

VERSION 2.0

POPULATIONS

Pregnant women

This PDF is a print-friendly reproduction of the content included in the *Populations – Pregnant Women* section of the *Australian Asthma Handbook* at astmahandbook.org.au/populations/pregnant-women

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ABBREVIATIONS

CFC	chlorofluorocarbon	LTRA	leukotriene receptor antagonist
COPD	chronic obstructive pulmonary disease	MBS	Medical Benefits Scheme
COX	cyclo-oxygenase	NHMRC	National Health and Medical Research Council
DXA	dual-energy X-ray absorptiometry	NIPPV	non-invasive positive pressure ventilation
ED	emergency department	NSAIDs	nonsteroidal anti-inflammatory drugs
EIB	exercise-induced bronchoconstriction	OCS	oral corticosteroids
FEV₁	forced expiratory volume over one second	OSA	obstructive sleep apnoea
FEV₆	forced expiratory volume over six seconds	PaCO	carbon dioxide partial pressure on blood gas analysis
FSANZ	Food Standards Australia and New Zealand	PaO	oxygen partial pressure on blood gas analysis
FVC	forced vital capacity	PBS	Pharmaceutical Benefits Scheme
GORD	gastro-oesophageal reflux disease	PEF	peak expiratory flow
HFA	formulated with hydrofluoroalkane propellant	pMDI	pressurised metered-dose inhaler or 'puffer'
ICS	inhaled corticosteroid	PPE	personal protective equipment
ICU	intensive care unit	SABA	short-acting beta ₂ -adrenergic receptor agonist
IgE	Immunoglobulin E	SAMA	short-acting muscarinic antagonist
IL	interleukin	SaO₂	oxygen saturation
IU	international units	SpO₂	peripheral capillary oxygen saturation measured by pulse oximetry
IV	intravenous	TGA	Therapeutic Goods Administration
LABA	long-acting beta ₂ -adrenergic receptor agonist		
LAMA	long-acting muscarinic antagonist		

RECOMMENDED CITATION

National Asthma Council Australia. *Australian Asthma Handbook*, Version 2.0. National Asthma Council Australia, Melbourne, 2019.

Available from: <http://www.asthmahandbook.org.au>

ISSN 2203-4722

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SPONSORS

National Asthma Council Australia would like to acknowledge the support of the sponsors of Version 2.0 of the *Australian Asthma Handbook*:

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Asthma in pregnant women

Overview

Good asthma control during pregnancy is a high priority, to protect the foetus as well as the mother. Untreated asthma, poorly controlled asthma or flare-ups during pregnancy put mothers and babies at risk.

Reducing asthma-related risk for women with asthma and their babies involves:

- giving preconception advice to women with asthma
- advising pregnant women about good asthma control
- managing asthma actively during pregnancy
- managing flare-ups during pregnancy.

Asthma medicines are used in pregnancy when the risks of poor asthma control outweigh the risks associated with medicines.

Most asthma medicines can be used by breastfeeding women, because the risks of poor asthma control outweigh the risks associated with medicines.

Table. Pregnancy safety categories for asthma and allergic rhinitis medicines

Please view and print this figure separately: <http://www.asthmahandbook.org.au/table/show/44>

Table. Local pregnancy and breastfeeding safety information services

Please view and print this figure separately: <http://www.asthmahandbook.org.au/table/show/71>

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Giving preconception advice to women with asthma

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Pregnancy

Managing asthma during pregnancy

<http://www.asthmahandbook.org.au/populations/pregnant-women/pregnancy>

Breastfeeding

Managing asthma in breastfeeding women

<http://www.asthmahandbook.org.au/populations/pregnant-women/breastfeeding>

Giving preconception advice to women with asthma

Recommendations

Offer advice about healthy pregnancy to all women of reproductive age who have current asthma or a history of asthma. Explain that:

- untreated asthma, poorly controlled asthma or flare-ups during pregnancy put mothers and babies at risk
- it is especially important to maintain good asthma control during pregnancy.

How this recommendation was developed

Evidence-based recommendation (Grade A)

Based on systematic literature review.

Clinical question for literature search:

What are the effects of (1) asthma and (2) asthma treatment on pregnancy outcomes?

(e.g. Does effective asthma control improve pregnancy outcomes [maternal, foetal] in women with asthma? Does poorly controlled asthma [evidenced by exacerbations, acute asthma episodes, emergency visits] affect pregnancy outcomes in women with asthma? Does asthma treatment affect pregnancy outcomes [maternal, foetal] in women with asthma?)

Key evidence considered:

- Clifton *et al.* 2010¹
- Moldenhauer *et al.* 2010²
- Murphy *et al.* 2006³
- Murphy *et al.* 2011⁴
- Namazy *et al.* 2012⁵
- Schatz *et al.* 1995⁶
- Schatz *et al.* 2001⁷
- Schatz *et al.* 2006⁸

For women with current asthma or a history of asthma who intend to conceive, offer asthma review and advice about asthma control during pregnancy (in addition to standard preconception care and advice).

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Provide (or update) an individualised written asthma action plan.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).


Assess recent asthma symptom control and perform baseline spirometry.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

If preventer therapy (e.g. low-dose inhaled corticosteroid) has been prescribed or is indicated, advise the woman to keep taking her preventer throughout pregnancy.


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Lim *et al.* 2011⁹
- Murphy and Gibson, 2011¹⁰
- Murphy *et al.* 2005¹¹
- Murphy *et al.* 2006³
- Murphy *et al.* 2011⁴
- Schatz *et al.* 2004¹²

Advise that women with asthma have a slightly increased overall risk of having a baby with congenital abnormalities, compared with non-asthmatic women, but do not have a higher risk of having a baby with major congenital abnormalities or stillbirth than women without asthma.


 *How this recommendation was developed*

Based on selected evidence

Based on a limited structured literature review or published systematic review, which identified the following relevant evidence:

- Murphy *et al.* 2013¹³

Advise quitting smoking and avoiding exposure to cigarette smoke.

 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹⁴

Arrange vaccinations (influenza, pertussis) according to current national recommendations (refer to current *Australian Immunisation Handbook*).

► Go to: [The Australian Immunisation Handbook](#)

 *How this recommendation was developed*


Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Australian Technical Advisory Group on Immunisation and Department of Health and Ageing, 2013¹⁵

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Review all current medicines, including intranasal corticosteroids, complementary medicines and food supplements.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

For a woman planning pregnancy, consider replacing current preventer with a preventer rated category A for pregnancy (currently only budesonide), to see if asthma control remains stable. However, once a woman has become pregnant and her asthma is well controlled on combination inhaled corticosteroid/long-acting beta₂ agonist, advise her to continue, and explain that stopping long-acting beta₂ agonist often leads to loss of asthma control, which should not be risked during pregnancy.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Brozek *et al.* 2012¹⁶

If the woman is anxious to stop taking long-acting beta₂ agonist before pregnancy, discuss risks and benefits of a treatment trial of inhaled corticosteroid alone.

Explain that, if asthma control worsens (e.g. symptoms increase or a flare-up occurs) on inhaled corticosteroid alone, this indicates that she should go back to the previously effective regimen and continue taking it when she becomes pregnant.

Follow the steps for conducting a treatment trial.

Table. Steps for conducting a treatment trial

1. Document baseline lung function.
2. Document baseline asthma control using a validated standardised tool such as the Asthma Score.
3. Discuss treatment goals and potential adverse effects with the person.
4. Run treatment trial for agreed period (e.g. 4–8 weeks, depending on the treatment and clinical circumstances, including urgency).
5. At an agreed interval, measure asthma control and lung function again and document any adverse effects.
6. If asthma control has not improved despite correct inhaler technique and good adherence, resume previous treatment and consider referral for specialist consultation.

► See: [Asthma Score \(Asthma Control Test\)](#)

Asset ID: 36

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Effects of asthma on pregnancy outcomes

Birth weight and related outcomes

Untreated asthma, poorly controlled asthma or asthma flare-ups during pregnancy put mothers and babies at risk:

- Overall (not taking into account asthma severity or treatment), women with asthma have a higher risk of pre-eclampsia⁴ and preterm delivery,⁴ and their infants have a higher risk of low birth weight^{3,4} and of being small for gestational age,⁴ compared with non-asthmatic women.
- Severe asthma flare-ups (symptoms requiring medical interventions such as hospitalisation, emergency department visits, other

unscheduled urgent visits to the doctor, or the use of emergency treatment) during pregnancy increase the risk of low birth weight, compared with infants of women with asthma who do not have any flare-ups during pregnancy.^{3, 5}

Active management of asthma by a health professional reduces the risk of preterm delivery. Among women with asthma that is managed by a health professional, the risk of preterm labour and preterm delivery is not significantly higher than for non-asthmatic pregnant women.⁴

Inhaled corticosteroid use may reduce the risk of flare-ups during pregnancy.³ Inhaled corticosteroids generally have good safety profiles in pregnant women.¹⁷

Although treatment with oral corticosteroids for flare-ups has been associated with low birth weight⁵ and preterm delivery⁵ compared with no oral corticosteroid use, it is uncertain whether the effect is due to the treatment itself or to the acute flare-ups.

Congenital malformations

Maternal asthma is associated with increased risk of any congenital malformation, and increased risk of cleft lip with or without cleft palate, but not major congenital malformations or stillbirth.¹³

The use of bronchodilators and inhaled corticosteroids is not associated with increased risk of congenital malformations.¹³

Effects of pregnancy on asthma control

In Australia the prevalence of asthma in pregnancy is approximately 12%.^{18, 19}

Most women with asthma experience a change in asthma control while pregnant. Asthma control improves in approximately one in three, and worsens in at least one in three women.¹⁰ These changes are unpredictable from woman to woman and from pregnancy to pregnancy.¹⁰

During pregnancy, approximately 6% of women with asthma are hospitalised with a severe asthma flare-up.^{20, 3} In a large Australian cohort of pregnant women, 36% of those with asthma experienced a severe flare-up that required medical intervention, and a further 19% experienced a milder flare-up.³

Although flare-ups occur at any time during gestation, they appear to be more common in the late second trimester.¹⁰

Risk factors for flare-ups during pregnancy include^{20, 10}

- 'severe' asthma (according to older classification based on pattern of symptoms when not treated)
- nonadherence to preventer medicines
- viral infections
- a range of other factors such as obesity and gastro-oesophageal reflux.

In an Australian study, almost one third of women who experienced a severe asthma flare-up during pregnancy reported that they had not been taking their prescribed preventer before the flare-up.²¹

Information for women about asthma and healthy pregnancy

Recommended reading for pregnant women with asthma and their partners includes material from the National Asthma Council Australia and Asthma Australia.

- ▶ Go to: National Asthma Council Australia fact sheet [Pregnancy: Managing your asthma](#)
- Go to: Asthma Australia's [Pregnancy](#) webpage

Prenatal and childhood exposure to tobacco smoke

Tobacco smoking by pregnant women damages children's respiratory health. It also increases the risk of stillbirth, spontaneous abortion, reduced foetal growth, preterm birth, low birth weight, placental abruption, sudden infant death, cleft palate, cleft lip and childhood cancers.¹⁴

Risk of developing asthma

Prenatal exposure to tobacco smoke and exposure during infancy increase the risk of wheezing during early childhood.²²

- ▶ See: [Primary prevention of asthma](#)

Effects on children's asthma

Evidence from an Australian cohort study suggests that children with asthma whose mothers smoked during pregnancy benefit less from treatment with inhaled corticosteroids, and show less improvement in airway hyperresponsiveness over time, than those with

asthma but no intrauterine exposure to smoke.²³

Smoking: effects on risk of developing asthma

Exposure to tobacco smoke toxins *in utero* or in infancy has been associated with increased risk of wheezing and asthma in children.^{24, 25}

Maternal smoking during pregnancy is associated with an almost twofold increase in asthma in infants aged 2 years or less.²⁵

Several large systematic reviews and meta-analyses of prospective cohort studies have reported that maternal smoking during pregnancy and exposure to tobacco smoke in infancy are associated with large increases in the risk of wheezing in the first 2 years of life.^{25, 26}

A meta-analysis of observational studies (mainly cross-sectional studies) found that exposure to environmental tobacco smoke was associated with an increase in childhood asthma,²⁷ but this association was weaker than that between exposure to environmental tobacco smoke and wheezing.

Epigenetic effects may modify the effects of environmental risk factors, including exposure to tobacco smoke, on development of asthma.²⁸ However, a longitudinal cohort study²⁹ found no association between smoking by grandparents (including during pregnancy with the mothers of the study cohort) early wheezing or asthma at age 7 in grandchildren.

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Safety of stepping down treatment during pregnancy

It may not be feasible to step down (e.g. reduce the inhaled corticosteroid dose or cease long-acting beta₂ agonist) during pregnancy, because this is usually accomplished over several months while monitoring asthma control.

Several studies have reported deterioration in asthma control after ceasing long-acting beta₂ agonist treatment in adults with asthma previously stabilised on inhaled corticosteroid/long-acting beta₂ agonist combination.^{16, 30} If inhaled corticosteroid/long-acting beta₂ agonist combination is replaced by inhaled corticosteroid only, patients should be advised to start taking their old combination inhaler again if asthma worsens within the first few days after switching.

In a woman planning a pregnancy, a failed treatment trial of inhaled corticosteroid alone may demonstrate that she needs to continue taking combination therapy during pregnancy in order to maintain asthma control.

Immunisation for pregnant women

The *Australian Immunisation Handbook*¹⁵ recommends influenza vaccination for pregnant women. Refer to the *Australian Immunisation Handbook* for up-to-date information on influenza, pneumococcal, pertussis and other vaccinations in pregnant women.

► Go to: [The Australian Immunisation Handbook](#)

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Managing asthma during pregnancy

In this section

Asthma advice

Advising pregnant women about good asthma control

<http://www.astmahandbook.org.au/populations/pregnant-women/pregnancy/asthma-advice>

Asthma care

Managing asthma actively during pregnancy

<http://www.astmahandbook.org.au/populations/pregnant-women/pregnancy/asthma-care>

Flare-ups


Managing flare-ups aggressively during pregnancy

<http://www.astmahandbook.org.au/populations/pregnant-women/pregnancy/flare-ups>

Advising pregnant women about good asthma control

Recommendations


Offer regular asthma review and advice about asthma control during pregnancy (in addition to standard prenatal care and advice).

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Arrange vaccinations (influenza, pertussis) according to current national recommendations for pregnant women (refer to current *Australian Immunisation Handbook*).


 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Australian Technical Advisory Group on Immunisation and Department of Health and Ageing, 2013¹

Advise women who smoke to quit, and offer support. Advise all pregnant women to avoid exposure to cigarette smoke.


 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011²

Provide (or update) an individualised written asthma action plan.


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Advise pregnant women that:

- asthma control and severity can change during pregnancy due to a range of factors (e.g. changes in the immune system, allergic rhinitis)
- good asthma control during pregnancy is a high priority, to protect the foetus as well as the mother
- treatment may need to change from time to time to maintain good asthma control throughout pregnancy, and therefore frequent planned asthma review is necessary.


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Ali and Ulrik, 2013³
- Clifton *et al.* 2009⁴
- Murphy and Gibson, 2011⁵
- Murphy *et al.* 2005⁶
- Murphy *et al.* 2006⁷
- Murphy *et al.* 2011⁸
- Namazy *et al.* 2012⁹
- Silverman *et al.* 2005¹⁰

If preventer therapy (e.g. low-dose inhaled corticosteroid) has been prescribed or is indicated, advise the woman to keep taking her preventer throughout pregnancy.


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Lim *et al.* 2011¹¹
- Murphy and Gibson, 2011⁵
- Murphy *et al.* 2005¹²
- Murphy *et al.* 2006⁷
- Murphy *et al.* 2011⁸
- Schatz *et al.* 2004¹³


Explain that asthma medicines are used in pregnancy when the risks of poor asthma control outweigh the risks associated with medicines.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).


Provide reliable information about asthma and health during pregnancy, and offer to discuss any information the woman may have read or be concerned about.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Reassure women that acute asthma rarely occurs during labour and delivery, although some may experience asthma symptoms. Advise them to make sure that their midwife and obstetrician know they have asthma and that this is recorded in their birth plan.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Murphy and Gibson, 2011⁵

More information

Effects of pregnancy on asthma control

In Australia the prevalence of asthma in pregnancy is approximately 12%.^{4, 14}

Most women with asthma experience a change in asthma control while pregnant. Asthma control improves in approximately one in three, and worsens in at least one in three women.⁵ These changes are unpredictable from woman to woman and from pregnancy to pregnancy.⁵

During pregnancy, approximately 6% of women with asthma are hospitalised with a severe asthma flare-up.^{3, 7} In a large Australian cohort of pregnant women, 36% of those with asthma experienced a severe flare-up that required medical intervention, and a further 19% experienced a milder flare-up.⁷

Although flare-ups occur at any time during gestation, they appear to be more common in the late second trimester.⁵

Risk factors for flare-ups during pregnancy include^{3, 5}

- 'severe' asthma (according to older classification based on pattern of symptoms when not treated)
- nonadherence to preventer medicines
- viral infections
- a range of other factors such as obesity and gastro-oesophageal reflux.

In an Australian study, almost one third of women who experienced a severe asthma flare-up during pregnancy reported that they had not been taking their prescribed preventer before the flare-up.⁶

Information for women about asthma and healthy pregnancy

Recommended reading for pregnant women with asthma and their partners includes material from the National Asthma Council Australia and Asthma Australia.

- ▶ Go to: National Asthma Council Australia fact sheet [Pregnancy: Managing your asthma](#)
- Go to: Asthma Australia's [Pregnancy](#) webpage

Prenatal and childhood exposure to tobacco smoke

Tobacco smoking by pregnant women damages children's respiratory health. It also increases the risk of stillbirth, spontaneous abortion, reduced foetal growth, preterm birth, low birth weight, placental abruption, sudden infant death, cleft palate, cleft lip and childhood cancers.²

Risk of developing asthma

Prenatal exposure to tobacco smoke and exposure during infancy increase the risk of wheezing during early childhood.¹⁵

- ▶ See: [Primary prevention of asthma](#)

Effects on children's asthma

Evidence from an Australian cohort study suggests that children with asthma whose mothers smoked during pregnancy benefit less from treatment with inhaled corticosteroids, and show less improvement in airway hyperresponsiveness over time, than those with asthma but no intrauterine exposure to smoke.¹⁶

Effects of asthma on pregnancy outcomes

Birth weight and related outcomes

Untreated asthma, poorly controlled asthma or asthma flare-ups during pregnancy put mothers and babies at risk:

- Overall (not taking into account asthma severity or treatment), women with asthma have a higher risk of pre-eclampsia⁸ and preterm delivery,⁸ and their infants have a higher risk of low birth weight^{7, 8} and of being small for gestational age,⁸ compared with non-asthmatic women.
- Severe asthma flare-ups (symptoms requiring medical interventions such as hospitalisation, emergency department visits, other unscheduled urgent visits to the doctor, or the use of emergency treatment) during pregnancy increase the risk of low birth weight, compared with infants of women with asthma who do not have any flare-ups during pregnancy.^{7, 9}

Active management of asthma by a health professional reduces the risk of preterm delivery. Among women with asthma that is managed by a health professional, the risk of preterm labour and preterm delivery is not significantly higher than for non-asthmatic pregnant women.⁸

Inhaled corticosteroid use may reduce the risk of flare-ups during pregnancy.⁷ Inhaled corticosteroids generally have good safety

profiles in pregnant women.¹⁰

Although treatment with oral corticosteroids for flare-ups has been associated with low birth weight⁹ and preterm delivery⁹ compared with no oral corticosteroid use, it is uncertain whether the effect is due to the treatment itself or to the acute flare-ups.

Congenital malformations

Maternal asthma is associated with increased risk of any congenital malformation, and increased risk of cleft lip with or without cleft palate, but not major congenital malformations or stillbirth.¹⁷

The use of bronchodilators and inhaled corticosteroids is not associated with increased risk of congenital malformations.¹⁷

Immunisation for pregnant women

The *Australian Immunisation Handbook*¹ recommends influenza vaccination for pregnant women. Refer to the *Australian Immunisation Handbook* for up-to-date information on influenza, pneumococcal, pertussis and other vaccinations in pregnant women.

► Go to: [The Australian Immunisation Handbook](#)

Last reviewed version 2.0

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Managing asthma actively during pregnancy

Recommendations

Manage asthma during pregnancy as for asthma in other adults, aiming to maintain the best possible asthma control and to avoid asthma flare-ups.

Note: The [Therapeutic Goods Administration](#) categorises medicines according to safety during pregnancy.

How this recommendation was developed

Evidence-based recommendation (Grade A)

Based on systematic literature review.

Clinical question for literature search:

What are the effects of (1) asthma and (2) asthma treatment on pregnancy outcomes?

(e.g. Does effective asthma control improve pregnancy outcomes [maternal, foetal] in women with asthma? Does poorly controlled asthma [evidenced by exacerbations, acute asthma episodes, emergency visits] affect pregnancy outcomes in women with asthma? Does asthma treatment affect pregnancy outcomes [maternal, foetal] in women with asthma?)

Key evidence considered:

- Clifton *et al.* 2010¹
- Moldenhauer *et al.* 2010²
- Murphy *et al.* 2006³
- Murphy *et al.* 2011⁴
- Namazy *et al.* 2012⁵
- Schatz *et al.* 2001⁶
- Schatz *et al.* 2006⁷
- Silverman *et al.* 2005⁸

For a pregnant woman with asthma, prescribe preventers, if indicated, just as for other adults, aiming to maintain the best possible asthma control and to avoid asthma flare-ups.

Note: Do not withhold preventer treatment due to pregnancy. Pregnancy is not a contraindication for asthma preventers.

How this recommendation was developed

Evidence-based recommendation (Grade A)

Based on systematic literature review.

Clinical question for literature search:

What are the effects of (1) asthma and (2) asthma treatment on pregnancy outcomes?

(e.g. Does effective asthma control improve pregnancy outcomes [maternal, foetal] in women with asthma? Does poorly controlled asthma [evidenced by exacerbations, acute asthma episodes, emergency visits] affect pregnancy outcomes in women with asthma? Does asthma treatment affect pregnancy outcomes [maternal, foetal] in women with asthma?)

Key evidence considered:

- Lim *et al.* 2012⁹
- Murphy *et al.* 2011⁴
- Silverman *et al.* 2005⁸

Step up the regimen as necessary to regain or maintain control during pregnancy.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Powell *et al.* 2011¹⁰

During pregnancy, consider stepping down only if the woman is taking an inappropriately high dose of a medicine.

Note: Stepping down is not a priority during pregnancy because of the risk of flare-up.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Offer regular review of asthma every 4 weeks during pregnancy. Assess asthma control consistently at each review (e.g. use a validated asthma assessment tool, and use the same tool each time).

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Identify and manage comorbid conditions that may affect asthma control or mimic asthma symptoms (e.g. allergic rhinitis, gastro-oesophageal reflux disease).

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Effects of pregnancy on asthma control

In Australia the prevalence of asthma in pregnancy is approximately 12%.^{11, 12}

Most women with asthma experience a change in asthma control while pregnant. Asthma control improves in approximately one in three, and worsens in at least one in three women.¹³ These changes are unpredictable from woman to woman and from pregnancy to pregnancy.¹³

During pregnancy, approximately 6% of women with asthma are hospitalised with a severe asthma flare-up.^{14, 3} In a large Australian cohort of pregnant women, 36% of those with asthma experienced a severe flare-up that required medical intervention, and a further 19% experienced a milder flare-up.³

Although flare-ups occur at any time during gestation, they appear to be more common in the late second trimester.¹³

Risk factors for flare-ups during pregnancy include^{14, 13}

- 'severe' asthma (according to older classification based on pattern of symptoms when not treated)
- nonadherence to preventer medicines
- viral infections
- a range of other factors such as obesity and gastro-oesophageal reflux.

In an Australian study, almost one third of women who experienced a severe asthma flare-up during pregnancy reported that they had not been taking their prescribed preventer before the flare-up.¹⁵

Effects of asthma on pregnancy outcomes

Birth weight and related outcomes

Untreated asthma, poorly controlled asthma or asthma flare-ups during pregnancy put mothers and babies at risk:

- Overall (not taking into account asthma severity or treatment), women with asthma have a higher risk of pre-eclampsia⁴ and preterm delivery,⁴ and their infants have a higher risk of low birth weight^{3, 4} and of being small for gestational age,⁴ compared with non-asthmatic women.
- Severe asthma flare-ups (symptoms requiring medical interventions such as hospitalisation, emergency department visits, other unscheduled urgent visits to the doctor, or the use of emergency treatment) during pregnancy increase the risk of low birth weight, compared with infants of women with asthma who do not have any flare-ups during pregnancy.^{3, 5}

Active management of asthma by a health professional reduces the risk of preterm delivery. Among women with asthma that is managed by a health professional, the risk of preterm labour and preterm delivery is not significantly higher than for non-asthmatic pregnant women.⁴

Inhaled corticosteroid use may reduce the risk of flare-ups during pregnancy.³ Inhaled corticosteroids generally have good safety profiles in pregnant women.⁸

Although treatment with oral corticosteroids for flare-ups has been associated with low birth weight⁵ and preterm delivery⁵ compared with no oral corticosteroid use, it is uncertain whether the effect is due to the treatment itself or to the acute flare-ups.

Congenital malformations

Maternal asthma is associated with increased risk of any congenital malformation, and increased risk of cleft lip with or without cleft palate, but not major congenital malformations or stillbirth.¹⁶

The use of bronchodilators and inhaled corticosteroids is not associated with increased risk of congenital malformations.¹⁶

Safety of stepping down treatment during pregnancy

It may not be feasible to step down (e.g. reduce the inhaled corticosteroid dose or cease long-acting beta₂ agonist) during pregnancy, because this is usually accomplished over several months while monitoring asthma control.

Several studies have reported deterioration in asthma control after ceasing long-acting beta₂ agonist treatment in adults with asthma previously stabilised on inhaled corticosteroid/long-acting beta₂ agonist combination.^{17, 18} If inhaled corticosteroid/long-acting beta₂ agonist combination is replaced by inhaled corticosteroid only, patients should be advised to start taking their old combination inhaler again if asthma worsens within the first few days after switching.

In a woman planning a pregnancy, a failed treatment trial of inhaled corticosteroid alone may demonstrate that she needs to continue taking combination therapy during pregnancy in order to maintain asthma control.

Safety of asthma medicines in pregnancy

Published evidence for the safety of asthma medicines during pregnancy is limited mainly to prospective and retrospective cohort studies, and regional or national register databases. Many studies of the safety of asthma medicines in pregnancy have been underpowered.¹³

Therefore, it is not possible to precisely distinguish the effects on foetuses of asthma treatments from those of maternal asthma; any outcome statistically associated with the use of reliever medicines could be due to either to the medicines or to poor asthma control necessitating reliever use, while any outcome associated with the use of emergency asthma medicines could be due either to the medicines or to the effects of a severe flare-up.

Table. Pregnancy safety categories for asthma and allergic rhinitis medicines

Please view and print this figure separately: <http://www.astmahandbook.org.au/table/show/44>

► Go to: The Therapeutic Goods Administration's [Prescribing medicines in pregnancy database](#)

Inhaled corticosteroids

A systematic review of evidence on the safety of regular preventer medicines during pregnancy did not find an association between the use of inhaled corticosteroids during pregnancy and any particular adverse event.⁹ This finding is consistent with earlier research.¹³

An adequately powered, large multicenter prospective cohort study found no significant relationships between inhaled corticosteroid use during pregnancy and adverse outcomes such as preterm birth at less than 32 weeks' gestation, major malformations, low birth weight, and small-for-gestational age infants.¹⁹ By maintaining adequate asthma control, inhaled corticosteroid use may protect against

low birth weight.^{13, 20}

Comparison of different formulations and doses

The majority of studies assessing the safety of inhaled corticosteroid use in pregnancy have involved women using budesonide.¹³ There is insufficient evidence to enable comparison between different inhaled corticosteroids,⁹ or to make conclusions about ciclesonide (a newer inhaled corticosteroid).⁹

There is little evidence about safety of different doses of inhaled corticosteroids.⁹ A study of pregnant women using beclometasone, budesonide or fluticasone propionate found that the rate of congenital malformations among those who used low-to-moderate doses in the first trimester was not higher than for those who did not use inhaled corticosteroids.²¹ The rate of congenital malformations (mainly musculoskeletal and cardiac malformations) was higher among those who used high doses than those who did not use inhaled corticosteroids.²¹ However, women who used higher doses of inhaled corticosteroid were older, more likely to have multiple fetuses, and more likely to have severe or uncontrolled asthma.⁹

The use of high doses of inhaled corticosteroids during pregnancy does not appear to affect foetal adrenal function.²²

ICS/LABA combinations

There is insufficient evidence to make conclusions about the combination of inhaled corticosteroids and long-acting beta₂ agonists during pregnancy.⁹

A systematic review of the safety of regular preventer medicines during pregnancy did not find an association between the use of long-acting beta₂ agonists during pregnancy and any particular adverse event.⁹

In a retrospective cohort study of 7376 pregnancies, during which 8.8% women took long-acting beta₂ agonists, long-acting beta₂ agonist use was not associated with increased risk of low birth weight, preterm birth, or small for gestational age.²³

Systemic corticosteroids

Associations have been reported between oral corticosteroid use during pregnancy and preeclampsia, preterm delivery, and reduced birth weight.¹³ However, it is difficult to separate the effects of the drug from the effects of the flare-up that necessitated its use.¹³

When systemic corticosteroids are required to manage severe acute asthma during pregnancy, the possible risks are less than the risks of severely uncontrolled asthma, which may result in maternal and/or foetal death.^{13, 24}

A meta-analysis of cohort studies found an association between the use of oral corticosteroid use and preterm delivery, low birth weight, and small-for-gestational age infants.²⁵ However, use of oral corticosteroids was a marker of severe asthma.²⁵

The use of oral corticosteroids during the first trimester may be associated with a small increase in the risk of oral cleft.²⁶

► Go to: Information on the safety of corticosteroids during pregnancy from [Motherisk, The Hospital for Sick Children, Toronto](#)

Gastro-oesophageal reflux in pregnancy

An estimated 30–50% of pregnant women experience symptomatic gastro-oesophageal reflux disease.²⁷ There is anecdotal evidence that pregnant women commonly develop alkaline reflux, which does not respond to treatment with proton pump inhibitors.

There is little published evidence for the best way to manage gastro-oesophageal reflux (including gastro-oesophageal reflux disease) in women with asthma during pregnancy.

► See: [Comorbid conditions and asthma](#)

Allergic rhinitis in pregnancy

The presence of allergic rhinitis is associated with worse asthma control.^{28, 29, 30}

If continuous treatment is required to manage allergic rhinitis, an intranasal corticosteroid is the first-choice treatment unless contraindicated.³¹ Budesonide nasal spray is rated pregnancy category A.³²

Pregnant women can also experience rhinitis-like symptoms of physiological congestion of nasal mucous membranes, due to pregnancy hormones.

Table. Pregnancy safety categories for asthma and allergic rhinitis medicines

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► Go to: National Asthma Council Australia's information paper [Managing allergic rhinitis in people with asthma](#)
See: [Allergies and asthma](#)

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Managing flare-ups during pregnancy

Recommendations

Intervene early during flare-ups, to minimise risk to the foetus.


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Namazy *et al.* 2012¹

When preparing a written asthma action plan for a pregnant woman, consider specifying a lower threshold for getting medical help (e.g. advise her to see a doctor rather than self-manage when asthma symptoms are slightly worse than usual or needing reliever more often than usual).


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

For a pregnant woman with asthma, prescribe oral corticosteroids if indicated, just as for other adults.

Note: Pregnancy is not a contraindication for oral corticosteroids. Oral prednisolone is rated category A for pregnancy.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Namazy *et al.* 2012¹

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For pregnant women with asthma who live in rural or remote areas, consider providing an emergency pack containing a 5-day course of oral corticosteroids to start at home, advising them to contact their primary care doctor as soon as possible.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

In emergency departments, ensure that pregnant women who present with acute asthma receive treatment immediately to minimise risk to the foetus and to the woman.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Effects of pregnancy on asthma control

In Australia the prevalence of asthma in pregnancy is approximately 12%.^{2, 3}

Most women with asthma experience a change in asthma control while pregnant. Asthma control improves in approximately one in three, and worsens in at least one in three women.⁴ These changes are unpredictable from woman to woman and from pregnancy to pregnancy.⁴

During pregnancy, approximately 6% of women with asthma are hospitalised with a severe asthma flare-up.^{5, 6} In a large Australian cohort of pregnant women, 36% of those with asthma experienced a severe flare-up that required medical intervention, and a further 19% experienced a milder flare-up.⁶

Although flare-ups occur at any time during gestation, they appear to be more common in the late second trimester.⁴

Risk factors for flare-ups during pregnancy include^{5, 4}

- 'severe' asthma (according to older classification based on pattern of symptoms when not treated)
- nonadherence to preventer medicines
- viral infections
- a range of other factors such as obesity and gastro-oesophageal reflux.

In an Australian study, almost one third of women who experienced a severe asthma flare-up during pregnancy reported that they had not been taking their prescribed preventer before the flare-up.⁷

Safety of asthma medicines in pregnancy

Published evidence for the safety of asthma medicines during pregnancy is limited mainly to prospective and retrospective cohort studies, and regional or national register databases. Many studies of the safety of asthma medicines in pregnancy have been underpowered.⁴

Therefore, it is not possible to precisely distinguish the effects on foetuses of asthma treatments from those of maternal asthma; any outcome statistically associated with the use of reliever medicines could be due to either to the medicines or to poor asthma control necessitating reliever use, while any outcome associated with the use of emergency asthma medicines could be due either to the medicines or to the effects of a severe flare-up.

Table. Pregnancy safety categories for asthma and allergic rhinitis medicines

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► Go to: The Therapeutic Goods Administration's [Prescribing medicines in pregnancy database](#)

Inhaled corticosteroids

A systematic review of evidence on the safety of regular preventer medicines during pregnancy did not find an association between the use of inhaled corticosteroids during pregnancy and any particular adverse event.⁸ This finding is consistent with earlier research.⁴

An adequately powered, large multicenter prospective cohort study found no significant relationships between inhaled corticosteroid use during pregnancy and adverse outcomes such as preterm birth at less than 32 weeks' gestation, major malformations, low birth weight, and small-for-gestational age infants.⁹ By maintaining adequate asthma control, inhaled corticosteroid use may protect against low birth weight.^{4, 10}

Comparison of different formulations and doses

The majority of studies assessing the safety of inhaled corticosteroid use in pregnancy have involved women using budesonide.⁴ There is insufficient evidence to enable comparison between different inhaled corticosteroids,⁸ or to make conclusions about ciclesonide (a newer inhaled corticosteroid).⁸

There is little evidence about safety of different doses of inhaled corticosteroids.⁸ A study of pregnant women using beclometasone,

budesonide or fluticasone propionate found that the rate of congenital malformations among those who used low-to-moderate doses in the first trimester was not higher than for those who did not use inhaled corticosteroids.¹¹ The rate of congenital malformations (mainly musculoskeletal and cardiac malformations) was higher among those who used high doses than those who did not use inhaled corticosteroids.¹¹ However, women who used higher doses of inhaled corticosteroid were older, more likely to have multiple foetuses, and more likely to have severe or uncontrolled asthma.⁸

The use of high doses of inhaled corticosteroids during pregnancy does not appear to affect foetal adrenal function.¹²

ICS/LABA combinations

There is insufficient evidence to make conclusions about the combination of inhaled corticosteroids and long-acting beta₂ agonists during pregnancy.⁸

A systematic review of the safety of regular preventer medicines during pregnancy did not find an association between the use of long-acting beta₂ agonists during pregnancy and any particular adverse event.⁸

In a retrospective cohort study of 7376 pregnancies, during which 8.8% women took long-acting beta₂ agonists, long-acting beta₂ agonist use was not associated with increased risk of low birth weight, preterm birth, or small for gestational age.¹³

Systemic corticosteroids

Associations have been reported between oral corticosteroid use during pregnancy and preeclampsia, preterm delivery, and reduced birth weight.⁴ However, it is difficult to separate the effects of the drug from the effects of the flare-up that necessitated its use.⁴

When systemic corticosteroids are required to manage severe acute asthma during pregnancy, the possible risks are less than the risks of severely uncontrolled asthma, which may result in maternal and/or foetal death.^{4, 14}

A meta-analysis of cohort studies found an association between the use of oral corticosteroid use and preterm delivery, low birth weight, and small-for-gestational age infants.¹⁵ However, use of oral corticosteroids was a marker of severe asthma.¹⁵

The use of oral corticosteroids during the first trimester may be associated with a small increase in the risk of oral cleft.¹⁶

► Go to: Information on the safety of corticosteroids during pregnancy from [Motherisk, The Hospital for Sick Children, Toronto](#)

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Managing asthma in breastfeeding women

Recommendations

Manage asthma in breastfeeding women as for asthma in other adults, aiming to maintain the best possible asthma control and to avoid asthma flare-ups while using the lowest effective doses.


Use preventers as indicated, step up the regimen as necessary to regain or maintain control, and consider stepping down when asthma is well controlled.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Explain to patients that most asthma medicines can be used by breastfeeding women, because the risks of poor asthma control outweigh the risks associated with medicines.

 *How this recommendation was developed*


Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

If possible, use asthma medicines that are likely to have low concentrations in breast milk.

Table. Local pregnancy and breastfeeding safety information services

Please view and print this figure separately: <http://www.astmahandbook.org.au/table/show/71>


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

If systemic corticosteroids are needed to manage an acute flare-up while a woman is breastfeeding, use oral prednisolone 37.5–50 mg as a single daily dose each morning for 5–10 days.

Reassure the woman that the amount of medicine in the breast milk will be low. Advise her that it can be reduced by feeding the baby just before each daily dose and avoiding feeding again until 4 hours after the dose.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Briggs *et al.* 2008¹
- Hale, 2010²
- US National Library of Medicine [Drugs and Lactation Database \(LactMed\)](#)

Advise women who smoke to quit, and offer support. Advise all breastfeeding women to avoid exposure to cigarette smoke.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Safety of asthma medicines while breastfeeding

Australian product information identifies some medicines that are known to pass into breast milk (e.g. adrenaline, aminophylline, prednisolone, sodium cromoglycate, terbutaline).³

The concentration of active ingredient in breast milk is likely to be low for several common asthma medicines (e.g. beclomethasone dipropionate, budesonide, fluticasone propionate, combination fluticasone propionate/salmeterol, nedocromil, ipratropium bromide).³

For some asthma medicines (e.g. formoterol, omalizumab, montelukast), or test substances (e.g. mannitol, used in bronchial provocation [challenge] testing), it is not known whether or not the active ingredient is excreted into breast milk, so caution is recommended.³

Australian product information identifies only a small number of asthma medicines that are not recommended for breastfeeding women (e.g. adrenaline, aminophylline, hydrocortisone for injection, prednisolone), and recommends that caution is needed when others (e.g. omalizumab, montelukast) are given to breastfeeding women.³

Information about the safety of medicines during lactation (included in product information for each medicine) emphasises the need to balance the potential benefits of asthma treatment with the possible risks to the infant.³

Note: Product information provided by pharmaceutical manufacturers and registered with the Therapeutic Goods Administration is written and approved when the medicine is first marketed, but is not routinely updated as new evidence becomes available. When product information includes a caution or contraindication for breastfeeding, health professionals should check current evidence before advising the woman about her choices, so that mothers do not stop breastfeeding unnecessarily, based on incomplete information.

Up to date information is available from the following sources:

- The Drugs and Lactation Database (LactMed), compiled by the US National Library of Medicine, provides comprehensive current information on the safety of medicines during breastfeeding
- The National Prescribing Service (NPS) Medicines Line provides information for the public about medicines and safety: 1300 MEDICINE (1300 633 424)
- Telephone information services about the safety of medicines while breastfeeding are also available for health professionals and breastfeeding women in some areas of Australia.

Table. Local pregnancy and breastfeeding safety information services

Please view and print this figure separately: <http://www.asthmahandbook.org.au/table/show/71>

- ▶ Go to: Therapeutic Goods Administration [database of product information](#) (including lactation safety codes for each medicine)
- Go to: The US National Library of Medicine's [Drugs and Lactation Database \(LactMed\)](#)

Systemic corticosteroids and breast milk

Peak plasma level of systemic corticosteroid occurs at approximately 2 hours post dose, so peak milk level will also occur around this time. Therefore, the infant's exposure to corticosteroids in breast milk can be further reduced by breastfeeding the infant just before each daily dose and avoiding feeding again until at least 4 hours after the dose.^{1, 2}

If high-dose corticosteroids need to be used for longer than 10 days, the infant should be monitored for growth and development.^{1, 2}

The US National Library of Medicine's Drugs and Lactation Database (LactMed) states that: *limited information indicates that maternal doses of prednisolone up to 50 mg produce low levels in milk and would not be expected to cause any adverse effects in breastfed infants. With high maternal doses, avoiding breastfeeding for 4 hours after a dose should markedly decrease the dose received by the infant. However, this [manoeuvre] is probably not necessary in most cases.*

- ▶ Go to: The US National Library of Medicine's [Drugs and Lactation Database \(LactMed\)](#)

Prenatal and childhood exposure to tobacco smoke

Tobacco smoking by pregnant women damages children's respiratory health. It also increases the risk of stillbirth, spontaneous

abortion, reduced foetal growth, preterm birth, low birth weight, placental abruption, sudden infant death, cleft palate, cleft lip and childhood cancers.⁴

Risk of developing asthma

Prenatal exposure to tobacco smoke and exposure during infancy increase the risk of wheezing during early childhood.⁵

► See: [Primary prevention of asthma](#)

Effects on children's asthma

Evidence from an Australian cohort study suggests that children with asthma whose mothers smoked during pregnancy benefit less from treatment with inhaled corticosteroids, and show less improvement in airway hyperresponsiveness over time, than those with asthma but no intrauterine exposure to smoke.⁶

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