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D.D.M. Braat , A.A.E.M. van der Velden , K. Fleischer ,
A.J.M. Oerlemans

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Article

Deciding on future fertility: considerations of girls with Turner syndrome and their parents to opt for or against ovarian tissue cryopreservation

S. Nadesapillai^{1*}, S. van der Coelen¹, L. Goebel¹, R. Peek¹, D.D.M. Braat¹, A.A.E.M. van der Velden², K. Fleischer³, A.J.M. Oerlemans⁴

¹ Department of Reproductive Medicine, Radboudumc, PO Box 9101, 6500 HB, Nijmegen, the Netherlands

² Department of Paediatrics, Radboudumc, Amalia Children's Hospital PO Box 9101, 6500 HB, Nijmegen, the Netherlands

³ Department of Reproductive Medicine, Nij Geertgen Center for Fertility, Ripseweg 9, 5424 SM, Elsendorp, The Netherlands

⁴ IQ healthcare, Radboud Institute for Health Sciences, Radboudumc, PO Box 9101, 6500 HB, Nijmegen, the Netherlands

**Corresponding author: Saphami Nadesapillai, department of Obstetrics and Gynaecology, Radboudumc PO Box 9101, 6500 HB, Nijmegen, the Netherlands. Tel: +31(0)243098063
E-mail: Saphami.Nadesapillai@radboudumc.nl*

ABSTRACT

Research Question: Ovarian tissue cryopreservation (OTC) is still considered an experimental procedure for girls with Turner syndrome (TS) to preserve their fertility. Deciding on an experimental fertility preservation option is a difficult process for girls with TS and their families. In this study, we explored considerations of girls with TS and their parents to opt for or against OTC.

Design: Semi-structured in-depth interviews were conducted with girls with TS and their parents until data saturation was reached. Participants were recruited through purposive sampling. Data were analysed using a thematic analysis approach.

Results: Thirteen parents and five girls who opted for OTC and seven parents and three girls who declined OTC were interviewed. Parents and girls mentioned that OTC offered hope, an opportunity to have genetic offspring, and clarity about their current fertility status. Most participants were not afraid of the risks of surgery and trusted healthcare providers with this procedure. In contrast, families had to deal with uncertainties, due to the lack of information on the success rate and long-term consequences of OTC in this group. Families indicated that they had to go through an important decision-making process in a short period of time, because of the limited number of inclusions.

Conclusion: A new opportunity and hope for future fertility were considerations to opt for OTC. However, OTC also came with uncertainties due to the experimental nature of this procedure in girls with TS. Healthcare providers could share these experiences with girls with TS and their parents to improve fertility preservation counselling in this group.

Keywords

Turner syndrome, Fertility preservation, Ovarian tissue cryopreservation, Decision-making, Interviews

INTRODUCTION

Turner syndrome (TS) is a heterogeneous chromosomal condition affecting one in 2500 live-born girls (Stochholm et al., 2006). Girls with TS have a partial or complete deletion of one of the sex-chromosomes (Gravholt et al., 2017; Saenger, 1996). These chromosomal aberrations cause a variety of phenotypic features in girls with TS, including short stature, lymphedema, congenital heart disease, and gonadal dysfunction (Saenger, 1996).

Most girls with TS will be diagnosed with premature ovarian insufficiency during childhood or early adolescence, due to an accelerated loss of ovarian reserve. (Modi et al., 2003; Reynaud et al., 2004). In previous studies, women with TS expressed that dealing with infertility is one of the heaviest burdens that they have to bear (Grynberg et al., 2016; Sutton et al., 2005; Sylvén et al., 1993). Approximately 70% of girls with TS do not develop signs of spontaneous puberty, and only 2-8% conceive spontaneously (Bernard et al., 2016; Folsom & Fuqua, 2015; Hadnott et al., 2011; Pasquino et al., 1997; Tanaka et al., 2015). In addition, the chances of having genetic offspring are further reduced, due to a higher risk of miscarriage (Bernard et al., 2016). Alternative options to become a parent, such as oocyte donation, adoption or foster care, should be considered by girls with TS who cannot conceive spontaneously (Gravholt et al., 2017).

Due to technological advances in recent years, cryopreservation techniques have improved rapidly. New fertility preservation treatments have become possible, creating opportunities for girls whose fertility is at risk (Dolmans & Manavella, 2019). As a result, girls with TS and their parents not only ask physicians about alternative options for parenting, but also about the possible options to preserve fertility (Grynberg et al., 2016; Sutton et al., 2005). Currently, cryopreservation of mature oocytes is the only available option for girls with TS to preserve their fertility (Oktay et al., 2016; Schleedoorn et al., 2019a). However, this treatment is limited to a small group of girls with TS (15%), as spontaneous menstruations are required to obtain mature oocytes (Oktay et al., 2016; Tanaka et al., 2015).

A fertility preservation technique that has proven highly successful in young patients undergoing gonadotoxic treatment, is ovarian tissue cryopreservation (OTC) (Dittrich et al., 2015; Dolmans et al., 2021; Jadoul et al., 2017; Van der Ven et al., 2016). Through OTC, ovarian tissue containing primordial follicles can be stored before the pool is completely depleted and it can be performed regardless of the patient's age or ovarian activity. Several studies have described OTC in young girls with TS and reported that primordial follicles were present (Borgström et al., 2009; Hreinsson et al., 2002; Peek et al., 2019; Schleedoorn et al., 2019a). However, follow-up data on autotransplantation of cryopreserved ovarian tissue in girls with TS and pregnancy outcomes are still lacking. Without

evidence of the effectiveness of OTC, it should not routinely be offered to young girls with TS (Schleedoorn et al., 2020). To explore the efficacy of OTC in young girls with TS, the TurnerFertility study was initiated in the Netherlands in 2017 (Schleedoorn et al., 2019b). As part of this study, the decision-making process regarding OTC in girls with TS was evaluated as well (van der Coelen et al., 2022).

Deciding on new experimental fertility preservation treatments in children is not only a challenging process for the patients, but also for their parents (Li et al., 2017). Several studies explored the decision-making process of parents and patients who were offered experimental fertility preservation treatments prior to gonadotoxic therapy (Ginsberg et al., 2014; Hershberger et al., 2016; Sullivan-Pyke et al., 2018). The decision to opt for an experimental fertility preservation treatment was largely based on hope for genetic offspring and preventing decision regret in the future, while the surgical risks of the procedure was the main reason to refuse this option.

The decision-making process for OTC in young girls with TS was evaluated, by exploring the experiences of girls with TS and their parents with surveys and focus group interviews with parents and healthcare providers (van der Coelen et al., 2022). This study reported that girls with TS and their parents highly valued the counselling about fertility preservation options and alternative options for future parenthood. On the other hand, healthcare providers experienced difficulties providing realistic counselling, since the outcomes of OTC in girls with TS are still unknown. Hope for future fertility and anticipated decision regret were mentioned by parents of girls with TS as motives to opt for OTC, which is in line with previous studies interviewing oncological patients (Ginsberg et al., 2014; Hershberger et al., 2016; Sullivan-Pyke et al., 2018).

Previous research of van der Coelen et al. primarily focused on the experiences of parents of girls with TS and healthcare providers. However, in order to improve fertility preservation counselling on OTC for future girls with TS, it is essential to receive input from girls with TS as well. In addition, little is known about the considerations of those who declined the option of OTC prior to or after counselling. For these reasons, we initiated a study to gain insights into the considerations of girls with TS and their parents to opt for or against OTC.

MATERIALS AND METHODS

Study design

This qualitative research is a sub-study of the TurnerFertility study, which was initiated at the Radboudumc in the Netherlands (NCT03381300). Girls with TS and their parents who were interested in the TurnerFertility study, first attended an information meeting and thereafter they could be referred for personal fertility preservation counselling with a gynaecologist or physician in reproductive medicine. During counselling, information was provided about the risks of pregnancy in women with TS, options for non-genetic offspring, the current assisted reproductive techniques for girls with TS, and OTC, which was specifically discussed in relation to the TurnerFertility study. In total, 100 girls, aged 2-18 years were eligible to participate.

In the current study, semi-structured in-depth interviews were conducted with girls with TS and their parents to explore individual considerations to opt for or against OTC. The COREQ checklist was used to design and report this study (Tong et al., 2007) (Supplemental 1).

Participants

Girls with TS, aged 2-18 years during the inclusion period of the TurnerFertility trial, and/or their parents were asked to participate in this study. Participants were selected through purposive sampling, considering the age of girls with TS, different karyotypes and their decision regarding OTC.

Families opting for OTC

In total, 29 families who had counselling in 2018 on options for future parenthood in girls with TS and opted for OTC were invited by letter with information on the purpose of the study and study design.

Families not opting for OTC

Twenty-nine families who did not opt for OTC were asked to participate in this study. The families who declined OTC after counselling were invited by letter (n= 6). Families who declined OTC before counselling were first approached by their own paediatrician at the Radboudumc, and after permission they received the same letter (n = 23).

All participants were contacted by telephone to make an appointment for the interview, after obtaining written informed consent. In the Netherlands, adolescents aged 16 and older sign their own informed consent. Children aged between 12 and 16 have to give consent, in addition to the consent of their parents. In this study, girls with TS aged 16 and older were asked for permission to interview their parents as well. Girls with TS between 12 and 16 were interviewed with their parents,

if both had given their consent. Parents of girls with TS aged under 12 were interviewed without their daughter. Participation was voluntary and we stressed that participants could withdraw from the study at any time.

Data collection

Interviews were conducted between October 2020 and June 2021 by the first author (SN), who is a female physician in reproductive medicine and PhD student with experience in performing qualitative research. She had not been involved in the counselling process of the participants and participants were aware of the interviewer's profession.

Due to COVID-19-related restrictions, interviews took place via video call using Skype for business. A topic list was designed to guide the interviews based on experiences of the research team and literature (Ginsberg et al., 2014; Hershberger et al., 2016; Sullivan-Pyke et al., 2018; van der Coelen et al., 2022). Interviews started with several warm-up questions such as: 'How did you find out that the TurnerFertility study started in the Netherlands?'; and 'What was your first impression?'. Thereafter, additional questions concerning having genetic offspring, the role of parents and daughters in the decision-making process and influencing factors (e.g. age of the girl and research setting) were discussed. Field notes were made during the interview. The topic list was not pilot tested, but was slightly modified after the first interviews to better reflect the aim of the study. Interviews lasted approximately 30 minutes (ranging from 20-45 minutes), were audio-recorded, transcribed verbatim, and subsequently pseudonymised. Transcripts were not returned to participants for comments or corrections.

Data analysis

All interviews were analysed and interpreted using a thematic analysis approach (Braun & Clarke, 2006). ATLAS.ti (version 8.2, Berlin) was used to manage and assist data analysis. To increase reliability, transcripts were read and coded independently by the interviewer and another author (LG) who was not present during the interviews nor involved in fertility preservation counselling. First, open coding was used to label relevant text fragments, describing the considerations of girls with TS and their parents to opt for or against OTC (i.e. using the words of the participant). Both authors then compared their codes and any differences were discussed in the presence of another author (AO, JV or KF) who read the corresponding transcript, until consensus was reached. Of these three authors, AO was not involved in the care of girls with TS or counselling process. Thereafter, codes were grouped into categories. Finally, categories were reviewed and major themes were defined with the research team. Data saturation was reached when analysis of two subsequent interviews yielded no new information. To improve the validity of the results, themes were discussed

with a 22-year old patient representative who underwent OTC as part of the TurnerFertility study, but did not participate in the interviews.

Ethical approval

This study was approved by the local Medical Research Ethics Committee in the Netherlands (2018-4945).

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RESULTS

In total, 10 out of 29 families (13 parents and 5 girls with TS) who opted for OTC and 6 out of 29 families (7 parents and 3 girls with TS) who declined OTC were willing to participate. Seven families indicated that they did not want to participate because of the psychological burden of the topic and the fact that there had been no decision-making process, since it was already clear for some that the likelihood of having oocytes was very low.

Interviews were conducted with 8 girls aged between 12 and 19 years of which 6 girls had numerical aberrations and 2 structural aberrations. The other 6 girls who did not participate were younger than 12 and 2 girls aged 12 and 13 felt uncomfortable participating. Of the 20 parents that were interviewed, 16 were women, 16 were in a relationship, and 10 were highly educated. Further characteristics of the participants are shown in Table 1.

Thematic analysis yielded five themes: 1. Opportunity to have biological children 2. Trusting the process 3. Uncertain about the unknown, 4. Dealing with a challenging timeframe, and 5. Making a family decision. These themes and categories are presented in Figure 1 and discussed below. Quotes are used to illustrate the main findings.

Opportunity to have biological children

Both families opting for and against OTC were glad that further research on a potential fertility preservation treatment for girls with TS was performed. In particular girls with TS mentioned that a reason to opt for OTC was to contribute to research that might not only help themselves, but also other girls with TS in the future.

" @ @ '1: 17-year-old girl opting for OTC)

For all participants the odds of having genetic offspring was a strong motive to consider OTC. Most girls with TS indicated that their desire to have a biological child had not completely disappeared, despite that they had been told at a young age that this was not an option for them. OTC offered renewed hope to have genetic offspring and for some families this was reason enough to opt for OTC, even if the chances were small. Parents who declined OTC mentioned that they also found it important for their daughter to have genetic offspring, however they did not want their daughter to have unrealistic expectations that could affect her well-being.

‡ *...ur own, but at the same
...@ ... U ... of 12-year-old girl not opting for
OTC)*

Besides renewed hope, OTC would also provide clarity about the current fertility status of girls with TS, and whether or not it would be necessary to consider alternative options to become a parent in the future. One mother also thought that her daughter would gain confidence in being a woman if oocytes were found to be present.

Parents' experiences of having children of their own also influenced their decision. Some parents with young children stated that they took this opportunity for their daughter, because they had difficulties becoming pregnant themselves. They found it important that their daughter would be given the option to make her own decision about having genetic offspring when she would be mature enough. In addition, most parents were afraid that, if they declined this option, they would regret their decision in the future, and that their daughter would blame them if this procedure was proven to be successful.

u *... possible and I could have become a mother and have my own baby. ...@ ... U ... -year-
old girl opting for OTC)*

Trusting the process

Families mentioned that the transparent and realistic counselling about the odds of finding oocytes and uncertainties regarding OTC created a sense of confidence in the professionals and the OTC process.

*...asant, honest and clear. She was just very friendly and clear and just very
easy-going and then you do feel more confident and you also feel more comfortable with the
... (Interview 12, 18-year-old girl opting for OTC)*

Girls with TS and their parents who eventually opted for OTC indicated to have considered the risk of surgery. However, it did not weigh heavily in their decision, since the risks of complications were small and they had faith in the expertise of the professionals. In addition, these families also mentioned that they were familiar with hospital visits due to the frequent check-ups for TS, and

several girls had already undergone surgery for other physical problems (e.g. tonsillectomy), so they knew what to expect from a surgical procedure.

Parents who declined OTC also indicated that the risk of surgery alone was not a reason to decline participation. However, some girls with TS had already developed a fear of hospital visits and blood tests at an early age, which caused parents to worry that the fear of hospital visits and emotional stress would increase if their daughter would participate in the study.

*o ut u
a needle or @ @ 7
13-year-old girl not opting for OTC)*

The involvement of the general paediatrician varied from family to family. Several families discussed the pros and cons of OTC with their own paediatrician to become more confident about their final decision, while other families did not.

Some parents and girls with TS not only discussed OTC with healthcare providers, but also with other girls with TS who had already participated in the study via a patient support group. Both parents and girls expressed that it was comforting to know that they were not the only one going through this process.

*u u u lanks, but when
. (Interview 16, Mother of
12-year-old not opting for OTC)*

Uncertain about the unknown

The experimental nature of OTC in girls with TS was a main factor of uncertainty for families, and weighed heavily in the decision-making process of those who did not opt for OTC. They indicated that it was difficult to opt for surgery, while it was unclear if oocytes would be present. Even if oocytes were present, it would still not guarantee that they would be of sufficient quality to become pregnant. Girls with TS and their parents were well aware that a positive outcome would give them hope, while it could still end in a disappointment and emotional burden if it turned out not to be successful after all. Several families who did not opt for OTC stated that they might have done so if more information about the odds of finding oocytes and pregnancies had been available at that time.

@ ... it means something too. And not only right now, but also with a future partner and trajectories that will have to be completed. Is it possible, are there oocytes ... @ ... U ... -year-old not opting for OTC)

Girls with TS who declined OTC and parents with a young daughter with TS doubted whether they should opt for a not-medically necessary procedure, without knowing the long-term physical and emotional impact. In addition, parents worried that opting for OTC might create a certain pressure or expectation for their daughter to use the tissue when she would be older, while she might not even want children or would not be capable to raise them at that point.

' ... are taking a risk for something you are not sure about, whether she would actually want to in the future. At the moment she is too young, I think, to really make that decision for the future, whether she would definitely want children or not, because maybe she has a very happy life without children and she finds a partner who does not ... @ ... U ... -year-old not opting for OTC)

Dealing with a challenging time frame

Girls with TS and their parents indicated that time pressure had influenced their decision-making process. Even though some participants were glad that more families were undergoing the same process, others felt the urge to decide quickly, because of the limited number of participants that could be included in the study. The idea that there was only room for 100 girls with TS, while not knowing how many girls with TS would be eligible and willing to participate, made them nervous. They were aware that whoever applied first, would be treated first. As a result, some parents mentioned that they signed up immediately after the information meeting and only thought more carefully about OTC afterwards. However, the majority mentioned that they would also have made a decision quickly if more girls with TS had been allowed to participate, because they thought that the odds of finding oocytes would decline as their daughter aged.

u ... though you may not be ready to make the decision yet, you get the idea that you have to register quickly, ... (Interview 13: Mother of 9-year-old opting for OTC)

Making a family decision

Most girls with TS mentioned that they went to the information meeting with their parents and had a conversation afterwards with them about their first impression of OTC. The parents often indicated that they first asked their daughter's opinion before expressing their own opinion. All girls with TS indicated that they felt a lot of support from their parents during the decision-making process. They expressed that it was their choice whether or not to choose for OTC, and that they never felt pressured by their parents. One girl with TS did mention that her parents were so positive about OTC that this may have influenced her decision.

@
 yourself. To be honest, after the information evening, I was called constantly [by my parents] with the question, hey, what do you think? Then I explained what I thought of it. The things I said at that time @
 actually always agreed, there were no matters that made us go, well, I did not think so or something
 (Interview 12: 18-year-old girl opting for OTC)

All parents with an older daughter with TS, agreed that the final decision was hers, as she had to decide about her own body and future. Parents indicated that they mainly played a role in informing their daughter about OTC and weighing the pros and cons together to help her decide. Several parents wondered whether they had influenced their daughter's decision during that process by giving their own opinion or by often talking about the subject. One family also mentioned that they trusted their religion and that they would be content with the outcome, whatever their decision would be.

o o @
 was fuelled by the fact that she picked it up from me, that I was also curious if it came entirely from ‡
 (Interview 9, Mother of 11-year-old girl opting for OTC)

Some parents with young daughters with TS reported that it was challenging to inform their daughter appropriately about OTC, and to assess to what extent she would understand the provided information. Some young girls immediately refused participation after they were informed about OTC. Several parents found it difficult at that time to determine whether the refusal stemmed from not wanting biological children or from a fear of surgery. These parents had multiple conversations with their daughter to make sure that she understood the long-term consequences. In the end, all

parents mentioned that they supported their daughter's final decision and never put pressure on her to change it.

‡ *...-year-old make her own choices, but we told her that it is an operation and that it can be painful. But we also explained what it is for and what the purpose is and that the purpose is twofold. And based on that, she simply said: yes, I want that. And if she had said: I really do not want this. u ... U ...-year-old girl opting for OTC)*

o *...realise what choice she is making. That's why we asked several times, and every time we said, so you know what this means, yes, we discussed it with her properly, but she was just very clear ... @ ... @ ... U ...-year-old not opting for OTC)*

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DISCUSSION

Main findings

Our study provides insights into the range of considerations that play a role in the decision-making process of girls with TS and their parents to opt for or against OTC. Main reasons to opt for OTC were: a new opportunity to possibly have biological children, clarity about their current fertility status, and a low-risk procedure. However, OTC also caused many uncertainties, due to the experimental nature in girls with TS, unknown long-term health consequences and projected future expectations. Girls with TS and their parents had to make a complex family decision in a challenging time frame, while worrying about possible future regrets.

Interpretation of the findings

Girls with TS have to face many challenges during their lifespan, including dealing with a high likelihood of infertility at an early age (Sutton et al., 2005). In this study, girls with TS mentioned that they still had the desire to have genetic offspring, after being informed that they were infertile. Renewed hope and an opportunity to have genetic offspring were important considerations for girls with TS and their parents to opt for OTC. Hope for genetic offspring was also frequently mentioned by boys and girls who had fertility preservation treatments prior to gonadotoxic therapy (Ginsberg et al., 2014; Hershberger et al., 2016; Sullivan-Pyke et al., 2018). Another important consideration to opt for OTC was the clarity that analysis of a small part of the ovarian tissue obtained for OTC could provide regarding the current ovarian reserve of girls with TS. Unlike children diagnosed with cancer, girls with TS are aware that they are likely to become infertile at an early age. However, it remains difficult to predict when this point is reached, since every girl with TS has different fertility outcomes (Folsom & Fuqua, 2015). By opting for OTC, girls with TS and their parents received information about the current fertility status and knew which options might remain to become a parent.

Several studies have evaluated the decision-making process of new invasive fertility preservation treatments in children with cancer and reported that the experimental nature of the procedure or the short period of time to make a decision did not deter parents or young patients to opt for the fertility preservation treatment (Ginsberg et al., 2014; Li et al., 2017; Sullivan-Pyke et al., 2018). In contrast, our study showed that parents and girls with TS who did not opt for OTC felt that the uncertain outcome of OTC outweighed the odds of having genetic offspring in the future. In addition, they mentioned that renewed hope could also end in an emotional burden if the procedure was not successful, due to a lack of sufficient follicles after autotransplantation. A possible explanation for this contrast is that, unlike girls with cancer, girls with TS and their parents already knew that the

odds of finding oocytes and having genetic offspring were small based on their current clinical and hormonal outcomes, and therefore did not opt for OTC.

In the previous study of van der Coelen et al., parents and girls with TS (who mainly opted for OTC) mentioned that they felt like they had actually no choice but to opt for OTC to seize every opportunity to have genetic offspring. By interviewing parents and girls with TS who did not opt for OTC, we saw that there were in fact participants who thoughtfully declined this treatment.

Another important element in the decision-making process is the dynamic between parents and children (Galvin & Clayman, 2010; Li et al., 2017). Most parents with a young child tried to involve their daughter in this process as much as possible, as advised by the expert panel on OTC in girls with TS (Schleedoorn et al., 2020). Some parents reported that the process was complicated, due to a disagreement that arose between them and their daughter. In these situations, parents had the difficult, yet important task to weigh the pros and cons of the treatment that could benefit their child in the future and consider the feelings of their daughter, taking her mental maturity into account (Galvin & Clayman, 2010). In families where the daughter was old enough to express her own opinion, parents described their role to be mainly an informative and supportive one, while their daughter made the final decision. However, it remains difficult to determine whether in fact parents had no influence on the decision of their daughter or whether giving their own opinion regarding OTC directed their daughter's opinion in a certain way.

In line with previous studies, we have observed that the parental decisions were influenced by certain personal factors that weighed into their decision to opt for or against OTC (Li et al., 2017; Sullivan-Pyke et al., 2018). For instance, some parents mentioned that having a biological child was important for them, so their daughter should have this opportunity as well. Furthermore, anticipated decision regret and the possibility that their daughter could blame them in the future for not participating were highly considered as well (van der Coelen et al., 2022).

The decision-making process regarding an experimental fertility preservation treatment is a difficult process for both parents and pediatric patients, as little is known about the success rate or long-term consequences, and there is often limited time to decide (McDougall et al., 2018; Sullivan-Pyke et al., 2018). The role of healthcare providers in this situation is crucial, as they have to provide sufficient information about the risks of pregnancies in women with TS and realistic counselling regarding OTC to parents and children, so that they can make a well-informed decision (Galvin & Clayman, 2010; van der Coelen et al., 2022). In order to improve the decision-making process regarding OTC in girls with TS, it is advised to counsel both parents and children, and schedule multiple appointments with them to prevent hasty decisions as much as possible (van der Coelen et al., 2022).

In addition, attention should be paid to mental health issues of girls with TS and their parents during the decision-making process, and psychological support should be provided when needed.

Strengths and limitations

In qualitative research it is a common challenge to collect and analyse data free from bias, especially if researchers have a dual role as healthcare providers. To improve the trustworthiness of this study, interviews were conducted by an author who was not involved in the counselling process.

Additionally, transcripts were coded and analysed independently by the interviewer and a second author who was not present during the interviews nor involved in TS care. Discrepancies were discussed with three additional authors, one of whom did not have a dual role as healthcare provider.

Secondly, using semi-structured in-depth interviews enabled us to explore a variety of considerations that were important to girls with TS themselves and their parents to opt for or against OTC. In this way, we have gained more insights into the decision-making process regarding OTC in girls with TS.

A potential limitation of this study is that both girls with TS and parents were interviewed in each other's presence, which may have prevented them from speaking freely. In addition, interviews took place by video call due to COVID-19 measurements, making family interactions and nonverbal communication less easy to observe. Furthermore, participants were interviewed almost three years after their decision-making process on OTC, which could have introduced recall bias. Finally, participation was voluntary, causing a possible selection bias.

In conclusion, OTC offered girls with TS hope and created a possible opportunity to still have genetic offspring. Although girls with TS and their parents trusted healthcare providers with the low-risk procedure, the experimental nature of this treatment created many uncertainties about the success rate and long-term outcomes of OTC. During fertility preservation counselling, healthcare providers should be aware that both girls with TS and their parents are going through a complex decision-making process and sufficient support should be offered. Healthcare providers could share the experiences of the participants with future girls with TS and their parents to help them make a well-informed decision on this difficult topic. Conducting interviews in 10 to 15 years with the same participants could be valuable to evaluate whether they still stand by their decision or would have preferred a different decision after all.

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Declaration of competing interest

The authors report no conflicts of interest.

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LEGENDS TO FIGURE

Figure. 1 Overview of themes and categories describing the considerations of girls with Turner syndrome and parents to opt for or against ovarian tissue cryopreservation (OTC). The total number of codes for each theme and category is shown in brackets.

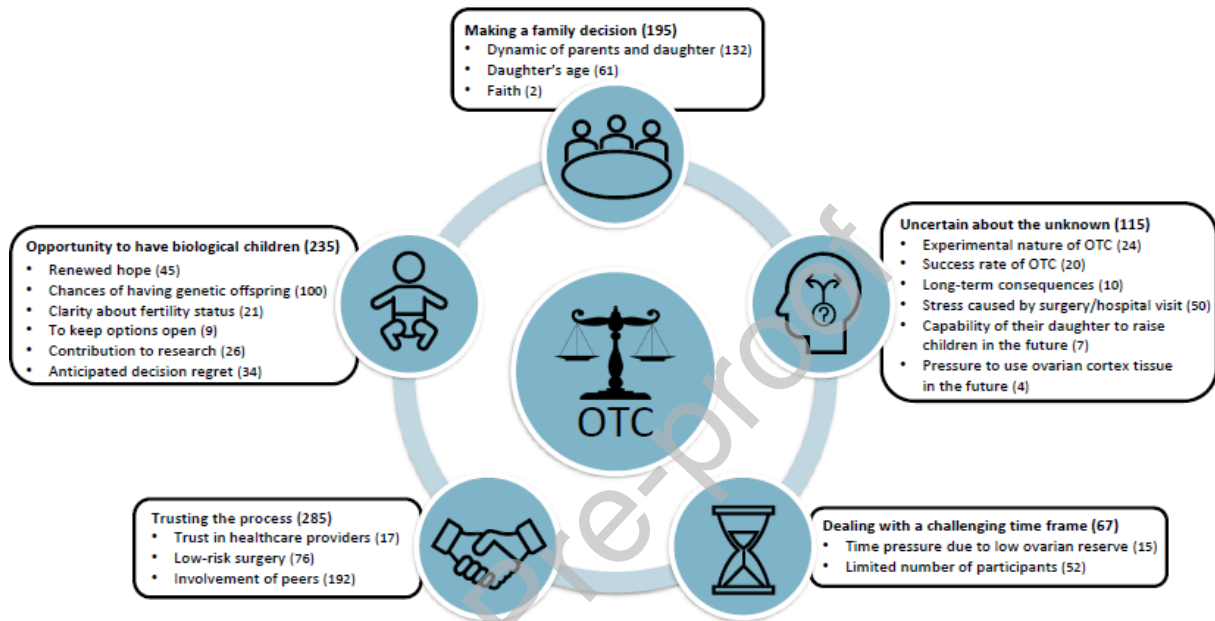


TABLE 1 CHARACTERISTICS OF GIRLS WITH TURNER SYNDROME AND PARENTS

<u>Girls with Turner syndrome</u>		(n=8)
Ovarian tissue cryopreservation	Yes	5
	No	3
Age in years	12-15	4
	16-19	4
Karyotype in lymphocytes	45, X	3
	45, X/46, XX	2
	45, X/46, XX/47, XXX	1
	Structural aberration	2
Educational level	Primary education	1
	Secondary education	6
	Secondary vocational education	
Years since diagnosis	0-5	2
	5-10	-
	10-15	4
	> 15	2
<u>Parents</u>		(n=20)
Gender	Male	4
	Female	16
Highest educational level	Primary education	1
	Secondary education	3
	Secondary vocational education	6
	Higher vocational education	7
	University	3
Relationship status	Single	4
	In a relationship	16
Ovarian tissue cryopreservation	Yes	13
	No	7
Daughter's age in years	< 12	6
	12-15	6
	16-19	4
Daughter's karyotype	45, X	8
	45, X/46, XX	3
	45, X/46, XX/47, XXX	1
	Structural aberration	4
Years since	0-5	3

daughter's diagnosis	5-10	4
	10-15	7
	> 15	2

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Vitae

Sapthami Nadesapillai is a physician in reproductive medicine at the department of Obstetrics and Gynaecology of the Radboudumc in the Netherlands. She is currently combining her clinical work with a PhD project that focuses on different aspects of fertility preservation in girls with Turner syndrome.



Key message

Making a decision about ovarian tissue cryopreservation is challenging for girls with Turner syndrome and their parents. This experimental procedure offered hope for genetic offspring, while the outcome and long-term consequences remain uncertain. Physicians can use our findings to improve fertility preservation counselling in girls with TS.