

Sex preference and interest in preconception sex selection: a survey among pregnant women in the north of Jordan

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BACKGROUND: Preconception sex selection for non-medical reasons is a controversial issue in bioethics. Little research has described preferences for preconception sex selection among Arab populations. This study describes the sex preference and interest in employing sex selection techniques among pregnant women in northern Jordan.

METHODS: A self-reported questionnaire was administered to 600 pregnant women in Irbid, Jordan. χ^2 test and binary logistic regression were used to examine the factors associated with interest in preconception sex selection.

RESULTS: In general, the interest in using sex selection was low. Women who preferred boys were more likely to be interested in sex selection, if paid for by the couple [odds ratio (OR) = 4.40, 95% confidence interval (CI): 1.75–11.11] or by health insurance (OR = 3.42, 95% CI: 1.94–6.06), or, if feasible, administered through oral medication (OR = 8.84, 95% CI: 5.05–15.63). Women with lower education were more likely to be interested in sex selection, if paid by health insurance (OR = 1.96, 95% CI: 1.10–3.45) and were more likely to believe that sex selection is legal (OR = 1.79, 95% CI: 1.06–2.86). Women who had no boys were more likely to be interested in sex selection, if paid by health insurance (OR = 1.94, 95% CI: 1.10–3.42) or, if feasible, through medication (OR = 3.03, 95% CI: 1.82–5.00).

CONCLUSIONS: The majority of participants were not in favor of using preconception sex selection. Those with a preference to have boys, with lower education, and those with an imbalanced family were more likely to be interested in using sex selection technology.

Key words: preconception sex selection / sperm sorting / sex preferences / sex ratio distortion / Jordan

Introduction

Preconception sex selection is currently used as a method of choosing the sex of future children (Serour, 2004). At present, it is possible to select the sex of a baby by two common methods. One method depends on separating the X and Y chromosome-bearing sperms using MicroSort™ sperm separation. The second common method uses preimplantation genetic diagnosis (PGD) (Serour, 2004), however strictly speaking this is not 'preconception' selection. Other traditional methods that are believed to contribute to sex selection include intercourse timing and position, vaginal douching and the use of ovulation induction medications or hormone measuring technologies (Savulescu, 1999).

Sex selection can be performed for medical reasons such as when the mother is a carrier of a sex-linked disease like hemophilia. Other reasons for sex selection are non-medical and usually reflect specific social reasons (Postnote, 2003; Serour, 2004). Many studies have shown that sex selection for social reasons is not considered to be ethically acceptable. These studies reported that sex selection may promote sexist attitudes and reinforce discrimination against women (Dahl, 2007). Others are concerned that social sex selection would lead to a considerable imbalance of the sexes in countries where a specific sex of the baby is preferred to the other. This is more apparent in countries with more preference for boys, such as India, China and Korea (Benagiano and Bianchi, 1999; Allahbadia, 2002; Mudur, 2002; Plafker, 2002; Balen and Inhorn, 2003; Dahl et al., 2003a).

The majority of sex selection surveys appear to have been carried out in the USA or Western Europe (Hall et al., 2006). In 2008, national demographic statistics in Jordan showed that the male to female ratio was 1.15 to 1 (Department of Statistics, 2008). There is little data about attitudes toward preconception sex selection among Jordanian Arabic women (Kilani and Haj Hassan, 2002). And to date, there is no Jordanian law that deals with legal and ethical aspects of sex selection. This study, conducted in the north of Jordan, describes the sex preferences of pregnant women and their interest in employing sex selection technology for non-medical reasons.

Materials and Methods

Design and sample

There were 600 pregnant women, aged 18–49 years, included in this study. We chose seven representative main maternal and child health centers in the north of Jordan. These centers serve populations with different levels of socio-economic status and education. Two centers are located in the main city of Irbid, and they are considered urban maternal and child health centers. The other five centers were chosen from 10 suburban maternal and child centers that serve the suburban population in the northern part of Jordan. Using systematic random sampling techniques, participants were selected from all pregnant women who were followed up in these maternal and child health centers in the period between 20th of July and 20th of September 2008.

A questionnaire, developed by Zubair et al. (2007) and consisting of 17 questions, was used in this study. The questionnaire was self-administered, and it included questions on demographic data, questions regarding attitude toward sex selection and questions regarding child sex preferences. Participants were asked if they could imagine selecting the sex of their children by using MicroSort TM. To assure informed decisions, participants were educated about the steps needed to use this technology. Participants were informed that couples seeking such technology should visit a center for reproductive medicine, provide a sperm sample for separation via flow cytometry, undergo an average of three to five cycles of intrauterine insemination and pay a fee of ~US\$2000 per attempt. To verify the true opinion of participants about sex selection they were asked about sex selection under two conditions: in the first condition, sex selection requires only one cycle of intrauterine insemination and is covered by their health insurance; and in the second condition, sex selection can be achieved by taking simple medication. Participants were also asked whether they believe that sex selection is legal. Data collection was done by five trained nursing students. Ethical approval for the study was obtained from the Ethical Research Committee at Jordan University of Science and Technology.

Data analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 15.0). Data were described using frequencies and percentages. For the purpose of univariate and multivariate analyses, those who had no interest in preconception sex selection and those who were undecided were pooled in one group. Interest in preconception sex selection according to socio-demographic and relevant characteristics was analyzed using χ^2 test. Binary logistic regression was used to determine the factors associated with interest in preconception sex selection and these were reported as appropriate for descriptive purposes. A *P*-value of <0.05 was considered statistically significant.

Table I Socio-demographic and relevant characteristics of women

Variable	n (%)
Age (years)	
18–25	211 (35.0)
26–30	160 (27.0)
31–35	114 (19.0)
36–40	74 (12.0)
>40	41 (7.0)
Education	
Primary school	52 (8.7)
Secondary school	65 (10.8)
High school	196 (32.7)
University	287 (47.8)
Number of children	
0	100 (16.7)
≥ 1	500 (83.3)
Number of males	
0	155 (26)
≥ 1	445 (74)
Number of females	
0	172 (29)
≥ 1	428 (72)
Pregnancy	
Planned	347 (57.8)
Unplanned	253 (42.2)
Knowledge of fetal sex	
Yes	331 (55.2)
No	269 (44.8)
Interest in sex determination	
Yes	201 (74.7)
No	68 (25.3)

Results

Participants' characteristics

Table I shows the socio-demographic and relevant characteristics of participants.

Table II shows the sex preferences and ideal number of children to have as believed by participants. Of all participants, 309 (51.5%) reported that they prefer to have equal number of boys and girls, 158 (26.3%) reported that they prefer to have more boys than girls, whereas only 13 (2.2%) reported that they prefer to have more girls than boys. Of 269 women who did not know the sex of their yet unborn child, 121 (45.0%) reported that they prefer to have a boy, 47 (17.5%) reported that they prefer to have a girl and the remaining 101 (37.5%) women had no preference. Of the 100 women who had no children, 39% preferred their first child to be a boy, 27% preferred their first child to be a girl and 34% had no preference. About half of the women (51.8%) considered four children to be an ideal number.

Table II Sex preference and ideal number of children

Variable	n (%)
Sex preference for fetus (n = 269)	
Boy	121 (45.0)
Girl	47 (17.5)
No preference	101 (37.5)
Preference for first-born child (n = 100)	
Boy	39 (39)
Girl	27 (27)
No preference	34 (34)
Sex preferences (n = 600)	
Only boys	39 (6.5)
Only girls	0 (0.0)
More boys than girls	158 (26.3)
More girls than boys	13 (2.2)
An equal number of boys and girls	309 (51.5)
No preference	81 (13.5)
Ideal number of children (n = 600)	
1	2 (0.3)
2	59 (9.8)
3	28 (4.7)
4	311 (51.8)
5	64 (10.7)
6	98 (16.3)
7	7 (1.2)
8	10 (1.7)
9	5 (0.8)
10	9 (1.5)
12	5 (0.8)
15	2 (0.3)

Preconception sex selection

Only 21 (3.5%) women reported that they would imagine using sex selection through sperm sorting. This number increased to 57 (9.5%) when we ask them to imagine that sex selection required only one cycle of intrauterine insemination covered by health insurance. Furthermore, this number rose to 77 (12.8%) if sex selection could be done by taking simple medication. Only 81 (13.5%) believed that sex selection should be legally acceptable (Table III).

Table IV describes the attitudes of participants toward sex selection according to socio-demographic and relevant characteristics. In the multivariate analysis, compared with women who preferred girls, women who preferred boys were more likely to be interested in sex selection if paid by couple [odds ratio (OR) = 4.40, 95% confidence interval (CI): 1.75–11.11, $P = 0.002$], if paid by health insurance (OR = 3.42, 95% CI: 1.94–6.06, $P = .001$) or if it was feasible through medication (OR = 8.84, 95% CI: 5.05–15.63, $P = .001$). Compared with women with higher education, women with high school education or less were more likely (OR = 1.96, 95% CI: 1.10–3.45, $P = 0.023$) to be interested in sex selection if paid by health insurance and were more to believe that sex selection is legal

Table III Demand for sex selection among pregnant women in Jordan

Interest in sex selection	n (%)
Interest in sex selection (if paid by couple)	
Yes	21 (3.5)
No	538 (89.7)
Undecided	41 (6.8)
Interest in sex selection (if paid by health insurance)	
Yes	57 (9.5)
No	493 (82.2)
Undecided	50 (8.3)
Interest in sex selection (if feasible through medication)	
Yes	77 (12.8)
No	478 (79.7)
Undecided	45 (7.5)
Moral attitude toward sex selection	
Should be legal	81 (13.5)
Should be illegal	458 (76.3)
Undecided	61 (10.2)

(OR = 1.79, 95% CI: 1.06–2.86, $P = 0.01$). Women who had no boys were more likely to be interested in sex selection if paid by health insurance (OR = 1.94, 95% CI: 1.10–3.42, $P = 0.022$) or if feasible through medication (OR = 3.03, 95% CI: 1.82–5.00, $P = 0.001$). Compared with women who had children, women who had no children were more likely to report that they were in favor of making social preconception sex selection legal (OR = 2.06, 95% CI: 1.16–3.66, $P = 0.01$). Women who think that five or more children is an ideal number were more likely to report they were in favor of making social preconception sex selection legal (OR = 2.11, 95% CI: 1.30–3.43, $P = 0.002$), compared with women who think that four or fewer children is an ideal number.

Discussion

The findings of this study showed that pregnant women receiving prenatal care in the north of Jordan generally do not accept the techniques that select the sex of their prospective children yet showed a preference to have more boys than girls. Although the preference for boys in Jordan had been reported in previous studies (Al-Zoubi, 1995; Khalaf and Callister, 1997; Al-Qutob *et al.*, 2003; Al-Akour, 2008), none of these studies assessed the attitude of Jordanian women toward preconception sex selection for non-medical reasons.

There appears to be a consistent conservative opinion about sex selection for social reasons by the majority of participants, even if this technology is offered free of charge or even if it can be achieved through simple medication. Zubair *et al.* (2007) showed similar attitudes toward the use of sex selection technology among pregnant Pakistani women. Studies from USA (Rosenzweig and Adelman, 1976; Adelman and Rosenzweig, 1978; Singer 1991; Fugger *et al.*, 1998; Gleicher and Barad, 2007), the UK (Dahl *et al.*, 2003b) and Germany (Dahl *et al.*, 2003a, 2004) have indicated that most people

Table IV Sex selection according to socio-demographic and relevant characteristics

In favor of making social sex selection legal [n (%)]	Interest in sex selection (if feasible through medication) [n (%)]	Interest in sex selection (if paid by health insurance) [n (%)]	Interest in sex selection (if paid by couple) [n (%)]	Variable
14 (2.9)	64 (13.2)	45 (9.3)	14 (2.9)	Mothers age (years)
7 (6.1)	13 (11.3)	12 (10.4)	7 (6.1)	≤35
				>35
51 (16.3)*	45 (14.4)	38 (12.1)*	13 (4.2)	Education
30 (10.5)	32 (11.1)	19 (6.6)	8 (2.8)	High school or less
				More than high school
61 (12.2)*	55 (11.0)	47 (9.4)	19 (3.8)	Having children
20 (20)	22 (22.0)	10 (10)	2 (2.0)	Yes
				No
55 (12.4)	42 (9.4)**	35 (7.9)*	9 (2.0)	Number of boys
26 (16.8)	35 (22.6)	22 (14.2)	12 (7.7)	≥ 1
				0
54 (12.6)	14 (3.3)	36 (8.4)	14 (3.3)	Number of girls
27 (15.7)	7 (4.1)	21 (12.2)	7 (4.1)	≥ 1
				0
43 (10.8)**	50 (12.5)	33 (8.3)	17 (4.3)	Ideal number of children
38 (19.0)	27 (13.5)	24 (12.0)	4 (2.0)	1–4
				≥5
31 (15.7)	53 (26.9)**	33 (16.8)**	13 (6.6)**	Sex preference ^a
50 (12.4)	24 (6.0)	24 (6.0)	8 (2.0)	Boys
				Others

^aSex preference for boys includes participants who chose only boys or more boys than girls; 'others' include all other participants.

* $P < 0.05$.

** $P < 0.01$.

have a negative attitude toward sex selection. British citizens appeared to be more interested in selecting the sex of their future children than did their German counterparts. In a study including 17 European countries, Hank and Kohler (2000) found that a balanced family is preferred in Austria, Belgium, Italy, Spain and Switzerland.

The results of this study are consistent with previous studies from Jordan in showing a trend of preference for boys over girls (Al-Zoubi, 1995; Khalaf and Callister, 1997; Al-Qutob *et al.*, 2003; Al-Akour, 2008). Liu and Rose (1995) examined the attitude of couples of Indian, European, Chinese and Middle Eastern origin. The authors found that the non-European couples expressed a clear preference for boys. This finding of preference for boys may be explained by understanding the cultural backgrounds. In Jordan and other Arab communities, parents prefer boys because they believe that boys are the source of strength to the family. They also believe that boys will carry the family's name to future generations and they contribute more to family income (Al-Zoubi, 1995; Jacobsen *et al.*, 1999; Al-Akour, 2008). A large body of literature has also demonstrated a preference for male offspring in Western Europe, North America and Canada (McDougall *et al.*, 1999; Dahl *et al.*, 2003a; Van Balen, 2006). The preference for boys is stronger than the preference for girls when couples

are planning to have only one child. These preferences are even more pronounced in Asia. A strong boy preference is found in India, Pakistan, China and South Korea (Li *et al.*, 2000; Junhong, 2001; Chan *et al.*, 2006; George, 2006; Zubair *et al.*, 2007). Recently, however, a study from Australia indicated that more than 70% of 149 couples preferred their first-born child to be a girl (Connolly, 2008).

The results of this study suggested that those participants with higher education were less interested in using preconception sex techniques. In USA, Rosenzweig and Adelman (1976) and Adelman and Rosenzweig (1978) found that married couples with university educations showed little interest in controlling the sex of their first child yet a strong interest in influencing the sex of their second child. Education is generally associated with more awareness about the negative medical and social aspect of sex selection.

Another interesting finding in the present study is that women who think that five or more children is an ideal number were more likely to report that they were in favor of making social preconception sex selection legal. This finding probably reflects an opinion on family balance rather than opinion on sex selection.

The current study showed a significant association between a preference for boys and interest in using preconception sex technology.

Swetkis *et al.* (2002) found a correlation between overall preference for first-born males and interest in using preconception sex selection techniques. Our findings also showed that women with no boys were more likely to be interested in employing preconception sex selection, whereas women with no children were more interested in making it legal. In a short communication, Drs Kilani and Hassan (2002) described their experience in their private infertility center in Amman, Jordan regarding the use of PGD. They suggested Jordanian women coming to that infertility clinic are eager to use sex selection technology for first-born sons. They believed that a strong social need for a specific sex in the family, such as the presence of three or more children of the same sex, is an enough justification for performing sex selection.

In conclusion, this study demonstrates that the majority of participants are not in favor of using preconception sex selection. Women with preference for having boys, women with lower education and women with an imbalanced family were the ones who were more likely to be interested in preconception sex selection.

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