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Smoking Cessation in Pregnancy: An observational study

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Abstract

Background The primary objective of the study was to measure referral rates to a hospital smoking cessation service after introducing midwife-led brief advice on smoking cessation. The study also aimed to ascertain the proportion of pregnant women who smoke.

Method A cross sectional study was conducted in 2009-2010 in the antenatal clinic in a West of Ireland hospital with approximately 1500 births annually.

All pregnant women aged ≥16 attending the public Antenatal care Clinic, a total of 716 pregnant women were invited to take part in the validated smoking status screening involving a combination of urine Cotinine and Carbon monoxide breath testing. Brief intervention was offered to all women recorded as current smokers. Referral rate to the hospital smoking cessation service was calculated for the study period and compared to 2008 figures prior to introduction of brief intervention at the hospital.

Results 16% of pregnant women (n=114) were recorded as current smokers. The total number of attending referrals to the Smoking Cessation Service in the study period was 41, corresponding to a referral rate of 36% of current smokers. This represents an increase in the referral rate of 30% compared to 2008 when brief intervention was not routinely conducted in the antenatal setting.

Conclusions Brief intervention in the antenatal setting can achieve smoking cessation referral rates of about one third of smokers.

Implications for practice Staff at the antenatal clinic that encounters pregnant smokers should encourage uptake of smoking cessation services.

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Introduction

Smoking in pregnancy is one of the leading preventable causes of adverse maternal and foetal outcomes (1). Smoking has been linked to preterm delivery, low birth weight, sudden infant death and poor lung function in infants (2-5). Lasting effects into childhood include higher risk of behavioural problems, asthma and obesity (5-7). There is growing evidence of an association between low birth weight and coronary heart disease, type 2 diabetes and obesity in adulthood (8). In addition to the well documented health impacts on smokers in general, the adverse effects of smoking to women of childbearing age include increased risk of complications during delivery and reduced fertility (1;9).

Smoking cessation during pregnancy can reduce the adverse effects to the infant, notably a reduction in the risk of low birth weight and preterm birth (10;11). In the US, up to 45% of women who smoke spontaneously quit before their first antenatal clinic (10;12). For those who continue to smoke, early access to smoking cessation interventions is important to maximise the potential quit rate. The effectiveness of smoking cessation interventions in pregnancy is well documented (10). These include behavioural and pharmaceutical interventions as well as measurement of foetal status and by-products of smoking. Biochemical validation of smoking status can in itself motivate pregnant women to quit spontaneously or to utilise available smoking cessation interventions (13;14).

Cluster randomised trials of smoking cessation interventions have shown weaker effectiveness than trials that applied individual randomisation. This may be due to reluctance by midwives to discuss smoking cessation at antenatal visits whilst establishing a relationship with the pregnant women (10). Pivotal to successful interventions at the antenatal clinic is

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therefore a sensitive approach, which protects the midwife to patient relationship.

In Ireland, 34-35% of women at child bearing age are current smokers (15). A cohort study of 11,100 families, found that 18% of expectant mothers reported having smoked at some point during pregnancy and 13% smoked throughout their pregnancy (16). A study published in 2011 reported smoking rates of 21% throughout pregnancy in a Dublin (Ireland) hospital (17).

Smoking cessation intervention programmes are available at Sligo Regional Hospital (SRH) to both in-hospital patients and those attending out-patient clinics. Prior to undertaking this study, the referrals to the hospital smoking cessation service (SCS) for pregnant smokers who attended the ante natal clinic at SRH were low (5%).

In this cross sectional study, we aimed to determine the referral rate to an established smoking cessation service following the introduction of routine midwife led brief advice on smoking cessation in the antenatal setting. A key secondary objective was to establish the validated point prevalence smoking rate in pregnant women at the first antenatal hospital visit.

Methods

Sample

All pregnant women > 16 years of age booked in for their first antenatal clinic (around 20 weeks' gestation) at Sligo Regional Hospital Ireland as a public patient from 12th October 2009 to September 1st 2010 were invited to take part in the study. Only women attending antenatal clinics at the hospital were included. The hospital operates off campus clinics based in rural locations and these were excluded. Participants received an invitation to the study with the appointment letter. Upon arrival at the antenatal clinic an information sheet was provided and informed consent sought for bio chemical validation of smoking status.

Smoking status

A screening questionnaire is routinely given to all pregnant women at the first antenatal clinic. This includes self reported current smoking status. In addition to this, all consenting participants underwent expired air carbon monoxide (CO) test and urine cotinine test performed by midwives in the antenatal clinic. The CO test was performed using the Smokerlyser® piCO+ CO monitor, which provides a reading of the CO (ppm) in circulation and % foetal carboxy haemoglobin (FCOHb). The result was shared with the woman and visualised using a MaternityCOTM chart. CO content of 0-6ppm was classified as non-smoker; 7-10ppm light smoker; 11-19ppm smoker and >19ppm heavy smoker. Cotinine levels were measured by NicCheckTM I Rapid Dipstick Test. The result was shared with the woman and an interpretation guide used to explain the result. Cotinine content was classified as follows: 0ppm non smoker; 1-7ppm light smoker and >7ppm heavy smoker. The composite outcome measure of either self reported smoker or validated smoker by way of either positive CO or cotinine test was used to classify a woman as a current smoker.

Brief Intervention

Prior to the commencement of this observational study, all midwifes in the antenatal clinic underwent training in brief intervention for smoking cessation. The training was a one day manualised Brief Intervention for Smoking Cessation Programme developed and accredited by the National Health Service Executive of Ireland. It was delivered on site by the Smoking Cessation Coordinator and involved motivational interviewing skills training specific to smoking cessation in pregnancy and post partum. The primary purpose of the training was to enhance and develop communication skills to enable midwives to engage with pregnant smokers in a non-confrontational and non-judgemental manner. In addition, practical skills training was delivered in CO & cotinine testing and on how to record and present individual results to the women. A Brief intervention questionnaire was conducted pre and 3 months post training to evaluate how the training impacted on patient care. A refresher course was delivered five months into the study period.

The brief intervention was an approximately 5 minute motivational interview, which included health impacts of smoking, exploration of willingness to consider smoking cessation, information about the established smoking cessation service and provision of an information pack. The pack included a variety of information leaflets addressing life style change and smoking cessation, various smoke free trinkets and contact details for the intensive smoking cessation service. The established smoking cessation service is an on-site intensive one to one behavioural intervention available to patients at the hospital, including pregnant women and their partners. Brief intervention was offered to all women recorded as current smokers, both those who consented to validation of smoking status and those who were self reported as being smokers.

Referral rates and quit rates

The referral rate to the smoking cessation service is calculated as the percentage of self reported smokers in the ante-natal setting who agree to a referral to the hospital smoking cessation service. The number of self

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reported smokers is extracted from the hospital ante-natal database system. Agreed referrals are sourced from the smoking cessation service database. The 2008 referral rate at Sligo Regional Hospital is used as a historical control in this study. That year, 1716 pregnant women attended the antenatal clinic of whom 201 (10%) self reported to smoke at the first antenatal visit. In this group of smokers, 11 (5%) were referred to the smoking cessation service offering intensive smoking cessation therapy.

Quit rates are calculated as the percentage of women who attend at least one smoking cessation therapy session in the hospital smoking cessation service and who have quitted smoking. Quitting is defined as having had "not a puff" since an agreed quit date and validated with a CO test.

Focus Group

A focus group was held after the completion of the study with participation of antenatal midwives with a view to exploring learning points, challenges and recommendations for ongoing smoking cessation interventions.

Ethical Approval

Sligo Regional Hospital Research Ethics Committee approved the study.

Results

Study Sample

The total number of pregnant women aged >16 yrs attending the public clinic at SRH in the study period was 716. Eighty six (12%) women consented to validation of smoking status by cotinine and CO testing and 630 women (88%) chose not to undergo validated smoking status screening.

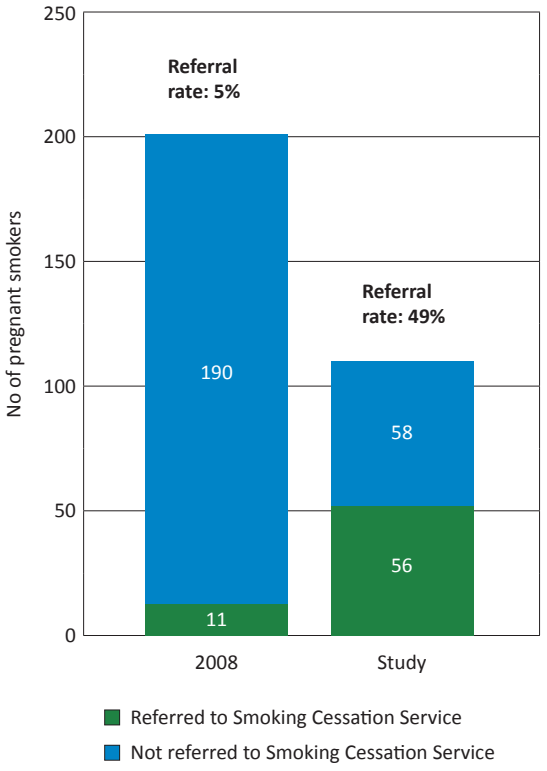
Smoking Status

16% (n=114) were recorded as current smokers [95% CI 13-19]. 596 women were recorded as non-smokers (83%) and data was unrecorded for 6 women (1%). (See Table 1 and Figure 1).

Table 1 Smoking status of all pregnant women attending the public antenatal clinic in the study period.

Smoking Status	%	(95%CI)	Number
Current Smoker*	16%	(13-19)	114
Non smoker	83%	(80-96)	596
Unrecorded	1%	(0-2)	6
Total	**100%**		**716**

*Composite measure of validated or self reported smoker



Included in the non smoking category are 3 women, who spontaneously quit smoking when they found out they were pregnant. This point prevalence
smoking rate is an increase of 4% compared with 2008 figures [95% CI 1-7]. Of the 86 women who consented to validated smoking status screening, 49 were self reported smokers. 65 (57%) of the self reported smokers did not consent. All self reported non smokers who consented were recorded as validated non smokers. Table 2 shows the screening results of the 49 self reported smokers who consented to validated smoking status.

Table 2 Validated smoking status of the consenting self reported smokers.

CO[ppm], category	n	(%*)	Cotinine [ppm], category	n	(%*)
0-6, non smoker	33	(68%)	0, non smoker	22	(45%)
7-10, light smoker	7	(14%)	1-7, light smoker	24	(49%)
11-19, smoker	8	(16%)	>7, heavy smoker	3	(6%)
>19, heavy smoker	1	(2%)			

*Denominator is 49

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Referrals to the Smoking Cessation Service

The total number of agreed referrals to the Smoking Cessation Service in the study period was 56 out of 114 smokers (49%). The women who agreed to a referral were older, of higher socio-economic status and had a lower Fagerstrom score than the women who declined (Table 3).

The vast majority, n=53, were referrals from the antenatal clinic. The remaining three were women who contacted the SCS after the antenatal appointment. Of the 56 referrals, 41 women (73%) attended the SCS either in person or by phone consultation. This corresponds to an attending referral rate of 36% [95% CI 27-45] of current smokers (Figure 2) and represents an increase in the referral rate of 30% [95%CI 21-40] compared to 2008 figures (Odds ratio = 9.7; [95% CI 5-20]). A quit rate of 68% was achieved for the 41 women who attended the SCS.

Table 3 Characteristics of agreed and declined referrals to the smoking cessation service

Agreed referrals		**Declined referrals**	
Number, n (%)	56 (49 %)	Number, n (%)	58 (51%)
Age, mean (range)	28 (23-36)	Age, mean (range)	22 (18-28)
Socio-economic group 1-3, n (%)	15 (27%)	Socio-economic group 1-3, n (%)	37 (64%)
Socio-economic group 4-5, n (%)	41 (73%)	Socio-economic group 4-5, n (%)	21 (36%)
Mean Fagerstrom score	3.9	Mean Fagerstrom score	

Focus Group

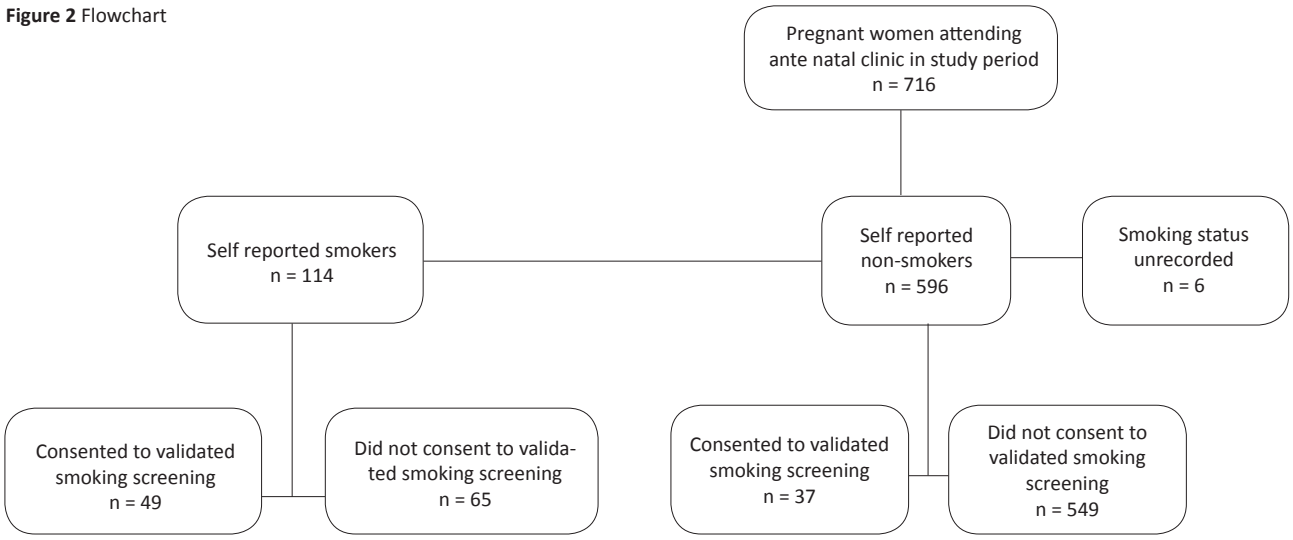
Four midwives participated in the focus group, which was facilitated by a student researcher and the smoking cessation officer at the hospital. The midwives identified staff shortages, reluctance on behalf of participants and change of practice as the main barriers to conducting the research study and in particular to obtaining of informed consent for the validated smoking status.

Discussion

The primary outcome of our study was that brief intervention at the first antenatal visit can increase the referral rate to established smoking cessation services leading to a reduction in women who continue to smoke throughout their pregnancy. The brief intervention was integrated into routine clinical care and the results are likely to be transferable to other similar antenatal settings.

The study has several limitations. Firstly, the low consent rate of 12% compromised meeting the secondary objective of the study, namely ascertaining a validated point prevalence smoking rate. In the focus group, work pressures and reluctance on behalf of pregnant women to participate was highlighted as possible reasons for the low consent rate. A study in Glasgow has similarly showed that booking midwives found it difficult to implement CO measurement (18). The point prevalence smoking rate of 16% observed in this study is therefore effectively a self reported smoking rate. This result is consistent with the findings of the "Growing up in Ireland" findings (16). Secondly, selection bias may have influenced the outcome. Women attending clinics held in more rural settings within the hospital catchment area were excluded from the study as were private patients.

Figure 2 Flowchart



Both of these groups were included in the comparative 2008 figures. Public patients generally have lower socioeconomic status and smoking is more prevalent in lower socioeconomic classes (15). This may contribute to the higher smoking rate than the 2008 figure. Women attending the outlying clinics may have characteristics different to the urban population, thus affecting the smoking rate. Thirdly, social desirability bias is likely to have affected the smoking prevalence estimate as some smokers may not have admitted to their habit. Overall, we believe the recorded smoking prevalence rate to be an underestimate of the true figure, primarily due to the unvalidated smoking status. Other studies have found self reported smoking rates to be less than validated rates (10;19). Fourthly, the use of the referral rate to the smoking cessation service is used as surrogate outcome measure for quit rates in the study sample. We believe using referral rate as the outcome measure is valid, as agreeing to a referral following a brief intervention is a first step in engaging with smoking cessation interventions.

There are a few likely reasons for the high proportion of self reported smokers being classified as non smokers following validation: The half life of CO is less than four hours in pregnant smokers due to the increased maternal metabolic rate and smoking may therefore not be detectable using this method alone (20). We did not determine the sensitivity of the cotinine test prior to the study. Cotinine's clearance rate increases and its half life decreases to just less than 9 hours in pregnant women (21). All clinics were scheduled in the morning and light smokers and occasional smokers may therefore not have been detectable if they had not smoked that day. Furthermore, the cotinine cut off points for each category of smoking intensity was based on non-pregnant smokers. Research has shown that, in pregnancy, cotinine levels are about half of what is seen in the same women after delivery with similar nicotine intake (21). Observer bias due to knowledge of self reported smoking status may also have influenced the result.

The 30% increase in referral rate to the established smoking cessation service represents a dramatic improvement. The increase must be seen in light of the low base line referral rate of 5%. Most studies evaluating interventions for smoking cessation in pregnancy have quit rates as an outcome measure. We are therefore not aware of comparative figures for our study population, but a study in a primary care population also found a significant increase in referral rates after introduction of brief intervention (22). For two reasons, we believe the 36% referral rate achieved is an underestimate of what the intervention could have effectuated: Firstly, performing validated smoking status tests on pregnant women has been shown to increase uptake of smoking cessation interventions (13). Our low consent rate prevented this to have an additive effect to the brief intervention. Secondly, the high non attendance rate to the SCS (and consequently the reduced attending referral rate) may in part be explained by the likely lower socioeconomic status of the study participants as women of low socioeconomic status have more barriers to smoking cessation (23;24).

The differences in the characteristics of the agreed and declined referrals reflects widely acknowledged evidence that younger, heavy smokers with a higher fagerstrom score, in lower socio-economic groups are often classified within the Stages of Change module as being in pre-contemplation and therefore more difficult to support in the motivational process towards a behaviour change (25).

These results have implications for clinical practice. Brief intervention does have an effect on smoking cessation in mid pregnancy. However, early cessation, before 15 weeks gestation, has shown to major reduction in adverse outcomes for infants (11). Intervention before the first hospital antenatal visit at 20 weeks gestation would therefore be desirable, for example in the primary care setting. It is therefore imperative that all health professionals involved in ante natal care pay attention to smoking behaviour and encourage the uptake of smoking cessation interventions.

Conclusion

In conclusion, our study has shown that brief intervention by midwives in the antenatal setting can increase the referral rate to established smoking cessation services.

Conflict of interest statement

None of the authors had any conflicts of interest.

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