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ORIGINAL ARTICLE

Attitudes towards embryo donation in Swedish women and men of reproductive age

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Abstract

Background. When performing *in-vitro* fertilization (IVF), more embryos than needed are often derived. These embryos are usually frozen and stored, but as ruled by Swedish law they have to be discarded after 5 years. In other countries it is legal to donate the excess embryos to other infertile couples who for different reasons cannot undergo the procedure of IVF. The aim of the present study was to investigate public opinion in Sweden regarding different aspects of embryo donation.

Methods. A questionnaire regarding attitudes towards aspects of embryo donation was sent to a randomized sample of 1,000 Swedish women and men of reproductive age.

Results. A total of 34% responded to the questionnaires. A majority of the respondents (73%) were positive towards embryo donation. Seventy-five per cent agreed that it should be possible to donate embryos to infertile couples. Approximately half of the participants (49%) supported embryo donation to single women. A majority of the participants emphasized that demands should be imposed on the recipient's age (63%), alcohol addiction (79%), drug addiction (85%), and criminal record (67%). Forty-seven per cent of the respondents agreed that the recipient should be anonymous to the donor, and 38% thought that the donor should remain anonymous to the child.

Conclusions. The results of the present study indicate support for embryo donation among a subset of the Swedish population of reproductive age. If embryo donation were to be allowed in Sweden, strategies for treatment and counselling need to be developed.

Key words: *Attitudes, disclosure, embryo donation, gender, Swedish population*

Introduction

Infertility is a common problem worldwide (1). The most common and effective treatment for infertility today is *in-vitro* fertilization (IVF) (2). In Sweden more than 3,500 out of approximately 120,000 (3.1%) of children are born annually after IVF treatment (3). During IVF treatment, quite often more good-quality embryos will be created than the couples will use (4). These supernumerary embryos are usually frozen and stored for later use. Embryo donation is legal in certain countries, such as Australia, Canada, England, Finland, France, New Zealand, and USA (5,6). For couples who carry a genetic disease, or where neither the male nor the female partner has viable gametes, embryo donation could be an alternative. In most countries, adoption is the only option for these couples. Embryo donation could also be an option for couples who have undergone several unsuccessful IVF treatments. Embryo donation is cost-effective and involves lower costs than IVF treatment, or egg and sperm donation (7). However, embryo donation requires many ethical considerations and difficult decisions (8,9). On the one hand, embryo donation makes it possible for the couple to experience pregnancy, childbirth, and early childhood (10). On the other hand, the consequences for the child of not being genetically related to any of the parents or of having genetic siblings in other families may be psychologically difficult to handle.

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There are a lot of embryos which continuously have to be discarded due to time limits for cryopreservation which could be used for treatment in selected cases of infertile couples (11). In Sweden embryos have to be discarded after five years' storage (12). If embryo donation is allowed, couples who undergo IVF treatment may have to make a decision whether they want to donate their surplus frozen embryos or have them discarded. Most couples undergoing IVF treatment have a hard time deciding what to do with their surplus embryos, and the decision process is often stressful for parents (13,14). Swedish figures have shown that 92% of infertile couples would choose to donate their superfluous embryos for stem cell research, rather than having them discarded (15). Infertile couples who have had embryos frozen are generally in favour of donating to research but are less likely to donate to other infertile couples (16-18). However, in practice it is most common that the couples, either by an active decision or by not responding to requests from IVF clinics, choose to have their stored embryos discarded, even in countries where donation is a legal option (19).

The majority of the Swedish population, over 70%, are positive to oocyte donation to infertile couples (20). Oocyte donation and sperm donation in conjunction with IVF treatment has been permitted since 2003 in Sweden. According to Swedish law, the donor's identity should be traceable for the donor-conceived person when they reach adulthood (12). However, embryo donation for reproduction, surrogacy, and assisted reproduction of single women is not allowed in Sweden. Some patients therefore may have to go abroad for infertility treatment.

Attitudes among embryo donors and recipients have earlier been studied (18,21). Popular attitudes towards embryo donation to other couples have, however, to our knowledge not previously been reported. The aim of this study was to evaluate attitudes towards donation of embryos in a random sample of the Swedish population of reproductive age.

Materials and methods

Potential participants received by post a letter with a questionnaire and a stamped, addressed envelope. The accompanying letter described the purpose of the study, provided brief information about embryo donation and current legislation, and asked participants for voluntary anonymous participation in the study (Supplement A, only available in the online version of the journal; please find this material with the following direct link to the article: http://www.informahealthcare.com/doi/abs/10.3109/03009734.2013.808294). A reminder was sent four weeks later to those who had not responded to the first questionnaire. This reminder letter stressed the importance of participation for the study's outcome and also clarified the selection criteria. A third letter was sent two weeks later to non-responders, where again the importance of participation and the assurance of anonymity was emphasized.

Approval of ethics committee

The study was approved by the Regional Ethics Committee of Uppsala University, D.nr. 2010/455.

Study population

Participants in the study were randomly selected from a data registry covering the whole Swedish population. A total of 500 women in the age group 18–45 years and 500 men in the age group 18–55 years were selected. The age groups were chosen to reflect the reproductive part of the population and thus those who might be concerned about donors and recipients of embryos. Socio-demographic data of the study participants are presented in Table I.

The responses were registered and handled in confidence, and anonymously coded to be processed in a database. No fee has been paid for the voluntary participation in the study. Altogether 200 women out of 500 (40%) responded to the questionnaire and 138 of the 500 men (28%) responded to the questionnaire. Twenty-three (0.02%) questionnaires were returned because they did not reach the respondent.

The questionnaire

The survey consisted of two parts. Part one covered the personal data and contained 16 questions, of which 14 were composed of two sub-questions. Part two contained 22 statements regarding embryo donation, donors, and recipients, on age, criminal background, tobacco use, etc. For the answers, we used a Likert scale where one agrees with the statements in varying degrees (22). The scale was a 5-point scale and contained the options 'strongly agree', 'agree to a large extent', 'neither', 'agree just a bit', and 'completely disagree'. Furthermore, the option 'do not know/cannot take a position' was included in all claims. At the presentation of material in the tables, the two positive categories 'strongly agree' and 'agree to a large extent' were conjoined, as were the more negative categories 'agree just a bit' and 'completely disagree'. The new variables are named 'agree' and 'disagree'. The option 'neither' remains the sole

Table I. Socio-demographic data regarding female and male participants. The figures are given in frequency % (*n*) of the total number of respondents to each question/statement. The mean age is presented with standard deviations (SD) and the number of years living in Sweden as means (M).

	Women (n = 200)	Men (n = 138)
	% (*n*)	% (*n*)
Mean age (SD)	32.5 (8.1)	38.8 (11.3)
Level of education		
University	46.2 (92)	33.3 (46)
High school at least three years	36.7 (73)	36.2 (50)
Upper secondary school	9.0 (18)	18.8 (26)
Elementary school	8.0 (16)	11.6 (16)
Marital status		
Single	17.5 (35)	25.4 (35)
Lives with wife/husband/partner	72.0 (144)	71.7 (99)
Lives alone but has a steady partner	10.5 (21)	2.9 (4)
Caused/experienced pregnancy	61.5 (123)	65.0 (89)
Difficulties in becoming pregnant/ causing pregnancy	37.0 (74)	4.3 (6)
Own children	55.0 (110)	65.9 (91)
By natural means	95.4 (103)	94.4 (85)
Through assisted reproductive technologies (ART)	3.7 (4)	3.3 (3)
By ART + naturally	0.9 (1)	2.2 (2)
Cryo-preserved fertilized eggs	0.5 (1)	2.2 (3)
Donated sperm/eggs	0.0 (0)	0.0 (0)
Born abroad	12.5 (25)	12.5 (17)
Living in Sweden		
One's entire life	83.4 (166)	85.3 (116)
Number of years (M) (distribution women 1–38, men 1–50)	13.4	20.3
Religious community/church		
None	22.8 (45)	29.4 (40)
Swedish church	70.1 (138)	63.2 (86)
Other	7.1 (14)	7.4 (10)
Active in help organization	16.5 (33)	17.6 (24)
Is/has been blood donor	14.6 (29)	22.1 (30)
Familiar with infertility in the surroundings	77.0 (154)	64.7 (88)

alternative in the form of a 'neutral' opinion (Tables II–IV).

Two versions of the questionnaire were sent out, one aimed at women (Supplement B, only available in the online version of the journal;please find this material with the following direct link to the article: http://www.informahealthcare.com/doi/abs/10.3109/03009734.2013.808294)and the other one at men (Supplement C, only available in the online version of the journal;please find this material with the following direct link to the article: http://www.informahealthcare.com/doi/abs/10.3109/03009734.2013.808294). The two questionnaires had different wordings in the section concerning personal information. The woman was asked if she had donated eggs, and the man if he had donated sperm. The wording of question 4 differed regarding whether the woman had been pregnant/if the man has given rise to pregnancies. Apart from these two questions the survey designs were identical for men and women.

Statistics

The program Statistical Package for the Social Sciences (SPSS) was used for recording responses and for statistical processing. To compare the differences between men and women in individual items, Mann–Whitney *U* test was used on the 3-degree scale. $P < 0.05$ was set as the threshold for significance. Median values were calculated on the original data (5-point scale) for each item.

Results

Attitudes towards embryo donation (Table II)

The statement 'embryo donation should be allowed in Sweden' was supported by over 73% of respondents, which suggests a positive attitude towards embryo donation in Sweden. An even a larger part, 75%, of respondents was in favour of allowing embryo donation to infertile couples, while fewer of the respondents (49%) were positive to embryo donation to single women. Just over half (51%) of the respondents were in favour of embryos being donated for research (Table II). Men were more willing than women to donate embryos to research.

Special requirements for the recipient of donated embryos (Table III)

A majority of respondents believed that one should be able to make demands on the recipient's age. The calculated mean of the appropriate minimum age of the recipient women was around 25 years and maximum age about 43 years (Table III). A majority of respondents thought that requirements should be imposed on the recipient's alcohol dependency, and here more women than men agreed with the statement. An even larger number of the respondents thought that requirements should be imposed on the

Table II. Women's and men's attitudes towards embryo donation in Sweden.

		All (n = 338)	Women (n = 200)		Men (n = 138)		
Statement	Answer	% (n)	% (n)	Md[a]	% (n)	Md[a]	P
Embryo donation should bepermitted in Sweden	Agree	72.8 (246)	74.5 (149)	4	70.3 (97)	4	NS
	Neutral	5.9 (20)	3.0 (6)		10.1 (14)		
	I disagree	13.0 (44)	14.0 (28)		11.2 (16)		
	Cannot decide	8.2 (28)	8.5 (17)		8.0 (11)		
Embryos should be allowed to be donated to research	Agree	51.2 (173)	45.0 (90)	3	60.1 (83)	4	0.005
	Neutral	13.6 (46)	17.5 (35)		8.0 (11)		
	I disagree	14.8 (50)	10.0 (20)		21.7 (30)		
	Cannot decide	20.4 (69)	27.5 (55)		10.1 (14)		
Embryos should be allowed to be donated to infertile couples	Agree	75.4 (255)	77.0 (154)	4	73.2 (101)	4.5	NS
	Neutral	5.0 (17)	3.5 (7)		7.2 (10)		
	I disagree	11.5 (39)	12.0 (24)		10.9 (15)		
	Cannot decide	8.0 (27)	7.5 (15)		8.7 (12)		
Embryos should be allowed to be donated to single women	Agree	49.1 (166)	54.0 (108)	4	42.0 (58)	3	NS
	Neutral	6.8 (23)	5.0 (10)		9.4 (13)		
	I disagree	32.8 (111)	31.0 (62)		35.5 (49)		
	Cannot decide	11.2 (38)	10.0 (20)		13.0 (18)		

The figures are given in frequency (%) and number (n) of the total number of respondents to each question/statement, unless otherwise indicated.Differences between women and men are statistically evaluated according to Mann–Whitney U test. $P < 0.05$ is set as the threshold for significance.
[a]Median is calculated on original data (5-point scale) for each statement.
NS = not significant.

recipient's drug addiction. This issue was found to be more important for women than for men. With regard to the recipient's criminal background a majority of respondents agreed that one should be able to set specific requirements, and more women than men considered this as an important issue (Table III).

Attitudes to embryo donation and anonymity (Table IV)

More than one-third of the respondents thought that the embryo donor should remain anonymous to the child. Almost half of the respondents stated that the embryo donor should remain anonymous to the recipient. About half of the respondents agreed that the recipient should be anonymous to the embryo donor.

Discussion

The presented results indicate that there is a positive attitude in Sweden towards allowing embryo donation. A majority of the participants in this Swedish population study supports embryo donation, especially to other infertile couples but also for research. Almost half of the respondents supported embryo donation to single women. The positive attitudes towards embryo donation are consistent with the previously demonstrated positive attitudes towards egg donation in Sweden (20). Even though a majority had a positive attitude towards oocyte donation, only 16% actually wanted to donate.

In the present study, men were more positive than women towards donation of embryos for research purposes. This might be explained by the view that many women to a greater extent than men regard embryos as potential human beings (23). In a previous Australian study, women who had embryos frozen regarded their embryos as human beings to a larger extent than men did, and were therefore less willing to donate them to research (24). It has also been shown that people who want children define embryos as people in earlier stages of the embryo's development than do people without such a desire (23). Women having frozen embryos are more willing to donate their embryos to scientific research than to infertile couples (25). The decision to donate embryos for fertility treatment is regarded as the most difficult decision (26). In a previous study, patients who were positive to donating embryos before treatment changed their minds after

Table III. Attitudes by two cohorts of Swedish women and men of reproductive age on embryo donation.

Statement		All (n = 338)	Women (n = 200)		Men (n = 138)		
Requirements should be imposed on	Answer	% (n)	% (n)	Md[a]/M[b]	% (n)	Md[a]/M[b]	P
Recipient woman's age	Agree	67.1 (221)	68.8 (137)	4	63.6 (84)	4	NS
	Neutral	12.1 (40)	7.0 (14)		9.8 (13)		
	I disagree	8.2 (27)	13.1 (26)		10.6 (14)		
	Cannot decide	12.5 (41)	11.1 (22)		15.9 (21)		
Appropriate minimum age for recipient woman, M	<25 years	30.1 (82)	25.0 (49)	24.8	26.0 (33)	24.5	NS
	25–35 years	34.6 (94)	48.0 (94)		40.2 (51)		
	36–45 years	2.2 (6)	1.0 (2)		3.1 (4)		
	>45 years	0.0 (0)	0.0 (0)		0.0 (0)		
	Cannot decide	33.0 (90)	26.0 (51)		30.7 (39)		
Appropriate maximum age for recipient woman, M	<25 years	0.0 (0)	0.0 (0)	42.8	0.0 (0)	42.6	NS
	25–35 years	5.9 (19)	5.1 (10)		7.1 (9)		
	36–45 years	54.5 (176)	56.2 (110)		52.0 (66)		
	>45 years	10.2 (33)	9.7 (19)		11.0 (14)		
	Cannot decide	29.4 (95)	29.1 (57)		29.9 (38)		
Recipient male partner's age	Agree	62.4 (204)	64.6 (128)	4	58.9 (76)	4	NS
	Neutral	8.6 (28)	7.6 (15)		10.1 (13)		
	I disagree	14.0 (46)	15.7 (31)		11.6 (15)		
	Cannot decide	15.0 (49)	12.1 (24)		19.4 (25)		
Appropriate minimum age for recipient male partner, M	<25 years	23.7 (75)	22.9 (44)	25.1	25.0 (31)	24.5	NS
	25–35 years	44.0 (139)	46.4 (89)		40.3 (50)		
	36–45 years	0.9 (3)	1.0 (2)		0.8 (1)		
	>45 years	0.3 (1)	0.0 (0)		0.8 (1)		
	Cannot decide	31.0 (98)	29.7 (57)		33.1 (41)		
Appropriate maximum age for recipient male partner, M	<25 years	0.0 (0)	0.0 (0)	44.4	0.0 (0)	45.3	NS
	25–35 years	3.4 (11)	3.6 (7)		3.1 (4)		
	36–45 years	39.6 (127)	41.2 (80)		37.0 (47)		
	>45 years	20.9 (67)	18.6 (36)		24.4 (31)		
	Cannot decide	36.1 (116)	36.6 (71)		35.4 (45)		
Recipient's level of education	Agree	12.0 (40)	11.1 (22)	1	13.6 (18)	1	NS
	Neutral	12.0 (40)	14.1 (28)		9.1 (12)		
	I disagree	63.4 (210)	65.8 (131)		59.8 (79)		
	Cannot decide	12.4 (41)	9.0 (18)		17.4 (23)		
Recipient's economic situation	Agree	36.9 (122)	38.2 (76)	2	34.8 (46)	2	NS
	Neutral	10.0 (33)	8.5 (17)		12.1 (16)		
	I disagree	42.0 (139)	44.7 (89)		37.9 (50)		
	Cannot decide	11.2 (37)	8.5 (17)		15.2 (20)		
Recipient's sexual orientation	Agree	17.0 (56)	14.6 (29)	1	20.5 (27)	1	NS
	Neutral	11.8 (39)	10.1 (20)		14.4 (19)		
	I disagree	57.0 (188)	62.1 (123)		49.2 (65)		
	Cannot decide	14.2 (47)	13.1 (26)		15.9 (21)		

Table III. (*Continued*).

Statement		All (n = 338)	Women (n = 200)		Men (n = 138)		
Requirements should be imposed on	Answer	% (n)	% (n)	Md[a]/M[b]	% (n)	Md[a]/M[b]	P
Recipient woman'smedical history	Agree	38.7 (128)	37.7 (75)	2	40.2 (53)	3	NS
	Neutral	11.5 (38)	9.0 (18)		15.2 (20)		
	I disagree	33.2 (110)	37.7 (75)		26.5 (35)		
	Cannot decide	16.6 (55)	15.6 (31)		18.2 (24)		
Recipient's male partner's medical history	Agree	38.0 (126)	36.7 (73)	2	40.2 (53)	3	NS
	Neutral	11.2 (37)	9.5 (19)		13.6 (18)		
	I disagree	34.1 (113)	38.2 (76)		28.0 (37)		
	Cannot decide	16.6 (55)	15.6 (31)		18.2 (24)		
Recipient's tobacco use	Agree	39.3 (130)	42.7 (85)	3	34.1 (45)	3	NS
	Neutral	11.8 (39)	8.5 (17)		16.7 (22)		
	I disagree	37.8 (125)	39.2 (78)		35.6 (47)		
	Cannot decide	11.2 (37)	9.5 (19)		13.6 (18)		
Recipient's alcohol abuse	Agree	79.2 (262)	84.4 (168)	5	71.2 (94)	5	0.006
	Neutral	2.7 (9)	0.5 (1)		6.1 (8)		
	I disagree	9.7 (32)	8.5 (17)		11.4 (15)		
	Cannot decide	8.5 (28)	6.5 (13)		11.4 (15)		
Recipient's drug abuse	Agree	84.6 (280)	89.9 (179)	5	76.5 (101)	5	0.002
	Neutral	1.8 (6)	0.0 (0)		4.5 (6)		
	I disagree	5.7 (19)	4.0 (8)		8.3 (11)		
	Cannot decide	7.9 (26)	6.0 1 (2)		10.6 (14)		
Recipient's criminal background	Agree	65.9 (218)	71.4 (142)	4	57.6 (76)	4	0.008
	Neutral	6.0 (20)	5.5 (11)		6.8 (9)		
	I disagree	16.0 (53)	13.6 (27)		19.7 (26)		
	Cannot decide	12.1 (40)	9.5 (19)		15.9 (21)		

The figures are given in frequency (%) and number (n) of the total number of respondents to each question/statement, unless otherwise indicated. Differences between women and men are statistically evaluated according to Mann–Whitney U test. $P < 0.05$ is set as the threshold for significance.
[a]Median is calculated on original data (5-point scale) for each statement.
[b]Mean age calculated from original data for statements related to appropriate minimum/maximum age for recipient woman/man.
NS = not significant.

they became parents, and had their embryos discarded (19). Some of the female participants (18%) in the present study have chosen not to state a position, indicating that it is a difficult question. Interesting to note is that embryo donation to infertile couples, in the present study, was supported by a large majority of both women and men, while donation to research did not have the same support among women. This is despite the fact that embryo donation for research is permitted in Sweden but not donation of embryos for reproduction to infertile couples. It might be the case that more participants would support donation if the type of research that the embryos would be used for was more clearly defined (27).

The participants had, to a large degree, requirements regarding the age of the recipient of the embryo donation. The participants believed that the appropriate maximum age for the female recipient would be around 43 years. At such an advanced age it can be difficult for the woman to conceive, and thus the need for help with donated eggs or embryos is great. Approximately 10% of the respondents stated that an upper age limit should be above 45 years, an age when it is very difficult for women to become pregnant and an age at which assisted reproduction under current rules is not allowed in Sweden (12). The recommended mean minimum and maximum age for the male recipient was 25 and 45 years, respectively.

Table IV. Swedish women's and men's attitudes towards embryo donation and anonymity.

		All (n = 338)	Women (n = 200)		Men (n = 138)		
Statement	Answer	% (n)	% (n)	Md[a]	% (n)	Md[a]	P
The embryo donor should be anonymous to the child	Agree	39.0 (130)	36.5 (72)	2	42.6 (58)	2	NS
	Neutral	11.1 (37)	9.6 (19)		13.2 (18)		
	I disagree	27.3 (91)	23.9 (47)		20.6 (28)		
	Cannot decide	22.5 (75)	29.9 (59)		23.5 (32)		
The embryo donor should be anonymous to the recipients	Agree	46.1 (154)	44.4 (88)	3	48.5 (66)	2	NS
	Neutral	9.6 (32)	8.1 (16)		11.8 (16)		
	I disagree	18.3 (61)	21.7 (43)		13.2 (18)		
	Cannot decide	26.0 (87)	25.8 (51)		26.5 (36)		
The recipients should be anonymous to the embryo donor	Agree	47.9 (160)	49.0 (97)	3	46.3 (63)	2	NS
	Neutral	11.7 (39)	9.1 (18)		15.4 (21)		
	I disagree	15.0 (50)	16.2 (32)		13.2 (18)		
	Cannot decide	25.4 (85)	25.8 (51)		25.0 (34)		

The figures are given in frequency (%) and number (n) of the total number of respondents to each question/statement, unless otherwise indicated. Differences between women and men are statistically evaluated according to Mann–Whitney U test. $P < 0.05$ is set as the threshold for significance.
[a]Median is calculated on original data (5-point scale) for each statement.
NS = not significant.

One-quarter of men responded that the male recipient should have an upper age limit of 45 years. A common maximum age for men to receive state-funded IVF treatment in Sweden is, however, 55 years. The recipient's educational level was generally not considered so important. It is interesting to note that a majority of the participants (56%) disagreed on the statement that you should be able to have requirements on the recipient's sexual orientation. This is in agreement with the Swedish regulations regarding sperm donation, allowing treatment also to lesbian couples.

As expected, the vast majority of participants thought that requirements should be imposed on the recipient's alcohol and drug addiction. Women disagreed, to a higher degree than men, with alcohol abuse among couples receiving embryo donation. A majority of respondents believed that demands should be imposed on the recipient's criminal background, and more women than men thought that this was important.

A limited proportion (38%) of participants in the study was of the opinion that the embryo donor should remain anonymous to the children. A larger proportion (45%) thought that the donor should be anonymous to the recipient, and 47% thought that the recipient should be anonymous to the donor. A British study showed that nearly half of the mothers of children born after embryo donation were not going to tell their children about this (28). Many studies suggest that parents of children being conceived through various types of donations would rather not want that the child knew about the donation. Despite this, Sweden has chosen to protect the rights of the children and their statutory right to know who their genetic parents are. In a previous study of Swedish public attitudes to egg donation it was shown that a large majority felt that children should know their genetic origin (20). The view that the embryo donor should remain anonymous to the child is in conflict with the Swedish legislation regarding gamete donation, where children born after gamete donation are entitled to receive identifying information about the donor, when the child has reached mature age (12). In Sweden, IVF staff, psychologists, and family therapists recommend that children should know their origin (20). The question regarding children's knowledge of the donor has been studied more in terms of gamete donation than embryo donation (29). However, studies of potential recipients of donated embryos emphasize the importance of openness and of the possibility to be able to access information regarding the child's genetic heritage (5). Embryo donation is more complicated than gamete donation, since it involves the full genetic material of the donating couple and might lead to two genetic full siblings of the same age living in the same city without knowing each other. There is a risk that the physical

similarities are commented on, and it would be traumatic for the children if they formed a relationship. The fact that the child is conceived by embryo donation can be revealed by chance, which could also be a traumatic experience for the child. Openness regarding the donation can prevent this. Embryo donation from one couple needs to be limited maybe to one recipient couple (30). Potential embryo donors must be offered counselling regarding the future use of their embryos. They need to be certain that they do not want to use the embryos for their own reproduction, and agree with the fact that other couples might conceive and have children as a result of their embryo donation (9). The well-being of the existing and coming children is of utmost importance and needs to be guaranteed (30). Counselling for donors and recipients can assist them in making the right decisions about donating or receiving an embryo and will also make them more positive towards disclosure regarding the donation (31). If embryo donation for reproduction were to be allowed in Sweden, rules and regulations need to be developed for treatment strategies and for counselling of the donor and recipient couples. Permitting embryo donation in Sweden would be beneficial for some infertile patients who under the current legislation have to go abroad for treatment.

The relatively low percentage of responses is a limitation to the study that may make it difficult to draw definitive conclusions from the material. There is, however, often a low response rate reported in studies that involve attitudes to embryo donation. Previously conducted studies, that were completely anonymous, reported response rates ranging between 29% and 45% (13). To analyse the effect of the drop-outs on the validity of the study the respondents were compared to the studied population. For the 40% of women who responded to the questionnaire the mean age was 32.5 years, which was equal to the mean age of the women who were sent a questionnaire, indicating that the women responding could accurately represent the attitudes of the population. The fact that only 26% of men returned the questionnaire makes the attitudes of men uncertain. Thirty-seven per cent of the responding women had experienced difficulties in becoming pregnant, and 55% had children of their own. These numbers differ from the 10%–15% prevalence of infertility in the Swedish population (32). There might be a selection of respondents, interested in the issues affecting assisted reproduction and embryo donation, who were more likely to answer the questionnaire. Altogether 4.7% of the women and 3.3% of the men had had children through assisted reproduction, which is close to the 3.1% of children born after IVF treatment in Sweden (3). A higher proportion of the participating women had university education compared to the male respondents, which is in agreement with the respective levels of education seen in the Swedish population (33).

In conclusion, the results from the study indicate that a majority of the Swedish population in reproductive age are in favour of donation of embryos, both for reproduction to infertile couples and for research. If embryo donation is to be allowed in Sweden, strategies for treatment and counselling need to be developed.

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References

1. Boivin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. Hum Reprod. 2007;22:1506–12.
2. Bhattacharya S. Effective use of assisted reproduction. Hum Fertil (Camb). 2003;6:S60–2.
3. Treatment outcome Sweden 2009 [Internet]. UCR, Uppsala university; Sweden: 2009. Accessed from: http://www.ucr.uu.se/qivf/index.php/behandlingsresultat [last accessed 19 Mar 2012].
4. Klock SC. Embryo disposition: the forgotten 'child' of in vitro fertilization. Int J Fertil Womens Med. 2004;49:19–23.
5. Goedeke S, Payne D. Embryo donation in New Zealand: a pilot study. Hum Reprod. 2009;24:1939–45.
6. Keenan JA, Gissler M, Finger R. Assisted reproduction using donated embryos: outcomes from surveillance systems in six countries. Hum Reprod. 2012;27:747–52.
7. Lee J, Yap C. Embryo donation: a review. Acta Obstet Gynecol Scand. 2003;82:991–6.
8. Robertson JA. Ethical and legal issues in human embryo donation. Fertil Steril. 1995;64:885–94.
9. Boivin J, Appleton TC, Baetens P, Baron J, Bitzer J, Corrigan E, et al. Guidelines for counselling in infertility: outline version. Hum Reprod. 2001;16:1301–4.
10. Widdows H, MacCallum F. Disparities in parenting criteria: an exploration of the issues, focusing on adoption and embryo donation. J Med Ethics. 2002;28:139–42.

11. Fuscaldo G, Savulescu J. Spare embryos: 3000 reasons to rethink the significance of genetic relatedness. Reprod Biomed Online. 2005;10:164–8.
12. Riksdag S. Act (2006:351) on genetic integrity etc. In Social-departementet, editor. SverigesRiksdag. 2006.
13. Hammarberg K, Tinney L. Deciding the fate of supernumerary frozen embryos: a survey of couples' decisions and the factors influencing their choice. Fertil Steril. 2006; 86:86–91.
14. Provoost V, Pennings G, De Sutter P, Gerris J, Van de Velde A, De Lissnyder E, et al. Infertility patients' beliefs about their embryos and their disposition preferences. Hum Reprod. 2009;24:896–905.
15. Bjuresten K, Hovatta O. Donation of embryos for stem cell research–how many couples consent? Hum Reprod. 2003;18: 1353–5.
16. Provoost V, Pennings G, De Sutter P, Gerris J, Van de Velde A, Dhont M. To continue or discontinue storage of cryopreserved embryos? Patients' decisions in view of their child wish. Hum Reprod. 2011;26:861–72.
17. Bangsboll S, Pinborg A, Yding Andersen C, Nyboe Andersen A. Patients' attitudes towards donation of surplus cryopreserved embryos for treatment or research. Hum Reprod. 2004;19:2415–19.
18. McMahon CA, Saunders DM. Attitudes of couples with stored frozen embryos toward conditional embryo donation. Fertil Steril. 2009;91:140–7.
19. deLacey S. Parent identity and 'virtual' children: why patients discard rather than donate unused embryos. Hum Reprod. 2005;20:1661–9.
20. Svanberg AS, Lampic C, Bergh T, Lundkvist O. Public opinion regarding oocyte donation in Sweden. Hum Reprod. 2003;18:1107–14.
21. Soderstrom-Anttila V, Foudila T, Ripatti UR, Siegberg R. Embryo donation: outcome and attitudes among embryo donors and recipients. Hum Reprod. 2001;16:1120–8.
22. Likert R. A technique for the measurement of attitudes. New York: 1932.
23. Krones T, Schluter E, Neuwohner E, El Ansari S, Wissner T, Richter G. What is the preimplantation embryo? Soc Sci Med. 2006;63:1–20.
24. McMahon CA, Gibson FL, Leslie GI, Saunders DM, Porter KA, Tennant CC. Embryo donation for medical research: attitudes and concerns of potential donors. Hum Reprod. 2003;18:871–7.
25. Provoost V, Pennings G, De Sutter P, Dhont M. The frozen embryo and its nonresponding parents. Fertil Steril. 2011;95: 1980–4, 1984e1.
26. Cattoli M, Borini A, Bonu MA. Fate of stored embryos: our 10 years experience. Eur J Obstetr Gynecol Reprod Biol. 2004;115:S16–18.
27. Provoost V, Pennings G, De Sutter P, Gerris J, Van de Velde A, Dhont M. Reflections by patients who undergo IVF on the use of their supernumerary embryos for science. Reprod Biomed Online. 2010;20:880–91.
28. MacCallum F, Keeley S. Embryo donation families: a follow-up in middle childhood. J Fam Psychol. 2008;22:799–808.
29. Baetens P, Devroey P, Camus M, Van Steirteghem AC, Ponjaert-Kristoffersen I. Counselling couples and donors for oocyte donation: the decision to use either known or anonymous oocytes. Hum Reprod. 2000;15:476–84.
30. Goedeke S, Payne D. A qualitative study of New Zealand fertility counsellors' roles and practices regarding embryo donation. Hum Reprod. 2011;25:2821–8.
31. Hammarberg K, Carmichael M, Tinney L, Mulder A. Gamete donors' and recipients' evaluation of donor counselling: a prospective longitudinal cohort study. Aust NZ J Obstet Gynaecol. 2008;48:601–6.
32. Persson L. Nu minskar barnlösheten. In Statistics Sweden, editor. Swedish Statistics. 2012. Accessed from: http://www.scb.se/Pages/Article____331986.aspx [last accessed 24 June 2012].
33. Sweden S. Population 16–74 years of age by highest level of education, age and sex. Year 1985–2011. In Statistics Sweden, editor. Statistics Sweden. 2012. Accessed from: http://www.scb.se/default____2154.aspx

Supplementary material available online

Supplement A (letter)
Supplement B (questionnaire)
Supplement C (questionnaire)