American Journal of Infection Control ■■ (2017) ■■-■■

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Noncompliance with surgical antimicrobial prophylaxis guidelines: A Jordanian experience in cesarean deliveries

Mariam Hantash Abdel Jalil PhD [a,*], Khawla Abu Hammour PhD [a], Mervat Alsous PhD [b], Rand Hadadden PharmD [a], Wedad Awad [a], Faris Bakri MD [c,d], Kamil Fram MD [e]

[a] Department of Biopharmaceutics and Clinical Pharmacy, Faculty of Pharmacy, University of Jordan, Amman, Jordan
[b] Department of Clinical Pharmacy and Therapeutics, Faculty of Pharmacy, Applied Science Private University, Amman, Jordan
[c] Division of Infectious Diseases, Department of medicine, University of Jordan, Jordan University Hospital, Amman, Jordan
[d] Infectious Diseases and Vaccine Center, University of Jordan, Amman, Jordan
[e] Department of Obstetrics and Gynecology, University of Jordan, Jordan University Hospital, Amman, Jordan

Key Words:
Surgery
Antibiotics
Adherence
ASHP
C-section

Background: Surgical site infections are common, especially in developing countries. Nevertheless, up to 60% of surgical site infections can be prevented with appropriate perioperative care, which includes among other measures using suitable surgical antimicrobial prophylaxis (SAP).

Methods: After a short interview with patients and retrospective review of medical charts, compliance with 6 SAP parameters was assessed for appropriateness; those parameters are indication, choice, dose, time of administration, intraoperative redosing interval, and duration of prophylaxis in 1,173 operations.

Results: Overall compliance was poor; nevertheless, certain components showed high compliance rates, such as indication and choice of antibiotics. The most frequent error noted was extended administration of prophylactic antibiotics, which was observed in 88.2% of the study population. Emergency operations were associated with a lower risk of noncompliance in administering the correct dose at the correct time (odds ratio, 0.63; 95% confidence interval, 0.47-0.83 and odds ratio, 0.21; 95% confidence interval, 0.14-0.3, respectively). On the other hand, women who underwent an emergency operation were associated with a 6-fold higher risk of receiving prophylactic therapy following surgery.

Conclusions: The present study demonstrated the existence of a surprisingly low level of overall compliance with the hospital-adapted SAP guidelines. Factors implicated in noncompliance were investigated, and the present results create a starting point to improve the current practice.

Within the past 15 years, Jordan, similar to other countries, has witnessed a notable increase in the rate of cesarean deliveries.[1] Based on Jordan University Hospital (JUH) statistics for 3 consecutive years (2012-2014), the annual number of cesarean deliveries performed at the hospital ranged from 1,627-1,783. The total number of deliveries during the same period ranged from 3,957-4,558, leading to an overall cesarean rate of 40.6%. This high rate is expected to be shadowed by an increase in the number of women affected by cesarean complications such as surgical site infections (SSIs). Despite their high prevalence in various types of surgeries, up to 60% of SSIs can be prevented with appropriate perioperative care, which includes among other measures the practice of using suitable antimicrobial prophylaxis.[2-4] For this reason, international evidence-based guidelines for various types of surgical procedures have been developed to guide clinicians in the optimal use of prophylactic antibiotics. One such set of guidelines is the American Society of Health-System Pharmacists (ASHP) clinical practice guidelines for antimicrobial prophylaxis.[5] Nevertheless, such guidelines are only effective if they are actually implemented in the clinical setting. Data regarding compliance with surgical antibiotic prophylaxis (SAP) in Jordan are sparse. A study at Queen Alia Heart Institute[6] showed that overall adherence to guideline parameters in cardiac surgeries was nil. As for JUH, the degree of compliance with SAP is unknown because it has never been investigated. For that reason, the present study was designed to audit and evaluate the current compliance with SAP guidelines by health care

* Address correspondence to Mariam Hantash Abdel Jalil, PhD, Department of Biopharmaceutics and Clinical Pharmacy, Faculty of Pharmacy, University of Jordan, PO Box 142150, 11844, Amman, Jordan.
E-mail address: m.abdeljalil01@ju.edu.jo (M.H. Abdel Jalil).

Funding for this research was provided by the deanship of academic research at the University of Jordan (project number 1752).
Conflicts of interest: None to report.

0196-6553/
http://dx.doi.org/10.1016/j.ajic.2017.06.033

providers in the department of obstetrics and gynecology, and pinpoint reasons for noncompliance to draw the attention of policymakers at JUH to possible areas of improvement to current practice.

METHODOLOGY

Study design

The current study is based on prospective recruitment and interview of patients followed by a retrospective review of medical charts.

Ethical approval and setting

The present study was conducted at JUH, which is a tertiary referral hospital in Amman, the capital of Jordan, with a maximum capacity of 600 beds. The protocol of the present study was reviewed, discussed, and approved by committees within the University of Jordan and JUH. It was first approved by the Department of Biopharmaceutics and Clinical Pharmacy at the School of Pharmacy of the University of Jordan, and then by the institutional review board of JUH. This study was conducted in accordance with JUH's ethical policy for preserving the rights of patients involved in research studies (policy No. Adm P021).

Data collection

During the period of protocol drafting, a data collection form was developed and it was pilot-tested in June 2015 by 3 different researchers, including the first author of this study. The data collection tool was modified multiple times until the final version was judged suitable by the 3 researchers to meet the research needs. Using the final version of the data collection form, the data collection process was started in July 2015 and continued until May 2016. Every working day, designated researchers identified women who underwent a cesarean operation, and provided them with a simple description of the study and its aims. Oral consent was then obtained from all included patients. All women who underwent a cesarean section at JUH during the study period were eligible for inclusion in the study unless they met 1 of the following exclusion criteria: women who received antibiotics for managing an established infection during their preoperative hospital stay (to preclude any confusion between conventional therapy of established infection and surgical prophylaxis) and women who underwent another surgery that required the administration of prophylactic antibiotics during the same admission.

After giving oral consent to participation in the study, women were interviewed briefly. A summary of the most important data collected from face-to-face patient interviews is provided in Table 1.

On the same day, the data collection process continued by collecting data from patient records such as medication sheets, anesthesia sheets, surgical notes, and progress notes. A summary of the most important data collected from patient records is provided in Table 1.

JUH uses a computerized system throughout its various departments. Thus, pharmacies, outpatient clinics, inpatient floors, and surgical floors are all linked by this system. To ensure completeness of the collected data, we used JUH's computerized system and extracted computerized patient records relevant to the study. This was done simultaneously for all patients at the end of the project. A summary of the most important data collected from the hospital's computer center is provided in Table 1. The computerized records completed the deficiencies noted in hand-written records.

Appropriateness of surgical prophylaxis

The appropriateness of the surgical prophylaxis regimen was judged based on the ASHP guidelines because these guidelines were adopted as the hospital's policy for SAP. In accordance with the guideline recommendations, 6 parameters were assessed for appropriateness. The parameters and the definitions of concordance with the guideline for each parameter are presented in Table 2.

Factors associated with non-compliance with the ASHP guidelines

All ASHP parameters with a noncompliance rate of 10% or greater were further evaluated using chi-square analysis and multiple logistic regression to detect patient-specific or operation-specific factors associated with noncompliance. Two patient-specific factors (term weight and age), and two operation-related factors (type of operation and responsible consultant) were tested as predictors of non-compliance. During the study period, a total of 10 consultants were responsible for the preoperative, intraoperative, and postoperative care of the 1173 women included in the present study. Nevertheless, one consultant was excluded from the current analysis, as he left the hospital during the initial period of the study. The remaining consultants were numbered from 1 to 9 during the current analysis.

Data analysis

After double-checking almost all data obtained from hospital records, all collected data were analyzed via SPSS version 22 (IBM-SPSS Inc, Armonk, NY). Descriptive statistics were used to present the results of the current study. Categorical variables were portrayed using frequencies, whereas the median and 5th and 95th percentiles were used to describe continuous variables. Correlations between categorical covariates, including correlation with noncompliance with guidelines were evaluated using the χ^2 test. When the assumptions of the χ^2 test were violated (expected frequencies were < 5), a Fisher exact test was used. Covariates with $P < .05$ during the χ^2 analysis were further investigated through multiple logistic regressions, using a stepwise method. $P < .05$ was considered statistically significant.

Table 1
Summary of the most important data collected from patients through face-to-face interview, patient records, and from the hospital's computer center

Data obtained from patients through face-to-face interview	Data obtained from patient files	Data obtained from the hospital's computer center
Weight, height, presence of allergies, number of previous surgeries, including cesareans, diabetic status, smoking status, and presence of chronic diseases	Date of birth, weight, height, name of responsible consultant, American Society of Anesthesiologists score, time of incision, duration of surgery, type of surgery (planned or emergent), type of anesthesia, gestational age, date of admission, and administered medications during hospital stay (name, strength, and number of received doses, in addition to time, route, and duration of administration)	Date of birth, dates of admission and discharge, name of responsible consultant, and list of administered medications during hospital stay