COMMON DISCOMFORTS OF PREGNANCY

CHAPTER 32

Cynthia Belew and Jamie Meyerhoff

I. Introduction to common discomforts of pregnancy

Most women suffer considerably during a pregnancy. The normal physiologic changes of pregnancy affect all body systems and can cause symptoms that range from mildly uncomfortable to debilitating. These discomforts very rarely pose a risk to the well-being of the fetus. The degree of discomfort experienced by an individual woman is affected by diet, exercise, genetics, personal self-care habits (e.g., obtaining adequate sleep), mood, body image, level of stress, and social support. A pregnant woman feels more satisfied and confident when her care provider listens to her concerns and treats her respectfully (Avery, Saftner, Larson, & Weinfurter, 2014). Pregnant women calling the Motherisk Helpline regarding common discomforts report that providers trivialize discomforts when attempting to normalize (Madjunkova, Maltepe, & Koren, 2013). A woman is likely to feel less stress when she understands the physiologic basis of her symptoms, knows when she may be reassured of the well-being of her baby, and knows when to seek additional medical evaluation. Knowledge regarding self-care measures to prevent and relieve discomforts may increase her sense of autonomy and control. It is therefore a primary responsibility of the healthcare provider to provide anticipatory guidance regarding the physiologic basis and treatment of common discomforts of pregnancy.

Women with multiple or severe symptoms must be screened for depression and anxiety, as these can each increase symptoms, and conversely, multiple symptoms may increase the risk of developing depression (Kamysheva, Wertheim, Skouteris, Paxton, & Milgrom, 2009).

Poor quality of sleep may also contribute to the development of physical complaints and depressive symptoms and may be correlated with preterm birth (Strange, Parker, Moore, Strickland, & Bliwise, 2009). Providers can help women prioritize adequate sleep and provide education regarding sleep hygiene practices. Poor sleep is a common discomfort of pregnancy (Kizilirmak, Timur, & Kartal, 2012).

II. Poor quality of sleep

Musculoskeletal discomfort, fetal movement, increased frequency of urination, increased appetite, nausea, and increased life stresses all contribute to poor quality of sleep during pregnancy. Women report poor quality of sleep in every trimester of pregnancy, including difficulty falling asleep and staying asleep and frequent waking.

A. Subjective

1. Timing and severity of sleep disturbances
2. Symptoms of depression and anxiety
3. Sources of stress
4. Impact on daily functioning
5. Caffeine and other stimulant intake
6. Current daily habits, including daily exercise and evening routine
7. Self-treatment

B. Goals for clinical management

1. Screen for underlying mood disorders in women with multiple or severe common discomforts.
2. Assess quantity and quality of sleep in pregnant women.
3. Educate pregnant women about sleep hygiene, circadian rhythms, and measures to improve sleep.

C. Management

Treatment approaches begin with education and behavioral changes. There is scant research specific to pregnancy and treatments for insomnia. Moderate exercise, such as daily brisk walking, has been demonstrated to be an effective treatment in other demographic populations (King, Oman, Brassington, Bliwise, & Haskell, 1997). There is some debate regarding whether exercise must occur before evening.

Creation of an evening rhythm that is performed every night before going to sleep including decreased stimulation before time of sleep may be helpful. A pregnant woman can note factors that help her feel drowsy, safe, and relaxed and be encouraged to systemically implement those every evening. Common things that relax include massage, warm baths and showers, low light, warm environment, strolling outside, calming music or scents, reading children's bedtime stories, singing lullabies, and humor.

Chamomile is shown to have effectiveness for anxiety (Amsterdam et al., 2009) and may be helpful for promoting sleep. Other safe herbs include linden, valerian, and passionflower. Catnip specifically helps with an overthinking/overactive mind. These herbs can be taken as a tincture, capsule, or tea.

The pregnant woman should also note individual factors that activate her. Common things that activate/overstimulate are media—movies, television, web surfing; disturbing information, news, charged conversations, topics related to changes, money, or planning; worry. Exposure to screen light from computers, tablets, and cellphones has an impact on circadian rhythms. Control of light/dark exposure patterns can powerfully affect sleep and mood. Evening exposure to blue light, including that from computer, tablet, and cellphone screens, suppresses melatonin production, disrupts sleep quality, and leads to decreased alertness the next morning (Sroykham & Wongsawat, 2013; West et al., 2011). Blocking of late evening blue-light exposure through use of amber-lensed glasses and/or low-blue-light bulbs improves sleep quality and mood (Burkhart & Phelps, 2009). Morning exposure to bright light, either through the use of a light box, blue-light enhanced bulbs, or sunlight, enhances cognitive performance, mood, and well-being (Gabel et al., 2013).

Many small studies in a nonpregnant population have shown acupuncture to be a highly effective treatment for insomnia (Lan et al., 2015). In a blinded randomized clinical trial using "double dummy" technique, the acupuncture cohort slept more and more deeply and also reported significantly better daytime functioning and return of their full energetic state; this concords with Chinese medical theory that "energetic daytime function" and "powerful nocturnal sleep" form a circle. Rupture of this cycle leads to "daytime low spirit" and "nighttime hyperarousal state" (Guo, Wang, Liu, Yi, & Cheng, 2013). In this trial, acupuncture was administered for 30 minutes three times a week. An increasing number of communities have the availability of low-cost acupuncture treatment through community acupuncture clinics (https://www.pocacoop.com).

Pharmacologic treatment of insomnia is discouraged for use in pregnancy due to inadequate safety data and side effects. Antihistamines such as diphenhydramine are Pregnancy Category B and sedating. However, pharmacologic treatment has been shown in meta-analysis to be no superior to behavioral therapy in treating insomnia (Mitchell et al., 2012).

III. Musculoskeletal

Hormonal changes of pregnancy cause relaxation of ligaments throughout the body. The resulting increased mobility of pelvic joints and widening of the sacroiliac and symphyseal joints facilitate childbirth but may lead to pelvic instability and pain. Biomechanical factors also contribute to pregnancy discomforts. The growing uterus moves the center of gravity forward, pulls the spine into lordosis, and strains the lower back. In most cases pain resolves within 4 weeks after delivery.

Two types of lumbopelvic pain are common during pregnancy. Low back pain (LBP) is musculoskeletal pain experienced in the area of the lumbar spine. Pelvic girdle pain (PGP) is musculoskeletal pain experienced in the sacroiliac area, the symphysis pubis, or gluteal area, possibly with radiation to the posterior thigh. LBP and PGP may occur concurrently (Vermani, Mittal, & Weeks, 2009). Both LBP and PGP may be provoked by any sustained posture or activity, including prolonged sitting, standing, or walking. PGP generally is more debilitating than LBP (Gutke, Oberg, & Ostgaard, 2006). Women with PGP may report a "catching" sensation in the leg while walking and may report that pain is aggravated by twisting, standing on one leg, climbing stairs, and turning in bed.

Many treatments target both LBP and PGP; differences in approach are specified next and in **Table 32-1.**

A. Prevention

The woman with strong abdominal, back, gluteal, and pelvic muscles may be less likely to develop lumbopelvic pain of pregnancy (Bewyer, Bewyer, & Messenger, 2009). Several studies show that physical fitness exercises before pregnancy may reduce a woman's risk of developing back pain in pregnancy (Vermani et al., 2009). A tailored exercise program during pregnancy was shown to be effective in preventing LBP (Mørkved, Salvesen, Schei, Lydersen, & Bø, 2007). Individualized exercise programs are generally more effective than group training or no treatment.

Workplace restrictions may significantly affect a woman's risk. Because sustained sitting, standing, or walking may provoke pain, a pregnant woman benefits from the freedom to change activities and positions frequently. Research shows that pregnant women who have job autonomy and the ability to take breaks at work experience less back pain, whereas those working in jobs that necessitate staying in a confined area experience more back pain (Cheng et al., 2009).

TABLE 32-1 Differential Diagnosis and Management of Pelvic Pain and Low Back Pain in Pregnancy

	Subjective	Physical Exam	Imaging	Treatment
Low back pain	Lumbar pain, worse with forward flexion	Negative posterior pelvic pain provocation test	Not indicated	Water aerobics Group exercise for abdominal, back, and pelvic strength Acupuncture Osteopathic manipulation Exercise: pelvic tilt Abdominal support garments
Pelvic girdle pain	Sacroiliac pain May radiate to posterior thigh May involve symphysis pubis or gluteal area	Positive posterior pelvic pain provocation test	Not indicated	Nonelastic pelvic belt to increase stability of sacroiliac joint Individualized pelvic stabilizing and core strengthening exercises
Cauda equina syndrome (severe nerve compression)	Rapid onset of bilateral radiating pain Lower extremity numbness and weakness Numbness of perineum, inner thigh, back of legs Bladder or bowel dysfunction	Supine straight leg raise elicits radiating pain to ipsilateral foot on flexion of hip	Immediate MRI	Orthopedic consultation If stable: bed rest and muscle relaxants If deteriorating: surgery

Data from Smith, M. W., Marcus, P. S., & Wurtz, L. D. (2008). Orthopedic issues in pregnancy. *Obstetrical & Gynecological Survey*, *63*(2), 103–111; Vermani, E., Mittal, R., & Weeks, A. (2009). Pelvic girdle pain and low back pain in pregnancy: A review. *Pain Practice*, *10*(1), 60–71.

B. Database (may include but is not limited to)

The distribution of pain is the most useful history item for diagnosis. The presence of "red flag" signs and symptoms indicates the possibility of disk herniation and requires immediate consultation and possibly magnetic resonance imaging of the spine (**Table 32-2**).

1. Subjective
   a. Signs or symptoms of preterm labor
   b. Signs or symptoms of pyelonephritis
   c. Events preceding onset
      i. Recent or past history of physical trauma
      ii. History of similar pain
      iii. Anxiety or depression
      iv. Patterns of activity throughout the day
   d. Location and characteristics of pain
      i. Radiation: bilateral or unilateral to thigh or foot
      ii. Pattern of pain: intermittent or constant
      iii. Postures or movements that provoke or alleviate pain
      iv. Quality: sharp, aching, dull; intensity
      v. Level of impact on function and patterns of pacing activity during the day
      vi. Self-treatment, coping strategies, pain beliefs, remedies, and over-the-counter medications

TABLE 32-2 Musculoskeletal Red Flag Symptoms Requiring Consultation or Referral

- Sudden onset of incapacitating back or leg pain, especially pain radiating from the spine along a dermatome bilaterally
- Numbness of perineum, inner thighs, or backs of legs
- Bladder or bowel dysfunction, decreased rectal sphincter tone
- Localized neurologic symptoms (symptoms limited to one nerve root dermatome)
- Decreased muscle strength and sensitivity
- Structural deformity
- Altered deep tendon reflexes
- Localized neurology (symptoms limited to one nerve root dermatome)

2. Objective
    a. Digital cervical examination to rule out preterm labor if indicated (see Chapter 35 on preterm birth management)
    b. Test for costovertebral angle tenderness to rule out pyelonephritis
    c. Observe gait and ability to change positions; observe distress level
    d. Palpate over the sacroiliac, lumbar, symphysis, and gluteal regions (may help to identify pain distribution to differentiate between LBP and PGP; may also rule out structural abnormalities)
    e. Do a posterior pelvic pain provocation test to differentiate PGP from LBP
        i. The patient lies supine with hips flexed to 90 degrees.
        ii. The examiner applies pressure on the flexed knee in the longitudinal axis of the femur while stabilizing the pelvis with the other hand resting on the opposite anterior superior iliac spine.
        iii. If this maneuver produces deep pain in the gluteal region, the test is positive and supports a diagnosis of PGP.
    f. Perform the supine active straight leg raise (SLR) test to identify the possibility of disk herniation with nerve compression. If the SLR elicits pain radiating in a dermatomal pattern or if there is numbness or leg weakness, carry out the following tests: reflexes (Achilles or knee), sensation of lateral and medial sides of feet and toes, and strength testing of the big toe during extension.
    g. Imaging studies, such as magnetic resonance imaging, are recommended only when there are multiple red flags (Albert, Ostgaard, Sturesson, Stuge, & Vleeming, 2008).
3. Differential diagnosis
    a. Pregnancy-related LBP or PGP
    b. Preterm labor
    c. Pyelonephritis
    d. Muscle strain caused by trauma
    e. Sciatica
4. Goals for clinical management
    a. Educate women about physical fitness for prevention of musculoskeletal pain
    b. Assess musculoskeletal pain in pregnant women, ruling out serious pathology
    c. Provide treatment plans, education, and referrals for women with low back pain or pelvic girdle pain during pregnancy
5. Management
    a. Maternity support garments
        i. For PGP, a nonelastic pelvic belt stabilizes the sacroiliac joints and may provide pain relief (Damen, Mens, Snijders, & Stam, 2006). It is most effective when at the level of the greater trocanters.
        ii. Physiotherapists recommend that it be worn for short periods of time rather than continuously (Albert et al., 2008; Chow et al., 2009).
        iii. PGP is less likely than LBP to respond to exercise classes. The abdominal lift garment may be the most beneficial type of maternity support garment for LBP (Albert et al., 2008).
    b. Exercise
        i. Group exercise focused on increasing strength and flexibility and water exercise have been shown to decrease LBP in the second part of pregnancy (Pennick & Liddle, 2013).
        ii. Gentle exercise at home may be helpful, including the pelvic tilt, knee pull, curl-up, lateral SLR, and pelvic floor exercises.
        iii. For PGP, pelvic stabilizing exercises given by a physical therapist are effective (Vleeming, Albert, Ostgaard, Sturesson, & Stuge, 2008).
    c. Workplace modification: a provider's letter to the employer recommending regular rest breaks and movement outside of confined working areas may be beneficial for some women.
    d. Medication for pregnancy-related LBP and PGP
        i. Acetaminophen may not be more effective than placebo for LBP and PGP of pregnancy (Vermani et al., 2009).
        ii. Nonsteroidal anti-inflammatory drugs are not recommended in the last trimester of pregnancy because of risk of premature closure of the ductus arteriosus and risk of oligohydramnios.
        iii. Opioids: Occasional use of small doses of opioids (e.g., codeine) is sometimes indicated in severe cases of pain. Opioid use in late pregnancy can cause respiratory depression in the newborn and, with long-term use, withdrawal effects in the newborn (Vermani et al., 2009).
6. Referrals and self-management resources
    a. European guidelines consider evidence sufficient to recommend the following for PGP:

exercise, individualized physical therapy, massage, acupuncture, osteopathic manipulation, and chiropractic care (Albert et al., 2008).

b. Useful online resources include the Association of Chartered Physiotherapists in Women's Health (www.acpwh.org) and the Pelvic Partnership (http://www.pelvicpartnership.org.uk/).

7. Patient education (adapted from www.acpwh.org)
   a. Teach pertinent anatomy and physiology and reassure that pelvic and back pain are a normal part of pregnancy for many women, likely to resolve in the weeks after birth.
   b. Provide guidance regarding appropriate pacing of activity and rest.
      i. Be as active as possible within the limits of pain. Staying active can reduce pain and improve function (Krismer & van Tulder, 2007).
      ii. Avoid fatigue by taking frequent rest breaks.
      iii. Avoid being in one posture for a prolonged time.
      iv. Avoid activities that worsen pain. Encourage sitting down to put on pants and shoes.
   c. Advise supportive shoes and avoidance of heels.
   d. Recommend placement of one pillow between the knees and one under the abdomen when sleeping side-lying

IV. Gastrointestinal tract

Elevated levels of progesterone during pregnancy facilitate maintenance of the pregnancy by relaxing the uterine muscle. However, smooth muscle relaxation decreases gastric and intestinal motility, leading to nausea, dyspepsia, and constipation. Mechanical pressure from the enlarging uterus contributes to heartburn. Management of common gastrointestinal tract discomforts of pregnancy, such as nausea, heartburn, and constipation, proceeds in a stepwise algorithm that begins with lifestyle and dietary modifications and gentle natural remedies. Pharmaceutical treatment is reserved for persistent or severe symptoms. This conservative approach is recommended because of the benign nature of common gastrointestinal tract discomforts of pregnancy.

The Canadian organization Motherisk, a clinical research and teaching program at The Hospital for Sick Children, has an excellent online resource (www.motherisk.org). They provide information both to pregnant and lactating women and to healthcare professionals regarding risks to the fetus from maternal exposure to drugs, chemicals, diseases, radiation, and environmental agents. They maintain several helplines, including one dedicated to questions regarding nausea and vomiting of pregnancy (NVP).

A. Nausea and vomiting of pregnancy

1. Definition and clinical implications

   Nausea and vomiting of pregnancy are considered to be a result of hormonal changes. About 50 to 85% of all pregnant women experience NVP. Typically, symptom onset is around 5–7 weeks from the last menstrual period, with resolution at 11–14 weeks gestation. In a subset of women, symptoms may persist until 18 weeks, and 5% of pregnant women have nausea throughout pregnancy. If onset of symptoms occurs at a gestational age of 10 weeks or greater, the etiology is not likely to be pregnancy.

   NVP is a normal part of most pregnancies. Although NVP may have a significant impact on a woman's daily life, it is benign. The presence of NVP is associated with a lower risk of miscarriage (Weigel et al., 2006). The reduced maternal nutrient intake that commonly occurs during the first trimester in women with NVP seems to cause complex hormonal and metabolic changes that actually enhance placental growth (Huxley, 2000). It is also proposed that NVP serves a protective evolutionary function, causing women to avoid foods that may cause harm to the embryo (Sherman & Flaxman, 2002). Most women make up for first-trimester weight loss by gaining more weight later in pregnancy.

   In contrast, hyperemesis gravidarum (HG) can pose serious risks and is a more debilitating condition. On the continuum from severe NVP to HG, HG is defined as symptoms that lead to weight loss of more than 5% of prepregnancy body weight, hypokalemia, and dehydration or ketonuria. HG may require hospitalization. Holmgrem and colleagues reviewed the management of HG (Holmgren, Aagaard-Tillery, Silver, Porter, & Varner, 2008). HG requires medical management because it can be associated with serious sequelae, such as micronutrient deficiency or Wernicke's encephalopathy, if not properly managed (Dodds, Fell, Joseph, Allen, & Butler, 2006).

   If heartburn exists concurrent with NVP, pharmacologic treatment of the heartburn is shown to decrease symptoms of NVP (Gill, Maltepe, Mastali, & Koren, 2009).

B. Database

1. Subjective data
   a. Timing of onset, pattern, and frequency of nausea and vomiting
      i. The "PUQE" (pregnancy-unique quantification of emesis/nausea) index may be used to evaluate severity. The woman's subjective experience of the impact of symptoms on her life is an important consideration and may override the PUQE score (King & Murphy, 2009) (**Table 32-3**).
   b. Triggers and coexisting gastric reflux
   c. Eating habits and self-treatment
   d. Red flags for gallbladder disease and HELLP syndrome (hemolysis, elevated liver enzymes, and low platelets)
      i. Epigastric pain, right upper quadrant pain, or coffee grounds emesis
      ii. Upper abdominal pain in a pattern of biliary colic (episodes of sharp, intense pain after meals or at night lasting 30 minutes to 3 hours, or radiation to back or right shoulder) may indicate gallbladder disease.
2. Objective data
   a. Weight loss
   b. Urinalysis: ketones and specific gravity
   c. Signs of dehydration: tachycardia, dry mucosa, and sunken eyes
   d. If severe symptoms are present: order an electrolyte panel and an obstetric ultrasound to rule out twin gestation or trophoblastic disease (molar pregnancy)
   e. If onset of symptoms occurs in third trimester: rule out HELLP syndrome with complete blood count (CBC) and platelets even if symptoms are not severe
   f. If symptoms suggest gallbladder disease: CBC, lipase, liver enzymes, and abdominal ultrasound
3. Differential diagnosis
   a. Dehydration
   b. Ketonuria
   c. Electrolyte imbalance
   d. HG
   e. Gallbladder, liver, or pancreatic disease
   f. HELLP syndrome (third trimester)
   g. Fatty liver of pregnancy (rare)
4. Goals for clinical management
   a. Differentiate normal nausea and vomiting of pregnancy (NVP) from hyperemesis and other serious pathology.
   b. Provide comprehensive education for women with NVP about dietary and lifestyle changes to minimize symptoms.
   c. Provide evidence-based information about safe alternative and complementary treatments for NVP.
   d. Provide evidence-based pharmacotherapy for treatment of NVP.
   e. Assess results of treatment and provide intravenous rehydration as needed.
5. Treatment

   Women commonly find that one therapeutic measure works well for a few days but then becomes less

TABLE 32-3 Pregnancy-Unique Quantification of Emesis and Nausea Index

1. On an average day, for how long do you feel nauseated or sick to your stomach?				
> 6 hr	4–6 hr	2–3 hr	≤ 1 hr	Not at all
(5 points)	(4 points)	(3 points)	(2 points)	(1 point)
2. On an average day, how many times do you vomit or throw up?				
≥ 7	5–6	3–4	1–2	None
(5 points)	(4 points)	(3 points)	(2 points)	(1 point)
3. On an average day, how many times do you have retching or dry heaves without bringing anything up?				
≥ 7	5–6	3–4	1–2	None
(5 points)	(4 points)	(3 points)	(2 points)	(1 point)
Total score (sum of replies to 1, 2, and 3): mild NVP, ≤ 6; moderate NVP, 7–12; severe NVP, ≥ 13.				

Reprinted from Lacasse, A., Rey, E., Ferreira, E., Morin, C., & Bérard, A. (2008). Validity of a modified Pregnancy-Unique Quantification of Emesis and Nausea (PUQE) scoring index to assess severity of nausea and vomiting of pregnancy. *American Journal of Obstetrics and Gynecology*, *198*(1), 71.e3; with permission from Elsevier.

effective. Knowledge about multiple treatments is beneficial to switch tactics as needed.

6. Education
   Reassure that mild to moderate symptoms do not have a negative effect on fetal growth and development. Discuss dietary and lifestyle changes.
7. Hydration and nutrition
   a. Avoid dehydration by sipping small amounts of water frequently (as little as an ounce every 15 minutes). Large volumes of fluid may provoke nausea.
   b. Drink cold fluids between meals instead of with meals.
   c. Eat small amounts of food that include protein every 1–2 hours. Low blood sugar provokes nausea. Eat a high-protein snack at bedtime.
   d. Keep dry crackers at the bedside and eat a few before rising in the morning.
   e. Avoid spicy or fatty foods.
8. Trigger avoidance: triggers are highly individual but may include
   a. Strong odors, stuffy rooms, or bus travel.
   b. The sight or smell of certain foods.
   c. Brushing teeth. Avoid brushing teeth within 1–2 hours after eating. Use a child's size toothbrush and small amounts of a low-foaming toothpaste or brush without toothpaste.
   d. Multivitamins: continue to take multivitamin if possible, because it may decrease symptoms, but if taking multivitamin aggravates nausea, discontinue and replace with 600 mcg of folic acid. Resume multivitamin at a later gestational age when NVP resolves. A multivitamin without iron may be more easily tolerated.
9. Therapeutic
   a. Alternative and complementary
      i. The Canadian Motherisk reports that 61% of women with NVP report use of complementary and alternative remedies but only 8% of women had discussed these remedies with their healthcare provider (Hollyer, Boon, Georgousis, Smith, & Einarson, 2002)
      ii. Ginger, chamomile, fennel seed, raspberry leaf, and mint are all used traditionally in a tea or tincture for gastric upset. These herbs are regarded as safe by the Canadian Motherisk group (Mills, Duguoa, Perri, & Koren, 2006) and the German Commission E (Blumenthal, Goldberg, & Brinckmann, 2000). Both are authoritative expert panels dealing with the topic of herb safety.
   b. Evidence exists supporting the effectiveness and safety of the following therapies:
      i. Acupressure wrist bands (Seabands, Travel-Eze) worn continuously over the P6 acupuncture point (Can Gürkan & Arslan, 2008).
      ii. Ginger capsules, 250 mg orally four times a day (Bryer, 2005)
      iii. Vitamin B_6, 25 mg orally three times a day. Avoid excessive doses, which may cause peripheral neuropathy (Keller, Frederking, & Layer, 2008).
   c. Intravenous fluid therapy: Intravenous fluid therapy with normal saline, alone or in combination with pharmaceuticals, typically causes an improvement of symptoms for several days. Some women choose it as a primary management strategy, receiving hydration every few days as needed (King & Murphy, 2009). Avoid dextrose-containing fluids, because they may precipitate Wernicke's encephalopathy, a rare but serious complication, in a woman with thiamine deficiency. The addition of thiamine is recommended for the prevention of Wernicke's encephalopathy. Potassium chloride may be added as needed. Consultation is necessary for persistent nausea and vomiting with dehydration, and intravenous vitamins and minerals may be required.
10. Pharmacotherapy (see **Table 32-4**)
   a. Antihistamines
      Diclegis, delayed release (doxylamine 10 mg, combined with pyridoxine 10 mg) is the only drug approved by the Food and Drug Administration (FDA) for nausea and vomiting during pregnancy. A large body of evidence supports both the safety and effectiveness of the combination. Years of widespread use of this medication in Canada and in the United States in the 1980s contribute to its high safety profile (Nuangchamnong & Niebyl, 2014). Diclegis is taken as a daily prescription, rather than as needed.
   b. Dopamine antagonists
      Metoclopramide has been a drug of choice for many providers in treating severe NVP and HG. Recent research examining more than 3,400 first-trimester exposures found no association with any of several adverse outcomes (Matok et al., 2009). In a comparison of promethazine and metoclopramide, Tan and colleagues found similar efficacy but metoclopramide had fewer side effects (Tan, Khine, Vallikkannu, & Omar, 2010). In a small study on treatment

TABLE 32-4 Pharmacotherapy for NVP

Generic Name (trade name)	Dosage	Major Side Effects
Antihistamines		
Doxylamine succinate-pyroxidine hydrochloride (Diclegis®)	10 mg doxylamine combined with 10 mg of pyridoxine, delayed release 4 tablets daily: 2 at night, 1 in the morning, 1 in the afternoon	Mild drowsiness
Diphenhydramine	50–100 mg q 4–6 hr PO/IM/IV For treatment of dystonic reaction: 50 mg IV	Drowsiness
Trimethobenzamide	200 mg IM/PR q 6–8 hr	Drowsiness
Dopamine antagonists		
Metoclopramide	1–2 mg/kg IV (dilute in 50 mL IVF) or 5–10 mg q 8 hr PO/PR/IM	Agitation, anxiety, acute dystonic reactions*
Prochlorperazine	5–10 mg PO/IV/IM q 6–8 hr or 25 mg rectal suppository BID/prn for breakthrough vomiting with other medications	Sedation, anticholinergic effects, EPS
Promethazine	12.5–25 mg PO/IV/IM/PR q 4–6 hr	Sedation, anticholinergic effects, dystonic reactions*
Serotonin (5-HT3) antagonists		
Ondansetron Publisher note	4–8 mg PO q 6–8 hr 4–8 mg IV q 12 hr, given over 15 min	Headache. Do not use during the first trimester
Other		
Pyridoxine (vitamin B_6)	25 mg TID. Consider combining with doxylamine	
Zingiber officinale (ginger)	Capsules: 250–500 mg TID-QID Not to exceed 1.5 g in 24 hr	

* Give 50 mg diphenhydramine before dose to prevent extrapyramidal reactions

Modified from King, T. L., & Murphy, P. A. (2009). Evidence-based approaches to managing nausea and vomiting in early pregnancy. *Journal of Midwifery & Women's Health*, *54*(6), 435; with permission from Elsevier.

of hyperemesis gravidarum, metoclopramide had similar efficacy with increased side effects compared to ondansetron (Abas, Tan, Azmi, & Omar, 2014). Metoclopramide was associated with increased dizziness, dry mouth, headache, diarrhea, and palpitations. Despite these side effects, it remains a reasonable treatment choice.

c. Phenothiazines
Promethazine and prochlorpemazine may be as effective as ondansetron and have no evidence of being teratogenic, although there is less human data than for metoclopramide and Diclegis (Briggs, Freeman, & Yaffe, 2015). These drugs cause significant sedation, making them difficult for women to tolerate.

d. 5-Hydroxytryptamine 3-receptor antagonists
Ondansetron has been used increasingly in treatment of NVP. However, two large studies have recently found statistically significant increases in fetal cardiac anomalies associated with use of ondansetron in the first trimester (Danielsson, Wikner, & Källén, 2014). Ondansetron should not be used during the first trimester. The FDA has issued warnings about serious maternal dysrhythmias associated with use of ondansetron (Koren, 2014). Additionally, there have been 33 case reports of rare but life-threatening intestinal obstruction in which ondansetron was the sole associated pharmaceutical, one of which was in a pregnant patient (Cohen et al, 2014).

11. Follow-up
    a. Send to labor and delivery for rehydration and medication as needed.
    b. Consider increasing the frequency of prenatal visits to once or twice weekly until symptoms diminish.
    c. Assessing and Treating Women with Nausea in Pregnancy.

V. Heartburn

A. Definition

Heartburn, also known as gastroesophageal reflux disease, is a normal part of most pregnancies. Symptoms are usually mild to moderate. Lifestyle and dietary modifications accompanied by safe home remedies and simple antacids often are effective in providing relief. Pregnancy seems to be protective against esophagitis and gastric ulcer disease, and these conditions are uncommon during pregnancy (Cappell, 2003). Even severe symptoms of gastroesophageal reflux disease usually resolve soon after birth.

B. Database (may include but is not limited to)

Red flag symptoms and signs (listed next in section 1b) help in the differentiation of benign heartburn from more serious medical conditions. Gallbladder disease, pancreatitis, and, in the third trimester, HELLP syndrome must be ruled out. Red flag symptoms and signs require immediate consultation.

1. Subjective
    a. Typical symptoms of gastric acid reflux during pregnancy include
        i. Burning in the upper abdomen or midchest.
        ii. Discomfort associated with eating or with a recumbent position.
        iii. Typically worsens as the pregnancy progresses.
        iv. Relieved by antacids.
    b. Red flag symptoms of include:
        i. Gallbladder disease: episodes of biliary colic
        ii. HELLP: Right upper quadrant, midepigastrium, or retrosternal pain, nausea, vomiting, and malaise. HELLP may occur without hypertension.
        iii. Pancreatitis: acute onset of persistent, severe epigastric pain.
2. Objective
    a. Physical examination
        i. Assess for red flag signs of HELLP
        ii. Right upper quadrant or midepigastrium tenderness
    b. Laboratory tests
        i. Serum amylase and lipase as indicated to rule out pancreatitis
        ii. Liver enzymes as indicated to rule out liver disease
        iii. Liver enzymes and platelets as indicated to rule out HELLP
3. Assessment
    a. Normal gastric reflux of pregnancy. This diagnosis is based on symptoms alone.
    b. Rule out liver disease, gallbladder disease, and, if in third trimester, HELLP
4. Goals of clinical management
    a. Assess reflux during pregnancy and rule out serious pathology.
    b. Select pharmaceutical treatments for reflux that have the minimum adverse effects.
    c. Educate women about the adverse effects of proton pump inhibitors and H2 agonists.
    d. Educate women about lifestyle and dietary modifications to minimize symptoms of reflux during pregnancy.
5. Management (see **Table 32-5**)

Stomach acid is necessary for absorption of essential nutrients, destruction of ingested pathogens, and maintenance of a beneficial gastrointestinal microbiome, all key functions for maintenance of optimal health. Suppression of stomach acid, especially the profound and long-lasting suppression of proton pump inhibitors (PPIs), is linked with a number of adverse effects. A stepwise approach to gastroesophageal reflux disease (GERD) is advised, starting with lifestyle and dietary modifications, moving to raft-forming or simple antacids and then to sucralfate, reserving histamine-2 receptor antagonists (H2RA) and PPIs for persistent severe symptoms. Adverse effects of H2RAs and PPIs are addressed later. The detrimental effects of PPIs may not be seen with antacids because antacids affect gastric acidity to a lesser degree and for a shorter duration of time. Rebound acid hypersecretion occurs after use of PPIs but not after use of H2RAs (Waldum, Qvigstad, Fossmark, Kleveland, & Sandvik, 2010).

Expert opinion and traditional use support the benefit and safety of marshmallow root (Althea) and the inner bark of slippery elm (Ulmas rubra) for heartburn and gastritis (Romm, 2010). They contain mucilage (insoluble polysaccharides), which absorbs acid and sooths irritated or inflamed mucosa (Deters et al., 2010).

Raft-forming antireflux medications (Gaviscon) combine a low dose of antacid (magnesium and aluminum salts) with alginic acid and may be more

TABLE 32-5 Management for Heartburn During Pregnancy

Lifestyle Modifications

- Eat small frequent meals rather than two large meals (Jarosz & Taraszewska, 2014)
- Avoid frequent consumption of mint tea (Jarosz & Taraszewska, 2014)
- Do not drink large amounts of liquid with meals
- Take a walk after dinner (Karim et al., 2011)
- Do not recline after meals (Karim et al., 2011)
- Do not gain more than the recommended weight during pregnancy
- Eat in a slow and relaxed manner (Yamamichi et al., 2012)
- Identify and avoid triggers, which may include carbohydrates (Austin, Thiny, Westman, Yancy, & Shaheen, 2006), tobacco, alcohol, and chocolate (Kaltenbach, Crockett, & Gerson, 2006)

Remedies (Romm, 2010)

- Raw almonds (8–10 at a time) chewed slowly, as frequently as needed
- Slippery elm lozenges 2–4 PRN, or slippery elm powder (one teaspoon stirred into applesauce, juice, or water)
- Marshmallow root: one ounce of dried herb steeped for at least 30 minutes in one quart of hot water, strain, sip throughout the day as needed, up to three cups daily.
- Strong tea of chamomile, fennel, ginger, linden, alone or in combination.
- Dandelion root tea (one to three cups sipped throughout the day) or tincture (20–40 drops diluted in a small amount of water three times daily); contraindicated if there are painful gallstones (acute biliary colic) or cholecystitis.

Antacids

Avoid sodium bicarbonate, bismuth, AlkaSeltzer (Mahadevan & Kane, 2006)

Medication	Considerations
Gaviscon (Quartarone, 2013)	• Avoid high doses in pregnancy • Generally well tolerated • For maximum effect, take 30 minutes after meals and maintain upright position.
Calcium- or magnesium-containing antacids (Tytgat et al., 2003)	• Excessive use of calcium carbonate (> 2 g/day) can result in milk alkali syndrome (hypercalcemia and alkalosis, which can cause renal damage). • Magnesium-containing antacids may cause diarrhea. • Avoid excessive doses of aluminum salts. • Although some advocate the benefits of calcium carbonate as an antacid because it also provides supplemental calcium, in reality calcium carbonate contains only 40% elemental calcium and has poor bioavailability (Sipponen & Härkönen, 2010).
Sucralfate	Adverse effects unlikely
Histamine-2 receptor antagonists (H2RA)	
Cimetidine or ranitidine are preferred (Mahadevan & Kane, 2006).	• A decrease in effectiveness to H2RA treatment may occur within 2–6 weeks of initiation of therapy (Komazawa et al., 2003). • The safety of H2RAs during the first trimester has not been established (Gilboa, Ailes, Rai, Anderson, & Honein, 2014).
Proton Pump Inhibitors	
Omeprazole (Prilosec®) is recommended as the PPI of choice (Mahadevan & Kane, 2006).	• The use of PPIs during pregnancy is not associated with an increased risk of birth defects, perinatal mortality, or morbidity (Matok et al., 2012). • Adverse effects include impaired micronutrient absorption, increased risk of enteric infections including gastroenteritis and *Clostridium difficile* infection, increased risk of community-acquired pneumonia, disrupted gastrointestinal microbiome, and an association with increased risk of allergic disease in the offspring (see text).

effective than antacids alone (De Ruigh, Roman, Chen, Pandolfino, & Kahrilas, 2014; Rohof, Bennink, Smout, Thomas, & Boeckxstaens, 2014). Alginate forms a viscous foam that floats on the surface of the gastric pool, providing a mechanical barrier to reflux. If reflux occurs the nonacidic foam rather than the acidic stomach content moves into the esophagus. Research has demonstrated alginate-containing antacids to be highly effective and safe during pregnancy (Quartarone, 2013).

a. Adverse effects of acid inhibitors:
    i. Micronutrient absorption
    A dramatic decrease in absorption of vitamin B_{12} is seen after only 2 weeks of treatment with a PPI (Marcuard, Albernaz, & Khazanie, 1994), and use of both H2RA and PPI is significantly associated with the presence of vitamin B_{12} deficiency (Lam, Schneider, Zhao, & Corley, 2014). The FDA has issued warnings regarding the correlation of PPI use with hypomagnesemia (FDA, 2011; Markovits et al., 2014). PPIs are also linked with hypocalcemia and hypokalemia (Luk, Parsons, Lee, & Hughes, 2013). The implications of PPI-induced hypomagnesemia and hypocalcemia and low B_{12} levels during pregnancy have not been explored. Adequate magnesium and calcium levels are important for normal fetal bone development, and the link between low calcium intake and risk of gestational hypertension is well described (Dodd, O'Brien, & Grivel, 2014). The theoretical link between PPI use and increased risk of calcium-deficiency disorders such as preeclampsia has not been investigated.
    ii. Risk of infection
    PPI use is associated with increased susceptibility of food-borne and enteric infection including *Salmonella*, invasive strains of *Escherichia coli*, *Listeria*, and *Clostridium difficile* infection (CDI) (Bavishi & Dupont, 2011). Outpatients prescribed PPIs have as much as a threefold increased risk of CDI compared with matched controls (Freedberg, Lebwohl, & Abrams, 2014). The FDA has issued a drug alert regarding the connection of PPI use with CDI (FDA, 2012) and has recommended that PPIs be prescribed at the lowest dose and shortest duration possible.
    iii. Alternations in the microbiome
    Use of acid-suppressing drugs rapidly alters the microbiome in the stomach, esophagus, and small intestine, shifting the population toward inflammatory flora (Freedburg et al., 2014) and causing small intestinal bacterial overgrowth (Del Piano et al., 2014). Researchers are exploring the role of selected probiotic supplements to negate the harmful effect of PPIs on the microbiome (Del Piano et al., 2014). The disruption in microbiome might explain the association of prenatal use of acid-suppressive drugs with an increased risk of allergic disease in the offspring (Mulder et al., 2014).

6. Follow-up
    a. Increase frequency of visits based on response to treatment
    b. Nutritionist referral
    c. Physician consultation for persistent severe symptoms unresponsive to treatment

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