SMOKING CESSATION IN PREGNANCY

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A thesis presented to the University of Newcastle in candidacy for the degree of Doctor of Philosophy.

I hereby certify that the work embodied in this thesis is the result of original research and has not been submitted for a higher degree to any other University or Institution.

(Signed)
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ABSTRACT

Smoking during pregnancy has been associated with many adverse pregnancy outcomes. However, debate continues about whether smoking causes these outcomes. Chapter 1 reviews the evidence that smoking is a cause of adverse pregnancy outcomes. The criteria of causation proposed by Bradford Hill (1966)\textsuperscript{1} are examined in relation to four outcomes: low birthweight, perinatal and neonatal mortality, spontaneous abortion and long-term developmental effects. The review found that the relative risk of having a low birthweight baby is nearly doubled in women who smoke during pregnancy compared with non-smoking women and that the relative risks of spontaneous abortion and perinatal and neonatal mortality are increased by about one-third. The magnitude of the long-term effects of maternal smoking on the physical and mental development of the offspring is small but measurable. The epidemiologic evidence associating maternal smoking with major adverse pregnancy outcomes in prospective and case-control studies displays a high degree of consistency. A dose-response gradient for smoking during pregnancy has not been clearly shown in relation to perinatal and neonatal mortality. However, there is strong support for a dose-response gradient in relation to low birthweight and spontaneous abortion and moderate support for long-term developmental effects. Although a biological causal mechanism has not been clearly delineated, considerable evidence indicates that the chemicals in tobacco smoke are capable of producing deleterious changes in the placenta and fetus. In addition to support for a causative role in the four outcomes examined in detail, the chapter also presents evidence that smoking in pregnancy increases the risk of other adverse outcomes including ectopic pregnancy, antepartum haemorrhage and Sudden Infant Death Syndrome. The findings support the importance of the goal of smoking cessation in pregnancy as a means of reducing the pregnancy-related burden of illness in the community.

Chapter 2 examines the effectiveness of smoking cessation programs in pregnancy. A review of the literature located 20 controlled evaluations of smoking cessation interventions in pregnancy. The studies were rated using the methodological criteria outlined by Windsor and Orleans (1986). Twelve of the studies were judged methodologically inadequate and excluded from the review. The remaining studies were found to support the efficacy of cognitive behavioural smoking cessation programs in pregnancy. There was insufficient evidence to determine whether advice, feedback or nurse home-visitation programs increased smoking cessation rates in pregnancy under ideal conditions. None of the methodologically adequate cognitive behavioural studies fulfilled the criteria necessary for a smoking cessation program to be incorporated into routine antenatal care. In public antenatal settings, the prevalence of smoking is high and usual care providers have the greatest opportunity to intervene with smoking women. Importantly, in only two studies were the smoking cessation interventions delivered by usual care doctors or midwives. The findings indicate that it is unsurprising that health care providers do not routinely deliver smoking cessation programs to pregnant smokers. This chapter indicates there is a need for the development and evaluation of new smoking cessation programs in pregnancy which are suitable for use in routine antenatal care.

Limited data are available documenting the perceptions of antenatal care providers in the area of smoking cessation. Chapter 3 describes a mail survey undertaken in 1992-93 which aimed to assess the smoking cessation practices of Australian public antenatal clinics. Questionnaires were returned by 140 (80%) of the 175 eligible hospitals. Smoking advice was rated an essential activity at the first antenatal visit by 69% of responding directors. Nonetheless, only 12% of clinics indicated they offered relevant training and 4% reported written policies. Results also indicate senior staff may have suboptimal levels of awareness of smoking risks. Clinics used a narrow array of strategies to promote cessation. Almost one-third of directors said they advised smokers to cut down rather than stop smoking.

completely. The survey supports the need for clinic policy development and for the dissemination of effective smoking cessation programs in pregnancy.

In Chapter 4, data collected in the study investigating the accuracy of usual care providers' detection of pregnant smokers (Chapter 5) and in the randomized, controlled trial of the smoking cessation program in pregnancy (Chapter 6) were used to identify the prevalence and predictors of smoking by pregnant women attending the antenatal clinic. A review of previous research investigating variables associated with smoking in pregnancy indicated that only three out of 40 studies had used multivariate analysis techniques. The prevalence of smoking in this population was found to be 37.9% (95% CI 36.0-39.8%). Using stepwise logistic regression analysis, five variables were found to be independent predictors of smoking in pregnancy: education (having four years or less high school), marital status (being unmarried), gravidity (being multigravida), age (being under 25 years) and language spoken at home (speaking English). The model correctly predicted 63.7% of cases.

The knowledge and attitudes of pregnant smokers were investigated using data from consenting subjects who completed the baseline questionnaire in the randomized, controlled trial which is described in Chapter 6. Three-quarters of the women claimed they had reduced their smoking since discovering they were pregnant. However, their mean intake of 13.7 cigarettes daily remained at a hazardous level. Approximately half (51%) of these smokers claimed to have tried to quit smoking in the current pregnancy. Most (61%) women said they believed smoking was definitely harmful to the unborn child. Nonetheless, when a list of 10 tobacco-related problems were presented, only three were identified by a majority of women as being potentially increased by smoking in pregnancy. Three reasons were identified by more than one-fifth of the women as being "very important" in encouraging their continued smoking: addiction (33%), stress coping (25%) and enjoyment (22%). Furthermore, of the women in a current relationship, 72% said their partner was a regular smoker. Less than half (45%) of the smokers who had seen a doctor about their current pregnancy could recall being advised to stop smoking, with a higher proportion (57%) recalling advice to cut down.
There is a need for health care providers to adopt a more systematic approach to smoking cessation counselling. The results also have implications for the development of smoking cessation programs. They emphasise the need to tailor interventions for persons (women and their partners) of low educational attainment and young age and to assist pregnant smokers to cope with the addictive nature of cigarettes. Efforts to convert quit attempts in pregnancy into sustained cessation represent a priority area of program development and evaluation.

Little is known about the accuracy of usual care providers’ detection of pregnant smokers. Chapter 5 reports the results of a study which explored the proportion of pregnant women misclassified as non-smokers by midwives in a public antenatal clinic. A sample of 204 women who midwives classified as non-smokers were asked to complete a self-administered questionnaire and to provide a urine specimen for cotinine analysis. Results indicate that midwives failed to detect a significant proportion of smokers. The conservative estimate of the proportion of midwife-identified non-smokers who could be reclassified as smokers on the basis of the questionnaire and urinalyses procedures was 7.4% (95% CI 3.8-10.9%), the medium estimate was 8.8% (95% CI 4.9-12.7%) and the worst case estimate was 19.1% (95% CI 13.7-24.5%). In order to increase the coverage achieved by smoking programs, antenatal clinics should consider incorporating carbon monoxide measurements into routine screening procedures. It is recommended that future studies examining smoking status in pregnancy should detail the methods used to classify subjects and document response rates in relation to each self-report and biochemical measurement.

Chapter 6 reports the results of a randomized, controlled trial (n=252) of a new cognitive-behavioural smoking cessation program in pregnancy, the Fresh Start Program. The program was delivered by usual care providers in a public antenatal clinic and the first visit components consisted of doctor advice (2-3 minutes), videotape (14 minutes) and midwife counselling (10 minutes) supported by a self-help manual, lottery, involvement of a support person (where appropriate) and a chart reminder. Smoking status was assessed four weeks after the first visit, at end-of-pregnancy and 6-12 weeks postpartum using self-report with cotinine tests.
of women reporting abstinence. The validated, end-of-pregnancy consecutive cessation rate was significantly higher \((p < 0.001)\) in the Fresh Start Group (9%) than in the Control Group (0%). Fresh Start Group women also demonstrated greater knowledge of the adverse consequences of smoking in pregnancy and more negative attitudes towards smoking on the midpoint questionnaire. The percentage of cotinine analyses in the Control Group (52%) inconsistent with self-reports of nonsmoking was significantly higher \((p = 0.0005)\) than the same percentage in the Fresh Start Group (12%). Although cessation rates were higher in Fresh Start Group women, checklists completed by doctors and midwives and audiotapes of their consultations documented substantial problems with compliance. There was also poor agreement between the checklists and audiotapes.

An important shortcoming of the intervention was the low participation rate of clinic smokers (40%) caused by the large number of ineligible women and the less than desired consent rate (54%). Despite this drawback, the Fresh Start Program appeared to be acceptable to both the patient participants and the doctors and midwives. Comparisons with U.S. studies also suggest the estimated $18 spent per smoking patient on delivering the Fresh Start Program would be cost-beneficial in the short-term. The findings support the value of smoking cessation efforts by antenatal clinic staff which go beyond the provision of brief advice. However, the modest participation and success rates achieved in this study highlight the importance of further research designed to develop and evaluate smoking cessation programs which are more acceptable, feasible and effective in public antenatal settings. The results of this study also emphasise that clinic-based programs must be supported by broader health promotion efforts which aim to prevent smoking uptake and to promote cessation in young women generally.
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In closing, I am pleased to have been given the opportunity to undertake a Ph.D. in the Discipline of Behavioural Science in Relation to Medicine and I hope the research described contributes to the betterment of the health of women and children in the future.
INTRODUCTORY NOTES
Style of Presentation

The work presented in this thesis comprises a series of studies which attempt to examine issues relevant to smoking in pregnancy. The first two chapters present literature reviews. Chapter 1 focuses on the effects of smoking in pregnancy and Chapter 2 examines the efficacy and effectiveness of smoking cessation programs in pregnancy. Chapter 3 presents the results of a survey of the medical and nursing directors of public antenatal clinics in Australia concerning the provision of smoking cessation interventions for pregnant patients attending their clinics. In Chapter 4, data documenting factors which predict smoking in pregnancy are reported and the knowledge and attitudes of pregnant smokers in this area are described. Chapter 5 examines what is known about the accuracy of self-report of smoking status in pregnancy and reports estimates of midwife misclassification in a study of 204 women identified as non-smokers at their first antenatal visit. Chapter 6 details the results of a randomized, controlled trial of a new smoking cessation program implemented at a public hospital antenatal clinic.

With the exception of Chapter 4, each chapter can be viewed as a discrete entity. Chapter 4 incorporates data collected as part of the studies described in Chapters 5 and 6. Accordingly, reference is made in Chapter 4 to these two chapters. Apart from this cross-reference, each chapter is presented as a self-contained report, in the style of a journal article. It is hoped that the ease of reading engendered by this approach compensates for the small amount of repetition which inevitably occurs using this approach.