

PREGNANCY

Asthma during Pregnancy: The Experiences, Concerns and Views of Pregnant Women with Asthma

ANGELINA S. LIM, B.PHARM. - (HONS),¹ KAY STEWART, B.PHARM. - (HONS), PH.D.,¹
MICHAEL J. ABRAMSON, M.B.B.S., B.MED.SC., PH.D., FRACP., FAFPHM.,² KATH RYAN, B.PHARM, PH.D.,³
AND JOHNSON GEORGE, B.PHARM., M.PHARM., PH.D.^{1,*}

¹Centre for Medicine Use and Safety, Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Parkville, VIC, Australia.

²Department of Epidemiology and Preventive Medicine, Monash University, The Alfred Hospital, Melbourne, VIC, Australia.

³Department of Nursing and Midwifery, La Trobe University, Melbourne, VIC, Australia.

Objective. To investigate how pregnant women manage their asthma during pregnancy and factors influencing their behavior. **Methods.** In-depth interviews (telephone or face-to-face) with a purposive sample of 23 asthmatic women at various stages of pregnancy and with varying severity of asthma. **Results.** Five major themes were discerned relating to health behavior of pregnant women with asthma. Many of the participants decreased or discontinued their asthma medications themselves and refrained from taking doses when necessary during pregnancy without consulting their doctors. Reasons behind their decisions revolved around lack of support and information about what to do, concerns about the safety of the medications, past experiences, and desire for an “all natural” pregnancy. Asthma monitoring during pregnancy was seen as a low priority for some women and their doctors. Communication between pregnant women and health professionals regarding asthma management was poor. The health behavior of pregnant women with asthma could be explained using the Health Beliefs Model. **Conclusions.** Pregnant women are not well supported in managing asthma during pregnancy, despite being concerned about outcomes. Interventions, education, and more support are warranted and wanted by pregnant women with asthma to optimize pregnancy and neonatal outcomes.

Keywords adherence, inhaled corticosteroids, obstetrics, in depth interviewing

INTRODUCTION

Asthma during pregnancy should be a high priority for health professionals as one in eight pregnant women has asthma (1). Furthermore, poor asthma management during pregnancy is hazardous for both mother and child, leading to increased risk of complications and poor outcomes, such as premature births, low birth weight, preeclampsia, impaired fetal brain development, and malformations (2–4). Prematurity has also been linked to an increased risk of heart disease in adulthood (5, 6). Optimal asthma control during pregnancy is vital to reduce risks; pregnant women should have their asthma monitored at least monthly (7).

Our recent systematic review highlighted a low incidence of adverse events when taking regular preventive asthma medication during pregnancy (8); studies that reported adverse events with asthma medication had numerous confounding factors and a direct association could not be drawn between medications and negative outcomes. Globally, asthma guidelines strongly recommend that women continue their asthma medications during pregnancy to maintain adequate control (7, 9–13). Furthermore, potential benefits of improved fetal growth (14), a reduction in asthma exacerbations (15, 16), and a reduction in the risks of malformations can arise from using asthma preventive medication

during pregnancy (17). Despite this evidence, disseminating this information to women and improving adherence is clearly a problem.

Adherence to asthma medications during pregnancy is a significant problem, with over one-third of women discontinuing their asthma medications during pregnancy, many without consulting their doctors (18, 19). Reasons for nonadherence to asthma medications during pregnancy and poor asthma management during pregnancy have not been explored in depth. Women have been shown to be more reliant on their bronchodilators (reliever therapy) and refrain from using their anti-inflammatory medications (preventive therapy) (18). Women who decreased their inhaled corticosteroid (ICS) had babies with lower mean birth weight and length than women who did not (14).

Two in five women are more likely to continue their asthma medication during pregnancy if recommended by their doctor (19). This suggests the crucial role of doctors in ensuring patient adherence to asthma medications during pregnancy. Our recent survey of family physicians' prescribing patterns, however, found that over a quarter would instruct their pregnant patients to decrease or discontinue asthma medication during pregnancy when asthma was well controlled by current therapy (20), potentially jeopardizing asthma control.

Pregnant asthmatic women may not be well supported in regard to their asthma and may be unaware of the risks of uncontrolled asthma during pregnancy. The views and experiences of asthmatic pregnant women were explored

*Corresponding author: Johnson George, Centre for Medicine Use and Safety, Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Parkville Campus, 381 Royal Parade, Parkville, VIC 3052, Australia; Tel: +61399039178; Fax: +61399039629; E-mail: Johnson.George@monash.edu

with a view to developing strategies to improve asthma management during pregnancy.

METHODS

Interviews

Interviews (5 face-to-face and 18 by telephone) were conducted with pregnant asthmatic women about their asthma control and management during pregnancy. The topic guide included perceptions about asthma medications, asthma symptoms during pregnancy, medication use, and support from health professionals.

Participants

Participants were recruited from a large maternity hospital in Australia through a database that identified all outpatient pregnant women with asthma. Participants were excluded if they were under 18 years of age, were non-English speaking, or had no asthma symptoms during the previous 10 years. Selection was also based on a pre-interview questionnaire which enabled us to select women with varying asthma severity (using questions derived from the Asthma Control Questionnaire (ACQ) (21) and classification according to the National Asthma Management handbook (22)) and at various stages of pregnancy (second trimester, third trimester, or delivered within the previous 5 weeks). Medication adherence prior to pregnancy was recalled using the Tools for Adherence Behaviour Screening (TABS), a subscale of the Beliefs and Behaviour Questionnaire (BBQ) (23).

Ethics Approval

This study was approved by the Mercy Health Human Research Ethics Committee and the Monash University Human Research Ethics Committee.

Data Collection and Analysis

Data collection and analysis ran concurrently. One trained researcher (AL) conducted all interviews, which were audio-recorded and transcribed verbatim. Transcripts were organized using NVivo Version 9.0 (QSR International, Doncaster, Australia). Two researchers (AL and KS) coded the transcripts independently for relevant content using the framework approach (24). Results were discussed to establish emerging themes and aid future direction of interviews. This process continued until data saturation was apparent.

RESULTS

Participants

From 179 potential participants, a purposive sample of 23 women was selected for interview. Participants (age range 21–43 years) had a range of demographic and obstetric characteristics and asthma severity (Table 1). Three participants were health-care card holders (25), indicating a lower than average household income. All participants reported they were non-smokers at the time of interview.

TABLE 1.—Characteristics of participants ($n = 23$).

Characteristic	<i>N</i>
Country of birth	
Australia	17
Other (China, England, Greece, New Zealand, Pakistan)	6
Gestation period	
Second trimester	7
Third trimester	12
Delivered	4
Other health conditions	
None	18
Allergic rhinitis	2
Depression	1
Eczema	1
Gestational diabetes	1
Sciatica	1
Time since asthma first diagnosed	
≤15 years	4
16–30 years	16
>30 years	3
Asthma medications	
SABA only	8
SABA + ICS	3
SABA + LABA/ICS	12
Asthma severity classification ^a	
Intermittent asthma	3
Mild persistent asthma	3
Moderate persistent asthma	8
Severe persistent asthma	9

Notes: ICS, inhaled corticosteroid; LABA, long-acting beta-agonist; SABA, short-acting beta-agonist.

^aAccording to the National Asthma Council classification (22).

Seven participants were primigravidae and the remaining were multigravidae, including three participants who had previous miscarriages. The sample included one assisted pregnancy (in vitro fertilization).

While participants had varying asthma severity, most were long-term moderate-to-severe persistent asthmatics who self-reported good adherence to their medications. The majority of participants ($n = 13$) experienced no changes to their asthma control during pregnancy, but some ($n = 7$) reported worsening of symptoms, mostly due to ceasing or reducing their preventive asthma medications.

Interview Themes

Five major themes relating to asthma management during pregnancy and changes in behavior emerged:

Risks versus Benefits. Perceived risks of uncontrolled asthma were overshadowed by concerns about medication use during pregnancy, especially anxiety about steroid use. However, for some individuals, the perceived risks of uncontrolled asthma distressed them more than the risks of medication use.

Concern for any medication use during pregnancy. Many women, especially those who opted for a home birth or a drug-free delivery, wanted to avoid medication use altogether during pregnancy:

Just the fact it was medication ... I don't even take [paracetamol] when I'm pregnant. (#23, 33 years, severe persistent asthma, second trimester)

Steroid phobia. The connotations of “steroid” distressed many women and deterred them from using their preventive asthma medications during pregnancy:

The fact that it’s a steroid and . . . no-one was really able to tell me that it was safe for the baby. (#20, 30 years, moderate persistent asthma, delivered)

Most participants could not name specific effects of steroids; however, they were seen to be detrimental to fetal growth and development:

It could influence things like the growth of the baby and have impacts on hormonal and sex development. (#9, 36 years, mild persistent asthma, second trimester)

Some participants limited the use of their preventive medication during pregnancy because of this concern:

I didn’t with both pregnancies use my preventive [ICS] unless I was at the desperate stage. (#1, 28 years, severe persistent asthma, third trimester)

Concern about steroid use was most apparent in the first trimester as it was seen as a critical period of development and growth:

Especially the first trimester . . . it’s such a formative crucial stage when all the main development is happening . . . I was really cautious of using it [ICS] then. (#6, 30 years, severe persistent asthma, third trimester)

The limited absorption and placental transfer likely to result from inhaled route did not alleviate concerns, as participants still linked adverse events with inhaled use:

The baby kicks a lot after my night time medication [ICS]. I can’t imagine the baby is not affected. (#10, 33 years, moderate persistent asthma, third trimester)

Preference for alternative therapies. Some participants reported trying alternative therapies, before reaching for their asthma medications, to minimize medication use:

I didn’t use it [ICS] at all during the first trimester. I would try just slowing down, doing different breathing. I even tried steam in the shower. (#1, 28 years, severe persistent asthma, third trimester)

Lack of confidence in the benefits of medication use. Interestingly, some participants were starting to lose faith in the benefits of asthma medications altogether:

I went on a course, just an info session . . . called Buteyko (26) . . . and it kind of made me question the validity of the use of asthma medication as the first port of call. (#9, 36 years, mild persistent asthma, second trimester)

Participants did their own risk/benefit assessment of using the medications and decreased their preventive therapy:

I didn’t think my asthma was that bad. I didn’t think it was necessary to be taking the preventer [ICS] every day. (#13, 23 years, mild persistent asthma, delivered)

Perceived risks of uncontrolled asthma during pregnancy. No specific risks were identified, but the idea of decreased oxygen availability to the baby was a recurring theme. The risks became more concerning to those participants who had encountered poor neonatal outcomes:

I’m more concerned about the lack of oxygen to the baby more so than the medication . . . the asthma attack is going to do more harm to the baby than keeping up preventers. (#3, 38 years, severe persistent asthma, third trimester)

My daughter was born with extra digits . . . I actually thought that I had caused that, being off the asthma medication. (#20, 30 years, moderate persistent asthma, delivered)

Other asthma medicines. Relievers (short-acting bronchodilators) were seen as completely safe to use or unavoidable; many participants did not even bother checking their safety during pregnancy:

I wouldn’t think twice about using my [salbutamol] . . . we use asthma puffers on really young kids anyway. (#1, 28 years, severe persistent, third trimester)

Many women appeared happy to rely heavily on their reliever therapy and decrease their preventive therapy:

I was having [salbutamol] anywhere up to eight puffs a night. (#23, 33 years, severe persistent asthma, second trimester)

Self-Efficacy. Self-management of asthma. Participants were mostly long-term asthmatics and felt quite confident in making their own decisions about their asthma:

To be honest, I probably haven’t had my asthma monitored properly for a good five to six years . . . I’ve had it for so long, I know when I can control it with [salbutamol]. (#5, 28 years, severe persistent asthma, second trimester)

Dealing with changes to asthma control during pregnancy. Many participants were unaware that pregnancy could change their asthma control and were not equipped to cope with changes. Asthma was described by some participants as significantly worse in their third trimester, although it was difficult for some to distinguish signs of worsening asthma from breathlessness associated with increasing uterine size. This made it difficult for some participants in deciding how to use their bronchodilator appropriately:

The last trimester is the worst because of the uterus compression, pressing on the lungs; you get that shortness of breath. (#3, 38 years, severe persistent asthma, third trimester)

It's a little bit unclear separating shortness of breath with asthma symptoms. (#23, 33 years, severe persistent asthma, second trimester)

Although worsening asthma could be attributed to ceasing or decreasing preventive medication, many participants thought it was unnecessary to restart their preventer:

So whether my asthma worsened because I stopped taking my preventive or my asthma worsened because of the pregnancy, I can't tell you. (#5, 28 years, severe persistent asthma, second trimester)

Asthma as a Priority. Impact of symptoms and severity. If participants had mild asthma or did not experience any symptoms, they were indifferent about asthma monitoring and management during pregnancy:

It [asthma] became a low priority, which means it wasn't bothering me very much. (#3, 38 years, severe persistent asthma, third trimester)

It was only when they experienced deterioration in control that they started to pay attention to their asthma:

I didn't even think about going to the GP about my asthma ... but the asthma attack frightened me. (#17, 39 years, severe persistent asthma, third trimester)

The exception was severe asthmatics who were more concerned about their asthma management:

I've been hospitalised with it several times when I was young, so yeah, it's still a priority for me. (#17, 39 years, severe persistent asthma, third trimester)

Lack of concern for asthma by their GP. In many cases, if the GP did not bring up the topic of asthma, it was usually ignored:

The GP never really asked about my asthma to be honest. (#12, 31 years, moderate persistent asthma, second trimester)

Competing priorities. Other medical conditions overshadowed asthma management during pregnancy:

Other issues with my pregnancy have just taken precedence. (#4, 31 years, moderate persistent asthma, second trimester)

The limited time in appointments with their GP was thought to be better spent on discussions about diet, labor, and so on:

You have lots of questions ... it might have actually just gone on the backburner. (#2, 36 years, severe persistent asthma, third trimester)

Past experiences. Participants were likely to be more cautious about their medication if it was their first pregnancy or they had a history of miscarriage:

It took me two years to get pregnant, so I was quite concerned about using the ICS. (#12, 31 years, moderate persistent asthma, second trimester)

Support and Guidance. Participants complained about the lack of information available on asthma during pregnancy and related topics:

I wasn't given any information, that's why I was so concerned ... It would have been good to know what effects different medications have [on the fetus]. (#13, 23 years, mild persistent asthma, delivered)

With the safety of asthma medications in pregnancy not clearly established, women were dissatisfied with the support they received regarding their medication:

I went to the doctor a couple of times, I talked to the pharmacist, the nurses at the hospital ... I found it quite frustrating because no one would give me an exact answer ... I didn't feel like I really got any advice that I could feel confident about. (#20, 30 years, moderate persistent asthma, delivered)

This lack of evidence and support forced women to make their own choices about medication management, sometimes unfortunately wrong decisions:

I felt I had to make a decision and the decision for me was not to take the [ICS]. (#5, 28 years, severe persistent asthma, second trimester)

Participants wanted more information on medication effects on the fetus, what to expect in regard to asthma changes during pregnancy and labor, medication reviews, regular asthma monitoring, asthma action plans for pregnancy, and alternative therapies. Participants preferred easily accessible information as they found it inconvenient to consult their GPs:

It would have been good just to know a bit more information than just having to go to the GP, which is hard to book in ... and they've got to see you so quickly. (#13, 23 years, mild persistent asthma, delivered)

Participants requested authoritative information from key stakeholders such as the Asthma Foundation or their hospitals:

I think there needs to be definitely information from the Asthma Foundation. (#2, 36 years, severe persistent asthma, third trimester)

Influences on Medication Use. Sources of information. The Internet was a major source of information for many participants, although some had doubts about the quality of information:

[If information was available from respectable organizations] either through an email or through a webpage, at least I'd know that it's from a reliable source and it's reliable information. (#12, 31 years, moderate persistent asthma, second trimester)

I've already lost two [babies, through miscarriages], so I didn't want to blindly Google for the third. (#8, 32 years, moderate persistent asthma, third trimester)

The Internet led some women to making the wrong decisions:

I did my own research, just because there wasn't any information available. So I went online and just Googled "asthma medication whilst pregnant" and it came back (that) I couldn't take [fluticasone-salmeterol combination] ... so I just took myself off it before I even consulted my doctor because I found enough evidence on the Internet to say it's better not to be on it. (#2, 36 years, severe persistent asthma, third trimester)

Some participants had support from family members who had medical or nursing backgrounds:

I talked to my mum over the phone and she said you shouldn't be using [salbutamol] that much. She's a nurse. (#15, 30 years, moderate persistent asthma, second trimester)

DISCUSSION

This is the first study using in-depth interviewing to explore the experiences of pregnant asthmatic women regarding their asthma management. Many of the participants decreased or discontinued their asthma medications or withheld doses during pregnancy, without consulting their doctors. Their decisions revolved around lack of support and information in regard to what to do, concerns about safety of the medications, past experiences, and a desire for an "all natural" pregnancy.

Lack of proactive support was a definite barrier to gaining optimal asthma control during pregnancy for these women. Asthma had been largely ignored by their health professionals, leading the women to believe that asthma was a low priority. In spite of this, women were concerned about steroid use during pregnancy, and made independent inquiries, for example, via the Internet, which sometimes resulted in confusing or incorrect information. It was clear from the interviews that women felt it would have been helpful if asthma had been brought up more by their health professionals, providing opportunities for pursuing more reliable information.

Along with barriers, the other themes discerned in these interviews concur with the six constructs of the Health Belief Model (25). This model postulates that the likelihood of an individual taking up a health-related behavior is dependent on their assessment of *perceived susceptibility*, *severity*, *barriers*, *benefits*, *cues to action*, and *self-efficacy*. Our results showed that pregnant women were

more likely to be more diligent with their asthma management during pregnancy if they were aware of the risks of poorly controlled asthma (*perceived susceptibility*), aware of the advantages of optimal asthma control during pregnancy (*perceived benefits*), and felt they had enough information to make informed decisions about their health (*self-efficacy*).

It was disappointing to note that some participants relied on incorrect information. Cases of poor asthma management were apparent when participants did not perceive uncontrolled asthma as a potential for causing poor outcomes during pregnancy (*perceived severity*), desired a drug-free pregnancy (*perceived barriers*), lacked support, and were not well informed about the risk of the condition (*cues to action*). Association between the themes and model was particularly demonstrated through changes to medication use. Those who did not perceive asthma to be a contributing factor to poor outcomes and perceived the effects of the medication use to be more dangerous discontinued or reduced their medications. This was evident in mild asthmatics, who either did not perceive or were led to believe that asthma was not a high priority. This is concerning as mild asthmatics can experience severe asthma exacerbations during pregnancy (26).

Perceived effects of medication use resulted in most participants avoiding steroid medications but, ironically, they had no qualms about using beta-agonist medications, thus jeopardizing their asthma control. Similar results were reported by Powell et al., who found that many women perceived teratogenic risks with oral (42%) and inhaled (12%) steroids but fewer perceived risks with short-acting beta-agonists (5%) (27). Women's anxiety over these perceived risks, and lack of knowledge of the benefits of ongoing use, could prevent them from achieving optimal asthma control.

Participants included a wide variety of pregnant women, in terms of gestation, severity of asthma, and other parameters, thus enabling us to elicit a range of views. Participants did not, however, include any women in the first trimester of pregnancy as most presented to the outpatient clinic after 12 weeks gestation. Participants easily recalled their management and experiences during the first trimester. Recruitment was only from one maternity hospital but the catchment of women was widespread (metropolitan, rural, and regional participants were approached). Participants included women from various ethnic groups and varying socioeconomic status. No participants were taking leukotriene receptor antagonists or cromolyns, which are not commonly used during pregnancy. Also no participants self-reported smoking during pregnancy. It was difficult to identify and recruit smokers because only 7.8% of pregnant women with asthma in Melbourne have been shown to smoke (1). In addition, given that smokers may feel uncomfortable about their habit, it is not surprising that none volunteered to be interviewed. It may be that their views and experiences would have been different from those of non-smokers.

With such limited independent information and resources for women to guide their asthma management

during pregnancy, more education is warranted. More information could be provided regarding asthma medication safety and changes in asthma during pregnancy, even to women with mild asthma who may be unaware of the potential effects of pregnancy on asthma control. Regular monitoring should be performed (7). The authors are currently developing an educational intervention targeting pregnant women and their health professionals for implementation in both hospital and community practice.

CONCLUSIONS

Asthma management during pregnancy can be explained using the Health Belief Model. Women are not well informed about or supported in their asthma management during pregnancy, despite concerns of both health professionals and women about asthma and safety of preventive asthma medications. Communication between pregnant women and health professionals regarding asthma management is also poor. Strategies for optimizing asthma management during pregnancy should be developed and evaluated in prospective studies.

ACKNOWLEDGMENTS

The authors would like to thank all the women who participated in the study. They also thank the Asthma Foundation of Victoria for supporting and endorsing the research. The authors also thank Paul Drinkwater, Gordon Spalding, and Tania Fletcher, all of Mercy Hospital for Women, Victoria, for facilitating participant recruitment.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

REFERENCES

1. Sawicki E, George J, Stewart K, Boer A, Wong S, Leung L, Paul E. Medication use for chronic health conditions by pregnant women attending an Australian maternity hospital. *Aust NZ J Obstet Gynaecol* 2011; 51(4):333–338.
2. Blais L, Kettani FZ, Elftouh N, Forget A. Effect of maternal asthma on the risk of specific congenital malformations: a population-based cohort study. *Birth Defects Res A Clin Mol Teratol* 2010; 88(4):216–222.
3. Sugai K, Ito M, Tateishi I, Funabiki T, Nishikawa M. Neonatal periventricular leukomalacia due to severe, poorly controlled asthma in the mother. *Allergol Int* 2006; 55:207–212.
4. Murphy V, Namazy J, Powell H, Schatz M, Chambers C, Attia J, Gibson P. A meta-analysis of adverse perinatal outcomes in women with asthma. *BJOG* 2011; 118:1314–1323.
5. Levine RS, Hennekens CH, Jesse MJ. Blood pressure in prospective population based cohort of newborn and infant twins. *Br Med J* 1994; 308:298–302.

6. Barker DJP. Fetal nutrition and cardiovascular disease in later life. *Br Med Bull* 1997; 53:96–108.
7. National Heart, Lung and Blood Institute. NAEPP Expert Panel report. Managing asthma during pregnancy: recommendations for pharmacologic treatment—2004 update. *J Allergy Clin Immunol* 2005; 115:34–46.
8. Lim A, Stewart K, Konig K, George J. Systematic review of the safety of regular preventive asthma medications during pregnancy. *Ann Pharmacother* 2011; 45:931–945.
9. British Thoracic Society. Asthma in pregnancy. In: *British Guidelines on the Management of Asthma*. Edinburgh: Scottish Intercollegiate Guideline Networks, 2009:71–72.
10. National Asthma Council of Australia. Pregnancy and asthma. In: *Asthma Management Handbook*. Melbourne: National Asthma Council Ltd., 2006:101–103.
11. American College of Obstetricians and Gynecologists and the American College of Allergy, Asthma and Immunology. Position statement: the use of newer asthma and allergy medications during pregnancy. *Ann Allergy Asthma Immunol* 2000; 84:475–480.
12. Global Initiative for Asthma. Special considerations—pregnancy. In: *Global Strategy for Asthma Management and Prevention*. Cape Town: Medical Communication Resources Inc., 2008:70–71.
13. National Heart, Lung and Blood Institute. Managing special situations—pregnancy. In: *National Asthma Education and Prevention Program (NAEPP) Expert Panel Report 3 Guidelines for the Diagnosis and Management of Asthma*. NIH Publication. Washington, DC: US Department of Health and Human Services, 2007:38–39.
14. Olesen C, Thrane N, Nielsen GL, Sørensen HT, Olsen J. A population-based prescription study of asthma drugs during pregnancy: changing the intensity of asthma therapy and perinatal outcomes. *Respiration* 2001; 68:256–261.
15. Stenius-Aarniala BS, Hedman J, Teramo KA. Acute asthma during pregnancy. *Thorax* 1996; 51:411–414.
16. Schatz M, Leibman C. Inhaled corticosteroid use and outcomes in pregnancy. *Ann Allergy Asthma Immunol* 2005; 95:234–238.
17. Blais L, Beauchesne MF, Rey E, Malo JL, Forget A. Use of inhaled corticosteroids during the first trimester of pregnancy and the risk of congenital malformations among women with asthma. *Thorax* 2007; 62:320–328.
18. Sawicki E, Stewart K, Wong S, Paul E, Leung L, George J. Management of asthma by pregnant women attending an Australian maternity hospital. *Aust NZ J Obstet Gynaecol* 2012;52(2):183–8.
19. Chambers K. Asthma education and outcomes for women of child-bearing age. *Case Manager* 2003; 14:58–61.
20. Lim A, Stewart K, Abramson M, George J. Management of pregnant women with asthma by Australian general practitioners. *BMC Fam Pract* 2011; 12:121.
21. Juniper E, O'Byrne P, Guyatt G, Ferrie P, King D. Development and validation of a questionnaire to measure asthma control. *Eur Respir J* 1999; 14:902–907.
22. National Asthma Council of Australia. Diagnosis and classification in adults. In: *Asthma Management Handbook*. Melbourne: National Asthma Council Ltd., 2006:78.
23. George J, Mackinnon A, Kong D, Stewart K. Development and validation of the Beliefs and Behaviour Questionnaire (BBQ). *Patient Educ Couns* 2006; 64:50–60.
24. Pope C, Ziebland S, Mays N. Analysing qualitative data. *BMJ* 2000; 320:114–116.
25. Centrelink Australia. Available at: http://www.centrelink.gov.au/internet/internet.nsf/payments/ftb_a_iat.htm. Accessed October 24, 2011.
26. Opat A, Cohen M, Bailey M, Abramson M. A clinical trial of the Buteyko breathing technique in asthma as taught by a video. *J Asthma* 2000; 37:557–564.
27. Powell H, McCaffery K, Murphy VE, Hensley MJ, Clifton VL, Giles W, Gibson PG. Psychosocial outcomes are related to asthma control and quality of life in pregnant women with asthma. *J Asthma* 2011; 48: 1032–1040.

Copyright of Journal of Asthma is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.