

Attitudes to prenatal and preimplantation diagnosis in Saudi parents at genetic risk

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Background Prenatal diagnosis (PND) is only available for severe abnormality in Saudi Arabia, and preimplantation genetic diagnosis (PGD) has been proposed as a valuable alternative. The acceptability of PGD is unexplored, and may ultimately determine the value of this technology in Saudi Arabia. This study reports attitudes towards PND and PGD of Saudi couples offered genetic counselling following the birth of a child with a single gene or chromosomal condition.

Methods Thirty couples attending the King Faisal Specialist Hospital and Research Centre in Riyadh were interviewed using a semi-structured questionnaire. One couple had previous experience of PND and none had experience of PGD or IVF.

Results Eight of the 30 couples (27%) would only accept PGD; four (13%) only PND; three (10%) either technology; the remainder would accept neither test, or were unsure. The main concerns of those who would accept neither technology were related to personal religious views. Specific concerns about PGD related to the IVF procedure, the risk of multiple pregnancies, the chance of mistakes and the chance of not getting pregnant. A high proportion of couples (six out of seven; 86%) who had a child with thalassaemia expressed interest in PGD, and all would be prepared to use technology to avoid having an affected child. Views were more mixed for the other conditions.

Conclusion PGD is acceptable to many couples and for some, it represents a valuable alternative to PND. However, parents' concerns are complex, and the acceptability of different reproductive technologies must be established on an individual basis. Copyright © 2006 John Wiley & Sons, Ltd.

KEY WORDS: prenatal diagnosis; preimplantation genetic diagnosis

INTRODUCTION

Prenatal diagnosis (PND) and termination of pregnancy spares a couple the birth of an affected child. However, termination of a wanted pregnancy is not without cost. Grief following a termination for foetal abnormality can be similar to that following neonatal death (Kenyon *et al.*, 1988). The specific genetic defect in families at risk of conceiving a child with a genetic disorder can increasingly be identified using biochemical, cytogenetic or DNA analysis (Lavery *et al.*, 2002). These families at high-risk might accept facing the risks associated with diagnostic procedures, such as chorionic villus sampling (CVS) or amniocentesis, and the levels of accuracy achievable with the tests available. They may also be prepared for the possibility that the foetus is genetically abnormal, and the difficult decision of whether to continue with an affected pregnancy. Since there are, as yet, no treatments available for most genetic diseases diagnosed *in utero*, high-risk families continuously face the prospect of repeated pregnancy termination (Soussis *et al.*, 1996).

As an alternative to conventional PND, preimplantation genetic diagnosis (PGD) has advantages. PGD is an early form of PND, in which embryos created *in vitro* are analysed for well defined genetic defects; only those free of the defects are placed into the womb (Sermon *et al.*, 2004). PGD was first reported in the late 1980s (Handyside *et al.*, 1992). Currently, the preimplantation technique is used mainly in two broad indication groups (Sermon *et al.*, 2004). The first group consists of individuals at high-risk of having a child with a genetic disease, for example, carriers of a monogenic disease or of chromosomal structural abnormalities such as translocations, who have repeatedly opted to terminate their pregnancies based on the results of prenatal tests, have concurrent infertility (as in congenital bilateral absence of the vas deferens), have had recurrent miscarriages (as is often the case in translocation carriers) or have religious or moral objections to abortion. The second group are those being treated with *in vitro* fertilisation (IVF), who might have a low genetic risk but whose embryos are screened for chromosome aneuploidies to enhance their chance of an ongoing pregnancy. PGD can increase the choices available to families at risk of having children with genetic abnormalities.

PGD is permissible in Islam provided the sperms and oocytes are from the husband and wife. Muslim jurists have agreed that preimplantation diagnosis of genetic disorders is permissible in Islam because IVF

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does not conflict with God's desire and might (El-Hashemite, 1995). Furthermore, this technique is not considered a modification of God's creation, because it is a kind of treatment. It has been argued that Muslims might reject PND and termination of pregnancy because of religious convictions (Zahed and Bou-Dames, 1997; Zahed *et al.*, 1999; Alkuraya and Kilani, 2001). Preimplantation diagnosis may be preferable to PND for Muslim parents, because it is done when embryos are only at the eight-cell stage and 'breathing the soul' has not occurred at this stage.

A number of studies have examined the acceptability of PGD. In a 2002 study (Lavery *et al.*) report the experiences and attitudes of patients who have undergone PGD, in a sample of 36 couples who had been treated at the Hammersmith Hospital, London and the Dexeus Institute, Barcelona. A total of 25% of couples were carriers for cystic fibrosis, 56% were carriers of X-linked disorders and 17% of couples had chromosomal disorders. Of the 26 couples who contemplated a further pregnancy, 20 (76%) would choose PGD again; four (16%) would opt for PND and two (8%) would have no test at all. Another study (Alkuraya and Kilani, 2001) examined potential patients' perspective of PGD. In a sample of 32 families who had previously experienced an affected pregnancy with haemoglobinopathies in Saudi Arabia, 62% would accept PGD. Few studies have looked at the attitudes of the general population, but Meister *et al.* (2005) report that over 60% of their large German sample would accept PGD for certain serious conditions.

It is more difficult to establish from the literature if parents would choose PGD in preference to PND, in the circumstances that both technologies were available to them. Pergament (1991) examined potential patients' perspective of PGD in the United States. In a sample of 58 women who had previously experienced an affected pregnancy, 55% expressed a possible preference for PGD in the future rather than PND. Miedzybrodzka *et al.* (1993) studied 474 women in Scotland, including some who were at risk of a single gene disorder, and found that most favoured PND rather than PGD (43 *versus* 38%). A preference for PND (67%) over PGD (30%) was also seen in a sample of 141 women in Hong Kong at risk of alpha or beta thalassaemia (Hui *et al.*, 2002).

In Snowdon and Green's (1997) study of 245 carriers of recessive disorders in the United Kingdom, only 11% of the sample thought that PGD was unacceptable, but of the reproductive technologies considered, PND was the first choice for 46% of the women and 50% of the men in the sample, compared to 28 and 23% of women and men, respectively, whose first choice was PGD. Parents' previous reproductive experiences were not related to their choices in this study. However, in a study of couples at risk of beta thalassaemia in Sicily, Chamayou *et al.* (1998) found that 34 out of 50 (68%) couples who had previously terminated an affected pregnancy considered PGD to be more acceptable than PND, whereas that preference was expressed by only a minority of couples without the termination experience.

The present study seeks to compare the possible acceptance of prenatal and PGD by parents at genetic risk in Saudi Arabia. It also seeks to explore some of the specific concerns these parents might have about the various procedures available and to see whether these concerns are related to religious views, previous experiences of reproduction or the disorder experienced by family members.

METHODOLOGY AND SAMPLE

This study was conducted with 30 sets of Saudi parents attending the King Faisal Specialist Hospital and Research Centre (KFSH&RC) in Riyadh, from June to September 1999, with one or more children affected by a single gene or chromosomal disorder. All couples whose attendance coincided with the researcher's timetable (9 A.M. to 5 P.M., covering virtually all scheduled appointments) were approached for interview, provided that there were records in their patient file confirming that they had received genetic counselling about their genetic risk. All the interviews with couples were conducted by the researcher, who filled in the responses in a pre-structured questionnaire especially designed for the study. This covered the following: socio-demographic data, degree of consanguinity, family and reproductive history, the awareness of prenatal diagnostic procedures, attitudes towards abortion and finally attitudes towards preimplantation diagnosis and factors influencing those attitudes. Detailed explanations about prenatal and preimplantation diagnosis were offered to all parents before the interview. As KFSH&RC provides medical care to referred families free of charge, the cost of tests was not mentioned. All the interviews were conducted in a private setting, and lasted for 45–60 min. The parents were not selected on the basis of age, education, social, or geographical background.

Data were analysed using 'JMP' version 3.2 (SAS Institute, Inc, NC, USA).

RESULTS

A total of 30 families were enrolled in the study. All participants were Muslims, and no one refused to participate in the study. Respondents represented a cross-section of Saudi families, with a wide range of age, education and background. The age of the fathers was 26–51 years (median 38.5 years), the age of the mothers was 21–40 years (median 30.5 years). Two-third of the fathers had completed secondary or university education (6 years or more of formal schooling); the remaining one-third had enrolled in Koranic School or primary school (completing 0–2 and 3–6 years, respectively). Two-third of the mothers had completed secondary or university education, the remaining one-third were housewives with no formal schooling. All the couples had at least one affected child. The diagnosis of the child(ren) was cystic fibrosis in 11 (36.7%) of the families, thalassaemia in 7 (23%) of the families,

Haemophilia in 4 (13%) of the families, chromosome translocation in 3 (10%) of the families, sickle cell anaemia in 3 (10%) of the families and Sakati-Nyhan Syndrome in 2 (6.3%) of the families. Spouses were closely related as first- or second-cousin marriages in 74% of cases ($n = 22$), reflecting a high-level of consanguinity in Saudi Arabia.

In total, 7 (23%) of the 30 couples said that they recalled receiving counselling about prenatal tests at their genetic counselling session. Twenty-three of the couples (76.7%) would not terminate an abnormal pregnancy, because of their belief in the 'hand of God', seven of the parents (23%) would accept PND and termination of pregnancy because they felt they 'could not cope with an abnormal child' (Table 1).

None of the couples had heard about PGD before the interview; however, 24 of the parents (80%) had heard about IVF. Thirteen of the couples (43.3%) would not accept PGD, 11 of the couples (37.7%) would accept PGD and two of the couples (6.7%) were not sure (Table 1). The couples were asked to give their perceptions of the advantages and disadvantages of PGD. The main reported advantage was the avoidance of termination of pregnancy. The reported disadvantages were as follows: four of the couples (13%) were concerned about the IVF procedure, six (20%) about the risk of multiple pregnancies, four of the couples (13%) about the chance of mistakes, five (17%) about the chance of not getting pregnant and 11 of the couples (37%) were concerned about religious views.

When individuals' attitudes to the two technologies were examined, important distinctions emerged: eight parents held favourable attitudes towards PGD only, and four parents held favourable attitudes towards PND only. Overall, half of the couples held favourable attitudes towards using technology to avoid having an affected child in the future.

As previously described, parents in the study carried a number of different genetic disorders. It was noticeable that willingness to avoid having an affected child in the future varied according to the condition that ran in the family (Table 2).

DISCUSSION

Twenty-three of the participants (77%) would not terminate a pregnancy affected by the condition that ran in their family, and gave their reason as their belief in the 'hand of God', as mentioned in the Qu'ran

Table 1—Attitudes towards prenatal and preimplantation genetic diagnosis

PND	PGD		Total
	Yes	No and not sure	
Yes	3	4	7
No	8	15	23
Total	11	19	30

Table 2—Parents' attitudes towards different conditions

Genetic condition	Number of parents	Willing to avoid an affected child	Not willing to avoid an affected child
Cystic fibrosis	11	3	8
Thalassaemia	7	7	0
Hemophilia	4	1	3
Chromosome translocation	3	2	1
Sickle cell anemia	3	1	2
Sakati-Nyhan syndrome	2	1	1

(LVII:22–23), 'Naught of disaster befalleth in the earth or in yourselves but it is in the Book before We bring it into being.' (Picktall, 1977). It also alleviated feelings of guilt (Qu'ran XXIV: 61: 'No blame is there upon the sick'), which afflicts parents in the West (McCrae and Cull, 1973; Antely *et al.*, 1973). Religious commitment was also found to be an important factor in rejecting PND and termination of pregnancy in previous studies that explored the attitudes of Muslim parents: Zahed *et al.* (1999) and Alkuraya and Kilani (2001) found that religious beliefs were the primary reason for refusing termination of the pregnancy.

None of the participants in the present study had heard about preimplantation diagnosis before the study; however, half had heard about IVF, and most information about these procedures had come from sources other than doctors. This is not unexpected, as preimplantation diagnosis was not available in Saudi at the time of this survey. None of the patients had undergone IVF themselves. Therefore, giving their opinion on the procedure was limited to a hypothetical understanding. As most of the participants had not discussed prenatal diagnostic tests and none of the participants had personal experience of the IVF procedure, the interviewer had to explain these procedures for the first time just prior to asking questions about attitudes, and participants may have given different responses if they had time for reflection.

It was also noticeable in the interviews that fathers, as the dominant partners in the relationship, tended to control the flow of conversation and this may have given a distorted picture of the feelings and the attitudes of the mothers.

In the current study, just over one-third (38%) of the couples expressed an interest in preimplantation diagnosis, which was somewhat lower than seen in previous studies in the western countries. However, in the general population sample of Meister *et al.* (2005) in Germany, acceptance rates varied considerably according to the condition being asked about, and a similar effect was observed in the present study of at risk families: only three out of 11 parents with a child with cystic fibrosis were interested in a test whereas, all the seven parents with a child with thalassaemia expressed an interest (Table 2). The decision to terminate a pregnancy because of fetal abnormality is already known to

reflect the perceived 'severity' of the condition diagnosed (Holmes-Siedle *et al.*, 1987; Verp *et al.*, 1988; Drugan *et al.*, 1990; Abramsky *et al.*, 2001), and acceptance of PGD is likely to be influenced by similar considerations. When comparing the overall PGD acceptance rate between studies, it is therefore necessary to consider the kinds of conditions included, and their proportions in the study sample. Acceptability rates are also likely to be different in samples selected because participants have already had, or have not had, previous experience of PGD.

A number of studies have investigated the nature of patients' concerns about preimplantation diagnosis procedures. In the American study, Pergament (1991) found that the risk of damaging the embryo and the costs of the procedure were the highest expressing concerns. Damage to the embryo was also of concern in a Hong Kong sample (Hui *et al.*, 2002). In a large Scottish study, Miedzybrodzka *et al.* (1993) found success rates of IVF and laboratory techniques were the highest; in Sicily (Chamayou *et al.*, 1998), it was success rates and the effects on women of IVF procedures that mattered the most. In a study by Snowdon and Green (1997) in the United Kingdom, women identified low success rates, long waiting lists and concerns about 'spare' embryos as the main disadvantages of PGD, while men were most concerned about the impact of the procedure on their partners, for example, pain and health risks. In the present study, religious views and multiple pregnancies were the most commonly mentioned concerns; religious views were not an expressed concern in the American, East Asian or European studies. It must also be acknowledged that PGD outcomes have improved since the first of these studies were conducted, and it may be that some of the reported parental concerns would be less apparent today.

It was observed that younger men in the present study expressed fewer concerns about PGD than older men. The age range amongst the wives was narrower, and therefore patterns of concern according to age were less easy to see. Similarly, participants (both men and women) with graduate and postgraduate education were observed to have fewer concerns about preimplantation diagnosis than those with less or no education. This may be due to better-educated parents having sound knowledge about new reproductive technology and also having a better understanding of the Islamic law, which allows these procedures in certain circumstances.

It has been assumed by policy makers that preimplantation diagnosis will be considered preferable to PND by Muslim parents, because it is done when embryos are only at the eight-cell stage and 'breathing the soul' has not occurred at this time. However, the findings of this study show that parents' concerns are more complex than this argument would suggest, and that the acceptability of different reproductive technologies must always be established on an individual basis: four out of the 19 couples interviewed who rejected or were uncertain about PGD would have accepted PND (Table 1). Further, the acceptability of either technology is likely

to be much higher for some conditions than others, suggesting that comparisons between studies must be made with care because of the differences in the samples studied, as well as the differences in cultural and health care settings.

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