: fertility preservation / oocyte cryopreservation / reproductive outcomes / non-medical / social

Introduction

Oocyte freezing has been available for several decades to preserve fertility in women about to undergo cytotoxic treatment likely to reduce their fertility (Argyle *et al.*, 2016). In the initial experimental phase of oocyte freezing, oocyte survival rates were low. As cryopreservation techniques have been refined, ART procedures incorporating frozen oocytes demonstrate a similar potential to result in a live birth as those incorporating fresh oocytes (Argyle *et al.*, 2016). In oocyte donation programmes, where most oocytes come from young and healthy women, high rates of successful pregnancies are reported for vitrified warmed oocytes (Cobo *et al.*, 2015). With improved efficiency, the application of oocyte cryopreservation has been extended as an 'insurance' against age-related fertility decline; increasing numbers of healthy women now freeze their eggs to mitigate age-related infertility (Domingo *et al.*, 2016). Data from surveys show that most Swedish women aged 30–39 years have a positive attitude towards oocyte cryopreservation for non-medical reasons (Wennberg *et al.*, 2016); about one in three women of reproductive age in Belgium would consider oocyte cryopreservation to extend their reproductive life (Stoop *et al.*, 2011) and among 257 childless women aged 28–35 years who completed an online survey, the intention to cryopreserve oocytes was associated with feeling susceptible to infertility, considering oocyte freezing useful to achieve parenthood, and expecting to have children at a later age (ter Keurst *et al.*, 2016). These data suggest that the practice of oocyte cryopreservation for non-medical reasons is likely to become more common. Since 2014 large companies, such as Apple and Facebook, have covered the cost of oocyte cryopreservation for their female employees. It has been argued (Baylis, 2015) that this is not an altruistic gesture, but most likely for the commercial benefit of not having childbearing interrupt the careers of young talented women. If this practice is taken up by other large companies, it may contribute to increased uptake of oocyte cryopreservation to avoid age-related infertility.

Opinions vary about whether and how oocyte cryopreservation for non-medical reasons may benefit women. Some argue that it adds to women's reproductive choices, gives them the opportunity to extend their reproductive lifespan, allows them more time to find a suitable partner and fulfil other life goals before having children, decreases the risk of age-related aneuploidies and foetal loss (Goold and Savulescu, 2009), and, according to a mathematical model, reduces the cost to obtain a live birth for women who plan to delay childbearing until age 40 years (Devine *et al.*, 2015). Others fear that the availability of fertility preservation might encourage women to delay childbearing and that this would result in more women having children beyond the natural reproductive lifespan with its associated medical risks (Radon *et al.*, 2015); that, rather than increase women's reproductive autonomy, it may lead to 'new and different pressures and ethical dilemmas' (Rebar, 2016) and that women are 'misled to believe that the reproductive fountain of youth is obtainable by freezing their eggs' (Schattman, 2016). Some make the case that, rather than encouraging oocyte cryopreservation to reduce the impact of age-related infertility, it would be more helpful to introduce family-friendly social policies that support people to have children during their most fertile years (Martinelli *et al.*, 2015; Mertes, 2015).

Regardless of opinions on potential risks and benefits, each woman who considers oocyte cryopreservation needs and deserves comprehensive, personalized information about the medical, social, psychological and financial aspects of the procedure, including estimates of her chance of having a baby from the frozen oocytes, to avoid raising false hope and to allow her to make an informed decision about whether to proceed (ESHRE Task Force on Ethics and Law, 2012). The likelihood of a birth from frozen oocytes is highly dependent on the woman's age at the time of collection and the number of oocytes stored (Pelin *et al.*, 2013; Cobo *et al.*, 2016; Doyle *et al.*, 2016). Various models have been proposed to estimate the chance of a birth from frozen oocytes. Doyle *et al.* (2016) calculated oocyte efficiency as the rate of births per oocyte for different age groups and reported it to be 8.7% in women aged 30–34 years, declining to 4.5% in women aged 38–40 years and 2.5% in women aged 41–42 years. Cobo *et al.* (2016) found the cumulative live birth rate of at least one baby from eight oocytes to be 41% in women aged 35 years or younger and 20% in women older than 35 years. Using a model constructed to determine the success and cost-effectiveness of oocyte preservation in comparison with no action, Mesen *et al.* (2015) concluded that the optimal age for freezing oocytes is 37 years. However, Tsafrir *et al.* (2015) recommended freezing oocytes at a younger age, preferably before 35 years, as their data revealed that one in five women undergoing ovarian stimulation for fertility preservation had a poor response and that this was related to age.

In Australia and the USA, the cost of freezing oocytes ranges between US$10 000 and 15 000, excluding the cost of storage and subsequent IVF treatment for those who return to use their stored oocytes (Bowden, 2015; Harwood, 2015). Harwood (2009) argued that, unless women are well-informed about the likely outcomes and potential risks of the procedure, they are vulnerable to commercial exploitation. An audit of the quality of information relating to oocyte cryopreservation for non-medical reasons available on US ART clinic websites found that most clinics did not meet recommended industry standards; the authors concluded that the type and quality of information provided should be improved (Avraham *et al.*, 2014).

Investigations of the characteristics of women who freeze oocytes for non-medical reasons have found that, at the time of storage, most are in their late 30s, socio-economically advantaged, highly educated, in professional occupations, and, contrary to the stereotype of women deliberately delaying childbearing to advance their careers, most cite

the lack of a partner as their main reason for freezing oocytes (Hodes-Wertz *et al.*, 2013; Vallejo *et al.*, 2013; Baldwin *et al.*, 2015; Stoop *et al.*, 2015). There is much more limited evidence about the proportions who return to use their stored oocytes, their reasons for not using them, and reproductive outcomes (from spontaneous and ART-related pregnancies, including with stored oocytes). There are reports from three studies on some of these aspects. Interviews with 23 women who had stored oocytes for non-medical reasons revealed that two had used their stored eggs (one of whom gave birth), two had given birth after spontaneous conception and two were pregnant at the time of the interview after conceiving spontaneously (Baldwin *et al.*, 2015). Stoop *et al.* (2015) interviewed 86 women who had cryopreserved oocytes 1–3 years earlier and found that almost all still wished for a child but only about half expected to use their stored oocytes. A survey of 183 women who had cryopreserved oocytes from 2005 to 2011 found that a third reported being 'very likely' to use their stored oocytes but most (93%) had not returned to use them (Hodes-Wertz *et al.*, 2013). Of the 20% who reported a successful conception in the years following oocyte cryopreservation, 50% resulted from spontaneous conception and 40% from using 'fresh' oocytes in an ART cycle. Stored oocytes had been used by only 11 women, of whom three had achieved a pregnancy. Whether or not these pregnancies resulted in a birth was not reported (Hodes-Wertz *et al.*, 2013).

To contribute to understanding the reproductive trajectories of women who store oocytes, including the outcomes from using the stored oocytes, the aim of this research was to describe the reproductive experiences of women who freeze oocytes for non-medical reasons.

Materials and Methods

Ethics committee approval

The research was approved by the Human Research Ethics Committees of Monash University (CF14/2224-2014001182) and Melbourne IVF (30/14-MIVF).

Setting

Melbourne IVF is a large private provider of fertility treatment in Victoria, Australia. It offers comprehensive fertility services, including fertility preservation for medical and non-medical indications. Oocyte cryopreservation using the 'slow freezing' protocol has been available since the early 1990s; in the first 10 years, it was mainly offered to preserve fertility before cancer treatment. Vitrification as the method of freezing oocytes was introduced in 2012. Women who cryopreserve oocytes for non-medical reasons bear the full cost of the procedure because it is not subsidized by government or private health insurance.

Participants

The inclusion criteria were to be a woman who had experienced at least one stimulated cycle at Melbourne IVF from January 1999 to December 2014 with the aim of collecting oocytes for cryopreservation without a medical indication.

Data source

A study-specific questionnaire was developed, based on the existing literature and the collective clinical and research experience of the authors. It included questions with fixed response options about demographic characteristics and social circumstances: age currently and at the time of oocyte cryopreservation, relationship status currently and at the time of oocyte cryopreservation, level of education, occupation and health insurance status (an indicator of socio-economic status). Questions about reproductive experiences were whether or not the woman had been pregnant (yes/no); timing of any pregnancies (before/after/both before and after storing oocytes); whether any pregnancies resulted from ART (yes/no); outcomes of any pregnancies (miscarriage/stillbirth/abortion/birth); year and method of oocyte freezing (vitrification/'slow' freezing/unsure); the number of stored oocytes; whether stored oocytes had been used (yes/no); reasons for not using stored oocytes (multiple responses from a list); outcome of using stored oocytes (eggs did not survive/embryos did not form/no pregnancy/pregnancy miscarried/birth); whether oocytes remained in storage (yes/no); whether the woman planned to use the stored eggs (yes/no/depends on circumstances); whether she wanted a future child or children (yes/no); her ideal number of children and how many children she realistically expected to have, considering her circumstances. The questionnaire also invited free-text comments.

Procedure

Clinic staff identified potential participants from medical records and mailed a study pack to each woman. The pack contained a personalized letter of invitation describing the purpose of the study, signed by the clinic's medical director; an explanatory statement about the research which emphasized that participation was voluntary and anonymous; a copy of the questionnaire and a reply-paid envelope addressed to the research team that was independent of the clinic. A second package containing a reminder letter, the explanatory statement, a questionnaire and a reply-paid envelope was sent to all potential participants 3 weeks later.

Data management and analysis

Data were entered into a password protected secure database and analysed in SPSS v 20 using descriptive statistics and the Student's *t*-test for comparisons of continuous variables (IBM Corp., Armonk, NY, USA). A value of $P < 0.05$ was considered significant.

Results

Response rate

Study packs were mailed by clinic staff to 193 eligible women. Ten packs were returned to the clinic marked 'address unknown' and 96 of 183 (53%) questionnaires were returned to the research team. One respondent provided only free-text comments. Data from 95 respondents are thus available.

Participants' characteristics

Participants' sociodemographic characteristics are presented in Table I. Their mean age at the time of freezing oocytes was 37.1 years (SD ± 2.6, range: 27–42) and at the time of completing the survey 39.9 years (SD ± 4.2, range: 30–54). When they froze their oocytes most respondents were single (86%) and almost half (47%) were 38 years or older. As a group, participants were socio-economically advantaged. Compared to the general population of women in Australia (Australian Bureau of Statistics, 2012a, 2012b, 2013), they were more likely to be university educated (89 versus 27%), employed in a professional or managerial occupation (88 versus 37%) and have private health insurance (93 versus 57%).

Table I Characteristics of women who cryopreserved oocytes for non-medical reasons and participated in a survey of their reproductive experiences

	Number (%)
Age at time of oocyte freezing (years, $n = 93$)	
≤37	49 (53)
38–39	28 (30)
≥40	16 (17)
Relationship status at the time of oocyte freezing ($n = 95$)	
Single	82 (86)
Married/living with male partner	3 (3)
Male partner not living together	7 (7)
Other	3 (3)
Relationship status at the time of survey ($n = 95$)	
Single	64 (67)
Married/living with male partner	19 (20)
Male partner not living together	11 (12)
Other	1 (1)
Year of oocyte storage ($n = 92$)	
Before 2010	15 (16)
2010–2012	32 (35)
2013–2014	45 (49)
Highest level of education attained ($n = 95$)	
Postgraduate university	38 (40)
University degree	47 (49)
Other	10 (11)
Occupation ($n = 95$)	
Managerial	22 (23)
Professional	62 (65)
Other	11 (12)
Private health insurance ($n = 95$)	
Yes	88 (93)
No	7 (7)

Oocyte cryopreservation and use of stored oocytes

Two respondents (including the woman who provided only free-text comments) had no oocytes available for freezing after hormone stimulation. Of those who had stored oocytes, almost half (49%) had stored them in 2013–2014 when the vitrification freezing method was used. Of the 91 respondents who completed the question, almost two-thirds (65%) were unsure which method had been used to freeze their oocytes, a quarter stated that they had been vitrified (25%) and the remainder that 'slow' freezing had been used (8%) or that both methods had been used for two separate batches of oocytes (2%). On average, respondents had stored 14.2 oocytes (SD ± 7.9, range: 0–42); 24% had stored <8 oocytes, 35% had 8–15, 25% had 16–23, 14% had >23 and 2% did not state the number of oocytes they had stored. Six women (6%) had used their stored oocytes, three of whom had given birth as a result. Two of the women who had not achieved a pregnancy with their stored oocytes subsequently gave birth after using fresh oocytes in an ART procedure. One women who gave birth after using her stored oocytes also gave birth to a spontaneously conceived child (Table II).

Reproductive experiences of all respondents

Overall, 32 women (34% of all) had been pregnant at some point in their lives. Of these, nine (28%) had used ART to conceive. Nineteen women (20% of all) had been pregnant before they stored eggs, experiencing a total of 27 pregnancies resulting in 13 miscarriages, 11 induced abortions and 3 births. A total of 21 women (22% of all) had become pregnant since storing oocytes; between them they had 27 pregnancies resulting in 6 miscarriages, 15 births and 6 current pregnancies. The 15 births and 6 ongoing pregnancies resulted from ART with frozen oocytes ($n = 3$, as described above), ART with fresh oocytes ($n = 6$) and spontaneous conception ($n = 12$).

Women who had not used their oocytes were asked to choose, from a list of possible reasons, all the reasons that applied to them; responses from the 87 women who answered the question are presented in Table III. The most commonly endorsed reasons were not wanting to be a single parent, preferring to conceive naturally and not wanting to use a sperm donor. Reasons related to financial circumstances and employment appeared to have played a very minor role.

A total of 87 (91%) respondents still had oocytes stored at the time of the survey. When asked whether they intended to use the stored eggs, most (69%) indicated that this would depend on their circumstances. Overall, 21% of respondents stated that they intended to use the eggs, 7% that they did not intend to use them and 3% were unsure.

Reproductive desires and expectations

When asked about their hopes and expectations relating to childbearing, the majority (85%) of respondents still wanted to have a child or another child. Respondents' ideal (if all things were possible) and expected (considering current circumstances) numbers of children are presented in Table IV. The average ideal number of children was significantly higher than the average expected number of children (2.11 versus 1.38, $P < 0.001$).

Discussion

This is one of the largest studies, and the first from Australia, of women who freeze their oocytes for non-medical reasons. The results add to the limited evidence about the reproductive experiences of this growing group of women.

The strengths of this research include a comparatively large sample, a relatively high response rate for an unsolicited survey on a sensitive topic, and the inclusion of questions about reproductive aspirations and outcomes on which there is little evidence. The limitations inherent in any survey also apply to this survey: participation bias, missing data and the possibility that some questions or response alternatives may have been ambiguous.

Consistent with other evidence about women who cryopreserve oocytes for non-medical reasons, most respondents were aged in their late 30s, well educated, socio-economically advantaged and single (Hodes-Wertz *et al.*, 2013; Baldwin *et al.*, 2015; Stoop *et al.*, 2015).

Table II Characteristics and reproductive outcomes of women who returned to use stored oocytes ($n = 6$)

Respondent	1	2	3	4	5	6
Year stored	2000	2003	2003	2007	2010	2003
Age at storage (years)	38	38	39	35	38	32
Relationship status						
At storage	Single	Single	Single	Single	Single	Single
Currently	Single	Single	Co-habiting[#]	Single	Co-habiting	Co-habiting[$]
Method of freezing	Unsure	Unsure	Unsure	'Slow'	Unsure	Unsure
Number of oocytes frozen	20	16	16	19	24	10
Survived thaw	Yes	Yes	Yes	Yes	Yes	No
Embryos developed	Yes (4 ETs*)	Yes (2 ETs*)	Yes	Yes	Yes	–
Pregnancy	No	No	Yes	Yes	Yes	–
Miscarriage (*n*)	–	–	No	No	Yes (3)	–
Gave birth (*n*)	–	–	Yes (1)	Yes (1)	Yes (1)	–
Oocytes still stored	No	No	No	Yes	Yes	No
Births from						
ART, fresh oocytes	Yes	No	No	No	No	Yes
Spontaneous conception	No	No	Yes	No	No	No

[#]Male partner.
[$]Female partner.
[*]Embryo transfers

Table III Reasons for not yet using stored oocytes ($n = 87$)

Reason	*Number (%) endorsing
Do not want to be a single parent	41 (47)
Want to try to conceive naturally	32 (37)
Don't want to use sperm from a donor	25 (29)
Not ready to have a baby	15 (17)
Too old or health not good enough	12 (14)
Conceived naturally or have completed family	10 (11)
Partner not willing to have a baby	2 (2)
Financial circumstances	2 (2)
Not in secure employment	2 (2)
Not eligible for maternity leave	2 (2)
Eggs discarded as no longer needed	2 (2)

[*]Women provided more than one reason.

Table IV Women's reports of their ideal and expected number of children

Number of children	Ideally, if all things were possible ($n = 92$)N (%)	Expected considering circumstances ($n = 95$)N (%)
0	2 (2)	10 (10)
1	10 (11)	29 (31)
2	59 (64)	31 (33)
3	15 (16)	2 (2)
>3	6 (6)	1 (1)
Unsure		22 (23)

Since the considerable cost of fertility preservation for non-medical reasons is borne by the individual, being financially well-resourced is likely to be a pre-requisite for oocyte cryopreservation. Although the increasing age of childbearing observed in most high-income countries is often framed as a result of women electing to pursue other life goals before having children, evidence suggests that the main reason for women having children later in life is the lack of a partner willing to commit to parenthood (Hammarberg and Clarke, 2005; Holton *et al.*, 2011). The finding that almost all surveyed women were in their late 30s and single when they froze oocytes could be interpreted to suggest that they froze their oocytes in hopes of still finding a partner willing to be a parent. That almost half of the respondents had stored oocytes in the 2 years preceding the survey may, in part, explain why so few had used them. Respondents' reasons for not having used their oocytes suggest that they were hoping to find a partner with whom they could have a child. Single parenthood using donated sperm appeared to be a less preferred option, as others have found (Baldwin *et al.*, 2015).

Almost half of the women surveyed froze their eggs at an age that may be deemed suboptimal (older than 37 years) (Mesen *et al.*, 2015) and one quarter had fewer than the 8–10 mature oocytes considered necessary for a reasonable chance of success (Cobo and Garcia-Velasco, 2016). Some experts recommend that women should freeze oocytes when they are young because this will ensure the best chance

of achieving a pregnancy later in life should they be unable to conceive spontaneously (Cobo and Garcia-Velasco, 2016). Others, however, claim that, rather than cryopreserving oocytes at age 25 years, it is more cost-effective for women who want to conceive at age 40 years to attempt spontaneous conception and, if unsuccessful, to use ART with fresh oocytes (Hirshfeld-Cytron et al., 2012). A third position is that, to optimize outcomes, women who are likely to benefit from oocyte cryopreservation should be encouraged to freeze their eggs before age 35 years and fertility clinics should be discouraged 'from specifically targeting women who have already surpassed the age at which good results can be expected' (Mertes and Pennings, 2011).

While the optimal age for freezing oocytes may be debated, it is important to know that women who store oocytes for non-medical reasons also can conceive spontaneously and with ART with 'fresh' oocytes. Since storing their oocytes, one in five women in our survey had given birth or were currently pregnant. Of the 21 viable pregnancies, more than half were from spontaneous conception, more than one quarter from ART with 'fresh' oocytes, and only 3 of 21 resulted from using stored oocytes. This is similar to the results from Hodes-Wertz et al. (2013) who reported that, of the 183 women who had stored oocytes for non-medical reasons, 20% had conceived in subsequent years but only in 10% of cases was conception the result of using their stored oocytes. The remainder had conceived spontaneously or by using 'fresh' oocytes in an ART cycle.

There were varied reproductive trajectories reported by the surveyed women: never having been pregnant, conceiving spontaneously before and after freezing oocytes, using ART to conceive with and without stored oocytes, experiencing pregnancy loss or abortion and having live births. The six women who had used their stored oocytes reported mixed outcomes: oocytes that did not survive thawing, repeated embryo transfers without achieving pregnancy, miscarriage and births. It should be noted that the 'slow' freezing method had been used for the six respondents who had used their stored oocytes. It is possible that women who stored oocytes after the introduction of vitrification as the freezing method in 2012 will have a greater chance of having a baby if they use their stored oocytes. Nevertheless, these results demonstrate the diverse potential reproductive outcomes and reproductive heterogeneity of women who freeze oocytes for non-medical reasons. Although they have different demographic and medical characteristics and reasons for cryopreserving oocytes, the limited evidence suggests that the rate of utilization of stored material among women who freeze oocytes or embryos before cancer treatment is also low and that most post-treatment pregnancies occur spontaneously or as a result of ART with fresh oocytes (Barcroft et al., 2013; Dahhan et al., 2014).

Most women in this survey (with or without children) still wanted to have a child in the future but only one in five stated that they definitely intended to use their stored oocytes. Furthermore, the number of children respondents ideally would have liked was considerably higher than the number of children they expected to have, suggesting unfulfilled parenthood aspirations. These results are consistent with those of Stoop et al. (2015) who found that almost all of the 86 women they interviewed still wished for a child but only about half expected to use their stored oocytes.

We are aware of arguments that, for women to be able to make informed decisions about oocyte freezing, the consent process must include information about success rates by age-group (Harwood, 2015) and that the information should be indication specific (Cil and Seli, 2013). Data from oocyte donation programmes indicate that oocyte cryopreservation in that context achieves satisfactory pregnancy rates with one programme reporting a 6.5% oocyte-to-baby rate (Cobo et al., 2015). Evidence about the rate of usage and outcomes from using cryopreserved oocytes for medical indications is emerging but is still very limited (Argyle et al., 2016; Kato, 2016). Because their characteristics are likely to differ, it is questionable whether data from women using cryopreserved donor oocytes or women cryopreserving oocytes for medical reasons can be extrapolated to women who freeze oocytes for non-medical reasons. Since only six of our respondents had used their stored oocytes, it is not possible to draw conclusions about the efficacy of oocyte cryopreservation. This requires systematic collection, compilation and reporting of national and international data. We endorse the recommendation that data on oocyte cryopreservation outcomes should be included in the data that clinics are required to report to bodies that compile ART data in order to 'yield better and more generalizable data' (Harwood, 2015). We would add that evidence-based information about the proportions of women who return to use their stored oocytes, reasons for not using them, and overall reproductive outcomes for women who store oocytes for non-medical reasons might help women to make more informed decisions about whether to freeze oocytes.

Women who consider oocyte cryopreservation for non-medical reasons need detailed, individualized information, which takes into account the woman's age and other circumstances that may affect the possible outcomes of the procedure, in pre-treatment counselling including that oocytes may not be recovered, there may be no oocytes suitable for cryopreservation, the oocytes may remain unused, that using stored oocytes does not guarantee a baby, and that they may conceive spontaneously. This study contributes to the limited existing evidence about the reproductive outcomes of women who freeze oocytes for non-medical reasons and can be used when counselling women who contemplate storing oocytes to guard against age-related infertility.

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Authors' roles

K.H., M.K., M.H., M.P., J.M., F.A., C.B. and J.F. contributed to the conceptualization and design of the study. K.H. and F.A. were responsible for data collection. K.H., N.P., M.K. and J.F. conducted the data analyses and all authors contributed to the interpretation of the findings. K.H. drafted the article which was critically reviewed by all authors. All authors approved the final version of the article.

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Conflict of interest

K.H. has received honoraria from Merck-Serono, J.M. is a clinician at Melbourne IVF, F.A. is a Melbourne IVF employee, J.F. is supported by

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