

# Necrotising fasciitis presenting as a blister: A case report on improving early recognition of surgical site infection following caesarean delivery

Alison Rothman<sup>a,\*</sup>, Nnabuike Chibuoke Ngene<sup>a,b</sup>

<sup>a</sup> Department of Obstetrics and Gynaecology, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

<sup>b</sup> Department of Obstetrics and Gynecology, Leratong Hospital, Krugersdorp, South Africa

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## ABSTRACT

Early recognition and treatment of surgical site infection (SSI) may prevent devastating consequences of wound infections complicating caesarean delivery (CD). SSI complicates 3–15% of CDs; among the severe forms are necrotising fasciitis (NF) and clostridial gas gangrene, with the latter being the most rapidly spreading and fatal. The aim of this report is to improve early recognition of SSI complicating CD.

An obese 32-year-old woman, gravida 2 para 1, with a previous uncomplicated vaginal delivery had a CD for fetal compromise in a district hospital. On day 6 after delivery, she presented to the same district hospital with a small blister located on her abdomen above the CD wound. The area around the blister was firm but had no crepitus. The blister was managed expectantly but spread rapidly and had a dusky colour. Both the blister and the surgical site for CD subsequently became foul smelling and the patient was managed in a regional hospital, where she had antibiotic therapy, wound debridement, negative-pressure wound therapy, and secondary wound closure. Healing was complete 69 days after the debridement. The histological report of the wound biopsy confirmed NF.

In conclusion, blistering around a surgical site is suggestive of NF. Healthcare professionals managing surgical wounds should have ongoing training on SSI to prevent lack of problem recognition in wound care. All healthcare facilities managing surgical wounds should establish a functional wound care clinic to improve early recognition and treatment of SSI. This entails effective integration of postnatal and CD wound services to improve the care of SSI. Therefore, the algorithm included in this article will be invaluable to care providers.

## 1. Introduction

Surgical site infection (SSI) is estimated to complicate 3–15% of caesarean deliveries (CDs) worldwide [1]. Unfortunately, measures aimed at preventing SSI are not always successful, particularly if there are risk factors for infection such as obesity [2]. Therefore, it behooves the managing healthcare team to institute measures for identification of early clinical features of SSI. This is crucial because some SSI are fast-spreading and can be fatal. An example is necrotising fasciitis (NF), which affects 0.4–1 in every 100,000 persons per year [3]. However, it is likely that the incidence of NF may be underreported due to timely antibiotic therapy which may treat SSI not recognised as early features of NF. Nonetheless, NF has been defined as a severe infection involving the skin, subcutaneous tissue, superficial fascia and muscles causing tissue necrosis [3].

An untreated SSI may result in sepsis, which is defined as organ

dysfunction that poses a threat to life because of the inability of the body to regulate the responses to infection [4]. This is noteworthy because the consequences of sepsis can be tragic. For instance, sepsis is among the most common causes of maternal death in low- and middle-income countries (LMICs) as well as in high-income countries [5]. The aim of this case report therefore is to promote the awareness of the need to improve early recognition of SSI such as NF following CD as well as to synthesise an integrated algorithm for postnatal and CD wound care services.

## 2. Case Presentation

A 32-year-old woman, gravida 2 para 1, with a previous uncomplicated vaginal delivery had normal antenatal care in the index pregnancy. She had a high body mass index (BMI) of 35 kg/m<sup>2</sup> but no other comorbidities. She presented to the district hospital in latent labour at

\* Corresponding author.

E-mail address: [alisonrothman1@wits.ac.za](mailto:alisonrothman1@wits.ac.za) (A. Rothman).

40 weeks of gestation with features of fetal distress. Written consent was obtained, and she had an emergency lower-segment CD through a suprapubic transverse skin incision. The patient was discharged home on day 3 after CD. On day 6, she noticed a small blister on her abdomen above the skin wound of the CD. She was subsequently reviewed at the

district hospital by a healthcare professional and down-referred to the primary healthcare clinic, where the attending staff told her it would heal without any treatment. On day 14 after CD, the patient presented to the emergency department of a regional hospital after noticing that the blistering abdominal skin had become dusky and foul-smelling.



**Fig. 1.** Blistering anterior abdominal wall on day 14 after caesarean delivery (A), and wound appearance following debridement (B), negative pressure wound dressing (C), and healing (D).

At the regional hospital, she had a blood pressure of 156/87 mmHg, pulse rate of 78 bpm, temperature of 36 °C and oxygen saturation of 99% on room air. She had a suprapubic abdominal pannus with a 20 cm by 15 cm sub-umbilical oval-shaped membranous-like lesion (blister), tender, with a sharply demarcated edge 6 cm superior to the CD skin incision site (Fig. 1A). The tissue between the lesion and skin incision site for CD was firm and tender but had no crepitus. The CD site oozed pus when the lesion was examined, implying a connection between the two wounds. Other parts of her abdomen were soft and non-tender. She had a vaginal discharge and a normal-looking cervix.

Blood results revealed a raised white cell count of  $17.58 \times 10^9/L$ , CRP of 200 mg/dL and platelet count of  $681 \times 10^9/L$ . Haemoglobin was 10.3 g/dL. LRINEC (Laboratory Risk Indicator for Necrotising Fasciitis) score was 7, indicating intermediate risk for NF. Computed tomography of the abdomen and pelvis was performed but reported only post-operatively, due to resource constraints. The report stated presence of cellulitis of lower abdomen with skin thickening and subcutaneous air locules. The uterus appeared bulky and abutting the anterior abdominal wall.

After commencing intravenous fluids and antibiotic therapy, the patient was reviewed by a multidisciplinary team including an obstetrician and general surgeon, consented and booked for an emergency wound debridement. The intraoperative findings revealed an SSI with extensive soft-tissue necrosis. Beneath the “blister” was necrotic tissue which was connected to the CD wound inferiorly. The rectus sheath was intact. During the surgery, the tissues beneath both the skin lesion and CD skin operation site were debrided until all necrotic tissues were excised and a bridge of viable skin tissue across the wound cavity was preserved (Fig. 1B). The wound was irrigated with hydrogen peroxide and normal saline and negative-pressure wound therapy (NPWT) was applied (Fig. 1C). Broad-spectrum intravenous antibiotics (piperacillin-tazobactam) were continued postoperatively for 14 days.

The microbiological cultures of the debrided tissue cultured *Streptococcus agalactiae* (STRAG) sensitive to penicillin. The histological report confirmed necrotising fasciitis. The wound was inspected post-operatively and found to be healing. A secondary closure of the wound was undertaken 20 days after debridement with no need for tissue grafting, and the patient was discharged home after three days. Subsequent out-patient follow-up was satisfactory; 69 days after the initial debridement, the patient was discharged from the wound clinic due to complete wound healing (Fig. 1D).

### 3. Discussion

The CD rate is increasing globally [6]. In South Africa, there is a disparity between the rate of CD in the public and the private health sector, presumably because of the option of “CD on request” in the latter. The rate of CD increased from 15.1% in 2006 to 24.1% in 2015 in the public sector [7]. In 2015, 73.6% of births in the private sector were via CD. Consequently, there are associated surgical complications of this procedure [8], with the commonest being wound complications. The wound complications are described on a spectrum of seroma, hematoma, infection and dehiscence [9]. These complications can occur together or in isolation. However, the most common postoperative complication is SSI [1], which has been defined by the Centers for Disease Control as an infection of the skin or subcutaneous tissue, deep soft tissue and/or internal organs occurring up to 30 days without an implant or one year after an operation with an implant placed in situ [10]. Of the SSIs, clostridial gas gangrene [11] is the most rapidly spreading and fatal [12,13]; however, NF remains a severe infection [14]. In NF, the classic skin changes of “visible bruising, bullae and cutaneous necrosis” are late manifestations, as the infection starts deep in the muscle and fascia layer and ascends towards the skin.

There are two types of NF: type 1 (polymicrobial), and type 2, which is due to haemolytic group A streptococcus [15]. The index patient had type 1 NF. The mainstay of management of NF includes: early

recognition, resuscitation with correction of metabolic and organ dysfunction and a septic work-up. Commencement of antimicrobial therapy should be within the first hour of presentation as per the Surviving Sepsis Campaign guidelines [16]. Imaging is necessary to guide the extent of wound exploration during debridement and diagnose any intra-abdominal collections. Wound dressing is preferably with a NPWT (vacuum-assisted closure [VAC]) [2,17]. The wound should be inspected after 48 h, and a repeat debridement undertaken if there is extension of the fasciitis. A secondary closure with or without tissue grafting will be undertaken by plastic or general surgeons; and follow-up care should continue until full healing has occurred. In obstetrics, the need for multidisciplinary team management of NF cannot be overemphasised, and this should involve the surgeons, anaesthesiologist, microbiologist and intensivist.

The patient was at increased risk of SSI because she had a BMI of 35 kg/m<sup>2</sup>, ongoing labour, and an emergency CD. To prevent SSI and sepsis, established perioperative measures including empiric antibiotic prophylaxis are recommended and have been described elsewhere [2,18]. Although the patient received basic care, it did not prevent a severe SSI. Other considerations that could have prevented the SSI in this kind of situation include: wound drainage (particularly when the subcutaneous tissue layer exceeds 2 cm in depth), and wound closure which is adequate to prevent bleeding but not too tight (as a bit of oozing of serous fluid but not blood is not harmful and may prevent SSI). Additionally, the blister formation should have prompted the opening of the part of the wound that looked suspicious. Therefore, early recognition of the SSI possibly would have reduced the morbidity.

Given that preventive measures may not always obviate infection, a high index of suspicion to identify poor wound healing or complications is needed. Unfortunately, many healthcare facilities in LMICs have not been able to establish functional integrated postnatal and postoperative wound care clinics managed by experienced healthcare professionals. These clinics will assist with wound care, particularly early recognition and treatment of SSI. The integrated clinic should have an algorithm for managing patients (Fig. 2). The timing of wound inspection at 6–24 h [19,20] and removal of staples and/or sutures 7–14 days after CD [21] are adapted in Fig. 2, although some experts suggest wound inspection on postoperative day 3 [2]. Understandably, variations exist in practice about the timing of skin suture and staples removal, and this requires further research. However, it is the responsibility of the clinician who performed the surgery to offer advice on how the patient should be followed up.

In the index case, there was no dedicated wound care clinic at the managing district hospital. This contributed to the failed recognition of features of SSI. It is in the authors' opinion that all clinicians involved in surgery and wound care should be able to promptly recognise, refer and/or treat SSI. This is crucial, given that pregnancy modulates the immune system, and the normal physiology in the postpartum period can mask the signs of infection [16]. This also implies that the maternal postpartum danger signs (MPDS) should be excluded. The MPDS include severe headache, high fever, chills, malodorous vaginal discharge, vaginal bleeding that soaks the pad, painful calf, sad feeling with or without suicidal ideation, difficult or fast breathing, and non-healing wound/incision [16]. Others include severe painful abdomen, convulsion, body weakness, blurring of vision, loss of consciousness, swelling of hands or face, excessive vomiting [22], painful breast, chest pain, urinary frequency, and urinary incontinence [23].

We emphasise that the following clinical features should be seen as “red flags” for wound sepsis (RFFWS) and warrant early referral to a dedicated wound care team or higher level of care. The RFFWS are:

- i. Crescendo pain around or deep to the incision requiring stronger analgesia as time passes. This is likely due to occlusion and infarction of the blood vessels and nerves [14].
- ii. Pain which is “out of proportion” to the appearance of the wound [15].

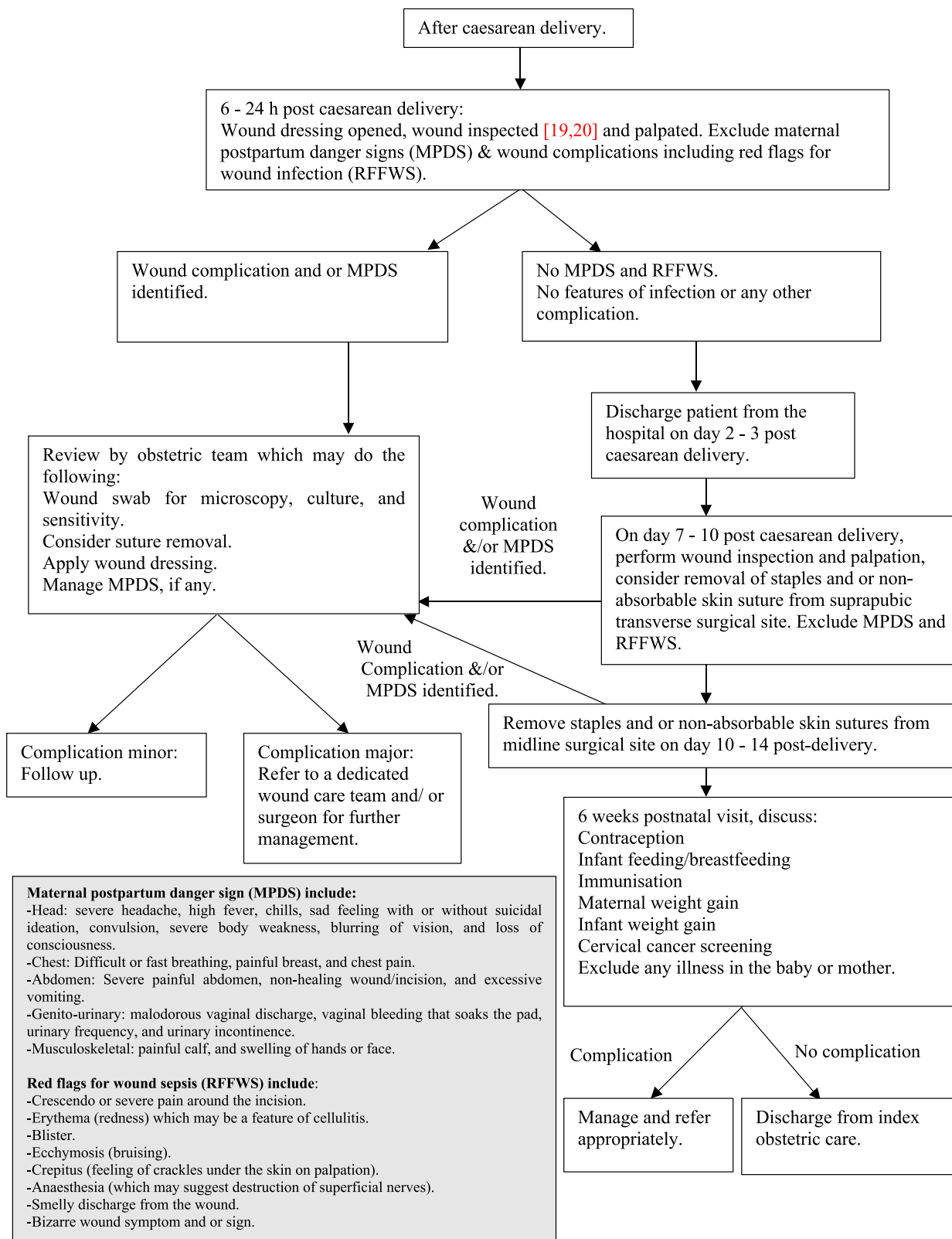


Fig. 2. Algorithm on integrated postnatal and caesarean delivery wound care services.

- iii. Erythema (redness) which may be a feature of cellulitis.
- iv. Blistering.
- v. Ecchymosis.
- vi. Crepitus (feeling of crackles under the skin on palpation).
- vii. Anaesthesia (which implies destruction of superficial nerves).

- viii. Smelly discharge from the wound.
- ix. Enigmatic wound symptom and or sign.

#### 4. Conclusion

Early recognition and treatment of SSI, including NF, after CD will prevent maternal morbidity and mortality. This requires continuous medical education on wound care for all healthcare professionals involved in managing surgical wounds. We implore the administrators of each healthcare facility providing CD to establish a functional integrated postnatal and CD wound care services.

#### Contributors

Alison Rothman contributed to patient care, conception of the case report, acquiring and interpreting the data, drafting the manuscript, undertaking the literature review and revising the article critically for important intellectual content.

Nnabuike Chibuoke Ngene contributed to patient care, conception of the case report, acquiring and interpreting the data, undertaking the literature review and revising the article critically for important intellectual content.

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#### Conflict of interest statement

The authors declare that they have no conflict of interest regarding the publication of this case report.

#### References

- [1] S. Suarez-Easton, N. Zafran, G. Garmi, R. Salim, Postcesarean wound infection: prevalence, impact, prevention, and management challenges, *Int. J. Women's Health* 9 (2017) 81–88, <https://doi.org/10.2147/IJWH.S98876>.
- [2] E. Ekanem, N.C. Ngene, J. Moodley, J. Konje, Prevention of surgical site infection and sepsis in pregnant obese women, *Best Pract. Res. Clin. Obstet. Gynaecol.* 91 (2023), 102406, <https://doi.org/10.1016/j.bpobgyn.2023.102406>.
- [3] A.J. Headley, Necrotizing soft tissue infections: a primary care review, *Am. Fam. Physician* 68 (2003) 323–328.
- [4] M. Singer, C.S. Deutschman, C.W. Seymour, M. Shankar-Hari, D. Annane, The third international consensus definitions for Sepsis and septic shock (Sepsis-3), *JAMA* 315 (2016) 801–810, <https://doi.org/10.1001/jama.2016.0287>.
- [5] E.K. Ekwuazi, C.O. Chigbu, N.C. Ngene, Reducing maternal mortality in low- and middle-income countries, *Case Rep. Womens Health* (2023), <https://doi.org/10.1016/j.crwh.2023.e00542>.
- [6] C. Antoine, B.K. Young, Cesarean section one hundred years 1920–2020: the good, the bad and the ugly, *J. Perinat. Med.* 49 (2021) 5–16, <https://doi.org/10.1515/jpm-2020-0305>.
- [7] G.C. Solanki, J.E. Cornell, E. Daviaud, S. Fawcus, Caesarean section rates in South Africa: a case study of the health systems challenges for the proposed National Health Insurance, *S. Afr. Med. J.* 110 (2020) 747, <https://doi.org/10.7196/SAMJ.2020.v110i8.14699>.
- [8] N.C. Ngene, T.D. Naidoo, M. Titus, J. Moodley, S. Craib, J. Stutterheim, Antepartum uterine rupture in a twin gestation presenting as an advanced extrauterine pregnancy in a patient with a previous lower segment caesarean section, *Trop. Dr.* 44 (2014) 176–178, <https://doi.org/10.1177/0049475514524954>.
- [9] T. Kawakita, H.J. Landy, Surgical site infections after cesarean delivery: epidemiology, prevention and treatment, *Matern. Health Neonatol. Perinatol.* 3 (2017) 12, <https://doi.org/10.1186/s40748-017-0051-3>.
- [10] T.C. Horan, R.P. Gaynes, W.J. Martone, W.R. Jarvis, T. Grace Emori, CDC definitions of nosocomial surgical site infections, A modification of CDC definitions of surgical wound infections, *Am. J. Infect. Control* 20 (1992) 271–274, [https://doi.org/10.1016/S0196-6553\(05\)80201-9](https://doi.org/10.1016/S0196-6553(05)80201-9).
- [11] K. Sapira, L. Sapira-Ordu, Gas gangrene in pregnancy, parturition, and abortions requiring urological and surgical intervention: patterns, features, and world distribution, *World J. Adv. Res. Rev.* 18 (2023) 870–878, <https://doi.org/10.30574/wjarr.2023.18.1.0646>.
- [12] M. Leiblein, N. Wagner, E.H. Adam, J. Frank, I. Marzi, C. Nau, Clostridial gas gangrene - a rare but deadly infection: case series and comparison to other necrotizing soft tissue infections, *Orthop. Surg.* 12 (2020) 1733, <https://doi.org/10.1111/os.12804>.
- [13] L. Haas, D. Tjan, A. van Zanten, Fatal clostridium septicum infection in a young pregnant woman, *Neth. J. Med.* 64 (2006) 254–255.
- [14] M.S. Morgan, Diagnosis and management of necrotizing fasciitis: a multiparametric approach, *J. Hosp. Infect.* 75 (2010) 249–257, <https://doi.org/10.1016/j.jhin.2010.01.028>.
- [15] Type II Necrotizing Fasciitis: Information for Clinicians | CDC. <https://www.cdc.gov/groupastrep/diseases-hcp/necrotizing-fasciitis.html>, 2023.
- [16] A. Rhodes, L.E. Evans, W. Alhazzani, M.M. Levy, M. Antonelli, Surviving Sepsis campaign: international guidelines for Management of Sepsis and Septic Shock: 2016, *Intensive Care Med.* 43 (2017) 304–377, <https://doi.org/10.1007/s00134-017-4683-6>.
- [17] P. Agarwal, R. Kukrele, D. Sharma, Vacuum assisted closure (VAC)/negative pressure wound therapy (NPWT) for difficult wounds: a review, *J. Clin. Orthop. Trauma* 10 (2019) 845–848, <https://doi.org/10.1016/j.jcot.2019.06.015>.
- [18] J.R. Salinaro, P.S. Jones, A.B. Beatty, S.K. Dotters-Katz, J.A. Kuller, N.P. Kerner, Optimizing surgical wound care in obstetrics and gynecology, *Obstet. Gynecol. Surv.* 78 (2023) 598–605, <https://doi.org/10.1097/OGX.0000000000001204>.
- [19] Healthcare Excellence Canada, Clinical Pathway for Cesarean Delivery. <https://www.healthcareexcellence.ca/en/>, 2023 (accessed September 29, 2023).
- [20] T. Zhang, F. Zhang, Z. Chen, X. Cheng, Comparison of early and delayed removal of dressing following primary closure of clean and contaminated surgical wounds: a systematic review and meta-analysis of randomized controlled trials, *Exp. Ther. Med.* 19 (2020) 3219–3226, <https://doi.org/10.3892/etm.2020.8591>.
- [21] B. Silverberg, A. Moyers, B.I. Wainblat, P. Cashio, K. Bernstein, A stitch in time: operative and nonoperative laceration repair techniques, *Prim. Care* 49 (2022) 23–38, <https://doi.org/10.1016/j.pop.2021.10.008>.
- [22] A.D. Dangura, Knowledge about childbirth and postpartum obstetric danger signs and associated factors among mothers in Dale district, Southern Ethiopia, *BMC Pregnancy Childbirth* 20 (2020) 340, <https://doi.org/10.1186/s12884-020-02989-7>.
- [23] World Health Organization Counselling for Maternal and Newborn Health Care: A Handbook for Building Skills, Geneva. <http://www.ncbi.nlm.nih.gov/books/NBK304190/>, 2013 (accessed November 7, 2023).