

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

4,800

Open access books available

122,000

International authors and editors

135M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities

**WEB OF SCIENCE™**Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.

For more information visit www.intechopen.com

Outcomes in Baby Deliveries among Pregnant Ebola Survivors

Wen-Ta Chiu, Jonathan Wu, Stanley Toy,
Rachele Hwong, John J Stewart and Jennifer Chang

Additional information is available at the end of the chapter

<http://dx.doi.org/10.5772/intechopen.74669>

Abstract

Greater El Monte Community Hospital (GEMCH), the Los Angeles Department of Public Health, and the Centers for Medicare and Medicaid Services assisted in the first documented case of Ebola survivor delivery in the United States. A descriptive qualitative review of GEMCH's events and the limited documented cases of outcomes of baby deliveries among EVD survivors is discussed. Limited resources and capacity in many developing countries impact adversely on the outcomes of the EVD survivors and their neonates. Three lessons for public health workers emerge: (1) the need for the United States to strengthen their capability to manage EVD cases and other highly contagious and severe infectious diseases; (2) the revealing that EVD survivors can deliver normal, EVD free babies when using the recommended guidelines; (3) The need for health care workers to adopt and share the practical procedures in the Recommended Guidelines by the CDC and LADPH from this event are useful and can be shared with the medical fraternity. This case illustrates that EVD survivors can be equally accepted and treated with success at designated health facilities. Demystifying Ebola and eliminating social stigma surrounding the disease is crucial in this undertaking.

Keywords: Ebola virus disease (EVD), survivor, pregnancy, public health awareness, neonate, stigma

1. Introduction

The West Africa Ebola virus disease (EVD) outbreak is globally recognized as one of the largest and most severe Ebola epidemic. The disease affected over 28,000 people and the case mortality rate was estimated to be around 50%. Among pregnant women, EVD increases the possibility for spontaneous abortion and pregnancy-associated hemorrhage. In addition, neonatal mortality

rate has been found to be high with almost no chances of survival [1]. Vertical transmission from mother to the fetus is not well understood. It can occur during the acute EVD infection leading to intrauterine fetal death or as stillbirth, or neonatal death. Acutely infected women have high levels of Ebola viral nucleic acid persist in the amniotic fluid following the clearance of viremia; it is not known if this fluid is infectious. Outside of this acute period of infection, little is known about vertical transmission. Furthermore, research on pregnancy outcomes among mothers who have recovered from EVD is limited. The media too has influenced community perception of risk and enhanced stigma against EVD survivors. Public health awareness is needed to educate the individual and community on health issues related to EVD. As of June 2016, an estimated 17,232 people survived the West Africa EVD outbreak [2]. Among the survivors 5000 women are of childbearing age [3]. Some of these women will require obstetric care. The aim of this study is to examine the outcomes at baby delivery among pregnant EVD survivors. There has been contrasting results in developed countries versus developing countries. The care provided to EVD patients and survivors requires evaluation in order to support the patient throughout their illness and recovery. In women who have been infected while pregnant, the virus may be found in the placenta, amniotic fluid and fetus.

2. Methods

To assess the outcomes of EVD survivors giving birth, a case study from the AHMC Health System facility and desk research was conducted. The primary case includes the first documented EVD survivor to give birth in the United States. The facility worked in collaboration with the Centers for Disease Control and Prevention (CDC) and Los Angeles County Department of Public Health (LACDPH) to provide coordinated care. This case study provided an empirical review which explores the outcomes of EVD survivors giving birth in a real-time context. Desk review was chosen to supplement this primary research and involved collecting data from existing resources. The systematic review collected and summarized empirical evidence related to Ebola survivors giving birth. The database used for desk research included PubMed and WorldCat. PRISMA was used to improve the quality of the results through identification, screening, and eligibility criteria.

2.1. First documented EVD survivor giving birth in United States

A 29-year-old physician from West Africa contracted EVD in July 2014, after caring for an EVD patient in Nigeria. On July 29, the woman began having generalized feelings of malaise, joint and muscle pain. She self-administered antimalarial medications which were effective in treating arthralgia and myalgia [4]. On August 1, the woman developed a fever, and on August 3, she started vomiting and had diarrhea. The woman was admitted to an Ebola treatment center. She was isolated after receiving positive results of a real-time reverse transcription polymerase chain reaction (PCR).

According to the woman, she spent 13 days in an Ebola treatment center, where she was treated with oral rehydration therapy (fluid with modest amounts of sugar and salts used to correct dehydration), and acetaminophen (an antipyretic and pain reliever). In addition, a

second course of antimalarial medications was also administered [4]. She was discharged from the Ebola treatment center on August 16, after testing negative for 2 separate EVD real-time reverse transcription PCR results. After her recovery, she developed some weariness, lethargy, loss of appetite, continued joint pain, and spot baldness. She did not report any sleep disturbances, headaches, or vision problems [4]. The woman's symptoms resolved 2–3 months later, and she fully recovered. Eight months prior to her EVD diagnosis, the woman had a spontaneous abortion at 10 weeks of gestation [4]. In January 2015, 22 weeks after her last negative EVD real-time reverse transcription PCR, she became pregnant again. The woman received routine prenatal care in West Africa. At her 25th week of pregnancy, a comprehensive ultrasound investigation was performed in Los Angeles County, California. The ultrasound assessment revealed standard fetus development [4].

In November 2015, Greater El Monte Community Hospital (GEMCH) treated this woman. GEMCH worked in cooperation with the Centers for Disease Control and Prevention (CDC) and the Los Angeles County Department of Public Health (LACDPH) throughout the patient's delivery process [5]. GEMCH identified staff members who were willing to assist during labor and delivery for the patient, and at 40 weeks and 1 day of gestation, labor was induced. Two doses of vaginal misoprostol, oxytocin, and an epidural anesthesia for pain management were administered to the patient. The woman successfully gave birth to a nine pound baby by normal delivery. The baby scored eight and nine on the Apgar scale at 1 minute and 5 minutes of age, respectively. The mother had a second-degree perineal laceration, which was repaired. The mother and her baby (**Figures 1 and 2**) were discharged from the hospital 36 hours postpartum [5]. The pair was



Figure 1. First documented mother EVD survivor in USA with new born baby and nurse, 2015.



Figure 2. GEMCH staff with first documented mother EVD survivor in USA with new born baby, 2015.

monitored for 6 weeks following the delivery, after which they returned home to West Africa. This case should raise awareness that EVD survivors can deliver healthy normal babies free of EVD.

Upon delivery, the Centers for Disease Control and Prevention (CDC) and Los Angeles County Department of Public Health (LACDPH) examined the mother's blood and the baby umbilical-cord blood. Oral and vaginal swabs were also sampled. Additional specimens were obtained from breast milk, first meconium, the placenta, and the amniotic fluid. All samples tested negative for EVD [5]. One week prior to the delivery, EVD real-time reverse transcription PCR testing was carried out on the patient's blood by both the LACDPH's laboratory and the CDC's Viral Special Pathogens Branch [5]. Both tests were reported negative for EVD. However, Ebola serum antibodies were detected.

2.2. Liberia EVD survivor

In 2014, a 26-year-old Liberian nurse assistant was recognized by Time Magazine. She was awarded *Persons of the Year 2014* by *Time Magazine* in recognition of her efforts to fight EVD. The woman had contracted EVD in the summer of 2014 and experienced the acute phase of EVD alongside her sister and fiancé, now husband, at the time [6]. She was discharged with Ebola free status from the Ebola Treatment Centre on August 28, 2014. Médecins Sans Frontières hire her as mental health counselors in their Ebola units [7]. The woman became pregnant with her fourth child in the summer of 2016, 2 years after her initial contraction of EVD. She experienced a difficult pregnancy which included gestational hypertension. In February 2017 she delivered by a cesarean section at Eternal Love Winning Africa Hospital (ELWA). She was discharged a few hours later. Soon after arriving home, the woman collapsed and began frothing at her mouth. Her spouse swiftly returned her to ELWA Hospital on the evening of February 19, 2017. She developed convulsions and seizures before admission [7]. With some hesitation she was eventually admitted to the hospital. She died on February 21, 2017, just 4 days after giving birth. She is survived by her husband and four children [8]. It is not known if her fourth child has been tested for the EVD antibodies.

2.3. Sierra Leone EVD survivor

A similar pregnancy was reported in Sierra Leone in an EVD survivor. She contracted the EVD infection when receiving gynecological services for her first pregnancy from a nurse, who had some physical contact with an infected person in Guinea during a memorial service. The first trimester of her gestation had complications which led into a miscarriage in May 2014. She was subsequently diagnosed with EVD [3]. She was discharged from the hospital on June 8, 2014 as Sierra Leone's first EVD survivor. Months after her recovery, she got pregnant again. She gave birth to a healthy baby boy on August 9, 2015. The baby was fed on formula milk substitutes. Only weeks after the baby was born, he developed a fever and died of an infection apparently not related to EVD. .

2.4. Other reported baby deliveries among Ebola survivors

Only one woman in the acute phase of EVD is reported to have given birth to a live, full term baby. This mother developed fever 4 days prior to delivery and the baby also developed fever and died 3 days later [9]. In the EVD outbreak at Mission Hospital in Yambuku, it was reported that 11 live babies were delivered from mothers in the acute stage of their EVD infection [9]. All babies had died in what appears to be neonatal mortality related to EVD. No other pathological data was available. Seven out of 10 babies were reported to have developed fevers. The route of infection from mother to baby is not clear. It is likely transmission occurred during gestation, birth, or through breast milk.

Although the virus has been isolated in breast milk, the risk of transmission must be balanced against the risk of malnutrition and other infections. If there is a safe alternative breastfeeding is not advisable [9, 10]. Neonates breastfed by mothers in the acute phase of their EVD infection have been reported to have become infected with EVD. Lactating women who are sick with EVD should be placed into isolation until recovery. Safer feeding options such as safe pasteurized donor milk or Ready to Use Infant Formula (RUIF), should be given to infant when available [3]. Breastfeeding shortly before convalesce of EVD may still expose the newborn to unnecessary risk. If available, laboratory testing of breast milk should be done to evaluate the EVD content of the milk, and if found negative breastfeeding can commence. Breastfeeding after full recovery from EVD is relatively safe and should be encouraged as there are many benefits of breast milk.

3. Discussion

3.1. Addressing stigma

There is always social stigma surrounding individuals infected with EVD and pregnant Ebola survivors are certainly at risk [11]. In major outbreaks thinly veiled prejudice is frequent [12]. The isolation of patients and the associated ostracism impacts the quality of life for those affected and their communities. Furthermore, the poor level of awareness

about transmission of the infection further undermined confidence and trust [11]. Mass communication and social media influenced community perception during the 2014 EVD epidemic [13]. The potential international hazard posed by EVD generated extensive media attention [3]. Structural deficiencies such as poverty, lack of education, and political conflicts further undermined the response and fueled stigma around EVD [14]. These issues fused with cultural norms led to mistaken beliefs and behavior regarding EVD and its mode of transmission [14]. Misguided understanding and stigma in individual communities also led to harassment, rejection and persecution [11].

Health providers need to support patients and those affected to access care and management free of stigma and discrimination. Emergency preparedness is needed to promote an enabling environment to overcome misconceptions and overcome related fear. Healthcare workers need to recognize the fear highly contagious diseases create, rather than treat those infected or are recovering from the disease as pariahs, need to overcome that apprehension to create preparedness. This case illustrates the need for health care providers to advocate for Assurance of the basic rights of the patients irrespective of the medical condition is essential in managing emerging infections like Ebola with high mortality. Ebola survivors should equally be accepted and managed at health facilities.

3.2. Promoting public education

Health education is critical in reducing misconceptions and fear. Initially, no hospital was willing to volunteer to admit this mother despite an appeal from the CDC and LACDPH. This would be the first documented EVD survivor to deliver in the USA. However, through partnership with CDC and LACDPH, the staff at GEMCH was educated about transmission and infection control and personal protection prior to delivery. With proper knowledge, public education and reassurance, it was possible to mobilize interdisciplinary teams for patient management. The United States is strengthening their capacity to manage EVD cases and other highly contagious and severe infectious diseases. In February 2015, 55 hospitals were designated as Ebola treatment centers. In June 2015, the Department of Health & Human Services (HHS) adopted CDC guidelines and identified and funded nine health facilities as regional EVD treatment centers for specialized emergency medical care. In California, for instance, Cedars-Sinai Medical Center serves as the regional treatment center and will serve Arizona, Hawaii, Nevada, and the U.S. territories in the Pacific.

3.3. Enhancing continuing medical training

A study published in the American Journal of Infection Control analyzed conventional training programs and reinforced training programs with their ability to decrease self-contamination during the usage of basic PPE and enhanced PPE. The reinforced training programs provided evidence of improvement in adhering to protocol and proficiency. However, there is still apprehension on a perfect barrier to infection contamination as this remains elusive [15]. According to the findings from the Ebola cases introduced, it is crucial for

healthcare providers to work in partnership in educating health workers and patients. The treatment must be provided in a manner that promotes patient dignity and comfort at the appropriate level of care. Healthcare facilities need to bring awareness to their physicians and medical staff in regard to pregnant Ebola survivors who have fully recovered. These patients pose virtually no risk to others including the neonates [16]. Thus healthcare workers can safely treat EVD survivors.

Recommended Guidelines.

Below is a summary of the Recommended Guidelines provided by the CDC and LADPH directly drawn from the GEMCH Ebola survivor delivery event:

- a. *Before delivery:* For pregnant patients with intact membranes, medical staff is not required to utilize Personal Protective Equipment (PPE). Routine hand hygiene before and after contact with the patient are required.
- b. *For vaginal exams with rupture membrane:* face protection with a face mask and face shield, fluid-resistant gowns, and gloves are required to prevent mucous membranes and splashes exposure.
- c. *For obstetrical and additional procedures where a large amount of fluid or blood is anticipated:* such as artificial rupture of membranes and postpartum hemorrhage, PPE is required.
- d. *During the delivery process:* medical staff must wear PPE for the patient and staff's safety. Prevent exposure from mucous membranes, body fluids, and splashes, utilize face protection with a face mask and face shield, fluid-resistant gowns, double gloves, and boot covers that extend to at least mid-calf, must be utilized. Pockets and surgical drapes should be placed to prevent dousing of gowns and boots from body fluids during the delivery process.
- e. *After the delivery:* medical staff should not remove PPE until the mother's gown and bedding have been changed.
- f. *Post delivery:* Upon vaginal and perineal examinations, non-sterile exam gloves and disposable gowns must be utilized. Face protection is not needed unless the occurrence of body fluid splash.
- g. *During initial contact with the baby:* medical staff must apply PPE when giving them a bath. If exposure to fluids when changing diaper and removing waste, non-sterile exam gloves and two face masks must be worn. At all cost, skin-to-skin contact should be delayed until baby is bathed.

There has been contrasting results in There is some contrast in outcomes of EVD survivors and the neonate between developed and developing. The treatment offered to survivors who become pregnant must be assessed and adapted to the different resource environments and should be consistent to support the patient throughout the delivery process. Positive outcomes can be achieved through the application of recommended guidelines so that EVD survivors as well as the neonates may be assured of their future.

4. Conclusion

The Ebola global threat has receded at least for now, but the world must remain vigilant. The challenges created should also provide opportunities for building capacity for early detection and control. Health systems for surveillance and human resource development must be reinforced as EVD and other highly infectious diseases may re-emerge in low resource settings without adequate capacity for timely containment. A global response is required to improve health care systems in all the affected regions [17]. The care provided to EVD patients must be evaluated to support the patient throughout their illness. If the mortality rate can be lowered through the application of the standard of care guidelines, EVD patients and survivors will cooperate in more seeking care. A number of medical problems have been reported in survivors, including mental health. Ebola survivors need comprehensive social support for the medical, mental and psychosocial challenges they face. In developing countries resources are limited. For such instances early detection and action is vital to Ebola containment. Further research is required to monitor the Ebola outbreaks as they occur in order to gain true insight to developing delivery management needs of EVD survivors especially during baby delivery.

Acknowledgements

The authors would like to thank all health facilities and staff involved with the research and writing of this manuscript. We would personally like to thank Adaora Igonoh for allowing us to share her story and bring to light EVD survivors can deliver normal, EVD free babies with standard growth and development. The authors would like to thank the staff at GEMCH including but not limited to Amanda Kamali, Moon Kim, Denise Jorison, Pierre Rollin, Okoi Lilian, Julius Kpaduwa, Evelyn Calubaquib, Jose Ortega, Stella Kpadowa, Yang Cho, Ifeoma Uisoa, and Sarah Schrier. Special appreciation to the Centers for Disease Control and Prevention (CDC) and Los Angeles County Department of Public Health (LACDPH) for their help and collaboration in this unique case. Furthermore, the authors would like to thank our system's A Team: Linda Marsh, Iris Lai, Patrick Petre, Philip Cohen, Karen Price-Gharzeddine, Rick Castro. We would also like to thank the corporate project team members Su-Yen Wu, Claire Huang, Molly Wu, Qian (Eowyn) Wen, Sasha Yu, Ping Lin.

Author details

Wen-Ta Chiu^{1,2}, Jonathan Wu¹, Stanley Toy¹, Rachele Hwong^{1*}, John J Stewart¹ and Jennifer Chang¹

*Address all correspondence to: rachele.hwong@ahmchealth.com

1 AHMC Health System, Alhambra, United States

2 Taipei Medical University, Taipei, Taiwan

References

- [1] Jamieson D. What obstetrician-gynecologist should know about Ebola: A perspective from the Centers for Disease Control and Prevention. *Obstetrics and Gynecology*. 2014; **124**(5):1005-1010. DOI: 10.1097/AOG.0000000000000533
- [2] Situation Report. World Health Organization. 2016. Retrieved September 29, 2017, from http://apps.who.int/iris/bitstream/10665/208883/1/ebolasitrep_10Jun2016_eng.pdf?ua=1
- [3] Ebola (Ebola Virus Disease). 2016, June 10. Retrieved September 29, 2017, from <https://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/survivors.html>
- [4] Kamali A, Jamieson DJ, Kpaduwa J, Schrier S, Kim M, Green NM, Mascola L. Pregnancy, labor, and delivery after Ebola virus disease and implications for infection control in obstetric services, United States. *Emerging Infectious Diseases*. 2016;**22**(7):1156-1161. DOI: 10.3201/eid2207.160269
- [5] Chiu WT, Toy S, Wu J. The first Ebola survivor to deliver a full term baby in the United States. *American Public Health Association*. 2016;**106**(6):e4-e5
- [6] McVeigh K. Ebola Survivor and Frontline Fighter Dies after Childbirth Complications. 2017, February 28. Retrieved September 29, 2017, from <https://www.theguardian.com/global-development/2017/feb/28/ebola-survivor-and-frontline-fighter-dies-after-childbirth-complications>
- [7] Krausz J. Salome Karwah Dies: Liberian Ebola Fighter Loses Life After Childbirth. 2017, February 27. Retrieved September 29, 2017, from <http://www.newsmax.com/TheWire/salome-karwah-dies-ebola-fighter/2017/02/27/id/775880/>
- [8] Why Ebola Fighters Are TIME's Person of the Year 2014. n.d. Retrieved September 29, 2017, from <http://time.com/time-person-of-the-year-ebola-fighters-choice/>
- [9] Richens Y, Gerrard J. Ebola in pregnancy. *British Journal of Midwifery*. 2014;**22**(11):771-775. DOI: 10.12968/bjom.2014.22.11.771
- [10] Fischer WA, Hynes NA, Perl TM. Protecting health care workers from Ebola: Personal protective equipment is critical but is not enough. *Annals of Internal Medicine*. 2014;**161**:753-754. DOI: 10.7326/M14-1953
- [11] Davtyan M, Brown B, Folayan MO. Addressing Ebola-related stigma: Lessons learned from HIV/AIDS. *Global Health Action*. 2014. DOI: 10.3402/gha.v7.26058
- [12] Sharfstein JM. On fear, distrust, and ebola. *JAMA*. 2015;**313**(8):784-784. DOI: 10.1001/jama.2015.346
- [13] Nagpal SJ, Karimianpour A, Mukhija D, Mohan D. Dissemination of 'misleading' information on social media during the 2014 Ebola epidemic: An area of concern. *Travel Medicine and Infectious Disease*. 2015;**13**(4):338-339. DOI: 10.1016/j.tmaid.2015.05.002
- [14] Gates B. The next epidemic – lessons from Ebola. *The New England Journal of Medicine*. 2015;**372**(15):1381-1384. DOI: 10.1056/NEJMp1502918

- [15] Casalino E, Astocondor E, Carlos J, Diaz-Santana DE, Aguila CD, Carrillo JP. Personal protective equipment for the Ebola virus disease: A comparison of 2 training programs. *American Journal of Infection Control*. 2015;**43**(12):1281-1287
- [16] Ebola Virus Disease in Pregnancy: Screening and Management of Ebola Cases, Contacts and Survivors. 2015. World Health Organization
- [17] Baden LR, Kanopathipillai R, Champion EW, Morrissey S, Rubin EJ, Drazen JM. Ebola—an ongoing crisis. *The New England Journal of Medicine*. 2014;**371**(15):1458-1459. DOI: 10.1056/NEJMe1411378

IntechOpen