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Major Article

Does surgical site infection after Caesarean section in Polish hospitals reflect high-quality patient care or poor postdischarge surveillance? Results from a 3-year multicenter study

Anna Różańska PhD [a], Andrzej Jarynowski MSc [b], Katarzyna Kopeć-Godlewska RN [c], Jadwiga Wójkowska-Mach PhD [a,*], Agnieszka Misiewska-Kaczur MD, PhD [d], Marzena Lech RN [e], Małgorzata Rozwadowska MD [f], Marlena Karwacka PhD [g], Joanna Liberda RN [h], Joanna Domańska PhD [i], Polish Society of Hospital Infections Team [†]

[a] *Department of Microbiology, Jagiellonian University Medical College, Kraków, Poland*
[b] *Smoluchowski Institute of Physics, Jagiellonian University, Kraków, Poland*
[c] *Faculty of Health Sciences, Jagiellonian University Medical College, Kraków, Poland*
[d] *Voivodeship Hospital, Bielsko-Biała, Poland*
[e] *SPZZOZ Hospital, Staszów, Poland*
[f] *Ujastek Obstetrics and Gynaecology Hospital, Kraków, Poland*
[g] *SPWZOS MSWiA Hospital, Bydgoszcz, Poland*
[h] *Henryk Klimontowicz Specialistic Hospital, Gorlice, Poland*
[i] *Institute of Theoretical and Applied Informatics, Polish Academy of Sciences, Gliwice, Poland*

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Background: Caesarean sections (CSs) are associated with a high infection risk. Surgical site infection (SSI) incidence is among the markers of effectiveness of infection prevention efforts. The aim of this study was to analyze risk factors for SSI, incidence, and microbiology in patients who underwent CS.
Methods: The study was conducted during 2013-2015 using active infection surveillance in 5 Polish hospitals according to the European Centre for Disease Prevention and Control surveillance network known as HAI-Net. For each procedure, the following data were registered: age, American Society of Anesthesiologists score, procedure time, elective or emergency procedure, use of perioperative antibiotic prophylaxis, microbiology, the treatment used, and other information.
Results: SSI incidence was 0.5% and significant differences were noted among hospitals (between 0.1% and 1.8%), for different American Society of Anesthesiologists scales (between 0.2% and 4.8%) and different values of standardized SSI risk index (between 0.0% and 0.8%). In 3.1% of procedures, with no antibiotic prophylaxis, SSI risk was significantly higher. Deep infections dominated: 61.5% with superficial infections in only approximately 30% of cases and 2.6% of infections were detected postdischarge without readmissions.

* Address correspondence to Jadwiga Wójkowska-Mach, PhD, MSc, Department of Microbiology, Jagiellonian University Medical College, 18 Czysta St, 31-121 Krakow, Poland.
E-mail address: mbmach@cyf-kr.edu.pl (J. Wójkowska-Mach).

Conflicts of interest: None to report.

AR designed the study, analyzed and interpreted the epidemiologic data, and drafted the manuscript; AJ performed statistical analysis; KK-G drafted the manuscript; JW-M designed the study, analyzed and interpreted the epidemiologic data, drafted the manuscript, and acted as the corresponding author. The Polish Society of Hospital Infections Team collected the data on the wards. All authors read and approved the final manuscript.

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

This work was approved by the Bioethics Committee of Jagiellonian University Medical College (approval No. 122.6120.29.2017). All data analyzed during this study was anonymized before analysis. The study was based on the data gathered during routine patient care and the analysis did not include any individual participant data. As a result, no statements on consent from participants was required.

[†]Team members are listed at the end of the article.

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Conclusions: Results showed high incidence of SSI in Poland without perioperative antibiotic prophylaxis, and secondly, ineffective surveillance according to CS status, considering outpatient obstetric care. Without postdischarge surveillance, it is not possible to recognize the epidemiologic situation, and further, to set priorities and needs when it comes to infection prophylaxis, especially because such low incidence may indicate no need for improvement in infection control.

A caesarean section (CS) is an obstetric surgical procedure intended to conclude pregnancy or to help labor or vaginal delivery that extends beyond the margin for safe delivery for the child and the mother. Thanks to progress in the medical sciences, such risk may be estimated using diagnostic tools. Based on mother and fetal parameters, one may categorize indications for a CS as being absolute and relative.[1] Elective CS, performed solely at the request of the mother without any medical indication, is considered a separate indication.

Currently, there exists a growing global tendency toward pregnancies being ended by CS.[2] In 2011, almost 30% of all labors were via CS,[3] but in Poland the percentage was higher at 37.4%.[3] Similar results were published in the United States, where in 2014, 32.2% of pregnancies were concluded with CS.[4] These are alarmingly high figures considering that the World Health Organization recommends the CS rate in any country to be ≤15%,[5,6] such as that in Finland or Sweden (14.7% and 16.2%, respectively).[1] These recommendations are the result of attempts to minimize risks related to mode of delivery. CSs are associated with an intrinsic risk of increased severe maternal outcomes and should only be performed when a clear benefit is anticipated; a benefit that might compensate for the higher costs and additional risks associated with this operation.[5] The most common CS complications are: severe blood loss; postpartum hemorrhage; thromboembolism, including pulmonary embolism; surgical injury to the urinary bladder, intestines, and ureter; hysterectomy; decreased fertility; and damage to the placenta. Furthermore, abnormalities in consecutive pregnancies are known to lead to a higher need to perform CS in the following pregnancy.[7]

CS also bears a higher risk of infections, such as urinary tract infection, endometritis, or surgical site infection (SSI). The total incidence after CS is estimated to be 7.4%, whereas that for vaginal delivery is 5.5%.[8] Incidence rates, especially time trend analysis, which takes into account the characteristics of specific patient populations, is among the markers of effective infection surveillance. These values also allow one to identify areas needing special attention or intervention regarding patient safety and the quality of medical services.[9] However, a reliable description of the epidemiology of SSI after CS faces challenges in the form of postdischarge surveillance. According to reports from the European Centre for Disease Prevention and Control (ECDC), CS is a surgical procedure that has the highest proportion—reaching 80% of all SSIs—of infections detected after patient discharge from hospital among all monitored surgical procedures.[10] Halwani et al[11] noted that, in US patients, the rates were 7.2% for standard hospital registration and a further 10% in patients in whom SSI were detected postdischarge. A Brazilian study[12] of postdischarge surveillance of SSI after CS showed the incidence to be 4.0%. Danish data[13] show that an effective postdischarge surveillance method may significantly increase the sensitivity of surveillance.

The aim of this study was to analyze the incidence and microbiology of SSI in patients after CS in 5 Polish hospitals during 2013-2015. Also assessed was the risk factors for these infections, based on continuous surveillance of infections according to the ECDC surveillance network known as HAI-Net coordinated in Poland by a nongovernmental organization, the Polish Society of Infection Control.

MATERIALS AND METHODS

The data used in this publication originate from the Polish Society of Infection Control program database of active registration of hospital infections and are related to SSIs reported by 5 Polish hospitals during the time frame from January 1, 2013, until June 30, 2015.

Program participation by respective hospitals was voluntary, and the analyzed databases were anonymized at the facility level. Targeted active surveillance was carried out using a standardized research protocol based on uniform criteria and definitions for diagnosing infections, according to ECDC recommendations.[14] For all surgeries, the following data characterizing the procedure and the patient were registered: age, date of hospital admission, and date of surgery; International Classification of Diseases 9th edition code of the procedure; wound class (assessment of the degree of contamination of a surgical wound at the time of the operation); American Society of Anesthesiologists (ASA) physical status classification score; procedure duration; elective or emergency CS; and use of or no perioperative antibiotic prophylaxis (PAP).

The basic PAP regimen in the participating hospitals was 1 g cefazolin IV administered approximately 30 minutes before skin incision (in patients with body mass >80 kg the dose was 2 g cefazolin IV). The studied hospitals did not perform a compliance measurement of PAP. The data mentioned above were sourced from operating theatre documentation, which shows that only real information was added to the database. The software also allowed for input; thus, records aside from those mentioned above were also included. This fact was included during the data cleaning stage for data analysis.

An infection risk index was also calculated using a 0-3 scale, where the patient received a point for each of the following factors: duration of the procedure during the fourth quartile, ASA score > 2, and wound class contaminated or dirty.[15]

For SSI diagnosis, aside from the data recorded above, the following information was also collected: date of discharge from hospital; date of death (if needed); possible association of infection with death; date of first infection symptoms; whether the infection was confirmed microbiologically; and in case of confirmation the bacterial factor, time of diagnosis (before discharge, postdischarge, or rehospitalization), SSI type (superficial, deep, or organ, according to ECDC definitions), and data about antibiotic therapy (drug, dosage, and length of therapy).

Microbiologic tests were performed when ordered by the attending physician. However, the method used for taking samples included only swabs without a recommended collection system to identify anaerobic bacteria.

All study hospitals had infection control teams consisting of epidemiology nurses (no more than 1 per 200 beds) and a physician as the team leader (their duties related to the study averaged one-fifth of fulltime equivalent work). SSI and other infections were identified based on ECDC definitions and by taking into account the time of symptom onset; that is, symptoms occurred within 30 days following the surgical procedure. No study hospitals actively performed surveillance after patient discharge from a hospital; postdischarge cases of SSI were only registered if patients reported symptoms during visits to the hospital outpatient unit, but