ORIGINAL ARTICLE

Surgical Risk Index and Surgical Site inPostpartum Women Submitted to Cesarean Section

Luana Machado Chianca[1], Roberta Maia de Castro Romanelli[2], Tais Marina de Souza[2], Werlley Meira de Oliveira[2], Eduarda Almeida Wakabayashi[2], Lucas Vieira Rodrigues[2], Stella D'Ávila de Souza Ramos[2], Renata Paixão Pio Fernandes,[2] Letícia Maria de Oliveira Aleixo Carvalho[2], André Tunes de Paula[2], Viviane Rosado[1], Henrique Vitor Leite[2], Regina Amelia Lopes Pessoa de Aguiar[2], Bruna Barbosa Coimbra[2], Wanessa Trindade Clemente[2]

[1] Hospital das Clinicas da Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil

[2]Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil

Submission: 07/09/2014

Accepted: 06/09/15

luchianca@hotmail.com

RESUMO

Justificativa e objetivos: Tendo em vista que o emprego de vigilância ativa colabora na identificação de infecção e a necessidade de estudos que utilizem o Índice de Risco Cirúrgico (IRC) para avaliação de Infecção de Ferida Cirúrgica (IFC) em cesarianas este estudo objetiva determinar a incidência de IFC e analisar a aplicabilidade do IRC na predição das IFC em puérperas submetidas à cesariana em hospital universitário entre abril de 2012 emarço de 2013. **Métodos:** Estudo de coorte prospectivo concorrente. Informações de notificação das IFC por vigilância ativa foram coletadas diariamente nos prontuários. Após alta hospitalar, as puérperas eram contatadas por ligações telefônicas para identificação de critérios de infecção até 30 dias após a cesariana.Análises descritivas e comparativas foram conduzidas. Para comparação dos grupos foi utilizado teste de Qui-quadrado. **Resultados:**Foram realizadas 737 cesarianas. Contato telefônico foi conseguido com 507 (68,8%) puérperas até 30 dias pós-parto, com perda de seguimento de 230 casos (31,2%). A consulta médica no puerpério ocorreu em 188 (37,08%) mulheres com quem foi obtido contato telefônico, em média, 17,28 dias (± 8,39) após o parto. Verificou-se que 21 casos preencheram critérios para IFC, taxa de 4,14%. Classificou-se 12 (57,1%) casos como infecção de ferida cirúrgica superficial, 5 (23,8%) como profunda e 4 (19,1%) de órgãos e cavidades. O IRC e suas variáveis de risco não foram associados à IFC em pacientes submetidas a cesarianas. **Conclusão:**O IRC e as variáveis de risco incluídas nesse índice não foram associados à IFC em pacientes submetidas a cesarianas.

Descritores: Cesárea; Infecção da FeridaOperatória; Vigilância epidemiológica; Controle de Infecções; Índice de Risco; Notificação de doenças.

Abstract

Background and objectives: Considering that the use of active surveillance helps in infection identification and the need for studies that use Surgical Risk Index (SRI) for assessment of Surgical Site Infection (SSI) in cesarean sections, this study aims to determine the incidence of SWI and analyze the applicability of SRI in the prediction of SWI in postpartum women after cesarean sections at a university hospital between April 2012 and March of 2013. **Methods:** Prospective cohort study. Information reporting SWI by active surveillance was collected daily from medical records. After hospital discharge, the mothers were contacted by telephone to identify infection criteria within 30 days after the cesarean section. Descriptive and comparative analyses were performed. Thechi-square test was applied to compare groups. **Results:** A total of737 cesarean sections were performed. Telephone contact was made with 507 (68.8%) women up to 30 days postpartum, with loss to follow-up of 230 cases (31.2%). Medical consultation in the postpartum period occurred with 188 (37.08%) women contacted by telephone, on average 17.28 days (SD=8.39) after delivery. It was found that 21 patients met the criteria for SSI, with a rate of 4.14%. A total of 12 cases (57.1%) were classified as superficial SSI, 5 (23.8%) as deep and 4 (19.1%) as SSI of organs and cavities. The SRI and its risk variables were not associated with the SSI in patients undergoing cesarean section. **Conclusion:** The SRI and the risk variables included in that index were not associated to SSI on patients submitted to cesareans.

Keywords: Cesarean Section; Surgical Wound Infection; Epidemiological Surveillance; Infection Control; Risk Index; Disease Reporting

INTRODUCTION

The high and increasing rate of cesarean deliveries in Brazil is an important issue for the health care of women due to the higher associated morbimortality [1]. Surgical Site Infections (SSI) are among the major postoperative complications and the underreporting of cases is due to lack of active surveillance after discharge, early discharge of postpartum women and women returning for consultation elsewhere, rather than at institution where the delivery occurred, considering the assistance at Basic Health Units. [2]

The use of active surveillance systems of patients submitted to cesarean section significantly contributes to greater identification of infection cases. Studies that included questionnaires for the attending physician and the patient to answer, telephone calls, search for electronic medical records after the discharge and clinical evaluation when the infection cannot be defined show an increase from 32.0 to 72.0% in the reporting of infection rates.[3-6]

The quality of post-operative assistance and care can be measured by healthcare-associated infection (HAI) rates and well-defined prevention measures and estimated morbimortality attributable to SSI are essential to reduce this complication and its implications, as well as cost reduction.[1, 7]

Active surveillance in cesarean cases was implemented in 2010 at Otto Cirne Maternity Hospital of the Federal University of Minas Gerais (HC-UFMG), with telephone contact with mothers being used to identify SSI cases up to 30 days post-delivery. After one year of follow-up, there was a significant increase in reported infection rate, from 0.9% with passive surveillance to 6.8% with active surveillance.[8]

The correct identification of infection cases allows the use of practices directly related to care improvement[7]. To adequate prevention practices, it is also necessary to

identify risk factors so that appropriate interventions are effective. The main risk factor for prediction of surgical wound infections is the surgical wound classification, characterized by its respective class (Clean, Clean-contaminated, Contaminated and Dirty-Infected) [9]. However, the Surgical Risk Index (SRI) is considered a better predictor of risk for SSI than the classic system alone. This index included, in addition to the potential of contamination, the duration of surgery based on the percentile of each type of surgery and the risk classification according to the American Society of Anesthesiology (ASA).[10,11]

Several other risk factors such as subcutaneous hematoma, cesarean section performed in a university hospital, higher body mass index, membrane rupture time, purulent amniotic fluid, chorioamnionitis and digital vaginal examinations during labor are described in the literature with conflicting results. [7,8,12-14]

Literature is scarce regarding the use of so-called SRI for evaluation of surgical wound infection prognosis regarding cesarean sections. Based on the present study, the aim is to determine the incidence of Surgical Site Infection (SSI) and analyze the applicability of SRI to SWI prediction in postpartum women submitted to cesarean sections in a tertiary university hospital from April 2012 to March 2013.

METHODS

This is a prospective cohort study, carried out in a tertiary university hospital in a Brazilian capital city, from April 2012 to March 2013.

All patients submitted to cesarean sections during the study period were included and those with whom telephone contact was not possible were considered lost to follow-up.

Information was collected daily from the medical records by professionals and trained students associated to the Hospital Infection Control Committee of the

institution, with SWI reporting being made through active surveillance. After hospital discharge, the postpartum women were contacted by telephone for identification of infection criteria up to 30 days after the surgical procedure.

In addition to demographic variables and variables related to childbirth collected from medical records, the questions asked included all the criteria of the National Health Care Safety Network.[15] Such questions were utilized according to the surveillance recommendations by the National Agency for Sanitary Surveillance (ANVISA), filled out and subdivided according to the site:[16]

a) Superficial Surgical Site Infection (SSI): infection that occurs within the first 30 days after the performed procedure. It affects the skin and subcutaneous tissue of the incision. It presents with spontaneous pain, hypersensitivity to palpation, localized edema, redness and heat associated with secretion drainage.

b) Deep Surgical Wound Infection (DSSI): infection that occurs within the first 30 days after the procedure. It affects the incision deep soft tissue (fascia or muscle). It shows at least one of the following criteria: purulent drainage from the deep incision, but not from an organ or cavity, spontaneous surgical incision dehiscence, opening with positive culture (or negative associated with fever), spontaneous localized pain or hypersensitivity to palpation, presence of abscess or other evidence of infection in the deep incision by direct examination, during a new surgery, or histopathological analysis.

c) Organ Space Surgical ~~Wound~~ Site Infection in ~~Organ or Cavity~~ (OSSSI~~SWIOC~~): infection that occurs within the first 30 days after the procedure. It affects organs or cavities manipulated during the surgical procedure, except for fascia and muscles. It shows at least one of the following criteria: purulent drainage at the drain inserted in the organ or cavity through the surgical incision or isolation of

microorganism in tissue or fluid culture, presence of abscess or other evidence of infection affecting the organ or cavity.

The descriptive analysis included demographic and maternal clinical evolution data; frequency and percentage of categorical variables were used, as well as infection rates per number of cesarean sections performed (number of ~~SWI~~SSI per 100 procedures), mean, standard deviation (SD) or median and range for continuous variables. The comparative analysis included predictor variables defined by the SRI, recorded in the operating room sheet: a) time of surgery (<or >57 minutes), anesthetic risk classification as determined by the American Society of Anesthesiology- ASA (I, II, III or IV) and potential of contamination by type of delivery (elective or emergency cesarean section). [10,11]

An elective procedure was considered as that performed without the woman going into labor and not preceded by any obstetric emergency and urgency/emergency procedures as those performed intrapartum or due to the presence of obstetric emergency that indicated immediate termination of pregnancy. The sum of points obtained in all items determined the total SRI score (0-3 points). The event (~~SWI~~SSI) was considered when ~~SWI~~SSI was notified, which allowed the comparison between the two groups (Group 1 - with ~~SWI~~SSI and Group 2 - without SWI). The chi-square test was used to compare the groups, with statistical significance set at $p < 0.05$. The statistical program used for the analysis was the SPSS® software, version 19.0.

The study was approved by the Research Ethics Committee of the University (ETIC 476/10), under protocol number 0476 0203000 10.

RESULTS

During the study period (April 2012 to March 2013) 737 Cesarean sections were performed in a total of 2,129 deliveries. The mean maternal age was 28.74 years (±

7.00) and the length of hospital stay was 4.72 days (± 5.40). Telephone contact was achieved with 507 (68.8%) postpartum women to collect clinical information up to 30 days after delivery, with 230 cases of loss to follow-up (31.2%). Postpartum medical consultations occurred in 188 (37%) of the women contacted by telephone, on average 17.28 days (± 8.39) after delivery.

A total of 21 patients met the criteria for SWI and were notified by telephone calls, which corresponds to a rate of 4.1%. Twelve cases (57.1%) were classified as SSSI~~SSWI~~, 5 (23.8%) cases as DSSI~~DSWI~~ and 4 (19.1%) as OSSSI ~~SWIOC~~(Chart 1). The rate of SRI was 2.55, 2.00 and 4.96 for SRI 0, 1 and 2, respectively. No case of infection was identified in patients with SRI = 3.

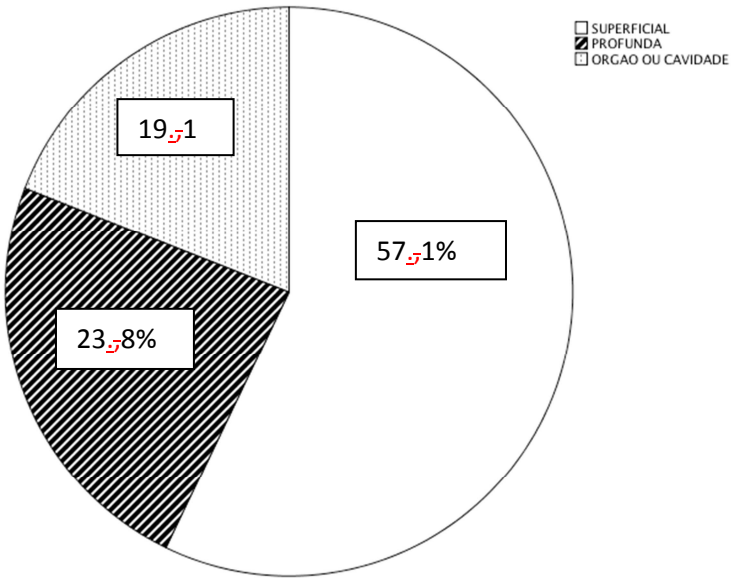
Chart 1 –Surgical wound infection reported in postpartum women submitted to caesarean section, according to the location of the infection, Otto Cirne Maternity Hospital, HC / UFMG, 2012-2013.

~~**No Grafico 1, substituir:**~~

~~**Profunda por Deep**~~

~~**Orgão ou cavidade por Organ or cavity**~~

~~**Vírgulas por pontos (ex., 19,1 por 19.1)**~~



:

Although not all the necessary variables were recorded ~~in the operating room sheet~~of patients with follow-up after hospital discharge, there was no difference regarding the information on the SRI variables among the assessed women and those related to the loss of follow-up (Table 1).

Table 1–Comparison of Surgical Risk Index variables between women with follow-up and those lost to follow-up, at Otto Cirne Maternity Hospital,HC/UFMG, 2012 to 2013.

	Lost to follow-up N (%)	**With follow-up N (%)**	**X^2**	***p***
Cesarean section				
Elective	99 (15.1)	235 (35.8)	1.72	0.19
Emergency/ IntrapartumEmergency	81 (12.3)	242 (36.8)		
Surgery duration				
< 57’	66 (10.6)	170 (27.3)	0.05	0.83

≥ 57’	111 (17.9)	275 (44.2)		
ASA				
I or II	162 (24.6)	430 (65.1)	0.03	0.88
III, IV, V	18 (2.7)	50 (7.6)		
SRI				
0	29 (4.9)	74 (12.4)	2.70	0.44
1	87 (14.6)	196 (32.9)		
2	44 (7.4)	141 (23.7)		
3	7 (1.2)	17 (2.9)		

SWI- Surgical Wound Infection

When compared to patients with follow-up, no statistically significant variable was observed for SWI, such as surgical time (p = 0.693), the anesthetic risk by ASA (p = 0.85) and the potential of contamination (p = 0.49) and the total SRI~~score~~ (p = 0.52) (Table 2).

Table 2– Comparison of Surgical Risk Index variables between patients with and without Surgical Wound Infection, at Otto Cirne Maternity Hospital, HC/UFMG, 2012 to 2013.

	WithSWI N (%)	**WithoutSWI N (%)**	**X^2**	***p***
Cesarean section				
Elective	7 (1.5)	228 (47.8)	0.46	0.50
Emergency	10 (2.1)	232 (48.6)		
Surgery duration				

< 57’	5 (1.1)	165 (37.1)	0.16	0.69
≥ 57’	10 (2.3)	265 (59.5)		
ASA				
I or II	15 (3.1)	415 (86.1)	0.03	0.85
III, IV, V	4 (0.8)	48 (10)		
SRI				
0	2 (0.5)	72 (16.2)	2.25	0.52
1	5 (1.2)	191 (44.6)		
2	7 (1.6)	134 (31.3)		
3	0	17 (4)		

SWI - Surgical Wound Infection

DISCUSSION

According to the Centers for Disease Control and Prevention, more than 30% of HAIs are ~~SWIs~~SSI, which are reported in approximately 2% of the procedures. The study, which also used the surveillance system proposed by the National Healthcare Safety Network (NHSN), revealed that the ~~SWIs~~SSI represented the highest proportion of HAI~~s~~ and that Cesarean sections are among the most common procedures, with a rate of 0.9 cases per 100 procedures. [17]The present study showed a higher rate than those described in the United States. However, the literature shows variations in these rates, which can reach up to 11% by different methods of active search.[6,18-21]

~~SWI~~SSI rates reported in the city of Belo Horizonte range from 3.0% by passive surveillance to 9.6% by active surveillance. [22,23] Although the ideal scenario is the active search for information based on the patient clinical evaluation, it is observed that

surveillance carried out by telephone contact made by trained professionals can increase the reporting rate. [8]

In obstetrics, active surveillance of post-cesarean ~~SWI~~SSI should be mandatory, as it is a surgical delivery. [15] Brazil is one of the countries with the highest rates of caesarean sections worldwide, which justifies the importance of identifying variables that allow the appropriate prediction of SWI risk. [1,15]

It is noteworthy that all infections were reported through the post-discharge surveillance system, thus recommended because most SS~~W~~I ~~s~~are diagnosed in this period. A study based on hospital and outpatient clinic records in the United States identified even higher rates, with 7.6% of ~~SWIs~~SSIs within 30 days postpartum. [24]. Another study in the UK, with post-discharge surveillance and primary care follow-up, identified a ~~SWI~~ SSI rate of 11%. [21]A major problem regarding the assessment of this rate is the under-reporting of these adverse events, as it is necessary to maintain the surveillance for 30 days after the delivery. [15]

Recently, the CDC recommendations increased surveillance duration to 90 days post-delivery. [9] Studies have shown that surveillance for 15 days identifies most of these infections. [8,25] There are several proposals for active surveillance systems to better estimate SWI rates. At the institution where the present study was carried out, the active surveillance was introduced in 2010 and, in addition to daily assessment of the medical charts of pregnant women submitted to cesarean sections, telephone contact is now made up to 30 days after the procedure for reporting of these events, in accordance with the criteria proposed by the NHSN. [8] A significant increase in SWI reporting was observed, with an increase from 0.9% to 6.8%, showing that underreporting occurs when there is noactive surveillance system for ~~SWIs~~SSI.

The identification of variables associated with the development of the SWI is important and necessary in all surgical areas, aiming to identify and specify the variables associated with each type of procedure. Adequate identification of risk factors for SWI may imply a change in care processes with the objective of promoting a decrease reduction in postoperative infectious complications. [26]

SWI rates according to the SRI initially proposed in a previous study [11] showed a variation of 4.2% (with SRI = 0) to 11.4% (SRI = 2). In the present study, we observed lower rates, from 2.7% to 4.9%, for the respective SRI = 0 and SRI = 2. No cases of SWI were identified for SRI = 3. The National Nosocomial Infection Surveillance System Basic SSI Risk Index also considers variations by type of surgery and the risk increases as ~~higher is the score~~ increases~~when the value of the index that considers the number of risk factors is higher~~[10].~~(final de frase confuso no original)~~

The index has been validated in a previous study,[27] which assessed ~~SWI~~ SSI in organs and cavities, including infections associated with hysterectomies. In Brazil, the index was assessed in five hospitals in the city of Belo Horizonte for several procedures such as hysterectomy, considering different weights for each variable and including post-discharge surveillance. [28] The authors proposed that adjusted scores can improve infection prediction accuracy.

A study carried out for two years in the US intended forsurgical procedure analysis aimed to identify other infection risk factors that could be included in SRI.[29] However, none of the variables alone showed to be effective for risk prediction. Characteristics associated with the hospital environment (number of beds or the presence of students) and characteristics related to the patient (such as body mass index and diabetes) were incorporated into the risk prediction assessment. It was observed that

by including specific procedure and patient factors, a better classification discrimination was achieved and, consequently, the optimization of risk prediction.

In another study carried out in the UK between 2002 and 2003, two other important risk factors were defined in relation to cesarean sections. The choice of submucosal suture, instead of staples to close the wound was associated with a reduced incidence of infections. [21] In addition, obese women had a significantly higher number of infections when compared to women with normal body mass index.

An English study carried out in 2009 emphasized that the body mass index (BMI) defined a higher risk of infection in cesareansections.[30] In this study, a BMI of 25-30 (overweight) and 30-35 (obesity) were independent risk factors for infection.

Regarding the sample assessed in this study, none of the variables that constitute the SRI alone (time of surgery, ASA classification and potential of contamination) was associated with the risk of ~~SWI~~SSI, with the same occurringin relation to global SRI. The observation suggests that this index does not show significant association with ~~SWI~~SSIin the assessed cesarean sections. An important limitation of our study is the sample size. Although the sample is representative of the population treated at our institution, it may have been insufficient to identify the determinant risk factors for SWI. Sample size calculation, whichwas performed based on the total number of patients and infection incidence, determined that the minimum sample size would be 492 patients for a confidence level of 99% and aprecision calculation of 1%.

Nevertheless, studies in this area are still considered scarce and it is believed that the data presented here may not only contribute to the discussion, but primarily stimulate the performance of more studies with similar methodology that can be carried out for comparison and to test the applicability of telephone contact intervention inthe follow-up of SWI cases after cesarean sections. The use of strategies that can minimize

the underreporting of ~~SWI~~SSIrepresents an important step in the identification and monitoring of the possible risk factors for this adverse event.

It is known that HAI~~s~~ represent an important public health problem worldwide, as they determine not only increase in healthcare costs but also have an impact on patient morbidity and mortality.[7] By identifying the risk factors, one expects to help in the surveillance of this adverse event and allow the creation of service routines that will have an impact on the decrease of SWI rates in obstetric services.

The SRI and risk variables included in this index were not associated with ~~SWI~~SSIin patients submitted to cesarean sections. It is possible that there may be influence of other variables associated with the procedure that were not assessed and the identification of these variables is crucial. The follow-up of postpartum women after the hospital discharge should be systematized and maintained, for it will possibly allow the identification and monitoring of risk factors and, therefore, the definition of targeted preventative measures.

REFERENCES

1. Victora CG, Aquino EM, Leal MC, Monteiro CA, Barros FC, Szwarcwald CL. Maternal and child health in Brazil: progress and challenges. Lancet. 2011;377(9780):1863-76. doi:10.1016/S0140-6736(11)60138-4.

2. Guimarães EER, Chianca TCM, Oliveira AC. Puerperal infection from the perspective of humanized delivery care at a public maternity hospital. Rev. Latino-Am. Enfermagem . 2007; 15(4): 536-542. doi:10.1590/S0104-11692007000400003.

3. Creedy DK, Noy DL. Postdischarge surveillance after cesarean section. Birth [Internet]. 2001; 28(4):264-269. doi 10.1046/j.1523-536X.2001.00264.

4. Eriksen H, Saether AR, Lower HL, Vangen S, Hjetland R, Lundmark H, et al. Infections after caesarean sections. Tidsskrift for den Norske Legeforening. 2009; 129(7):618-622.

5. Gravel-Trooper D, Oxley C, Memish Z, Garber GE. Underestimation of surgical infection rates in obstetrics and gynecology. Am J Infect Control. 1995; 23(1):22-26. doi: 10.1016/0196-6553(95)90004-7

6. Friedman C, Sturm LK, Chenoweth C. Electronic chart review as an aid to post discharge surgical site surveillance: increased case finding. Am J Infect Control. 2001; 29(5):329-332. doi: 10.1067/mic.2001.114401

7.Yokoe, Classen D. Improving Patient Safety Through Infection Control: A New Healthcare Imperative. Infection Control and Hospital Epidemiology. 2008; 29(Suppl 1): S3 - S11.doi: 10.1086/591063.

8. Romanelli RMC, Aguiar RLP, Leite HV, Silva DG, Nunes RVP, Brito JI, et al . Estudo prospectivo da implantação da vigilância ativa de infecções de feridas cirúrgicas pós-cesáreas em hospital universitário no Estado de Minas Gerais, Brasil, 2010 a 2011. Epidemiol. Serv. Saúde.2012; 21(4): 569-578. doi: 10.5123/S1679-49742012000400006.

9- Center for Diseases Control and Prevention. National Healthcare Network Safety (NHSN).Surgical Site Infection (SSI) Event.rocedure-associated Module; 2015 (citado2015 abr 25). Disponivel em: http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf.

10- Gaynes RP, Culver DH, Horan TC, et al. Surgical Site Infection (SSI) Rates in the United States, 1992–1998: The National Nosocomial Infections Surveillance System Basic SSI Risk Index. Clinical Infectious Diseases. 2001; 33(Suppl 2):S69–77. doi: doi: 10.1086/321860

11. Culver DH, Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG, Banerjee SN, Edwards JR, Tolson JS, Henderson TS. Surgical wound infection rates by wound class, operative procedure, and patient risk index. National Nosocomial Infections Surveillance System. Am J Med. 1991;91(3B):152S-157S.

12. Olsen MA, Butler AM, Willers DM,.Risk factors for surgical site infection after low transverse cesarean section. Infect Control Hosp Epidemiol. 2008; 29(6):477-484. doi:10.1086/650755

13. Killian CA, Graffunder EM, Vinciguerra TJ, et al. Risk factors for surgical site infections following cesarean section. Infect Control Hosp Epidemiol. 2001; 22(10):613-617. doi:10.1111/j.1471-0528.2012.03452

14. Farret TCF, Dallé J, Monteiro VS, Riche CVW, Antonello VS. Risk factors for surgical site infection following cesarean section in a Brazilian Women's Hospital: a case-control study. Braz J Infect Dis . 2015 ; 19(2): 113-117. doi: 10.1016/j.bjid.2014.09.009.

15. Horan TC, Andrus M, Dudeck MA.CDC/NHSN surveillance definition of health care–associated infection and criteria for specific types of infections in the acute care setting. Am J InfectControl. 2008; 36(5):309-332. doi: 10.1016/j.ajic.2008.03.002.

16- Brasil. Agência Nacional de Vigilância Sanitária. Gerência Geral de Tecnologia em Serviços de Saúde. Gerência de Investigação e Prevenção das Infecções e dos Eventos Adversos. Manuais. Sítio Cirúrgico. Critérios Nacionais de Infecções Relacionadas a Assistência a Saúde. Disponivel em:http://www.anvisa.gov.br/servicosaude/manuais/criterios_nacionais_ISC.pdf

Acesso:25/05/15. Brasília, Março de 2010.

17- Lewis SS. Moehring RV, Chen LF, et al. Assessing the Relative Burden of Hospital-Acquired Infections in a Network of Community Hospitals. Infect Control Hosp Epidemiol. 2013; 34(11):1229-30. doi: 10.1086/673443.

18- Olsen MA, Butler AM, Willers DM, et al. Risk factors for surgical site infection after low transverse cesarean section. Infect Control Hosp Epidemiol. 2008; 29 (6): 477-84. doi: 10.1086/587810.

19- Corcoran S, Jackson V, Coulter-Smith S. Surgical site infection after cesarean section: Implementing 3 changes to improve the quality of patient care. Am. J. Infection Control. 2013; 41(12): 1258-1263. doi: 10.1016/j.ajic.2013.04.020

20- Henman K, Gordon CL, Gardiner T,.Surgical site infection following caesarean section at Royal Darwin Hospital, Northerm Territory. Healthcare Infection. 2012; 17(3): 47-51. doi: 10.1071/HI11027

21 - Johnson A, Young D, Reilly J. Caesarean section surgical site infection surveillance. J HospInfect. 2006; 64(1):30-35. doi: 10.1016/j.jhin.2006.03.020

22. Brasil. Prefeitura de Belo Horizonte. Secretaria Municipal de Saúde. Gerência de Vigilância em Saúde e Informação. Boletim de Vigilância e Saúde. 2011; 1(10):5-7.

23. Couto RC, Pedrosa TM, Nogueira JM, et al. Postdischarge surveillance and infection rates in obstetric patients. Int J GynaecolObstet. 1998; 61(3):227-231. doi:10.1016/S0020-7292(98)00047-2

24 - Yokoe DS, Christiansen CL, Johnson R, et al. Epidemiology of and Surveillance for Postpartum Infections. Emerging Infectious Diseases. 2001;7(5):837-41. doi:10.3201/eid0705.010511

25- Cardoso Del Monte MC, Pinto Neto AM. Postdischarge surveillance following cesarean section: the incidence of surgical site infection and associated factors. Am J Infect Control. 2010; 38(6):467-472. doi:10.1016/j.ajic.2009.10.008.

26. Ercole FF, Starling CEF, Chianca TCM, Carneiro M. Applicability of the national nosocomial infections surveillance system risk index for the prediction of surgical site infections: a review. Braz J Infect Dis [Internet]. 2007 Feb [cited 2015 June 22] ; 11(1): 134-141. doi:10.1590/S1413-86702007000100028.

27- Anderson DJ, Chen LF, Sexton DJ, Kaye KS.Complex surgical site infections and the devilish details of risk adjustment: important implications for public reporting. Infect Control Hosp Epidemiol.2008; 29(10):941-6. doi:10.1086/591457.

28- Biscione FM, Couto RC, Pedrosa TMG. Performance, Revision, and Extension of the National Nosocomial Infections Surveillance System's Risk Index in Brazilian Hospitals. Infect Control Hosp Epidemiol. 2012;33(2):124-134. doi:10.1086/663702.

29. Mu Y, Edwards JR, Horan TC, et al. Improving Risk-Adjusted Measures of Surgical Site Infection for the National Healthcare Safety Network. Infect Control Hosp Epidemiol. 2011; 32(10): 970-86. doi:10.1086/662016.

30. Wloch C, Wilson J, Lamagni T. Risk factors for surgical site infection following caesarean section in England: results from a multicentre cohort study. BJOG. 2012; 119(11):1324-33. doi: 10.1111/j.1471-0528.2012.03452.