



An observational study of the impact of an antenatal asthma management service on asthma control during pregnancy



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ABSTRACT

Objective: We sought to investigate the impact of introducing an antenatal asthma management service (AMS) on asthma control during pregnancy and subsequent perinatal outcomes.

Study design: Prospective, observational cohort study of pregnant asthmatic women attending a tertiary hospital antenatal clinic. Asthmatic women were recruited from the antenatal clinic and were followed prospectively with visits at 12, 20, 28 and 36 weeks gestation. A new nurse-led AMS was introduced offering asthma self-management education and support. Outcomes were compared between women recruited before and after the AMS was introduced ($n = 89$ and 80 , respectively) and included; prevalence of exacerbations during pregnancy, asthma control throughout pregnancy and perinatal outcomes, including preterm birth and small-for-gestational-age (SGA).

Results: The relative risk for exacerbations (0.69; CI: 0.33–1.42), loss of control (0.67; CI 0.46–0.99) and persistent uncontrolled asthma (0.48; CI 0.26–0.9) were all reduced with attendance to AMS during pregnancy. AMS was associated with non-statistically significant reductions in asthma exacerbations (19.1–15.0%; $p = 0.480$) and uncontrolled asthma at ≥ 2 study visits (21.3–11.3%; $p = 0.078$).

Conclusions: These findings demonstrate the potential impact of an AMS in improving asthma control during pregnancy, supporting the need for an adequately powered RCT to determine its clinical- and cost-effectiveness.

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Introduction

Pregnancy is recognised as a major challenge in the management of asthma as it can alter the course of asthma severity and its treatment, which in turn can affect pregnancy outcomes. Maternal asthma is associated with numerous adverse perinatal outcomes, including increased risk of low birth weight (RR 1.46; 95%CI 1.22, 1.75), small-for-gestational age (RR 1.22; 1.14, 1.31), preterm birth (RR 1.41; 1.22, 1.61) [1] and neonatal hospitalisations (RR 1.50; 1.03, 2.20) [2]. Existing guidelines recommend managing asthma during pregnancy in the same manner as a non-pregnant adult, including management of asthma medications. Despite guidelines and awareness of the substantial adverse effects associated with asthma during pregnancy, little has been done to improve its

management and reduce associated perinatal morbidity and mortality. While a small number of women with very severe asthma receive monitoring during pregnancy in the antenatal clinic with respiratory specialist support, treatment is often limited to women self-managing their asthma with support from their GP. Current asthma management appears to be focused on a reactive, not proactive, approach. This is demonstrated by only 15% of asthmatic pregnant women involved in our previous prospective study having an asthma action plan [3]. The evidence is that current care of asthmatic pregnant women could be significantly improved and there is an immediate need for evidence based approaches for improving clinical practice [4].

In non-pregnant adults, Cochrane reviews have identified that the provision of asthma self-management education compared to usual care reduces asthma exacerbations [5] and that nurse-led asthma care is as effective as physician-led care and likely more cost-effective [5]. Whether these interventions translate to the antenatal setting remains undetermined [4]. Recent trials in pregnant asthmatic women indicate use of exhaled fraction of nitric oxide (FeNO), as a measure of inflammation, to adjust asthma

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management during pregnancy, was associated with a significant reduction in the prevalence of women experiencing an exacerbation [2] and supports the concept that active management can significantly improve maternal asthma. However the generalizability of FeNO based management of asthma to all clinical settings may be limited [2] and raises the question of whether nurse-led asthma management in the antenatal setting could be a more generalisable option. We have piloted the introduction of an antenatal nurse-led asthma management service within a socially disadvantaged population. We aimed to determine whether antenatal asthma management and education within this setting could improve asthma control during pregnancy, reduce the number of exacerbations and improve perinatal outcome.

Methods

Approval for the study was provided by the The Queen Elizabeth Hospital, Lyell McEwin Hospital, and Modbury Hospital Human Research Ethics Committee and The University of Adelaide Human Research Ethics Committee. All women gave written informed consent.

Prospective asthma study and standard-care

Pregnant women with a doctor diagnosis of asthma ($n = 169$) were recruited through the Lyell McEwin Hospital antenatal clinics (South Australia, Australia) between May 2009 and May 2012 to take part in a non-interventional prospective cohort study evaluating the impact of maternal asthma on perinatal outcomes. Women were assessed by a midwife, with additional respiratory training, at 12, 20, 28, and 36 weeks gestation. The midwife utilised a standardised data collection tool to collect demographic data including maternal weight, height, previous obstetric history, medical history. Maternal smoking was assessed by maternal self-report, with women classified according to smoking status during the first antenatal visit. Socioeconomic status for each woman was determined using her residential postcode at the time of delivery. Women were then ranked according to their level of advantage, or relative disadvantage, based on data from the Socio-Economic Indexes for Areas, calculated from the Australian Bureau of Statistics' 5-yearly Census of Population and Housing. These indexes are widely used measures of relative socioeconomic status.[6] In addition to demographic variables, data were collected to determine current asthma therapy and control, current asthma triggers, co-morbidities and past history including frequency of oral corticosteroid use and hospital admissions for asthma. Asthma control was assessed using the Asthma Control Questionnaire (ACQ). The ACQ is a 7-item validated questionnaire which covers asthma symptoms and lung function, with scores >1.5 indicative of uncontrolled asthma [7]. Forced expiratory volume at 1 s (FEV1) and forced vital capacity (FVC) was measured by an Easy One spirometer before and after administration of salbutamol. FEV1% predicted was calculated based on the patient's age, ethnicity and height using the equations of Gore et al. [8]. Data was prospectively collected on asthma medications (dose, frequency and duration across trimesters). The same midwife saw women for each of their respective visits. Patients assessed as unstable and requiring medical review were referred to their primary care physician or to a respiratory physician.

Nurse-led antenatal asthma management service

Half-way during this prospective study in, January 2011, a new nurse-led antenatal asthma management service was introduced, with asthmatic women offered two visits with a respiratory nurse,

alongside their routine study visits with the midwife. The Antenatal Asthma Management Service was led by a respiratory nurse with qualifications in asthma self-management education and spirometry. Asthma self-management education was provided over a series of 30–60 min visits using a standardised 'managing asthma in pregnancy resource manual' to ensure a systematic approach to delivering care. This manual was developed based on previous experience in managing maternal asthma and has been adapted from evidence-based guidelines and adult-based recommendations for asthma self-management education. Key aspects of asthma self-management education are presented in Table 1. Additional counselling was provided on the importance of smoking cessation in relation to their asthma and the health of their baby with direct referrals made to QuitSA for additional cessation support. Women in this group received an individualised written asthma action plan, developed according to evidence based principles by the asthma educator using a standardised template following National Asthma Council recommendations [10]. In addition, current asthma management therapies were evaluated and recommendations regarding optimal therapy were made, with close collaboration with the women's primary healthcare practitioner. At each visit, recommendations for step-up therapy were made in women with uncontrolled asthma ($ACQ > 1.5$), where appropriate, in accordance with well-established clinical guidelines and previous studies [3]. Detailed asthma management reports were written by the respiratory nurse and provided to the chosen GP and/or respiratory specialist for collaborative management. This encompassed the review and approval of the written asthma action plan and any required changes to medication management. Between visits, women were encouraged to follow their asthma action plan closely and see their GP if their asthma worsened.

Outcomes were compared between 89 women who received standard care only and 80 women who took part in the antenatal asthma management service.

Maternal asthma and perinatal outcomes

Details of the exacerbations were obtained from the study visit notes and confirmed by consulting the medical record if necessary. An exacerbation event was defined as moderate/severe if it required a hospital admission, emergency department presentation, an unscheduled doctor visit, or a course of oral steroids due to asthma. An exacerbation was defined as mild (loss of control) if it required increased medication use or was characterized by increased symptoms or decreased peak flow, which was managed by the subject and did not require medical intervention. Additional asthma outcomes included persistent uncontrolled asthma, defined as an ACQ score greater than 1.5 during two or more study visits, and commencement of new inhaled corticosteroid (ICS) during pregnancy. Data was prospectively collected at each study visit across both groups. Date on perinatal outcomes were collected at delivery from the medical records, including infant sex, gestational age, birthweight, birth length, head circumference, method of delivery, and Apgar scores. Gestational age was

Table 1
Asthma self-management education content.

Impact of pregnancy on asthma control
Impact of asthma on pregnancy and pregnancy outcomes
Medication use (including safety in pregnancy; medication adherence; inhaler technique)
Recognition of asthma deterioration/symptoms
Provision and use of AAP
Trigger identification and avoidance
Smoking cessation

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