Smoking cessation and associated factors during pregnancy

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(Cese del consumo de tabaco durante el embarazo y factores asociados)

Abstract

Objective: To examine smoking habits before and during pregnancy, as well as factors associated with smoking cessation, in three European settings.

Methods: Women seeking antenatal care in Ashford (UK), Minorca and Barcelona (Spain) were recruited to the Asthma Multicenter Infant Cohort Study (AMICS). Questionnaires inquiring into the smoking habits of each woman and her partner, demographic data, occupation, educational level, number of previous children, breast feeding, alcohol intake, and history of asthma and of other allergic diseases were completed during pregnancy and in the first year after delivery.

Results: A total of 1 572 pregnant women were included in the three cohorts. Smoking prior to pregnancy was more common in Barcelona (46.2%) than in Minorca (39.8%) or Ashford (31.6%). Cessation rates during pregnancy also differed: 18% of women in Ashford, 20.4% in Minorca and 31.9% in Barcelona were still smoking during the first trimester. In a multivariate regression model, the factors showing a significant (negative) association with smoking cessation during pregnancy were having older children, having a partner who smoked and starting smoking at a young age.

Conclusions: Baseline smoking habits and changes in smoking habits during pregnancy significantly differed between the three communities studied. Women pregnant with their first child, those who had started smoking at a later age and those whose partners were non-smokers were more likely to stop smoking when pregnant.

Key words: Smoking. Smoking cessation. Pregnancy.

Resumen

Objetivo: Describir el hábito tabáquico antes y durante el embarazo y los factores asociados con su cese con relación al embarazo en distintos entornos europeos.

Métodos: Se ha incluido en el estudio a las mujeres captadas durante el embarazo para participar en el estudio AMICS (Asthma Multicentre Infant Cohort Study) en Ashford (Reino Unido), Barcelona y Menorca (España). Se administró un cuestionario durante el embarazo y otro durante el primer año posparto, que incluía los siguientes aspectos: hábito tabáquico de la mujer y de su compañero, datos demográficos, ocupación, nivel de estudios, número de hijos previos, lactancia materna, consumo de alcohol e historia de asma y otras enfermedades alérgicas.

Resultados: Entre las 3 cohortes se incluyó a un total de 1.572 mujeres. Antes del embarazo, el porcentaje de mujeres fumadoras fue mayor en Barcelona (46,2%) que en Menorca (39,8%) o Ashford (31,6%). Las tasas de abandono del hábito tabáquico en relación con el embarazo también variaron en cada cohorte, de manera que durante el primer trimestre de embarazo continuaron fumando el 18% en Ashford, el 20,4% en Menorca y el 31,9% en Barcelona. En un modelo de regresión múltiple, tener hijos previos, que el compañero sea fumador y haber empezado a fumar más joven muestran una asociación (negativa) con la probabilidad de abandonar el tabaco en relación con el embarazo.

Conclusiones: El consumo de tabaco antes y durante el embarazo muestra importantes diferencias en las 3 comunidades estudiadas. Las mujeres en su primer embarazo, que empezaron a fumar más tardíamente y cuyo compañero no fuma son las que con mayor frecuencia abandonan el tabaco al quedarse embarazadas.

Palabras clave: Hábito tabáquico. Abandono del hábito tabáquico. Embarazo.

Introduction

Smoking during pregnancy has been related to a number of pregnancy outcomes and childhood events, including low birth weight[1], early wheezing[2] and diminished lung function[3,4]. Despite increasing evidence of its harmful effects it is not clear what impact this has had in changing the smoking habits of pregnant women in Europe.

The prevalence of pregnancy-related smoking has been studied in different settings and shows a wide range of values, summarised in table 1. Smoking habits prior to pregnancy at the end of the 1980's ranged from 26% in Italy[5] to 60% in a region of Spain[6]. The proportion of women quitting during pregnancy also varies widely: from 16% quitting in Norway[7] to 48% in Spain[6]. As a result, the proportion of women continuing to smoke once aware of their pregnancy was 14% in Italy[5] and 39% in Norway[7] with intermediate values in Canada[8], USA[9,10], Sweden[11], UK[12] and Spain[6].

Data published from the early 1990's in England[13] and Italy[14] reflect no major changes with respect to the previous decade, though a tendency to a higher proportion of smokers stopping during pregnancy may be observed. In Canada[8] the reduction observed between 1983 and 1992 is larger, mainly due to a 10% reduction in the prevalence of smoking prior to pregnancy. In Denmark, a reduction from 34% to 21% of pregnant smokers was observed between 1989 and 1996[15]. In Norway[7,16], an important reduction in women smoking prior to and during pregnancy was observed between 1986 and 1995. Data from Spain in 1992-93[17] and 1996[18] also show a reduction in smoking before pregnancy (table 1). It has to be considered, though, that the studies cited refer to specific areas, and usually do not represent any country as a whole. In any case, the comparison of data between different studies has to be taken with caution given different methodologies and criteria used.

Different surveys have identified factors associated with quitting during pregnancy[19]: lower educational level[5,8,9,12,20] as well as lower socio-economic status[8,12,21,22] have been associated with lower chances of quitting. Those women that smoked a smaller amount before pregnancy[6,9,22,23] and who had started smoking at an older age[24], have been shown to be more likely to give up smoking once pregnant. The smoking habit of the partner has appeared to be an important predictor of the likelihood of quitting during pregnancy[12,22,25,26]. Age and marital status have also been associated in some studies[8,12] but not in others[5,6]. Women in their first pregnancy have shown in several studies being more successful in quitting than multiparae women[22,23,27].

Smoking habits are continuously changing in the european context, the sense and magnitude of this changes depending on the baseline situation on each specific setting[28,29]. Smoking rates in females are growing in all countries, and specially in women on childbearing age. This highlights the importance of collecting up to date data on both smoking behaviour in relation to pregnancy and on potential determinants of quitting.

In this paper, we examine the smoking habits of three cohorts of pregnant women, one from the UK and two from Spain, and examine factors associated with smoking cessation in relation to pregnancy. We used data from the Asthma Multicentre Infant Cohort Study (AMICS), the main objective of which is to examine the separate effects of pre- and post-natal environmental exposures on the inception of early childhood atopy and asthma. The use of identical collection protocols in three different European settings, with sufficient variation in important characteristics, has the potential for powerful analyses of factors associated with quitting smoking.

Table 1. Smoking habits prior to and during pregnancy in different settings					
Author	Years covered	Country	Smokers prior to pregnancy (%)	Women quitting during pregnancy (%)	Smokers during pregnancy (%)
Bolumar[6]	1989	Spain	60.1	48.3	31.1
López[17]	1992-93	Spain	53.5	46.9	28.4
Castellanos[36]	1996	Spain	31	25.1	23.2
Bonati[5]	1989-90	Italy	25.8	39.3	19.4
Chatenoud[14]	1990-95	Italy	27.2	55.2	12.2
Haug[24]	1986-87	Norway	45.6	15.7	38.7
Eriksson[16]	1994-95	Norway	34	38.2	21
Stewart[8]	1983	Canada	37.4	23.9	28.5
	1992	Canada	26.4	29.2	18.7
Fingerhut[9]	1980-86	USA	32	39.3	19.4
Cnattingius[11]	1987	Sweden	33	22	25
Madeley[12]	1986	UK	38	20	31
Owen[13]	1992-97	England	37.5	28	27

Materials and methods

Women were recruited in three different European settings: Ashford, a provincial town in the UK (1995-1996), Barcelona, a large city (1996-1998), and Menorca, a Spanish Mediterranean island (1997-1998). Each cohort followed the process of recruitment and data collection protocol with minor adaptations to any local peculiarities of the health care process. The Ashford and Menorcan cohorts are population based and include over 90% of eligible mothers, while the Barcelona cohort recruited women attending a local authority hospital which provides care to its surrounding area as well as to municipality civil servants. No specific intervention was introduced in any of the participating centres in terms of counselling on smoking.

Smoking habits were collected using face to face interviews and telephone questionnaires. In Ashford, mothers were interviewed during the first and third trimesters of pregnancy, and around three months and one year of the baby's life. In Barcelona and Menorca, only two face to face interviews took place, one during pregnancy and another during the first three months of baby's life, and a telephone interview took place at around the year of life of the child. Questionnaires enquired into current smoking status and where appropriate the quantity and brand of cigarettes smoked each day, any changes related to pregnancy and the age of starting smoking. For those quitting during pregnancy and for ex-smokers prior to pregnancy, we included questions on starting and stopping ages. We also collected information on the smoking habits of partners and others in the household.

Other interview data collected include demographic data (age and ethnicity), occupation, educational level (in Ashford and Menorca), reproductive history (previous pregnancies, abortions and livebirths), breast feeding, alcohol consumption (units/day) and history of asthma and other allergic diseases. Social class was coded according to the Standard Occupational Classification of the U.K. Office of Population Censuses and Surveys[30].

Statistical analyses included descriptive univariate statistics for each of the three cohorts and a comparison between them using Fisher's test for categorical data and Anova for continuous variables. Factors associated with quitting smoking were analysed in the combined cohort using multiple logistic regression adjusting for centre. Variables entered into the model included: number of previous children, smoking habit of the partner, current age, age when first smoked, alcohol consumption, social class, breast feeding and history of asthma. Interactions between variables were also evaluated and included in the model when significant. The statistical analysis was performed using Stata software[31].

Results

A total of 1,603 pregnant women were included in the three cohorts, of which 1,572 completed the data collection protocol refered to smoking during pregnancy: 621 from Ashford, 475 from Menorca and 476 in Barcelona. Baseline characteristics are presented in table 2, showing differences in most of the parameters.

Smoking up to the point at which the woman became aware she was pregnant, was more common in Barcelona (46.2%), than in Menorca (39.8%) or Ashford (31.6%), this differences being statistically significant. The different rates of never-smokers between cohorts, however, did not reach statistical significance (p = 0.08), while the rates of ex-smokers did. Differences were also observed in the rates of smoking cessation during pregnancy, with a much lower proportion of women stopping in Barcelona. As a result of these variations, the proportion of women continuing to smoke once they were aware of pregnancy was similar in Ashford (18%) and Menorca (20.4%) but much higher in Barcelona (32.9%) (table 3). Most of those who stopped smoking did so during the first trimester and continued to abstain during the rest of the pregnancy, few relapsed during pregnancy (29 out of 245 who had earlier stopped smoking) or quit after the first trimester (31 out of 370 smoking during the first trimester).

In terms of the quantity of cigarettes smoked, most women who continued to smoke reduced their daily intake (table 3). On average, this reduction was between half and one third of the cigarettes smoked per day and was observed in each of the three cohorts. As for complete cessation, the reduction in the amount smoked took place early, with no further reduction later in pregnancy.

In both Barcelona and Menorca, more than 50% of the women's male partners were smokers prior to their partner's pregnancy; virtually none stopped during this pregnancy. In Ashford, 31.8% of men smoked before their partner's pregnancy and 11.1% quitted in relation to it; over 30% of those who continued to smoke declared a reduction in the amount smoked. This proportion was lower in Barcelona (9.9%) and Menorca (17.5%).

In a multivariate logistic model (table 4) older children, a partner who smokes and a young age when first smoked each showed significant, negative associations with the odds of quitting smoking after adjustment for centre. Social class did not show any effect in any community and in neither Ashford nor Menorca did the level of education show a significant relationship. The interaction between centre and alcohol consumption was statistically significant, alcohol modifying the chances of quitting smoking only in Menorca, where women who consumed any quantity of alcohol had a lower chance of quitting. The older the woman had started smoking, the higher the

Table 2. Baseline characteristics of the three cohorts of pregnant women

	Ashford (n = 621)	Menorca (n = 475)	Barcelona (n = 476)	p
Age (years), n (%)				
< 20	39 (6.3)	5 (1.1)	25 (5.3)	< 0.001
20-24	134 (21.6)	54 (11.4)	76 (16.0)	
25-29	264 (42.5)	196 (41.4)	160 (33.6)	
30-34	139 (22.4)	158 (33.4)	137 (28.8)	
> 34	45 (7.2)	60 (12.7)	78 (16.3)	
Age, mean (95% CI)	27.2 (26.8, 27.5)	29.4 (29.0, 29.8)	28.8 (28.3, 29.3)	< 0.001
Previous children, n (%)				
0	262 (42.2)	242 (51.0)	160 (44.8)	0.001
1	228 (36.7)	175 (36.8)	145 (40.6)	
≥ 2	131 (21.1)	58 (12.2)	52 (14.6)	
Social class, n (%)				
I Professional	38 (7.1)	35 (7.6)	25 (6.4)	< 0.001
II Managerial & Tech.	119 (22.4)	41 (8.9)	49 (12.5)	
IIIN Skilled (non manual)	73 (13.7)	87 (18.8)	85 (21.7)	
IIIM Skilled (manual)	183 (34.4)	242 (52.4)	157 (40.1)	
IV Partly skilled	91 (17.1)	54 (11.7)	65 (16.6)	
V Unskilled	28 (5.3)	3 (0.6)	11 (2.7)	
Alcohol consumers, n (%)	78 (12.6)	44 (9.3)	40 (8.5)	0.062
Partner smokes, n (%)	187 (30.3)	232 (49.3)	254 (55.8)	< 0.001
Child never breast milk, n (%)	370 (59.6)	86 (18.1)	58 (18.9)	< 0.001
History of asthma, n (%)	88 (14.2%)	34 (7.2%)	37 (7.8%)	< 0.001

Table 3. Smoking habits related to pregnancy

	Ashford (n = 621)	Menorca (n = 475)	Barcelona (n = 476)	p
Smoking habits prior to pregnancy				0.00
Never smokers	319 (51.4%)	212 (44.6%)	232 (48.7%)	0.08
Ex-smokers	105 (16.9%)	74 (15.6%)	25 (5.3%)	0.00
Current smokers	197 (31.7%)	189 (39.8%)	219 (46.0%)	0.00
Current smokers prior to pregnancy	(n = 197)	(n = 189)	(n = 219)	
Quit during 1st trimester of pregnancy	85 (43.2%)	92 (48.7%)	67 (30.6%)	0.00
Reduce amount smoked	89 (45.2%)	92 (48.7%)	135 (61.6%)	0.01
Smokers 1st trimester of pregnancy	112 (18%)	97 (20.4%)	152 (31.9%)	0.00
Cig/day prior to pregnancy (SD)	17.5 (6.7)	20.6 (8.0)	22.7 (10.3)	0.00
Cig/day during 1st trimester (SD)	8.8 (5.0)	6.6 (4.2)	9.3 (7.2)	0.00

SD: standard deviation.

chances were of quitting during pregnancy; this variable was equivalent to the combination of both current age and the number of years smoked, each of which was also independently related to smoking cessation.

Discussion

The three cohorts of women included in the present study show clear differences in smoking habits prior to and during pregnancy: the UK centre had the highest pro-portion of women who had never smoked. In terms of ex-smokers, that is women who had stopped before pregnancy, Barcelona was far behind the other two centres which themselves had similar rates. These last two centres also included much higher proportions of women who stopped smoking once aware of their pregnancy.

Smoking among partners was clearly less frequent in the UK than in Spain where the reduction in smoking prevalence among young males was still moderate when our data was collected[32]. In addition, UK men who smoked were more likely to report that they had stopped smoking, or reduced their consumption, once aware of their

Table 4. Factors associated to quitting smoking related to pregnancy*

	Odds ratio	95% confidence interval	p
Menorca center	1.76	1.11-2.75	0.040
Barcelona center	.42	.25-.71	0.004
One previous child	.63	.42-.94	0.018
Two previous children	.35	.19-.66	0.002
Partner smokes	.55	.37-.83	0.003
Alcohol consumption	1.92	.70-5.27	0.239
Alcohol* Barcelona	.36	.07-1.92	0.185
Alcohol* Menorca	.15	.04-.69	0.014
Age when first smoked	1.16	1.08-1.25	0.000

Reference category: Ashford center, no previous children, partner not smoking, not any alcohol consumption.
*Logistic model with 530 observations of women smokers prior to pregnancy. Chi square for the model: 86.54 (p = 0.0000)

partner's pregnancy. Given the importance of the smoking habit of the partner in the probability of quitting for the pregnant woman, a much higher effort should be devoted to help the partners on quitting, the situation in the UK showing that an important opportunity for improvement exists in this aspect.

Although the time and number of interviews was not exactly the same in all centres, all three cohorts followed the same data collection protocol, leading to the collection of equivalent data, what makes us quite confident on that the observed differences between cohorts can not be attributed to different methodologies. Moreover, in Barcelona and Ashford, validation studies have been performed using as a reference method urine, hair and cord blood cotinine measurements which confirm an equivalent high validity of the questionnaires used for both centres[33,34].

The logistic model confirmed the differences in smoking between the three centres, with the highest probability of cessation in relation to pregnancy in Menorca, where there is a high baseline prevalence of female smoking; followed by the UK centre, were the proportion of smokers prior to pregnancy was smaller. Barcelona had both the lowest probability of quitting during pregnancy, and the highest baseline proportion of smokers. This important variability in baseline characteristics between centers gives an increased potential for detecting relevant associations with a pooled analysis, which we have made using multivariate logistic regression, always adjunting by center to avoid the artificial appearance of associations due to not measured variables linked to the centers. In addition, interactions between included variables and center were also tested.

Our data show that woman in their first pregnancy, those whose partner does not smoke and those who started to smoke at a late age appear to be more successful in quitting smoking when pregnant. The association observed in other studies with socio-economic indicators[8,12] or educational level[5,8,9,12] was not observed with our data. This could partly be due to different classifications used and to the different social contexts in which the different surveys have been done.

Given the design of our questionnaire, aimed at the quantification of passive exposure of the child, we could not study the effect of other variables, such as the number of cigarettes previously smoked each day, a factor which has been associated with quitting in other studies[6,9], nor the effect of marital status.

Conflicting results among different published studies with respect to the impact of age on quitting may indicate that in fact the relevant variable is not age by itself, but as a correlate of another variable, namely the age when first smoked. Our data would support this hypothesis, age showing an effect when adjusting for number of years smoked, both together being equivalent to age when first smoked.

We have observed quite different pictures of smoking habits prior to and during pregnancy in three European settings; it has not been possible entirely to explain these with our data. Health beliefs, knowledge and perception of the harmful effect of smoking for herself and for the child and the role of health professionals who keep in frequent contact with the woman during pregnancy, probably also play important roles. The factors included in our final multiple regression model explain only part of the differences between centers, the centre remaining an important variable. Although the important differencies in the baseline characteristics between the different cohorts, most of the relevant variables for quitting are common to all three centres, independent of the prevalence of each one of the variables in the different centres.

Although quitting smoking is a long and complicated process, tools are available for helping in this process[35-37]. From the public health perspective, advantage should be taken of the opportunities for smoking cessation during pregnancy, the first pregnancy appearing as a key point for quitting. Campaigns directed to delay the age of starting smoking should also be encouraged given its additional potential role in increasing the later probability of quitting. An additional strategy in this sense should be directed to the smoker partners of the pregnant women, which in Spain seem not to have become aware of their important role for a healthier pregnancy.

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