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Lifetime prevalence of infertility and infertility treatment in the UK: results from a population-based survey of reproduction

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BACKGROUND: The aim of this study was to investigate the prevalence of infertility and the use of infertility treatment among women aged 40–55 years. METHODS: Population-based postal questionnaire survey of UK women. Over 60 000 women randomly sampled from the 2001 electoral roll were sent a questionnaire, and those aged 55 years and under who had ever been pregnant or tried to achieve a pregnancy ($n = 6584$) were asked to provide a reproductive history. RESULTS: Overall, 2.4% of women aged 40–55 years had unresolved infertility with no pregnancies, and a further 1.9% had been pregnant but not achieved a live birth. The prevalence of unresolved fertility did not differ among birth cohorts. Sixteen percent of women reported ever consulting a doctor because of infertility and 8% reported receiving treatment to conceive. Across the whole sample, 4.2% of women reported that they had achieved at least one pregnancy as a result of treatment. Compared with earlier birth cohorts, women born later were more likely to report consultations (18% versus 13%) and treatment (9% versus 6%) for infertility, and pregnancies as a result of infertility treatment (6.7% versus 2.7%). Among those who reported medical consultations, women born more recently first consulted at a later age compared with those born earlier. CONCLUSIONS: Although both the number of women seeking medical care for infertility and the proportion reporting pregnancies as a result of infertility treatment has increased, there is no evidence to support an overall increase in unresolved infertility over the past 15 years. The vast majority of women aged 40–55 who reported difficulties conceiving did have a child, or children, at some point in their lives.

Keywords: infertility; unresolved infertility; infertility treatment; pregnancy; IVF

Introduction

Despite estimates that infertility affects 10–15% of couples in the UK (Evers, 2002), there is a noticeable lack of reliable data on the current lifetime prevalence of infertility and use of infertility treatment in the UK. Previous research has tended to focus on limited samples of those already known to have fertility problems and the few relevant population-based studies that have been carried out in the UK have used small samples or were conducted at least a decade ago (Hull *et al*., 1985; Templeton *et al*., 1990; Gunnell and Ewings, 1994). Current information on treatment at a population level is limited to Human Fertilization and Embryo Authority data on the number of cycles of IVF and ICSI performed in the UK (Nyboe Andersen *et al*., 2007). The proportion of women in the general UK population who have experienced IVF or ICSI, or indeed any type of infertility treatment, is currently unknown.

We report data collected from The National Women's Health Study, a large retrospective population-based study of the reproductive histories of UK women (Maconochie *et al*., 2004). In this paper, we focus on: (i) the prevalence of unresolved infertility, (ii) the prevalence of reported consultations and treatment for infertility and (iii) the proportion of women who have conceived at least one pregnancy as a result of infertility treatment.

Materials and Methods

Survey

Full details of the study design are reported elsewhere (Maconochie *et al*., 2004). In brief, this was a population-based postal survey of reproductive histories, designed to enable the construction of a retrospective cohort of reproductive outcome in adult women living in the UK. A random sample of 60 814 women estimated to be under 55 years old at the time of the survey was selected from electronic electoral registers for England, Wales, Scotland and Northern Ireland.

The postal survey had two stages. Stage one consisted of a single-page 'screening' questionnaire which asked for details of all pregnancies experienced by study participants, as well as periods of infertility

and infertility treatment. This form was sent to the whole sample in 2001. The response rate (adjusted for undelivered mail) was 46%, a total of 26 050 questionnaires being returned. Comparison of key reproductive indicators (stillbirth and multiple birth rates and maternal age at first birth) with UK population statistics showed that the data were similar to the general population, and thus that this was a representative population-based sample (Maconochie *et al*., 2004). The data presented in this paper are from Stage one of the survey only.

Statistical methods

We excluded women who had never been pregnant and had never tried to have a child. For the investigation of infertility in women, we restricted the sample to those women aged 40–55 at the time of the first survey. This is because women at this age are at the end (or nearing the end) of their reproductive years and it enabled us to examine complete, rather than partial, reproductive experience.

Data manipulation and analysis was performed using Stata 9 statistical software (Stata Corporation 2005: college Station, TX, USA). Confidence intervals (CIs) for prevalence estimates were calculated using the binomial distribution, and trends in prevalence by Chi-squared tests for linear trend. *P*-values quoted are two-sided and values <0.05 were taken to indicate statistical significance.

Ethical approval

The study received approval from the Trent Multi-Centre Research Ethics Committee and the Ethics Committee of the London School of Hygiene and Tropical Medicine.

Results

Prevalence of unresolved infertility, or childlessness

A total of 6584 women were aged 40–55 at the time of the survey and stated that they had either been pregnant or had tried to get pregnant. Of these, 159 (2.4%, 95% CI 2.0–2.8) had failed to achieve any pregnancy, despite trying. A further 120 women had only ever had pregnancies which ended in miscarriage or other adverse outcome. Thus, a total of 279 (4.2%, 95% CI 3.8–4.8) women failed to achieve a live birth despite trying. There was no evidence for a birth cohort effect in the prevalence of unresolved infertility where no pregnancy was achieved (primary unresolved infertility) (Table I, *P*-value for trend = 0.94) or in the prevalence of unresolved infertility where pregnancies had occurred but no live birth resulted (Table I, *P*-value for trend = 0.35).

Ever consulting a doctor for problems conceiving and ever having infertility treatment

About 16% ($n = 1045$) of women aged 40–55 reported that at some point in their life they had consulted a doctor about problems conceiving, and 8% ($n = 531$) had received fertility treatment (Fig. 1). There was a strong birth cohort effect in both measures: of women born 1945–1949, 13% had consulted a doctor and 6% had received fertility treatment, whereas 18% of women born 1960–1962 had consulted a doctor and 9% had received fertility treatment at some point in their lives (*P*-values for trend = 0.0005 and 0.0002, respectively).

The mean age at first consultation for all women consulting was 29.7 years, and for those who went on to receive treatment it was 29.8 years (Table II). There was a trend with birth cohort, with women born later consulting at older ages. For women born 1945–1949, the mean age at consultation was 28.4 years for all those who had consulted a doctor, and 29.1 years for those who had received treatment. This compared with 30.8 and 30.5 years, respectively, for women born 1960–1962.

Ever conceiving a pregnancy as a result of fertility treatment

Overall, 4.2% of women reported conceiving at least one pregnancy as a result of fertility treatment (Table III). There was

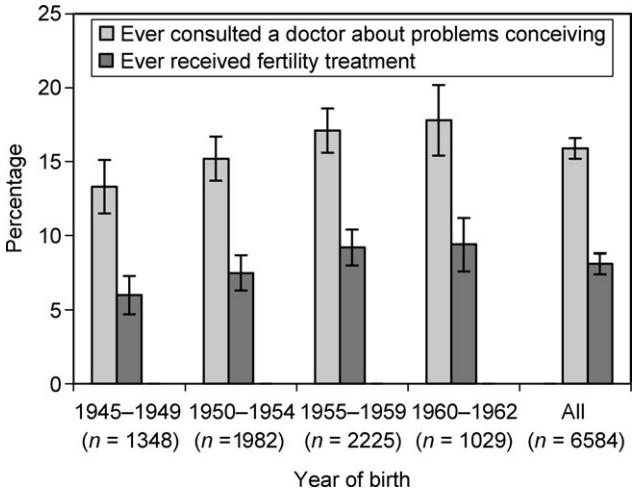

Figure 1: Proportion of women aged 40–55 years at survey who reported ever consulting a doctor about problems conceiving, and who reported ever receiving fertility treatment to help achieve a pregnancy, by year of birth

Table I. Prevalence of involuntary childlessness in women aged 40–55 years by birth cohort.

	Total	Never pregnant		Total	Never live birth	
	N	*n*	Prevalence % (95% CI)	*N*	*n*	Prevalence % (95% CI)
Year of birth						
1945–1949	1348	36	2.7 (1.8–3.5)	1328	55	4.1 (3.1–5.2)
1950–1954	1982	40	2.0 (1.4–2.6)	1952	72	3.7 (2.8–4.5)
1955–1959	2225	60	2.7 (2.0–3.4)	2203	110	4.6 (4.1–5.9)
1960–1962	1029	23	2.2 (1.3–3.1)	1006	42	4.2 (2.9–5.4)
All women	6584	159	2.4 (2.0–2.8)	6489[a,b]	279	4.3 (3.8–4.8)

[a]Excluding 38 women who said they had been pregnant but left outcome blank, and 1 women currently pregnant with her first child.
[b]Excluding 56 women who had only ever had terminations for non-medical reasons and never consulted a doctor about fertility problems.

strong evidence of a trend with birth cohort (*P*-value for test for trend $P < 0.001$), with the proportion of women reporting at least one pregnancy resulting from fertility treatment rising from 2.7% of women born 1945–1949 to 6.0% of women born 1960–1962.

Discussion

In this study of 6584 UK women aged ≤55 years who had ever tried to become pregnant, we found that 4 in 100 women reported that they were involuntarily childless at the end of their reproductive life. Approximately half of these women had been pregnant, but these pregnancies had not resulted in live births. Therefore, 2.4% of the overall sample experienced primary unresolved infertility. Our data provided no evidence for an increasing proportion of reported unresolved infertility with birth cohort. A study in Somerset conducted in the early 1990s reported 2.2% primary unresolved infertility (no pregnancies conceived) and 3.0% unresolved infertility with pregnancies but no live births (Gunnell and Ewings, 1994). Around the same time, 3.5% of a sample in Aberdeen aged over 45 years reported primary unresolved infertility (Templeton *et al*., 1991). A small study in Shropshire conducted later in the mid 1990s reported 2.4% for primary unresolved infertility and 2.8% for unresolved infertility with pregnancies but no live births (Buckett and Bentick, 1997). Similar prevalences have been found in other Western European countries. Unresolved infertility with no births was reported by 2.6% of Norwegian women aged 40–42 in the early 1990s (Sundby and Schei, 1996), and 4% of Danish women aged 40–45 in an earlier study carried out in 1979 (Rachootin and Olsen, 1982). Overall, available data provide little or no support for the hypothesis of an increasing trend in unresolved infertility over time.

Around 1 in 6 of our sample of women reported difficulties conceiving, and 1 in 12 had consulted a doctor for this reason, at some time in their lives. Our data support previous reports of a birth cohort effect in medical consultations for problems conceiving, with women in the later cohorts (i.e. the younger women in the study) being more likely to seek advice and treatment than those born earlier (Templeton *et al*., 1990). This is likely to be associated with greater acceptability of infertility and infertility treatment. Women born in the later cohorts consulted on average at a slightly later age, consistent with demographic patterns of later childbearing. A similar trend was observed in the proportion of women reporting that they had experienced at least one pregnancy as a result of infertility treatment. More than twice as many women born 1960–1962 compared with 1945–1949 reported at least one pregnancy conceived as a result of treatment. Whether these women would have contributed to a rise in prevalence of unresolved infertility if they had not had treatment to aid conception is a

Table II. Age at first consultation for women aged 40–55 years who had ever consulted a doctor about problems conceiving and those that had received treatment to help them conceive, by year of birth.

	Year of birth									
	1945–1949		1950–1954		1955–1959		1960–1962		All women[a]	
	All consulted *n* (%)	Received treatment *n* (%)	All consulted *n* (%)	Received treatment *n* (%)	All consulted *n* (%)	Received treatment *n* (%)	All consulted *n* (%)	Received treatment *n* (%)	All consulted *n* (%)	Received treatment *n* (%)
Total no. of women	140 (100)	76 (100)	223 (100)	140 (100)	290 (100)	187 (100)	137 (100)	83 (100)	790 (100)	486 (100)
Age (years)										
<30	96 (68.6)	50 (65.8)	139 (62.3)	85 (60.7)	157 (54.1)	104 (55.6)	67 (48.9)	43 (51.8)	459 (58.1)	282 (58.0)
30–34	24 (17.1)	12 (15.8)	45 (20.2)	27 (19.3)	67 (23.1)	39 (20.9)	34 (24.8)	18 (21.7)	170 (21.5)	96 (19.8)
35–39	14 (10.0)	9 (11.8)	27 (12.1)	22 (15.7)	48 (16.6)	34 (18.2)	29 (21.2)	21 (25.3)	118 (14.9)	86 (17.7)
≥40	6 (4.3)	5 (6.6)	12 (5.4)	6 (4.3)	18 (6.2)	10 (5.3)	7 (5.1)	1 (1.2)	43 (5.4)	22 (4.5)
Mean (SD)	28.4 (5.46)	29.1 (5.83)	29.1 (5.64)	29.3 (5.61)	30.1 (5.95)	30.1 (5.86)	30.8 (5.36)	30.5 (5.23)	29.7 (5.73)	29.8 (5.69)

[a]Two hundred and fifty-five women had missing age at consultation: 39 (22%), 79 (26%), 91 (23%) and 46 (25%) of those born in <1950, 1950–1954, 1955–1959 and 1960–1962, respectively.

Table III. Proportion of women aged 40–55 years reporting at least one pregnancy conceived as a result of infertility treatment, by year of birth.

	Total	Ever conceived a pregnancy as a result of fertility treatment		
	N	*n*	Prevalence %	(95% CI)
Year of birth				
1945–1949	1312	35	2.7	(1.8–3.5)
1950–1954	1941	75	3.9	(3.0–4.7)
1955–1959	2164	103	4.8	(3.9–5.6)
1960–1962	1006	60	6.0	(4.5–7.4)
All women[a,b]	6423	273	4.2	(3.7–4.7)

[a]All women aged 40–55 who reported at least one pregnancy.
[b]Two women (one born 1950–1954 and one born 1955–1959) did not provide information on whether reported pregnancies resulted from fertility treatment.

pertinent, but complex, question. The possible decline of human fecundity is a topical issue, and there has been an interesting recent debate in the literature concerning evidence, or the lack of it, from time-to-conception studies (Sallmen *et al*., 2005). It is plausible that factors such as exposure to environmental chemicals or simply delayed childbearing are contributing to a decline in fecundity, with the increased accessibility and success of infertility treatment masking this trend and leading to a stabilization in the proportion of women with unresolved infertility. The alternative explanation is that a growing proportion of women seeking infertility treatment would otherwise conceive spontaneously without the aid of treatment. The authors are currently investigating the impact of treatment on the prevalence of unresolved infertility using modelling techniques and will be reporting on this in due course.

Conclusions

The results of this study confirm that a significant proportion of women aged 40–55 have experienced problems conceiving at some point and have sought advice and treatment as a result. Our figures suggest that women from more recent birth cohorts are more likely to seek both advice and treatment for infertility compared with those from earlier birth cohorts, with this trend being accompanied by an increase in mean age at first consultation among more recent birth cohorts. Despite the apparent increase in treatment-seeking behaviour, there is no evidence for an increase in the proportion of women experiencing unresolved infertility with successive birth cohorts. These trends may result from declining fecundity alongside increased acceptability and success of treatment, or they may be explained by a growing proportion of women seeking treatment unnecessarily.

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