

What Obstetrician–Gynecologists Should Know About Ebola

A Perspective From the Centers for Disease Control and Prevention

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West Africa is currently in the midst of the largest Ebola outbreak in history. Although there have been no Ebola virus disease cases identified in the United States, two U.S. health care workers with Ebola virus disease were medically evacuated from Liberia to the United States in early August 2014. The Centers for Disease Control and Prevention has been working closely with other U.S. government agencies and international and nongovernmental partners for several months to respond to this global crisis. Limited evidence suggests that pregnant women are at increased risk for severe illness and death when infected with Ebola virus, but there is no evidence to suggest that pregnant women are more susceptible to Ebola virus disease. In addition, pregnant women with Ebola virus disease appear to be at an increased risk for spontaneous abortion and pregnancy-associated hemorrhage. Neonates born to mothers with Ebola virus disease have not survived. Although it is very unlikely that obstetrician–gynecologists (ob-gyns) in the United States will diagnose or treat a patient with Ebola virus

disease, it is important that all health care providers are prepared to evaluate and care for these patients. Specifically, U.S. health care providers, including ob-gyns, should ask patients about recent travel and should know the signs and symptoms of Ebola virus disease and what to do if assessing a patient with compatible illness. This article provides general background information on Ebola and specifically addresses what is known about Ebola virus disease in pregnancy and the implications for practicing ob-gyns in the United States.

(Obstet Gynecol 2014;124:1005–10)

DOI: 10.1097/AOG.0000000000000533

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Financial Disclosure

The authors did not report any potential conflicts of interest.

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ISSN: 0029-7844/14

West Africa is currently in the midst of the largest Ebola virus disease outbreak in history. As of August 22, 2014, 2,252 people have confirmed or suspected Ebola virus disease and 1,427 have died in Liberia, Sierra Leone, Guinea, and Nigeria (Fig. 1),¹ and the outbreak is expected to take a long period of time to control.² On August 8, 2014, the Director General of the World Health Organization declared the current Ebola outbreak a Public Health Emergency of International Concern.^{3,4} Although there have been no Ebola virus disease cases identified in the United States, two U.S. health care workers with Ebola virus disease were medically evacuated from Liberia to the United States. The Centers for Disease Control and Prevention (CDC) has been working closely with other U.S. government agencies and international and nongovernmental partners for several months to respond to this global crisis.⁵ This article provides general background information on Ebola virus disease and specifically addresses what is known about Ebola virus disease in pregnancy and the implications for practicing obstetrician–gynecologists (ob-gyns) in the United States. As the information





Fig. 1. Countries with confirmed or suspected cases as part of recent Ebola virus disease outbreak in West Africa (as of August 22, 2014).

Jamieson. *Ebola in Pregnancy. Obstet Gynecol* 2014.

evolves, more information will be available on the CDC web site.¹

BACKGROUND ON EBOLA

Ebola virus disease is a rare but severe viral hemorrhagic fever that is caused by five different species of Ebola virus. The virus species causing the current epidemic (*Zaire ebolavirus*) first was identified in 1976 when there was an outbreak of viral hemorrhagic fever near the Ebola River in Zaire (now the Democratic Republic of the Congo).⁶ Ebola virus disease is a zoonotic infection for which the natural reservoir is thought to be fruit bats.⁷ Human disease occurs initially through direct contact with bats or their excretions or through contact with animals (eg, great apes) that have been infected by bats.^{7,8} Once infection is established in humans, Ebola virus can be transmitted person-to-person by direct contact of skin or mucous membranes with blood or body fluids of infected patients, contaminated objects (eg, needles), or the bodies of individuals who died with Ebola virus disease. The incubation period ranges from 2 days to 21 days (typically 8–10 days), and infected persons become contagious once fever and symptoms appear. Infectiousness increases with illness severity. The clinical presentation is nonspecific and easily can be confused with other

febrile diseases common to endemic areas such as malaria and typhoid. Ebola virus disease is characterized by abrupt onset of fever, chills, malaise, myalgia, weakness, and fatigue. Gastrointestinal symptoms such as diarrhea, vomiting, and abdominal pain frequently occur. Ebola viruses have tropism for multiple tissues, and multiorgan infection can occur.^{7,9} Ebola virus infection elicits cytokine dysregulation resulting in a robust host inflammatory response,¹⁰ and patients may progress to critical illness with multiorgan failure and septic shock. Other complications can include cerebral edema, seizures, coma, coagulopathy, and hemorrhagic manifestations.^{7,9} Although past outbreaks have been associated with almost 90% mortality,¹¹ the case-fatality proportion in this outbreak is approximately 55–75%.⁹

There are no approved specific treatments for Ebola virus disease.¹² Clinical management consists of supportive care, particularly fluid and electrolyte management, correction of coagulopathy, treatment of secondary infections, and management of other complications.⁹ A critical element of clinical management is prompt isolation and implementation of recommended infection-control measures (standard, contact, droplet precautions) using appropriate personal protective equipment for persons who are under investigation and patients with confirmed Ebola virus



disease.¹³ Several investigational therapeutics are in development but either lack human data or have very limited availability.^{12,14} There is no approved Ebola vaccine, but Ebola vaccines are in development, and phase I trials of some vaccines are planned for initiation soon.¹⁴ The most effective way to stop the current outbreak is early identification of persons with possible Ebola virus infection, followed by isolation and diagnostic testing, combined with tracing contacts to stop the chain of transmission. Individuals with possible Ebola exposure should be monitored for 21 days, with prompt isolation and testing for those who become symptomatic.^{9,13}

WHAT IS KNOWN ABOUT EBOLA IN PREGNANCY

Much of what we know about Ebola in pregnancy comes from previous outbreaks of Ebola virus disease in Africa. However, in the resource-limited settings where Ebola virus disease outbreaks generally occur, pregnancy information is not usually systematically collected. Limited evidence suggests that pregnant women are at increased risk for severe illness and death when infected with Ebola virus,¹⁵ but there is no evidence to suggest that pregnant women are more susceptible to Ebola virus infection. In addition, pregnant women with Ebola virus disease seem to be at an increased risk for spontaneous abortion and pregnancy-related hemorrhage.^{7,15} Neonates born to mothers with Ebola virus disease have not survived, and the causes of these deaths are uncertain.^{6,15}

In 1976, there were 318 cases of an acute viral hemorrhagic fever in the Yambuku area of Zaire (now the Democratic Republic of the Congo).⁶ The virus later was identified as Ebola virus, and the outbreak was linked to receipt of injections with contaminated needles in a hospital setting. Although a disproportionate number of pregnant women were affected (46% of 177 Ebola-infected women were pregnant), this was largely attributed to the receipt of vitamin injections that were given as part of routine prenatal care. During this outbreak, overall mortality (88%) as well as mortality among pregnant women (89%) were high. Among the 82 pregnant women, 19 (23%) had spontaneous abortions, including first-trimester and second-trimester losses. Among 11 neonates born to mothers with Ebola virus disease, all died within 19 days of life; 7 of the 11 neonates had fever. It is not known whether these neonatal deaths were due to perinatally acquired infection with Ebola virus or to other causes, such as endemic infections (eg, malaria, typhoid) or malnourishment.⁶

During an outbreak in 1996 in Kikwit, Democratic Republic of the Congo, 105 women were identified with Ebola virus disease; 15 (14%) were or had been pregnant during their illness.¹⁵ All 15 of these women developed vaginal and uterine bleeding, and 14 died within 10 days of illness onset; one woman survived despite hemorrhage-induced hypovolemic shock after fetal loss. Among hospitalized patients, 14 of 15 (93%) pregnant women died compared with 28 of 40 (70%) nonpregnant women. In terms of fetal outcomes, among the 10 women who presented in the first or second trimester of pregnancy, all experienced spontaneous abortion. Among the five third-trimester pregnancies, all resulted in fetal or neonatal loss. One liveborn neonate died on the third day of life with fever; the mother of this neonate died from postpartum hemorrhage. Pregnant women were more likely than the overall patient population with Ebola virus disease to have hemorrhagic complications, specifically vaginal and uterine bleeding associated with abortion or delivery.¹⁵

Among 15 cases of Ebola virus disease identified in Guinea early in the current outbreak, a 16-year-old patient experienced spontaneous abortion and survived.¹⁶ No other data on pregnancy outcomes are available from the current outbreak.

THE CURRENT SITUATION IN AFRICA: MATERNAL AND INFANT HEALTH ISSUES

In previous outbreaks, Ebola virus attack rates have been higher in women than in men, largely owing to cultural practices, including the role of women as caregivers.¹⁷ According to UNICEF, women are being disproportionately affected by this current Ebola outbreak.¹⁸ This is likely the result of their role as caregivers for sick children and other family members as well as their roles as health care providers and birth attendants.

Because this devastating outbreak is occurring largely in resource-constrained settings, it is likely that already overburdened health care services will be weakened further. This may affect access to critical emergency obstetric services such as cesarean delivery. In addition, without enough adequately trained staff and hospitals equipped to provide personal protective equipment and to implement infection-control procedures, hospitals, and obstetric wards in particular, may serve as “amplification points” for Ebola virus transmission to health care personnel and other patients.¹⁹ Thus, women requiring pregnancy-related care may be reluctant to access services. Furthermore, because prior Ebola outbreaks have been associated with contaminated needles, women may be reluctant to receive injections. Progesterin injectables are a common form



of contraception in affected areas,^{20,21} and uptake may be reduced, resulting in increased rates of unintended pregnancy. Lastly, fear of contaminated needles could result in decreased vaccination rates among pregnant women and their children.

Another critical issue is how mothers with suspected or confirmed Ebola virus disease will safely feed their infants in these settings. In the vast majority of situations, particularly in resource-limited settings, breastfeeding is the optimal method of infant feeding. During an Ebola outbreak, decisions about how mothers should feed their infants are particularly complicated. Although Ebola virus has been detected in breast milk,²² it is unknown whether Ebola virus can be transmitted from mothers to infants through breastfeeding, but given what is known about Ebola virus transmission and evidence from other viral infections, it seems likely that ill mothers would be at high risk for transmitting the virus to their infants through breast milk and close contact, including the act of suckling. Virtually nothing is known about the clearance of Ebola virus from breast milk in convalescing women. However, in many of these settings, there may not be a safe alternative to breastfeeding. In resource-limited settings, non-breastfed infants may be at increased risk of death from starvation and other infectious diseases such as diarrheal and respiratory diseases.²³ In addition, there may be concern about whether an infant exposed to a mother with Ebola virus disease poses a contact risk to other caregivers.

THE CURRENT STATUS OF THE CENTER FOR DISEASE CONTROL AND PREVENTION'S RESPONSE

On August 6, 2014, the CDC elevated the activation level of its Emergency Operations Center in Atlanta to the highest level, level 1, owing to the critical nature of the Ebola outbreak. The CDC has deployed teams of public health experts to West Africa to assist with prevention and control efforts. As of August 19th, 2014, more than 60 CDC staff members are deployed to Ebola-affected areas. Additionally, more than 350 CDC staff members are coordinating response efforts at CDC's headquarters. In addition to providing logistical and scientific support to field staff and key partners, staff members are developing and disseminating guidance on a variety of Ebola issues, including how to prevent, diagnose, and treat Ebola virus disease; recommendations regarding travel to and from affected areas; how to protect health care workers; how to trace contacts of persons with Ebola virus disease; and how lactating women in affected areas should feed and care for their infants.^{9,12,13}

CLINICAL QUESTIONS ABOUT EBOLA FOR THE UNITED STATES

At the time this article was published online, there were no confirmed cases of Ebola virus disease in the United States, except for the two U.S. health care workers medically evacuated from Liberia. Most hospitals in the United States have private rooms and adequate supplies and staff trained to adhere to recommended infection-control procedures. The CDC has published infection-control recommendations to assist hospitals, physicians, and staff to prepare.¹³ With strict adherence to infection control,¹³ it is highly unlikely that Ebola would pose any substantial risk of spread in the United States. However, given the increased risk of body fluid exposure, obstetric units caring for patients with Ebola virus disease should employ additional personal protective equipment, such as shoe covers, double gloves, and leg covers.

What if a Pregnant Woman From West Africa Presents to Labor and Delivery With Fever?

Among the approximately 4 million women who give birth in the United States each year, fewer than 8,000 (less than 0.2%) are reported as nonresidents in vital statistics data.²⁴ Thus, the number of pregnant women in the United States who are residents of the Ebola-affected countries is likely to be small. Despite this, obstetric providers who care for foreign-born women or women with a recent travel history should become familiar with Ebola signs and symptoms and transmission.

Women with fever or other signs and symptoms of Ebola virus disease should be asked about recent travel history (within 21 days) to affected areas (as of August 22, 2014, Liberia, Sierra Leone, Guinea, and Nigeria). Clinical signs and symptoms of Ebola virus disease include fever of 38.6°C or higher and additional symptoms such as severe headache, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage. The differential diagnosis also should include other, much more common causes of fever in Ebola virus disease–endemic areas such as malaria and typhoid⁹ as well as obstetric causes (eg, chorioamnionitis). Until a diagnosis of Ebola virus disease can be ruled out, the patient should be isolated and infection-control precautions implemented.¹³ The CDC's guidelines for evaluating and testing patients suspected of having Ebola virus disease are available online.²⁵

What if a Pregnant Woman is Diagnosed With Ebola Virus Disease in the United States?

In the very unlikely event that a pregnant woman in the United States is diagnosed with Ebola virus disease, the clinical guidance would be the same as for



nonpregnant adults, with an emphasis on monitoring for and early treatment of hemorrhagic complications. Although pregnant women may be more at risk for severe complications from Ebola virus disease, the same general principles for care would apply whether or not the patient is pregnant. Standard treatment for Ebola virus disease in the United States is supportive therapy to maintain plasma volume and blood pressure, electrolyte balance, and oxygenation. Correction of coagulopathy, including early and prompt treatment with blood products, and treatment of obstetric hemorrhage after delivery or fetal loss will be especially important. In addition, secondary infections and other complications should be managed appropriately.¹² Spontaneous abortion appears to be common among women with Ebola virus disease, and high neonatal mortality rates among Ebola virus-infected women have been reported.^{6,15} Although there is little information available to ascribe the cause of death definitively as Ebola virus disease for these neonates, it seems prudent to observe all of the infection-control precautions used for other probable and confirmed cases when caring for the neonates of infected women.

What if a Pregnant Health Care Provider is Providing Care for an Ebola Patient?

Because the only two cases of Ebola virus-infected patients in the United States were the result of evacuation efforts, this represents a very rare situation. However, all health care providers, including those who are pregnant, should follow recommended infection-control procedures, including standard, contact, and droplet precautions.¹³ Health care workers involved in aerosol-generating procedures (eg, intubation, airway suctioning) should wear respiratory-protective devices, and these procedures should be performed in an Airborne Infection Isolation Room when feasible.¹³ Given that many procedures performed as part of routine obstetric care involve potential body fluid exposure, additional personal protective equipment (eg, double gloves, shoe covers, and leg coverings) is recommended, along with strict adherence to infection-control protocols.

CONCLUSIONS

Although it is very unlikely that ob-gyns in the United States will diagnose or treat a patient with Ebola virus disease, it is important that all health care providers are prepared to respond to ensure that Ebola virus transmission is contained. Specifically, U.S. health care providers, including ob-gyns, should ask patients about recent travel to affected countries in West

Africa, know the signs and symptoms of Ebola virus disease, and know what to do if they have a patient with compatible illness.

REFERENCES

- Centers for Disease Control and Prevention. 2014 Ebola outbreak in West Africa. Available at: <http://www.cdc.gov/vhf/ebola/outbreaks/guinea/>. Retrieved August 24, 2014.
- Frieden TR, Damon I, Bell BP, Kenyon T, Nichol S. Ebola 2014-new challenges, new global response and responsibility. *N Engl J Med* 2014 [epub ahead of print].
- World Health Organization. IHR procedures concerning public health emergencies of international concern (PHEIC). Available at: <http://www.who.int/ihr/procedures/pheic/en/>. Retrieved August 18, 2014.
- World Health Organization. WHO Statement on the Meeting of the International Health Regulations Emergency Committee regarding the 2014 Ebola outbreak in West Africa. Available at: <http://www.who.int/mediacentre/news/statements/2014/ebola-20140808/en/>. Retrieved August 20, 2014.
- Dixon MG, Schafer JJ. Ebola viral disease outbreak—West Africa, 2014. *MMWR Morb Mortal Wkly Rep* 2014;63:548–51.
- World Health Organization. Ebola hemorrhagic fever in Zaire, 1976. *Bull World Health Organ* 1978;56:271–93.
- Feldmann H, Geisbert TW. Ebola haemorrhagic fever. *Lancet* 2011;377:849–62.
- Feldmann H. Ebola—a growing threat? *N Engl J Med* 2014 [epub ahead of print].
- Centers for Disease Control and Prevention. Ebola virus disease information for clinicians in U.S. healthcare settings. Available at: <http://www.cdc.gov/vhf/ebola/hcp/clinician-information-us-healthcare-settings.html>. Retrieved August 19, 2014.
- Wong G, Kobinger GP, Qiu X. Characterization of host immune responses in Ebola virus infections. *Expert Rev Clin Immunol* 2014;10:781–90.
- Green A. WHO and partners launch Ebola response plan. *Lancet* 2014;384:481.
- Centers for Disease Control and Prevention. Questions and answers on experimental treatment and vaccines for Ebola [updated August 8, 2014]. Available at: www.cdc.gov/vhf/ebola/outbreaks/guinea/qa-experimental-treatments.html. Retrieved August 19, 2014.
- Centers for Disease Control and Prevention. Infection prevention and control recommendations for hospitalized patients with known or suspected Ebola hemorrhagic fever in U.S. hospitals. Available at: <http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>. Retrieved August 19, 2014; updated August 5, 2014.
- Wong G, Qiu X, Olinger GG, Kobinger GP. Post-exposure therapy of filovirus infections. *Trends Microbiol* 2014;22:456–63.
- Mupapa K, Mukundu W, Bwaka MA, Kipasa M, De Roo A, Kuvula K, et al. Ebola hemorrhagic fever and pregnancy. *J Infect Dis* 1999;179(suppl 1):S11–2.
- Baize S, Pannetier D, Oestereich L, Rieger T, Koivogui L, Magassouba N, et al. Emergence of Zaire Ebola virus disease in Guinea—preliminary report. *N Engl J Med* 2014 [epub ahead of print].
- Okware SI, Omaswa FG, Zaramba S, Opio A, Lutwama JJ, Kamugisha J, et al. An outbreak of Ebola in Uganda. *Trop Med Int Health* 2002;7:1068–75.



18. United Nations Radio. UNICEF: women most affected Ebola outbreak in W. Africa. Available at: http://www.unmultimedia.org/radio/english/2014/07/unicef-women-most-affected-ebola-outbreak-in-w-africa/#.U_IMwnYpDcs. Retrieved August 18, 2014.
19. Gostin LO, Lucey D, Phelan A. The Ebola epidemic: a global health emergency. *JAMA* 2014 [epub ahead of print].
20. Liberia Institute of Statistics and Geo-Information Services, Ministry of Health and Social Welfare, National AIDS Control Program, MEASURE DHS, ICF International. Liberia demographic and health survey 2013: preliminary report. Available at: <http://dhsprogram.com/pubs/pdf/PR39/PR39.pdf>. Retrieved August 20, 2014.
21. Statistics Sierra Leone, MEASURE DHS, ICF International. Republic of Sierra Leone: Sierra Leone demographic and health survey 2013: preliminary report without results of HIV prevalence. Available at: <http://dhsprogram.com/pubs/pdf/PR42/PR42.pdf>. Retrieved August 20, 2014.
22. Bausch DG, Towner JS, Dowell SF, Kaducu F, Lukwiya M, Sanchez A, et al. Assessment of the risk of Ebola virus transmission from bodily fluids and fomites. *J Infect Dis* 2007;196 (suppl 2):S142-7.
23. Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality. *Lancet* 2000;355: 451-5.
24. Centers for Disease Control and Prevention. Vital statistics data available online. Birth data files. 2014. Available at: http://www.cdc.gov/nchs/data_access/Vitalstatsonline.htm. Retrieved August 15, 2014.
25. Centers for Disease Control and Prevention. Guidelines for evaluation of US patients suspected of having Ebola virus disease. 2014. Available at: <http://www.bt.cdc.gov/han/han00364.asp>. Retrieved August 19, 2014; updated August 8, 2014.

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rev 7/2013

