

The influence of demographic change and cumulative risk of pelvic inflammatory disease on the incidence of ectopic pregnancy

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SUMMARY

A retrospective study was carried out to determine the recent epidemiology of ectopic pregnancy in England between the biennial years 1988/9 and 1992/3. The number of ectopic pregnancy cases were combined with numbers of conceptions and the rates analysed for trend over time. The incidence of ectopic pregnancy rose significantly ($P = 0.05$) over this period. However, this could be entirely explained by increasing numbers of births in older women and a highly significant positive association was found between risk of ectopic pregnancy and maternal age ($P < 0.0001$). Over the study period the incidence of ectopic pregnancy in women aged 40 years or more was over 14 times that observed in those under 16 years of age. It is suggested that this reflects cumulative risk of acquiring pelvic inflammatory disease. The surveillance of ectopic pregnancy provides a useful indicator of the level of reproductive morbidity in women.

INTRODUCTION

A rise in the incidence of ectopic pregnancy has been observed in the USA and a number of European countries since the mid-1980s [1–4]. Ectopic pregnancy has been linked with pelvic inflammatory disease (PID) and tubal factor infertility [5], which accounts for a substantial proportion of all infertility, and is the leading cause of maternal death during the first trimester of pregnancy in industrialized countries [6]. In England and Wales, ectopic pregnancy accounted for 9.7% (22 of 226) of deaths resulting from complications of pregnancy, the puerperium and childbirth in the period 1988–93 [7]. The Hospital Episodes Statistics (HES) dataset is the only source of national surveillance data on ectopic pregnancy, this study examined trends in the incidence of ectopic pregnancy using 5 years of HES data (financial years

1988/9–1992/3). This is the first study to use these data and it provides a unique insight into the epidemiology of ectopic pregnancy in England.

METHODS

The HES dataset is based on a 25% extract sample of finished consultant episodes. The data were grossed for diagnostic coverage by the Department of Health to produce an estimated number of ectopic pregnancies. The first year of HES, 1987/8, was not included in the analysis because its coverage was known to be incomplete (L. Lancucki, personal communication). Data on hospital deaths and discharges for cases of ectopic pregnancy by six age groups (under 16, 16–19, 20–24, 25–34, 35–39 and 40 years and over) were obtained from HES for the financial years 1988/9–1992/3. Data on the number of conceptions (livebirths, stillbirths and abortions) in

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England for calendar years 1988–92 (the latest year for which information was available) were obtained from the Office of National Statistics (ONS). Rates of ectopic pregnancy (incidence) for each financial year were estimated as the number of ectopic pregnancies divided by the sum of the number of conceptions in the relevant calendar year and the number of ectopic pregnancies. χ^2 tests were used to compare the age distributions of women having ectopic pregnancies. The χ^2 test for trends in proportions was used to compare changes over time in the proportion of total conceptions in women aged 25 or over. Finally, the data were analysed using a logistic regression model in GLIM4 [8]. Year and age were included in the analysis as main effects. The data were analysed for each factor separately and then for both factors together. Where over-dispersion was found rescaling was used in subsequent analyses [8].

RESULTS

Both the number and incidence of ectopic pregnancies rose over the study period and with increasing age (Table 1). Women having ectopic pregnancies were younger in 1988/9 than in 1989/93 ($\chi^2 = 116.5$, D.F. = 5, $P < 0.0001$), 27.2% were aged under 25 years old in 1988/9 compared to 22.3% in 1992/3. The proportion of conceptions occurring in women aged 25 and over rose significantly from 56.2% in 1988/9 to 65.0% in 1992/3 (χ^2 for linear trend = 14387.0, D.F. = 1, $P < 0.0001$).

The number and incidence of ectopic pregnancy per 100 total conceptions and odds ratios (OR) from the logistic regression analysis, both unadjusted and adjusted for the other variables are shown in Table 2. The incidence in each age group is plotted by year in Figure 2 and the incidence in each year is plotted by age group in Figure 2.

When year and age were analysed as single variables there was a significant rise in incidence over time ($P = 0.0455$). The incidences in 1991/2 and 1992/3 were 8% higher than those observed in 1988/9. There were highly significant differences in incidence between age groups ($P < 0.0001$). Incidence rose steeply with age, a conception in a woman aged 40 or over was more than 12 times more likely to result in an ectopic pregnancy than a conception in a teenager. When year is adjusted for age, the increase in incidence of ectopic pregnancy over time was not significant ($P = 0.7919$).

Table 1. Estimated incidence of ectopic pregnancy by age and year

	1988/9	1989/90	1990/1	1991/2	1992/3
	Cases and conceptions (incidence/100 conceptions)				
Under 16	23/8246 (0.28)	10/7920 (0.13)	9/8118 (0.11)	13/7426 (0.18)	4/6790 (0.06)
16–19	410/106020 (0.39)	356/103212 (0.34)	345/100590 (0.34)	331/90062 (0.37)	336/74520 (0.45)
20–24	1804/245208 (0.74)	1559/240618 (0.65)	1678/234956 (0.71)	1589/224278 (0.71)	1476/191500 (0.77)
25–34	4791/399582 (1.20)	5247/419494 (1.25)	5508/433116 (1.27)	5445/436390 (1.25)	5268/431300 (1.22)
35–39	916/50732 (1.81)	1052/53104 (1.98)	1117/55034 (2.03)	1136/56572 (2.01)	1152/60600 (1.90)
40 and over	267/11234 (2.38)	229/11458 (2.00)	225/11650 (1.93)	261/11822 (2.21)	260/12000 (2.17)
Total	8211/821022 (1.00)	8453/835806 (1.01)	8882/843464 (1.05)	8775/826550 (1.06)	8596/776710 (1.10)

Table 2. Incidence of ectopic pregnancy (per 100 conceptions), unadjusted and adjusted ORs & 95% confidence limits

	Cases (n)	Conceptions (n)	Incidence*	Unadjusted OR (95% CL)	Adjusted OR (95% CL)
Year					
1988/9	8211	821022	1.00	1.00	1.00
1989/90	8453	835806	1.01	1.01 (0.96–1.07)	1.00 (0.95–1.05)
1990/1	8882	843464	1.05	1.05 (1.00–1.11)	1.03 (0.98–1.09)
1991/2	8775	826550	1.06	1.06 (1.01–1.12)	1.02 (0.97–1.08)
1992/3	8496	776710	1.08	1.08 (1.02–1.15)	1.01 (0.95–1.07)
Age group					
Under 16	61	38500	0.15	1.00	1.00
16–19	1778	474404	0.37	2.44 (1.47–4.09)	2.45 (1.47–4.09)
20–24	8106	1136560	0.71	4.67 (2.81–7.75)	4.68 (2.82–7.75)
25–34	26259	2119882	1.24	8.15 (4.92–13.50)	8.15 (4.92–13.49)
35–39	5373	276042	1.94	12.88 (7.76–21.38)	12.88 (7.76–21.37)
40 and over	1242	58164	2.13	14.15 (8.45–23.71)	14.15 (8.45–23.70)

* Incidence per 100 total conceptions.

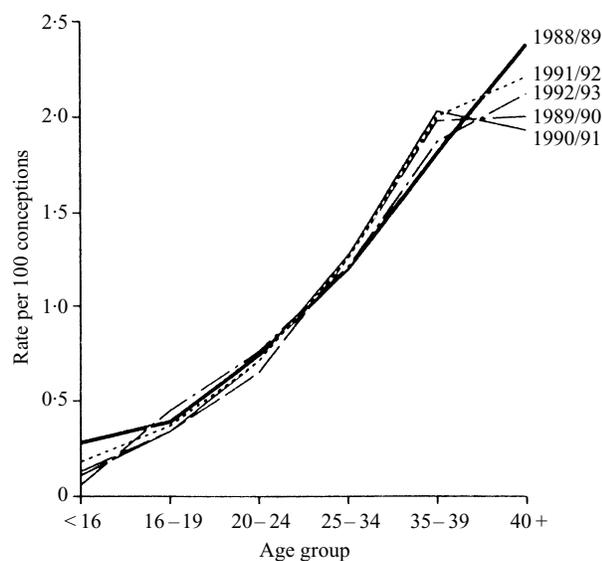


Fig. 1. Incidence of ectopic pregnancy by age group and year, 1988/9–1992/3.

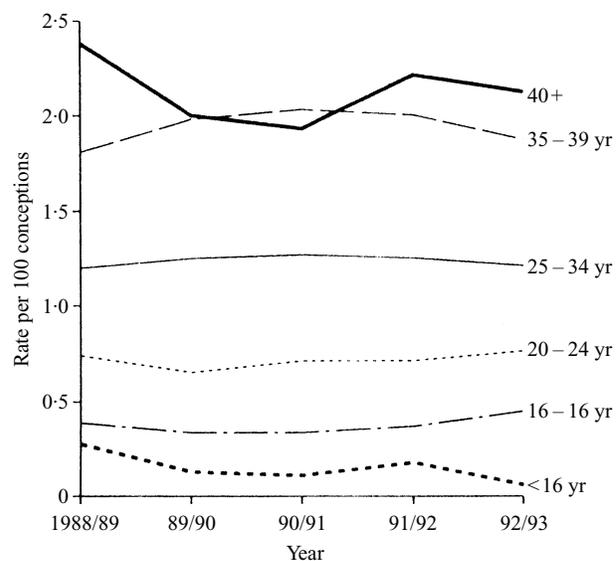


Fig. 2. Incidence of ectopic pregnancy by year and age group, 1988/9–1992/3.

DISCUSSION

As far as we are aware this is the first study to investigate national trends in ectopic pregnancy for England. Diagnostic coverage in the HES dataset is

known to have varied over time and increased from 70% in 1988/9 to 94% 1992/3 (L. Lancucki, personal communication), however, the consistent findings of this analysis over time indicate that this has not

compromised the interpretation of the dataset for this condition.

The incidence of ectopic pregnancy rose significantly ($P = 0.05$) over the short time period covered by this study. Although the information recorded in the HES dataset does not allow a comprehensive investigation of risk factors or potential confounding factors on the incidence of ectopic pregnancy, the risk of ectopic pregnancy increases steeply with age. The significant upward trend in ectopic pregnancy rates with time could thus be accounted for by increasing numbers of women becoming pregnant later in life. Between 1988 and 1993 fertility rose by 6% and 22% in the 30–34 and 35–39 age groups respectively. In contrast, fertility fell by 5%, 13% and 8% in the 20 or less, 20–24 and 25–29 age groups respectively [9]. This study indicates that an inevitable consequence of such secular trends is a rise in the incidence of ectopic pregnancy. The incidence of ectopic pregnancy rose in parallel with fertility rates (births per 1000 women) in older age groups, an observation that has also been made in Sweden [3, 10]. The most plausible explanation for the rise is an accumulating risk of acquiring damage to the upper reproductive tract, notably from sexually transmitted infections and pelvic inflammatory disease. A recent French study suggested that 43% of ectopic pregnancies are caused by *Chlamydia trachomatis* [11], a pathogen whose importance is increasingly recognized in the UK [12, 13].

This study has provided a limited insight into the epidemiology of ectopic pregnancy. Reproductive morbidity is of public health importance and the surveillance of PID, ectopic pregnancy and tubal factor infertility plays a central role in the assessment of STI intervention strategies as has been demonstrated by a recent case control study [14]. The surveillance of reproductive morbidity is notoriously problematic because of difficulties in case definition, ascertainment and reporting of PID and tubal factor infertility. In contrast, since most cases of ectopic pregnancy result in hospital treatment, ectopic pregnancy provides a useful indicator of reproductive morbidity amongst women. However, surveillance will need to be enhanced to allow monitoring of risk factor if the potential of this dataset is to be realised. This may be complicated by the increased management of cases in out-patient settings as has been the case in the USA [4].

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