**Integrating Emerging Research into Evidence-Based Management of Pregnant Individuals with Hyperlipidemia**

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Hyperlipidemia, defined as an elevation of lipid levels, is not an independent disease state (Hill & Bordoni, 2023). However, the condition is closely associated with serious comorbidities that do present risks to the health of individuals diagnosed with it, including type II diabetes, hypertension, and atherosclerotic cardiovascular disease (ASCVD) (Hill & Bordoni, 2023).

Within the public health setting, hyperlipidemia has become an increasing common diagnosis. The most recent data by the US Centers for Disease Control and Prevention (CDC, 2024a) estimates that at least 25 million individuals in the US currently possess hyperlipidemia. More specifically, an average of 10 percent of adult women are affected (CDC, 2024a).

Hyperlipidemia is particularly concerning in pregnancy, because in addition to the risk factors pertinent to the general population, it is correlated with pregnancy-specific health hazards, specifically gestational hypertension, preeclampsia, preterm delivery, and neonates large for gestational age (Poornima et al., 2023). These risks extend beyond pregnancy; women who experience pre-eclampsia are twice as likely to experience heart disease and stroke after pregnancy than those who do not (Poornima et al., 2023).

Recent developments in medicine, including the use of GLP-1 agonists and improvements in reproductive technology, enable women who previously experienced infertility to become pregnant. This population includes both women with preexisting health conditions and women of advanced maternal age, who are more likely to experience complications in the first place (Martinez & Daniels, 2023). The average age of first-time mothers in the United States is at an all-time high at 24.1 years, and nearly four percent of children are born to mothers 40 years of age or older (Martinez & Daniels, 2023).

The prevalence of comorbidities, the rising average age of motherhood, medical and reproductive technology, and legal restrictions on reproductive choice have combined to result in a higher proportion of women whose health conditions require management within the context of the childbearing year. Although such patients are often more appropriately comanaged with ob-gyns and maternal fetal medicine specialists, nurse midwives and women’s health nurse practitioners should be aware of current recommendations for hyperlipidemia, including pre-pregnancy, antepartum, and postpartum management.

**Diagnosis**

Diagnosis of hyperlipidemia is dependent on lab results, specifically a fasting lipid panel that includes high-density lipoprotein (HDL), low-density lipoprotein (LDL), very-low-density lipoprotein (VLDL), triglycerides (TG), and total cholesterol (TC). An LDL greater than the 90th percentile of the general population, or an HDL less than the 5th percentile, is diagnostic (Hill & Bordoni, 2023).

For women, lipid panels are recommended to begin at 45 years of age in the absence of cardiovascular risk factors, or 30 years if risk factors are present (Hill & Bordoni, 2023). While this panel is not typically included in the initial obstetric workup, it is prudent to include it in a patient with an existing diagnosis to provide a baseline. This is especially important because physiologic changes of pregnancy increase lipid levels; by the third trimester, triglyceride levels may as much as double (Poornima et al., 2023). For pregnant individuals, dyslipidemia is categorized as TG, TC, and LDL levels greater in the 95th percentile for gestational age, or HDL less than the 5th (Poornima et al., 2023). Other labs that are typically included in the prenatal panel that can aid identifying common comorbidities or assessing current management strategies include hemoglobin A1C.

When hyperlipidemia is suspected, a thorough review of systems should be conducted, with particular attention paid to cardiac concerns, edema, fatigue, urinary changes, and shortness of breath (Grundy et al., 2019). A complete family history should also be taken, as hypercholesterolemia often runs in families. Physical exam focal points include vital sign assessment, body mass index (BMI) calculation, auscultation for cardiac rate, rhythm, murmurs, and bruits, peripheral pulse palpation, and examination for xanthomas and edema (Grubbs & Davis, 2023). Lifestyle factors, including diet, exercise, stress, and substance abuse should be investigated and documented, as those variables can provide evidence of both risk factors and opportunities to incorporate change (Grundy et al., 2019).

Once this data is collected, it can be used to calculate both a 10-year and lifetime risk of ASCVD using the American College of Cardiology’s (ACOC) ASCVD Risk Estimator (2024). The Risk Estimator tool also provides treatment suggestions, including medicinal management of both hyperlipidemia and its comorbidities.

**Management**

 The approach to treating hyperlipidemia is multifaceted and requires examination of individual factors such as diet and exercise habits, socioeconomic challenges, determinants of health, and estimated risk via a quantitative tool like the ASCVD (ACOC, 2024). A low score on the ASCVD supports lifestyle changes and holistic therapy. An elevated one indicates the need for medication, primarily a statin.

Although statins are the bedrock of hyperlipidemia management, they have traditionally been considered contraindicated during pregnancy. Previously the US Food and Drug Administration (FDA) cited concern for teratogen potential, but new data supports the potential use in patients who are high-risk for ASCVD (Mauricio & Khera, 2022). The discussion around statin risks and benefits during pregnancy presents an example of the importance of informed consent, patient autonomy, and collaborative decision-making. Adding a lipid panel to the standard new obstetric labs, in addition to evaluating personal risk factors, will help to assist in determining whether statin continuation is warranted.

If a statin is prescribed during pregnancy, careful attention should be paid to the medication’s specific chemical characteristics, which influence how easily, and in what ratio, a particular medication crosses into the placenta. In the FDA recommendation noted above, pravastatin in particular is cited as a safer option given comparatively low transfer levels while atorvastatin crosses more easily and may be present at similar concentrations as in maternal plasma (Mauricio & Khera, 2022).

 While the use of statins during pregnancy remains up for debate, aspirin is far more widely recommended as a medication with the potential to prevent maternal complications. A growing body of evidence supports the use of aspirin therapy to reduce the risk of pre-eclampsia, and the link between hyperlipidemia and pre-eclampsia warrants preventative measures (Poornima et al., 2023). Current American College of Obstetricians and Gynecologists (ACOG) guidance recommends initiation of low-dose (81 mg daily) aspirin therapy after 12 weeks gestation in all pregnant individuals with at least one high risk factor for preeclampsia or more than one moderate risk factors (2023). High risk factors include history of preeclampsia, diabetes (type 1 or type 2), and hypertension, while moderate ones include obesity, nulliparity, familial history and advanced maternal age (ACOG, 2023). While hyperlipidemia is not expressly included, individuals with that diagnosis are likely to possess one of the conditions mentioned above as a comorbidity. Therefore, comprehensive medical history taking, including family history, is important in determining the appropriateness of starting an aspirin regimen in patients with hyperlipidemia.

Pregnancy also offers a unique opportunity to integrate holistic treatments into hyperlipidemia management. Increasing evidence supports the efficacy of omega-3 fatty acid in not only decreasing TG levels, but in reducing the LDL levels as well, lowering total cholesterol (Wang et al., 2023). Although the exact dosing of omega-3 supplementation required to provoke change is inconclusive, research suggests that most hyperlipidemic individuals would benefit from integrating a daily supplement.

Emerging research additionally suggests that microbiota in the gut have a profound influence on lipid metabolism (Jia et al., 2021). Metabolites produced by dietary fiber-digesting microbes appear to be particularly impactful. These substances also demonstrate potential to increase satiety and decrease intake, processes which offer promise in promoting weight loss (Jia et al., 2021). Pre- and probiotic supplements are generally considered safe during pregnancy, offer additional potential benefits related to blood glucose regulation, and can easily be integrated into a supportive daily routine (Obuchowska, 2022).

**Case Example**

 SC is an African American female who is 41 years old when she presents to the OBGYN clinic for pregnancy confirmation following a positive home pregnancy test. She states that although her menstrual cycles are normally regular and approx. 28 days, her menstrual cycle is ‘a couple weeks late’ and that she’s had several positive home pregnancy tests. Although this pregnancy is unplanned, she desires to continue it and establish care with the clinic.

 A complete history and physical are obtained. This is SC’s second pregnancy. She states that she became pregnant in her early 20s but had an elective abortion, making her a G2P0. She reports that since then, she has not been in any serious relationships as she has primarily focused on her career. When she is sexually active, she utilizes condoms for birth control. SC’s most recent Pap was in 2022 and was within normal limits. She has never had an abnormal Pap and denies a history of STIs. She did not receive the Gardasil vaccine. She reports that her only surgery was wisdom teeth removal during her teenage years.

 SC’s medical history is notable for chronic hypertension, hyperlipidemia, and type 2 diabetes mellitus (DMII), all diagnosed by her primary care provider in 2022 when she was 39 years of age. She was diagnosed following annual labs, including a fasting lipid profile, A1C, and comprehensive metabolic panel (CMP). The ASCVD Risk Calculator (ACOC, 2024) was utilized to estimate her risk of lifetime risk of disease and determine an appropriate treatment. Based on her lipid panel (LDL 210, HDL 90, TC 300), an initial blood pressure of 140/90, no current statin, antihypertensive, or aspirin therapy, nonsmoker status, and concurrent DMII, her 10-year risk was calculated to be high, and lifetime risk was calculated at 50% (ACOC, 2024).

After her diagnosis, SC was started on a medication protocol of labetalol, 100 mg, by mouth (PO), twice daily, hydrochlorothiazide, 25 mg, PO, daily, atorvastatin, 20 mg, PO, daily, and metformin, 500 mg, PO, BID per personalized ACOC recommendations (2024). Although she received health education when she was initially diagnosed, including diet, education, and diabetes management, she admits that she ‘was not the best’ at implementing lifestyle changes. While she was compliant with her medication, she found it difficult to lose the recommended amount of weight and exercise was challenging due to her body habitus. For this reason, a glucagon-like peptide-1 receptor agonist (GLP-1RA), semaglutide (Ozempic) was incorporated approximately six months ago, resulting in a weight loss of 35 lbs. Her pre-pregnancy weight and BMI were therefore 235 lbs (5’8”) and 36, down from 270 lbs and a BMI of 41 prior to starting Ozempic.

SC is still taking her medication (labetalol, atorvastatin, hydrochlorothiazide, and metformin) as prescribed. Her last Ozempic injection was approximately one week prior to her appointment. She denies taking any vitamins or supplements and denies drug allergies.

 SC lives with her mother, who has also been diagnosed with hyperlipidemia, hypertension, and DMII. Her father passed away several years ago from complications following a major heart attack. She has no siblings, but along with her mother resided with her 4 cats and miniature Daschund. She denies a history of drug and tobacco use but admits to having a ‘glass of wine’ several days a week prior to becoming pregnant. SC reports having reliable transportation, good health benefits, and access to fresh foods. She walks about 30 minutes a day, three days a week.

Per her review of systems, SC denies feeling heart palpitations, urinary changes, new-onset edema, and shortness of breath. She acknowledges feeling more fatigued than usual and reports urinary frequency.

 Upon exam, SC’s blood pressure is 128/80. Her remaining vital signs are within normal limits. Her current weight is 240 lbs., making her BMI 36.5. Her cardiac exam is normal, with a regular rate and rhythm, bruits and murmurs absent. SC’s thyroid is palpated and does not feel enlarged, nor are nodes palpable. The CNM does observe two small, approximately one centimeter xanthomas on SC’s left superior eyelid.

 The prudent midwife quickly recognizes that due to SC’s medical complications, she requires co-management with the partner OBGYN and referral to maternal fetal medicine (MFM). The CNM discusses this plan with SC so that her next appointments can be appropriately scheduled. However, she still takes care to complete both basic early pregnancy education and education specific to the patient’s lifestyle and health challenges, including optimizing diet, exercise, and weight gain (Poornima et al., 2023). The CNM discusses the lack of safety data concerning Ozempic use during pregnancy, and SC agrees to discontinue injections for the duration (Cesta et al., 2023).

SC is also encouraged to initiate a prenatal vitamin, discontinue her hydrochlorothiazide, continue her metformin and labetalol, and begin taking low-dose aspirin (81 mg) when she reached 12 weeks’ gestation (ACOG, 2023). The CNM collaborates with the obstetrician on call, and they discuss statin continuation with SC. They collaboratively decide to discontinue the statin until SC can meet with the MFM. In addition to the standard prenatal panel, the midwife orders a CMP, lipid profile, and A1C to provide baseline lab data.

SC receives follow-up diabetes education and following ACOG’s recommendations for DMII in pregnancy, checks her blood sugar daily, including both fasting blood sugar and two-hour postprandials (ObG Project, 2024). She is compliant with her metformin regimen and diet recommendations and keeps a detailed journal of her diet and blood sugar data. Her blood sugars are well-controlled for the duration of her pregnancy. Twice-weekly testing, including a non-stress test at the obstetric office and a biophysical profile with MFM, is initiated at 32 weeks of gestation given hypertension, obesity, advanced maternal age, and diabetes. Additionally, serial growth scans are scheduled for every three weeks (ObG Project, 2024).

Blood pressure values, urinalysis, and lab values stay within normal limits until her 36-week obstetric appointment. At that visit, her blood pressure is 140/94. SC denies headache, scotoma, and epigastric pain, although her urinalysis reveals trace protein. The midwife confers with the obstetrician on call and MFM. They reach a mutual decision to initiate a 24-hour urine collection and collect labs. When SC returns the next day to turn in her sample, her blood pressure is 152/95. Her urine sample contains 540 mg of protein. She again denies scotoma, headache, and epigastric pain. She meets criteria for a diagnosis of chronic hypertension with superimposed pre-eclampsia with severe features and is admitted to the hospital for induction (ACOG, 2021).

In the early hours of SC’s induction, her blood pressures continue to rise. Once her pressures require treatment per her hospital’s policy, iv labetalol is administered per the unit’s hypertensive protocol and magnesium therapy is initiated. Despite these challenges, SC labors successfully and delivers a five-pound infant via spontaneous vaginal delivery at 36 weeks and three days gestation. SC stays on magnesium therapy for 24 hours postpartum and continues to take labetalol by mouth. She has chosen to breastfeed her newborn and after discussion with both the lactation consultant and her midwife, decides to defer restarting statin therapy until the cessation of breastfeeding. After the magnesium is discontinued, her pressures remain stable for the duration of her postpartum stay and she is discharged.

SC returns to the office three days later for a blood pressure check, which is within normal limits. She is then scheduled for her six-week follow-up, when a repeat lipid panel is drawn per National Lipid Association guidance; of note, ACOG does not provide recommendations for postpartum testing at this time (Poornima et al., 2023). At that appointment, she reports that she is no longer breastfeeding, desires to initiate hormonal birth control, and would like to resume Ozempic. Her blood pressure remains well-controlled. The midwife facilitates a discussion on which option is most appropriate given SC’s medical history, diagnoses, BMI, age, and personal preferences (CDC, 2024b); an IUD is successfully placed. The midwife reinforces the importance of continued efforts to maintain positive lifestyle changes and urges near-term follow-up with her primary care provider to resume her medication management.

**Conclusion**

Hyperlipidemia, while not an independent disease state, is linked to serious comorbidities and has significant implications for the childbearing year and beyond. The correlation between hyperlipidemia and pre-eclampsia is particularly concerning, especially given recent data indicating that pre-eclamptic individuals have double the lifetime risk of heart attack and stroke (Poornima et al., 2023).

It is critical for nurse midwives to identify risk factors for hyperlipidemia, especially in women who do not regularly undergo health screening or lack access to primary care, and screen pregnant patients appropriately. While specific guidelines related to hyperlipidemia management in pregnancy are lacking, the protocols promoted by various professional medical organizations remain applicable with additional considerations for the dyad. Coordination with obstetricians, maternal fetal medicine specialists, and other specialists serves to mitigate risk and optimize management as much as possible both during the childbearing year and beyond.

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