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Termination Rates After Prenatal Diagnosis of Down Syndrome, Spina Bifida, Anencephaly, and Turner and Klinefelter Syndromes: A Systematic Literature Review

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The aims of this systematic literature review are to estimate termination rates after prenatal diagnosis of one of five conditions: Down syndrome, spina bifida, anencephaly, and Turner and Klinefelter syndromes, and to determine the extent to which rates vary across conditions and with year of publication. Papers were included if they reported (i) numbers of prenatally diagnosed conditions that were terminated, (ii) at least five cases diagnosed with one of the five specified conditions, and (iii) were published between 1980 and 1998. 20 papers were found which met the inclusion criteria. Termination rates varied across conditions. They were highest following a prenatal diagnosis of Down syndrome (92 per cent; CI: 91 per cent to 93 per cent) and lowest following diagnosis of Klinefelter syndrome (58 per cent; CI: 50 per cent to 66 per cent). Where comparisons could be made, termination rates were similar in the 1990s to those reported in the 1980s.

KEY WORDS: Down syndrome; Klinefelter syndrome; spina bifida; anencephaly; Turner syndrome; prenatal diagnosis; termination

INTRODUCTION

Many studies have been published documenting termination rates following the diagnosis of different types of fetal abnormalities, but these have most often been single studies from single countries, often from just one centre. While there do exist a number of population-based registers recording termination rates across geographical regions within a country (such as The Northern Region Congenital Malformations Register, in the UK) or across countries (such as EUROCAT) these data rarely are published, thus precluding unbiased ascertainment of all registers. There has, to our knowledge, been no attempt to summarize published findings systematically. Variability across conditions has been shown in published series from single centres (e.g. Pryde *et al*. (1993)). Such

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series, however, rarely provide sufficiently large sample sizes to enable reliable estimations of termination rates. Data pooled across studies could also be used to examine the extent to which termination rates for particular conditions may be changing over time.

The aims of this systematic literature review are to describe termination rates for five conditions: Down syndrome, spina bifida, anencephaly, and Turner and Klinefelter syndromes, and to determine the extent to which they vary across conditions and year of publication. The conditions were chosen to comprise the more common prenatally diagnosed conditions, and to reflect a range in terms of severity and type of disability, ranging from a lethal condition (anencephaly) to one compatible with an average life expectancy (Klinefelter syndrome). They also ranged in terms of public awareness of the condition, from conditions that much of the public are familiar with, such as Down syndrome, to ones that are largely unfamiliar, such as Klinefelter syndrome.

METHOD

Selection criteria

Papers were included in the systematic review if they met the following criteria:

(i) The number of women who had been diagnosed with a fetal abnormality and the number of these women who terminated their pregnancies were both reported.
(ii) The fetal abnormality was one of the following five: (i) Down syndrome; (ii) spina bifida, (iii) anencephaly; (iv) Turner syndrome or (v) Klinefelter syndrome.
(iii) A minimum of five cases involving a particular diagnosis were reported.

Search strategy

The following strategies were used:

(i) searching computerized databases of psycINFO, Medline and Bath Information and Data Services (BIDS) Embase using the following MeSH headings: abortion, prenatal diagnosis, chromosome abnormalities and neural tube defects;
(ii) references drawn from previously obtained papers;
(iii) consultation with health professionals in the UK, Europe and the US with known expertise in the area under review.

Data extraction

Data relating to termination rates were transferred onto a data extraction sheet. Agreement concerning termination rates was reached in all cases by two raters (CM and SH or TMM).

Statistical analyses

Chi-square tests were used to test for associations between termination rates and (i) condition diagnosed, and (ii) year of publication.

RESULTS

20 papers were identified which met the inclusion criteria. Details of each of these are presented in the Appendix. Altogether, these papers included 37 data sets from 11 different countries.

Condition

Termination rates varied across conditions (Chi square=269; df=4; $p<0.0001$). The largest proportion of pregnancies was terminated for Down syndrome; the smallest proportion of pregnancies was terminated for Klinefelter syndrome (Table 1).

Time

The number of papers published in each year was insufficient to allow analysis based upon annual rates. Rates in papers published in the 1980s were therefore compared with those published in the 1990s (Table 2). Statistical comparisons were not made for neural tube defects given that confidence intervals could not be calculated for this condition from papers published in the 1980s. For Down syndrome and Turner and Klinefelter syndromes there was no difference in the rates of termination in 1980 compared with series reported in the 1990s.

DISCUSSION

Termination rates varied across conditions. They were highest following a prenatal diagnosis of Down syndrome and lowest following diagnosis of Klinefelter syndrome. Where comparisons could be made, termination rates were similar in the 1990s compared with those reported in the 1980s.

Before discussing the possible explanations for these findings, it is necessary to consider what termination rates reflect. It seems likely that they reflect a myriad of factors which may differ for different conditions, including the way tests are initially offered and to whom. They will also reflect values of the women undergoing tests as well as those of the health professionals providing any counselling. Thus, high rates might reflect thorough counselling and systematic decision-making before a diagnostic test is undergone, with all those not inclined to terminate a pregnancy affected by the condition being tested for, declining

Table 1—Systematic literature review based on 20 studies of trisomy 21, spina bifida, anencephaly and sex chromosome anomalies

	Study number[a]	Year of study	Total numbers terminating	Country	Total percentage terminating	Confidence intervals
Trisomy 21	1	1998	4438/4824	UK	92%	92%–93%
	3	1992	6/6	New Zealand	100%	—
	10	1995	76/76	France	100%	—
	13	1990	5/5	UK (NI)	100%	—
	20	1992	4/5	Singapore	80%	62%–98%
	2	1985	42/43	US	98%	96%–100%
	19	1988	13/15	US	87%	78%–96%
	17	1982	14/14	UK	100%	—
	18	1990	20/28	France	71%	62%–80%
	5	1980	18/19	US	95%	90%–100%
			4636/5035		**92%**	**92%–93%**
Spina bifida	7	1991	73/119	UK	61%	57%–65%
	7	1991	1/5	Belgium	20%	2%–38%
	7	1991	38/60	France	63%	53%–73%
	7	1991	4/5	Italy	80%	62%–98%
	11	1987	6/6	US	100%	—
	15	1995	9/9	US	100%	—
			131/204		**64%**	**61%–67%**
Anencephaly	7	1991	163/208	UK	78%	75%–81%
	7	1991	15/16	Belgium	94%	88%–100%
	7	1991	4/5	Denmark	80%	62%–98%
	7	1991	9/16	Holland	56%	44%–68%
	7	1991	82/87	France	94%	92%–97%
	7	1991	15/15	Italy	100%	—
	15	1995	18/18	US	100%	—
			306/365		**84%**	**82%–86%**
Turner syndrome	4	1989	5/7	UK	71%	54%–88%
	9	1987	6/6	UK and Finland	100%	—
	16	1989	4/9	US	44%	27%–61%
	19	1988	35/47	US	74%	68%–80%
	8	1996	71/100	Denmark	71%	66%–76%
	14	1984	5/7	Denmark	71%	54%–88%
			126/176		**72%**	**69%–75%**
Klinefelter syndrome	2	1985	5/8	US	63%	46%–80%
	4	1989	4/11	UK	36%	22%–51%
	9	1987	10/15	UK and Finland	67%	55%–79%
	16	1989	34/75	US	45%	39%–51%
	19	1988	3/5	US	60%	38%–82%
	6	1982	3/5	Australia	60%	38%–82%
	12	1984	23/25	German	92%	87%–97%
	14	1984	9/12	Denmark	75%	63%–88%
			91/156		**58%**	**54%–62%**

[a]See Appendix.

testing. Alternatively, they may reflect directive counselling from health professionals putting pressure on women to undergo a termination. Clearly the results of this review cannot address this. It is, however, important to avoid evaluating rates that are high or low as good or bad.

The results of this review confirm results from smaller series in showing that termination rates vary across conditions (Pryde *et al.*, 1993; Drugan *et al.*, 1990; Hassed *et al.*, 1993). The high rates for Down syndrome reflect the negative attitudes towards giving birth to a child with serious cognitive impairments (Faden *et al.*, 1987; Drake *et al.*, 1996). The lower rates for Klinefelter syndrome reflect the greater tolerance for giving birth to a child with relatively minor physical and cognitive impairments and the fact that this is a chance finding. There is a greater range of severity amongst spina bifida and Turner syndrome than for Down and Klinefelter syndromes. As severity of these diagnoses was not reliably reported in published series, it is difficult to comment upon how terminations may reflect severity of the diagnosed condition. In addition

Table 2—Termination rates (95 per cent CI) following prenatal diagnosis by year of publication

	Down syndrome	Spina bifida	Anencephaly	Turner syndrome	Klinefelter syndrome
1980s (study numbers: 2, 4, 5, 6, 9, 11, 12, 14, 16, 17, 19)[a]					
Numbers diagnosed and terminated	87/91	9/9	0/0	55/76	91/156
Termination rates (95 per cent CI)	96% (92–100%)	100%	0%	72% (62–82%)	58% (50–66%)
1990s (study numbers: 1, 3, 7, 8, 10, 13, 15, 18, 20)[a]					
Numbers diagnosed and terminated	4549/4944	139/208	306/365	71/100	0/0
Termination rates (95 per cent CI)	92% (91–93%)	67% (61–73%)	84% (80–88%)	71% (62–80%)	0%

[a]See Appendix.

to severity, many other factors seem to affect decisions about whether or not to continue with a pregnancy affected by a fetal abnormality (Marteau and Mansfield, 1998). These include timing of diagnosis as well as the information parents receive about the diagnosed condition.

The data in this review suggest that termination rates have remained stable over the past 18 years. Fears have been expressed that increasingly widespread prenatal testing for fetal abnormalities may result in a lower tolerance of disability resulting in higher termination rates (Stacey, 1996). The results of this review suggest that, over a relatively short time period, these fears may be unfounded.

The strength of conclusions that can be made on the basis of this review are weakened by the sample sizes both in relation to the number of series that have been published and the relatively small numbers of cases reported in many of the papers. This makes it difficult to determine how much variability there is in termination rates within conditions across different centres within the same country and across countries. The strength of conclusion is further weakened by little or no information being provided on the representativeness of the women included in the series of prenatal diagnoses. While acknowledging these weaknesses, this review provides good estimates of termination rates following the diagnosis of more commonly diagnosed conditions. More precise estimates and fuller explanations for these will come from publication of existing registers containing large unselected series of prenatal diagnosis and outcomes.

APPENDIX. STUDIES IN THE SYSTEMATIC REVIEW

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