



Post-Cesarean Parietal Suppurations in a Level II Maternity Hospital in Guinea: Sociodemographic, Clinical, Therapeutic and Prognostic Aspects

Ibrahima Koussy Bah^{1,2}, Abdourahmane Diallo^{1,2}, Sekouba Kouyate^{1,2},
Thierno Souleymane Diallo^{1,2}, Oumar Diawara^{1,2}, Ibrahima Amadou Diallo^{1,2},
Yero Diouma Sow^{1,2}, Abdoul Karim Bangoura^{1,2}, Telly Sy^{1,2}

¹Department of Gynecology and Obstetrics, Faculty of Health Sciences and Techniques of Gamal Abdel Nasser University in Conakry, Conakry, Guinea

²Department of Gynecology-Obstetrics of the Ignace Deen National Hospital, Gamal Abdel Nasser University, Conakry, Guinea

Email address:

ibrahima.koussy@gmail.com (I. K. Bah), adiallo69gn@yahoo.fr (A. Diallo), sekoubakouyate1976@gmail.com (S. Kouyate), drthierno79@gmail.com (T. S. Diallo), oumardiawara111@gmail.com (O. Diawara), idiallo1981@gmail.com (I. A. Diallo), mohamedsow992@gmail.com (Y. D. Sow), abdoulkarimban907@gmail.com (A. K. Bangoura), sytelly@gmail.com (T. Sy)

*Corresponding author

To cite this article:

Ibrahima Koussy Bah, Abdourahmane Diallo, Sekouba Kouyate, Thierno Souleymane Diallo, Oumar Diawara, Ibrahima Amadou Diallo, Yero Diouma Sow, Abdoul Karim Bangoura, Telly Sy. Post-Cesarean Parietal Suppurations in a Level II Maternity Hospital in Guinea: Sociodemographic, Clinical, Therapeutic and Prognostic Aspects. *Journal of Gynecology and Obstetrics*. Vol. 10, No. 1, 2022, pp. 26-31. doi: 10.11648/j.jgo.20221001.14

Received: December 24, 2021; Accepted: January 15, 2022; Published: January 24, 2022

Abstract: Surgical site infections are frequently encountered in developing countries. In the world, cesarean section is one of the most performed surgical procedures for women. The objective of this study was to describe the socio-demographic, clinical, therapeutic and prognostic aspects of post-cesarean suppurations in the gynecology-obstetrics department of the Communal Medical Center of Ratoma. This was a descriptive study carried out in the gynecology-obstetrics department of the Communal Medical Center of Ratoma (maternity level II) in Guinea extended over six months from April 1 to September 30, 2020. The patients who presented with post suppurations - cesarean section and accepted to participate in the study were included. The variables were socio-demographic, clinical, therapeutic and prognostic. Forty-eight cases of suppurations were recorded out of 1090 cesarean sections, i.e. a frequency of 4.4%. The 31 to 36 age group was the most represented (41.67%). The average age was 23.29±4.76 years with extremes of 16 and 36 years. These were mainly housewives (41.66%), married women (95.84%) and residents mostly in the municipality of Ratoma (75.01%). The time to rupture of the membranes was less than 12 hours in 62.50% of cases and cesarean section was performed urgently in 83.33% of cases and the most frequent indication was foeto-pelvic disproportion in 33.34% of cases. The mean duration of the operation was 37.78±9.10 minutes with extremes of 20 and 75 minutes in the majority of cases. Suppuration was diagnosed at week 1 (60%) and the identified germ was staphylococcus aureus in 61, 53% of cases. No revision surgery had been performed and no maternal deaths were recorded. Post-cesarean parietal suppuration remains frequent; thus a better identification of the factors favoring this affection could make it possible to significantly reduce their incidence and consequently improve the maternal prognosis.

Keywords: Suppuration, Post-cesarean, Guinea

1. Introduction

Post-cesarean suppurations are frequently encountered in developing countries. Cesarean section is one of the oldest

and most performed surgical procedures for women in the world, it has a 5 to 20-fold risk of infection compared to vaginal birth [1]. Cesarean section rates vary greatly from country to country. However, they remain low overall in most developing countries, while the rate of caesarean sections for

medical reasons is estimated between 10 and 15%. Although a Caesarean can save lives and is generally considered very safe, however, it may be associated with a risk of complications [2, 3], including suppuration, especially in the current climate of early discharge from hospital.

Despite the availability of different sterilization and hygiene equipment in health establishments, these infections persist more and more and this because of certain risk factors which have contributed to an increase in the incidence of these infections [4]. If the cesarean section constitutes a safe method of delivery in developed countries where the operating conditions and the management of post-operative layers are better, it remains feared and formidable in many developing countries. The frequency of suppurations varies by country: in the United States 10% in 2014 [5]; in England 9.6% [6]; France 1.5% in 2016 [7]; Tunisia 8.47% in 2018 [8]; Burkina Faso 3.5% in 2015 [1] Surgical site infections, such as cesarean section, are associated with increased costs, higher rates of patient dissatisfaction, longer hospital stays, and high mortality and morbidity rates [9].

The aim of the study was to describe the aspects socio-demographic, clinical, therapeutic and prognosis of post-cesarean suppurations.

2. Patients and Methods

The study took place at the obstetric gynecology department of the Communal Medical Center (CMC) of Ratoma in Conakry. This was a descriptive cross-sectional study extended over a 6-month period from April 1 to September 30, 2020. Women who presented with post-cesarean suppuration and who agreed to participate in the study were included. Not included were patients who presented with post-cesarean suppuration for whom management was carried out outside the CMC. The variables were socio-demographic, clinical, therapeutic and prognostic. The questionnaire included information on the duration and type of intervention, the Altemeier contamination class (class I / clean, class II / clean-contaminated, they were then analyzed in the software Epi-info version 7.2.2.3. A descriptive analysis was performed on the entire study population. We obtained informed consent from patients, anonymity and confidentiality were respected.

3. Results

Frequency: During the study period, we recorded 1090 cases of caesarean section, of which forty-eight (48) patients had developed post-cesarean parietal suppuration (4.4%).

Sociodemographic profile: The distribution of patients according to socio-demographic characteristics is presented in table 1.

Age: The mean age of the patients was 23.29 ± 4.76 years with extremes of 16 and 36 years. The most represented age group was that of 31 to 36 years (20 cases) or 41.67%.

Profession: Housewives were in the majority 41.66% (20/48) followed by pupils / students 33.32% (16/48 cases).

Marital status: Brides were more concerned 95.84% (46/48 cases) against (4.16%) single people.

Provenance: Three quarters of the patients (36/48, 75.01%) resided in the municipality of Ratoma and twelve (12) in other municipalities.

Clinical features: Table 2 shows the clinical features of childbirth.

The time to rupture of membranes was in most cases less than 12 hours (62.50%). Half of the patients (24/48 cases) had conditions associated with post-cesarean suppuration, i.e. 50% of which twelve (12) anemic patients (25%), four HIV positive patients (8.34%), two hypertensive patients and two diabetics.

Cesarean section was performed urgently in the majority of cases (40/48, 83.33%) and the indications were dominated by foeto-pelvic disproportion (16/48, 33.34%) followed by scarring uteri (14 / 48) or 29.17%. The mean duration of the operation was 37.78 ± 9.10 minutes with extremes of 20 and 75 minutes. The duration between 30 and 59 minutes was more frequent (66.67%).

3.1. Diagnosis of Suppuration

In postoperative follow-up, the mean time to diagnosis of post-cesarean suppuration was 7.63 ± 1.92 days with extremes of 4 and 11 days. Suppuration was diagnosed between the 7th and 10th day in 32 cases (66.67%). It occurred in fourteen patients (14/48 cases) in less than 6 days (29.16%) and after 10 days in two case or 4.17%.

In Table 3, forty (44) cases of suppurations (91.66%) were discovered after discharge from hospital and four (04) cases occurred during hospitalization. The mean length of stay was 3.65 ± 0.72 days with extremes of 2 and 8 days and most patients (44/48, 91.67%) were discharged four days after hospitalization. Ten (10) patients had a fever (20.8%) on examination and thirty-eight (38) others had not developed a fever (79.20%). Forty-four (44) cases of suppurations were superficial or 91.67% and twenty-eight (28) patients had an ASA1 score or 58.33% and forty-two (42) patients had an NNIS score between 0 and 1 or 87.50%. Twenty-six (26) patients had a contaminated Altemeier class (54.16%). The care was provided mainly by antibiotics, analgesics, solutions. The antibiotics administered as prophylaxis were ampicillin 1g at a rate of 2g in all patients for prophylaxis and curative treatment relayed by the oral route with the amoxicillin-clavulanic acid combination or cloxacillin.

A sample of pus for a bacteriological study and an antibiogram was carried out in twenty-six (26) patients. *Staphylococcus aureus* was the germ most frequently encountered during the antibiogram (16/26 cases, 61.63%). Thus, the identified germs are shown in Table 4.

3.2. Management and Prognosis

Local care was carried out in all patients, and appropriate antibiotics were prescribed according to the antibiogram as well as analgesics and antianemics. No revision surgery had been performed and no maternal deaths were recorded.

4. Discussion

4.1. Frequency

During this period of the study, 1090 women underwent cesarean sections, 48 of whom developed post-cesarean suppuration (4.4%). Several other studies carried out across sub-Saharan Africa, found various frequencies: Wendmagegn *et al.* [10] in Ethiopia 11.7%; Sawadogo *et al.* [1] in Burkina 3.5%. From this observation, it emerges that the incidence of post-cesarean section infections is still high in developing countries. Sawadogo *et al.* [1] reported that compliance with infection prevention standards in hospitals would undoubtedly help to reduce these wall suppurations.

4.2. Sociodemographic Profile

The 31 to 36 age group was the most represented (41.67%) with an average of 23.29 ± 4.76 years of the extremes of 16 and 36 years as well. Merzougui *et al.* [8] observed a mean age of 30.6 ± 5.2 years with extremes of 14 and 45 years. However, the increase in age as well as a decrease in host immunity and associated comorbidities would increase the risk of infection according to other studies [3, 8].

The housewives came first (41.66%) just like at Sawadogo *et al.* [1] who found a majority (70%) of housewives [1]. The strong presence of housewives in our studies could be explained by the monopolization of women of this job title which they often confuse with that of housewife in our countries. This could be explained by the low level of education of these women. Most of the time, they are the central pillar of a good number of households where their absence considerably reduces the off-season financial contributions. So this socio-professional category does not have sufficient income to fulfill not only the prescriptions as well as the biological examinations requested, the transport to respect the dressing days given that they are in the oven and in the mill.

Patients residing in Ratoma were the most represented (75%). This result could be explained by the choice of proximity in order to reduce the cost of travel.

Married women represented the majority (95.8%) of cases of suppuration. It was the same with Sawadogo *et al.* [1] with 77.1% in case. In Guinea, the predominance of married couples is above all a fact both cultural and religious which does not allow pregnancy outside a matrimonial home.

4.3. Clinical Features of Post-cesarean Suppuration

Duration of rupture of membranes on admission mainly less than or equal to 12 hours (30/48, 62.50%). This result is comparable to those of Merzougui *et al.* [8] who reported that the pocket of broken water less than 12 hours was the majority (87%). Thus, premature rupture of membranes is an independent risk factor for post-cesarean infection [11]. The longer the duration of labor, the longer the period of rupture of the membranes; the higher the number of vaginal examinations, the greater the risk of germs rising from the vagina to the uterine cavity [2].

Half of the cases (24/48, 50%) had no known associated conditions, while 1/4 of the cases were anemic or 25%. This high rate of cases with no known history could be explained by the circumstances of the intervention (especially emergency situations do not allow war to be explored under our conditions). However, a study by Krieger *et al.* [11] reported that co-morbidities such as gestational diabetes and hypertension in pregnancy are risk factors. While, Zejnullahu *et al.* [3] reported that 10.8% of patients had one or more co-morbidities namely, hypertensive disease (17, 5.2%), hemorrhage (16, 4.9%), diabetes (6, 1.8%).

The majority of Caesarean sections, (40/48, 83.33%) were performed urgently against 16.67% (8/48) of scheduled cases. Sawadogo *et al.* [1] had reached the same conclusions. His emergency intervention situation is mentioned in the literature as a factor favoring post-cesarean suppurations, especially since all the asepsis and antisepsis measures are not well combined [8].

In addition, the majority of indications for Caesarean section were obstetric emergencies, including 33.34% foeto-pelvic disproportion (16/48) followed by scarred uterus 29.17% (14/48 cases). These emergency situations did not make it possible to postpone the interventions. On the other hand, Sawadogo *et al.* [1] reported that fetal distress was the first indication (34.3%) and the scarred uterus dominated in the study by Merzougui *et al.* [8].

The average duration of the intervention was 37.78 ± 9.10 min with extremes of 20 and 75 min; thus, suppurative post-cesarean patients with an intervention duration of 30 to 59 min (66.67%) had a significantly higher percentage than less than 30mn (29.17%). Comparatively, Sawadogo *et al.* [1] also concluded that the average intervention time was 46.6 ± 18.9 min with extremes of 20 and 138 min and the intervention time 30 to 59 min was the most represented. A duration of intervention greater than 1 hour increases the risk of post-cesarean suppuration and exposes the life of the fetus to anesthetic drugs; on the other hand, a reduced duration of intervention has a protective effect against infections of the surgical site [3].

4.4. Diagnostic

The length of stay of less than four (4) days was the majority (91.66%). The mean length of stay was 3.65 ± 0.72 days with extremes of 2 and 8 days. Merzougui *et al.* [8] reported a mean total length of stay of 3 ± 2.5 days.

This result could be explained by the fact that the patients recover very quickly thanks to early emergencies but also by the high number housed in this hospital, whose patients and their doctors decide to go home after a satisfactory general condition.

The mean time to diagnosis of post-cesarean suppuration was 7.63 ± 1.92 days with extremes of 4 and 11 days. The majority of suppuration was diagnosed (32/48, 66.66%) between the 7th and 10th postoperative day. Suppuration appeared in 91.66% after discharge from the hospital.

From these two observations we deduce that the major part

of the cases of suppuration occurred outside the hospital environment. Thus, the post-cesarean suppurations in our case are essentially a neglect of compliance (taking medication, monitoring the operative wound) on the part of the patient and her entourage.

Our results are corroborated by those of Sawadogo et al. [1] who had found an average time of onset of suppuration of 6.7 ± 2.3 days with extremes of 4 and 13 days [1].

The temperature of the patients at the time of the diagnosis of suppuration was predominantly either 79.20% (38/48) below 38°C with average of $37.07 \pm 0.92^\circ\text{C}$ and extremes of 35.7 and 38.7°C . This could be explained by the taking by some patients of antipyretic analgesics which reduce the fever. Sawadogo et al. [1] reported that 75.7% of patients had a fever on admission.

Suppuration was superficial in the majority of cases (91.67%). Our data can be superimposed on those of Merzougui et al. [8] who reported that 87.5% of infections were superficial [8].

Indeed, these observations on the sites of infection confirm the observations made both on the length of stay and on the time of installation of these infections. After the classic three-day period on clean and painless dressings, the patient is authorized to use the oral route when the gases are emitted by the rectal route (sign of a good resumption of digestive transit).

On the basis of these observations (dry dressings, resumption of transit, etc.), the patient is authorized to return to the family home for external follow-up. However, far from the eyes of the hospital staff, the lack of observance of the prescribed measures, the dressings are put to severe tests and undergo enormous soiling and make the bed of superficial suppurations.

Post-cesarean suppurative patients with an ASA 1 score had a higher percentage (58.33%) compared to that with another ASA 2 score (29, 17%).

However, Merzougui et al. [8] concluded, if the ASA score is greater than or equal to 3, it is considered a risk factor that may promote suppuration.

Post-cesarean suppurative patients with an NNIS score of 0 to 1 had a high percentage (87.50%) compared to those in the NNIS score of 2 to 3 (12.50%).

On the other hand, Merzougui et al. [8] reported that patients at low risk of infection are those with an NNIS score less than or equal to 1.

Suppurates with a contaminated or dirty Altemeier class respectively 54.16% and 25% had a high percentage compared to that of clean or clean contaminated class (20, 84%). This high rate of the "dirty or contaminated" class among suppurative patients is consistent with the pathophysiology of the infections. A dirty or contaminated wound is prone to suppuration. Merzougui et al. [8] found that the rate of suppuration among the infected (66.7%) was higher.

Our results are consistent with those found by Merzougui et al. [8] and in terms of the proportion of suppuration. Better still; the presence of a class of "dirty or contaminated"

Altemeier multiplies by 35 the risk of occurrence of suppuration.

4.5. Medical Management

All the patients diagnosed had received intraoperative antibiotic prophylaxis based on ampicillin at a rate of 2g, as antibiotic prophylaxis in the majority of cases (91.6%, before the surgical incision or after cord clamping) and the follow-up of the treatment was followed postoperatively during and after hospitalization, as well as analgesics and antianemics in all patients. No patient was returned for secondary suturing or trimming. Among the suppurative 54.16% (26/48) of the cases had performed an antibiogram.

The germs isolated following the antibiogram were represented by *Staphylococcus aureus* in 16/26 cases (61.53%) followed by *Escherichia coli* or 23.07% (6/26).

However, several studies have shown that the most common germ during post-cesarean suppurations was *Staphylococcus aureus* [1, 3].

4.6. Prognosis

No surgical revision had been performed and no maternal deaths were recorded during the study. Sawadogo et al. [1] and Berthe et al. [4] had reached the same conclusion. On the other hand, a study carried out by Mpogoro et al. [12] in Tanzania had recorded one death from sepsis; another study by Demisew et al. [13] reported a case fatality rate of 9%. Half of the mothers who died had undergone revision surgery for wound dehiscence after surgical site infection. Merzougui et al. [8] reported revision surgery for post-cesarean peritonitis.

5. Conclusion

The frequency of post-caesarean section suppurations remains high despite aseptic and antibiotic prophylaxis measures. The age range of 31 to 36 years was the most concerned; the average age was 23.29 ± 4.76 years with extremes of 16 and 36 years. The sociodemographic profile of the patients was characterized mainly by married and housewives. The time to rupture of the membranes was less than 12 hours in most cases. The majority of cases were emergency cesarean sections. The main indication for cesarean section was fetal-pelvic disproportion. The average duration of the operation was 37.78 ± 9.10 minutes with extremes of 20 and 75 minutes in most cases. In the majority of cases, suppuration was diagnosed during the first week of hospitalization. The main germ identified was *staphylococcus aureus*. No revision surgery was performed and no maternal deaths were recorded.

Management of the factors that contribute to this condition could significantly reduce their incidence and therefore improve maternal prognosis. A larger scale study is needed to better identify the factors contributing to these infections in order to contribute effectively to their prevention.

Appendix

Table 1. Sociodemographic profile.

Sociodemographic profile	n=48	%
Age		
16-20 years	2	4.16
21-25 years	12	25
26-30 years	14	29.17
31-36 years	20	41.67
Average: 23.29±4.76 years Extreme=16 and 36 years days		
Profession		
Household	20	41.66
Liberal	10	20.86
Pupil	16	33.32
Official	2	4.16
Marital status		
Married	46	95.84
Single	2	4.16
Origin		
Ratoma	36	75.01
Dixinn	4	8.33
Matoto	2	4.16
Others	6	12.50

Table 2. Clinical features of childbirth.

Clinical data	n=48	%
Duration of rupture of membranes on admission		
≤12 hours	30	62.50
>12 hours	18	37.50
Associated conditions		
HTA	2	4.16
Hemorrhage	4	8.34
Diabetes	2	4.16
HIV	4	8.34
Anemia	12	25.00
No associated condition	24	50.00
Indications for cesarean section		
Feto-pelvic disproportion	16	33.34
Scarred uterus	14	29.17
Presentation of the shoulder	4	8.33
Fetal suffering	8	16.67
Seat presentation + limit basin	4	8.33
Preeclampsia	2	4.16
Intervention conditions		
Urgent	40	83.33
Programmed	8	16.67
Duration of intervention		
<30 min	14	29.17
30-59 mins	32	66.67
≥60 min	2	4.16
Average: 37.78±9.10 min Extremes=20 and 75 min		
Intervening staff	4	8.33
Gynecologist	34	70.84
Specialized doctor	10	20.83

Table 3. Post-cesarean section diagnosis and follow-up.

Post-cesarean section diagnosis and follow-up	n=48	%
Diagnostic		
Before the release	4	8.34
After the exit	44	91.66
Temperature (°C)		
<38	38	79.20
≥38	10	20.80
Medium: 37.07±0.92°C Extreme=35.7 and 38.7°C		
Site of infection		
Superficial	44	91.67

Post-cesarean section diagnosis and follow-up	n=48	%
Deep	4	8.33
ASA Score		
1	28	58.33
2	14	29.17
3	6	12.50
NNIS score		
0-1	42	87.50
2-3	6	12.50
Altemeier class		
Own	0	0.00
Dirty	12	25.00
Clean contaminated	10	20.84
Contaminated	26	54.16

Table 4. Germs identified by antibiogram.

Identified germs	Effective	%
Staphylococcus aureus	16	61.53
Escherichia coli	6	23.07
Streptococcus	2	7.7
Proteus mirabilis	2	7.7
Total	26	100

References

- [1] Sawadogo YA, Komboigo E, Kiemtore S, Zamane H, Ouedraogo I, Kain DP, et al. Post-parietal suppurationsCaesarean sections at the YalgadoOuedraogo University Hospital Center, Burkina-Faso: epidemiological, clinical, therapeutic and prognostic aspects. *Pan Afr Med J* 2019.
- [2] Farret TCF, Dallé J, Monteiro V da S, Riche CVW, Antonello VS. Riskfactors for surgical site infection followingcesarean section in a Brazilianwomen's hospital: a case-control study. *Braz J Infect Dis Off PublBrazSoc Infect Dis* 2015; 19: 113–7. <https://doi.org/10.1016/j.bjid.2014.09.009>.
- [3] Zejnullahu VA, Isjanovska R, Sejfiija Z, Zejnullahu VA. Surgical site infections aftercesarean sections at the universityclinical center of Kosovo: rates, microbiological profile and riskfactors. *BMC Infect Dis* 2019; 19: 752. <https://doi.org/10.1186/s12879-019-4383-7>.
- [4] Berthé B, Traoré S, Konaté I, Sogoba D, Tall S, Samaké A, et al. Comparative study of surgical site infections: systematic cesarean section versus iterative cesarean section at the reference health center of commune V of the district of Bamako / Mali 2019.
- [5] Shrestha B, Marhatha R, Giri A, Jaisi S, Maskey U. Surgical site wound infection in relation to antibioticprophylaxisgivenbefore skin incision and aftercord clamping during cesareandelivery. *Nepal Med Coll J NMCJ* 2014; 16: 148–51.
- [6] Searle RJ, Myers D. A survey of caesarean section surgical site infections with PICO™ Single Use Negative Pressure WoundTherapy System in high-risk patients in England and Ireland. *J Hosp Infect* 2017; 97: 122–4. <https://doi.org/10.1016/j.jhin.2017.02.023>.
- [7] Simon L, Heriteau F, Astagneau P, Bernet C, Berger-Carbonne A. Surveillance of surgical site infections in French healthcare establishments 2016.

- [8] Merzougui L, Marwen N, Hannachi H, Asma M, Elhaj OB, Waddah M, et al. Incidence and risk factors of surgical site infection after cesarean section in a maternity hospital in Tunisia. *Public Health* 2018; 30: 339–47.
- [9] Berrios-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. *JAMA Surg* 2017; 152: 784. <https://doi.org/10.1001/jamasurg.2017.0904>.
- [10] Wendmagegn TA, Abera GB, Tsehay WT, Gebresslasie KB, Tella BG. Magnitude and determinants of surgical site infection among women under cesarean section in Ayder comprehensive specialized hospital Mekelle City, Tigray region, Northern Ethiopia, 2016. *BMC Pregnancy Childbirth* 2018; 18: 489. <https://doi.org/10.1186/s12884-018-2075-8>.
- [11] Krieger Y, Walfisch A, Sheiner E. Surgical site infection following cesarean deliveries: trends and risk factors. *J Matern Fetal Neonatal Med* 2017; 30: 8–12. <https://doi.org/10.3109/14767058.2016.1163540>.
- [12] Mpogoro FJ, Mshana SE, Mirambo MM, Kidenya BR, Gumodoka B, Imirzalioglu C. Incidence and predictors of surgical site infections following caesarean sections at Bugando Medical Center, Mwanza, Tanzania. *Antimicrob Resist Infect Control* 2014; 3: 25. <https://doi.org/10.1186/2047-2994-3-25>.
- [13] Amenu D, Belachew T, Araya F. Surgical site infection rate and risk factors among obstetric cases of jimma university specialized hospital, southwest ethiopia. *Ethiop J HealthSci* 2011; 21: 91–100. <https://doi.org/10.4314/ejhs.v21i2.69049>.