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Original Research Article

Bacteriological study of post-operative wound infection in DMCH

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ABSTRACT

Background: Post-operative wound infection is leading cause of morbidity, prolonged hospital stays. Understanding the bacteriological profile and associated risk factors is essential for effective prevention and management. This study was aimed to determine the bacteriological profile and associated factors of post-operative wound infections in women treated at Dhaka Medical College Hospital (DMCH).
Methods: This cross-sectional study was conducted at department of gynecology and obstetrics, Dhaka Medical College Hospital, Dhaka, from October 2019 to September 2021. A total of 200 women diagnosed as post-operative wound infection were enrolled in the study by purposive sampling. A detailed history, thorough clinical examination and wound swab culture and sensitivity test were carried out in each patient. Separate case-record data were gathered, and SPSS 24 was used for analysis.
Results: Among the post-operative wound infected women maximum had culture positive bacteriological findings (67%), where gram-positive bacteria, primarily *Staphylococcus aureus* (33.6%) were the most common pathogens, followed by gram-negative bacteria, including *Escherichia coli* (20.9%), *Pseudomonas* (20.9%), *Acetobacter* (14.2%) and *Klebsiella* (10.4%). Gram positive infections were associated with anemia (91.1%) and gram-negative infections with diabetes mellitus (23.6%). There was no significant association between bacterial type and the type of surgery, duration of hospital stays or obstetric factors like prolonged rupture of membranes or preeclampsia.
Conclusions: Gram positive and gram-negative bacteria cause post-operative wound infections in DMCH, with anemia, diabetes, and other comorbidities being equally important. However, further larger studies in different surgical units are warranted.

Keywords: Gram-negative bacteria, Post-operative wound infection, Risk factors, *Staphylococcus aureus*

INTRODUCTION

Skin, the largest organ in the human body, plays a crucial role through regulation of water and electrolyte balance, thermoregulation, and by acting as a barrier to external noxious agents including microorganisms. A wound occurs when the skin's epithelial integrity is compromised, this may be characterized by the classic signs of redness, pain, swelling, raised temperature and fever.[1,2]

The type, location, size, and depth of the wound, the degree of contamination, the amount of blood flow to the wound, the host's overall health and immune status, the microbial load, and the virulence displayed by the various microorganisms involved are all likely to play a role in the development of an infected state.[3]

Cesarean section (CS) is a common operation in obstetrics. An analysis of health and demographic surveys of 72 low- and middle-income countries (LMICs) conducted between 2010 and 2014 showed national CS rates ranging from 0.6% in South Sudan to 58.9% in the Dominican Republic. In Bangladesh, the CS rate increased from 3% in 2000 to 33.22% in 2018 (BIDS). As a result, post CS wound

infection rate is also increasing. Generally speaking, body mass index (BMI) greater than 25, anemia, prolonged operative time, premature rupture of membranes (PROM), emergency procedure, pre-existing medical illness, and procedures performed by junior surgeons have been identified as risk factors for cesarean-section surgical site infection (CS-SSI).[4]

The gynecological procedures at high risk of post-operative infection include abdominal hysterectomy and exploratory laparotomy. In any surgical wound presence of foreign bodies, trauma, hematoma etc. enhance the effect of bacterial inoculums. The potential sources of postoperative infections are patient, hospital environment, food, other patients, staff, infected surgical instruments, dressings and even drugs and injections.[5]

A multitude of bacteria can infect a wound. *Streptococcus pyogenes* and *Staphylococcus aureus* are the two most prevalent gram-positive bacteria. The gram-negative organisms are *Escherichia coli*, *Klebsiella* species, *Pseudomonas aeruginosa*, *Enterobacter* species, and *Proteus* species.[6] The fungal organisms are *Candida* species and molds such as *Aspergillus* species.[4] The control of wound infections has become more challenging due to widespread bacterial resistance to antibiotics.[7]

Depending on the kind of bacterial infection, certain SSIs may appear as early as the third postoperative day, although they often appear between the fifth and eight postoperative days.[5] SSI is diagnosed by documenting the typical clinical signs of inflammation, redness, pain and discharge of purulent material.

The purpose of this study was to analyze the cases of wound infection to find out the prevalence and to identify the risk factors of surgical site wound infection in DMCH.

Objective

The objective of this study was to carry out the bacteriological profile of post-operative wound infection in Dhaka Medical College Hospital (DMCH), Dhaka.

METHODS

This cross-sectional study was conducted in the department of gynecology and obstetrics, Dhaka Medical College Hospital, Dhaka, from October 2019 to September 2021. A total of 200 women diagnosed as post-operative wound infection were enrolled in the study by purposive sampling.

Inclusion criteria

Women diagnosed as post-operative wound infection. Women willing to participate in the study.

Exclusion criteria

Patients with infections resulting from non-surgical trauma. Women who did not give their consent.

Data collection

Formal ethical approval was obtained from the Dhaka Medical College Hospital's ethical review committee before starting the study. Women diagnosed with post-operative wound infection in the department of gynecology and obstetrics were approached. After explaining the study's aim, purpose, and procedure, 200 patients who met the inclusion and exclusion criteria were enrolled. A parent or guardian's informed written consent was acquired. A pre-made proforma was used to record pertinent data. Detailed histories and cesarean section reports were collected; for those without cesarean section reports, wound swabs were taken and sent to DMCH pathology department for bacteriological study. Data were collected using a semi-structured case record form and managed following a standard guideline for post-operative wound infection. The investigator personally collected data using a separate case record form.

Ethical consideration

Patients meeting inclusion criteria were reviewed in-depth after hospital admission. A printed handout was used to convey the study's specifics in the local tongue. Written informed consent was obtained after providing all necessary information, ensuring patient privacy, and clarifying that participation would not affect treatment and involved no financial gain or invasive procedures.

Statistical analysis of data

Data were collected, verified for consistency, and tabulated using SPSS version 24. Statistical significance was set at a 95% confidence level with a 5% error margin. Socio-demographic, clinical, and wound swab culture and sensitivity profiles were reported. Continuous data were presented as mean and standard deviation, while categorical data were shown as frequency and percentage. A p value of <0.05 was considered statistically significant.

RESULTS

Table 1 shows the relationship between socio-demographic factors and bacteriological findings among the participants. There was a significant association between age groups and bacteriological positivity, with the highest positivity in the 20-29 age group (56%, $p<0.01$). Occupational status was also significantly related to bacteriological outcomes, with housewife showing a higher rate of negative findings (69.7%, $p<0.01$). However, there was no statistically significant association with BMI and bacteriological findings ($p=0.371$).

Table 1: Association of socio-demographic factors with bacteriological profile (n=200).

Characteristics		Positive findings (%)	Negative findings (%)	P value
Age group (years)	20 to 29	75 (56)	13 (19)	<0.01
	30 to 40	43 (32.1)	33 (50)	
	>40	16 (11.9)	20 (30.3)	
Mean±SD		32.1±7	38.4±8.2	
Occupational status	Service	50 (37.3)	20 (30.3)	<0.01
	Student	2 (1.5)	0 (0)	
	Unemployed	24 (17.9)	0 (0)	
	Housewife	58 (43.3)	46 (69.7)	
BMI (Kg/m^2)	<18.5	9 (6.7)	5 (7.6)	0.371
	18.5 to 24.9	37 (27.6)	26 (39.4)	
	25 to 29.9	36 (26.9)	15 (22.7)	
	>30	52 (38.8)	20 (30.3)	

Table 2: Association of Indication of surgery and comorbidity with type of bacteria found (n=134).

Characteristics		Gram positive (%)	Gram negative (%)	P value
Indication of surgery	Lower section CS	25 (55.6)	48 (53.9)	0.503
	Abdominal hysterectomy	11 (24.4)	25 (28.1)	0.408
	Exploratory laparotomy	9 (18)	16 (20)	0.474
Comorbidity	Anemia	41 (91.1)	70 (78.7)	0.09
	Diabetes mellitus	4 (8.9)	21 (23.6)	0.059

Table 3: Association of obstetric factors and duration of hospital stay with type of bacteria found (n=134).

Parameters	Gram positive (%)	Gram negative (%)	P value
Duration of hospital stay			
1 to 5 days	18 (40)	39 (43.8)	0.862
6 to 10 days	17 (37.8)	34 (38.2)	
≥11 days	10 (22.2)	16 (18)	
Prolonged rupture of membrane	13 (59.1)	27 (62.8)	0.793
Preeclampsia	7 (31.8)	13 (30.2)	1
Meconium present	3 (13.6)	7 (16.3)	0.544

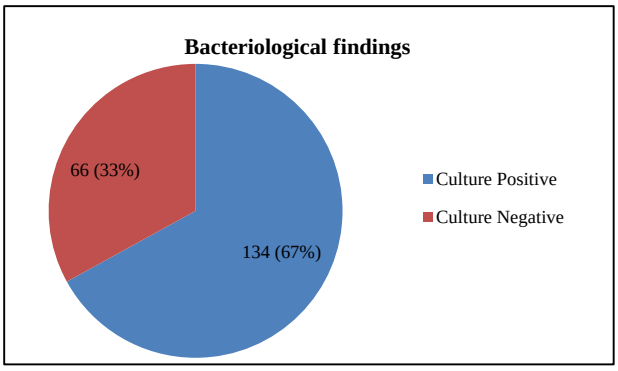

Figure 1: Bacteriological findings among the participants (n=200).

Figure 1 show the bacteriological profiles identified in 134 culture-positive cases. Among the gram-positive bacteria, *Staphylococcus aureus* was the most common 45 (33.6%). Gram-negative bacteria included *Escherichia coli* 28 (20.9%), *Pseudomonas* 28 (20.9%), *Acetobacter* 19 (14.2%), and *Klebsiella* 14 (10.4%), highlighting the diverse bacterial spectrum in post-operative wound infections.

Table 2 illustrates correlation between surgical indications, comorbidities and bacterial types respectively. The type of the surgery, lower section cesarean section (55.6% gram positive and 53.9% gram negative), abdominal hysterectomy, and exploratory laparotomy, did not show significant relationship (p>0.05) with bacterial types. However, while gram positive infections were associated with anemia (91.1% versus 78.7%, p=0.09), it was not statistically significant. The prevalence of gram-negative infection was higher in diabetes mellitus (23.6%, p=0.059).

Table 3 assesses the relationship between obstetric factors, hospital stay duration, and bacterial type. There was no significant association of the type of bacteria with the

duration of hospital stay (1-5 days, 6-10 days, or ≥11 days) (p=0.862). Similarly, no significant correlation with obstetric factors such as prolonged rupture of membranes (p=0.793), preeclampsia (p=1), and the presence of meconium (p=0.544) with bacterial types was found.

DISCUSSION

Post-operative wound infection is a major complication of surgery. Even though postoperative wound infections seldom result in death, they can be expensive for both the patient and the hospital administration due to extended recuperation times, extended postoperative hospital stays, additional expenses, nursing care, and time wasted. Data on risk factors, etiologic agents, patterns of antibiotic susceptibility, and unique traits of these agents must be made available for successful wound infection control and the administration of prudent medication. The current study aimed to identify the causative organisms of wound infection as well as identify the risk factors of wound infection. A total of 200 women with post-operative wound infections admitted to the department of gynecology and obstetrics were enrolled in the study.

Among all, more than fifty percent were ≥30 years with the mean age of 32.1±7 in positive bacteriological findings women and 38.4±8.2 in negative bacteriological findings women. In the study of Rahman et al, mean age of the population was 29.73±94, ranges 18 to 60 years and all were females.[8] Harish et al also found that advanced age was a risk factor for wound infection.[9] A similar finding was observed in a previous study by Bhadauria and Hariharan.[10]

The current study found that 67% had positive Bacteriological findings and 33% of cases had negative Bacteriological findings. Among the positive findings, Staphylococcus aureus was the most predominant gram-positive organism (33.6%), consistent with findings by Shittu et al in Nigeria, where gram-positive organisms, particularly *Staphylococcus aureus*, accounted for a large proportion of infections.[11] It was observed among gram negative organisms that Escherichia coli and *Pseudomonas aeruginosa* were both most prevalent (20.9%), consistent with Narula et al observations that gram negative organisms are most common in post-operative wound infections.[12] These results also demonstrate the significant contribution of both gram positive and gram negative pathogens in surgical site infections (SSIs).

The type of surgery was not significantly associated with infections, which happened across delivery by cesarean section, abdominal hysterectomy and laparotomy. The findings are similar to those reported by Deshpande et al reporting little difference in bacterial patterns among different surgical interventions.[5] Nevertheless, the high prevalence of infections in cesarean sections in our study is in line with global trends reported by Berríos-Torres et al suggesting that obstetric surgeries are susceptible to infections because the surgeries are prolonged and occur with emergency.[13]

Anemia was one of the most common comorbidities in this study but was more frequent in gram positive infections (91.1%, NS). Rahman et al similarly identified anemia as a major risk factor for post-operative wound infections in Bangladeshi patients undergoing abdominal surgery.[8] A trend observed by Kurhade et al, who reported higher rates of gram negative infections in diabetic patients, was more often associated with gram negative infections (23.6%).[7] These results underscore the importance of meticulous preoperative management of comorbidities to minimize SSI risk.

In this study, prolonged rupture of membranes, preeclampsia, and meconium presence did not correlate significantly with bacterial types. These findings are consistent with the observations of Bhadauria and Hariharan who also observed that the bacteriological profile of SSIs in gynecological surgeries was not markedly influenced by the obstetric factors.[10] Bacterial invasion and wound infection are increased by the prevalence of protracted membrane rupture, prolonged labour, and repeated internal examinations during labour, and home labour trials.[14] Based on this, it would seem that intrinsic patient factors may be a more important factor in determining bacterial patterns than obstetric complications.

Consistent with previous international studies by Cooper and Yin et al our findings reveal significant geographical variations in bacterial profiles and resistance patterns compared to international studies.[15,16] This regional variability highlights the importance of regionally specific infection control policies and local antibiotic stewardship programs.

Finally, this study demonstrates the crucial part gram-positive and gram negative bacteria play in post-operative wound infections. Anemia and diabetes mellitus were found to have common association with infections indicating the need for improving physiological health preoperatively. The findings emphasize that SSIs be effectively mitigated through targeted infection control measures and region specific antibiotic guidelines.

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community. It is necessary to do additional extensive investigation in various surgical departments enable clinicians to make a better infection management protocol for DMCH.

CONCLUSION

The study findings showed that maximum study women had positive bacteriological findings, wherein *Staphylococcus aureus* was most commonly found bacteria followed by *E. coli*, *Pseudomonas*, *Acetobacter*

and *Klebsiella*. Frequent comorbidities included anemia and diabetes mellitus, emphasizing the necessity of preoperative optimization.

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REFERENCES

1. Zafar A, Anwar N, Ejaz H. Bacteriology of infected wounds- a study conducted at children's hospital Lahore. Biomedica. 2008;24(January-June):71-4.
2. Sanjay KR, Prasad MN, Vijaykumar GS. A study on isolation and detection of drug resistance gram negative bacilli with special importance to post operative wound infection. J Microbiol Antimicrob. 2010;2(6):68-75.
3. Bowler PG, Duerden BI, Armstrong DG. Wound microbiology and associated approaches to wound management. Clin Microbiol Rev. 2001;14(2):244-69.
4. Kc R, Shrestha A, Sharma VK. Bacteriological study of wound infection and antibiotic susceptibility pattern of the isolates. Nepal J Sci Tech. 2013;14(2):143-50.
5. Deshpande SA, Someshwaran R, Gnanaprakash K. A bacteriological study of post operative wound infections and its antibiotic sensitivity pattern from a tertiary care hospital, Coimbatore, India. Int J Curr Microbiol Appl Sci. 2016;5(8):629-34.
6. Rajput RB, Telkar A, Chaudhary A, Chaudhary B. Bacteriological study of post-operative wound infections with special reference to MRSA and ESBL in a tertiary care hospital. VHL Regional Portal. 2019.
7. Kurhade A, Akulwar S, Mishra M, Kurhade G, Justiz-Vaillant A, Kurhade K, et al. Bacteriological study of post-operative wound infections in a tertiary care hospital. J Bacteriol Parasitol. 2015;6(6):1.
8. Rahman MM, Haider MR, Moinuddin M, Rahman AE, Ahmed S, Khan MM. Determinants of cesarean section in Bangladesh: cross-sectional analysis of Bangladesh Demographic and Health Survey 2014 Data. PLoS One. 2018;13(9):e0202879.
9. Harish Babu BG, Narmadha NS, Soujanya L, Rathika R, Haja Abdul Nazeer MJ. Surgical wound infections in obstetrics and gynaecology- a study from rural tertiary care hospital. Int J Innov Res Med Sci. 2017;2(12):1569-72.
10. Bhadauria AR, Hariharan C. Clinical study of post operative wound infections in obstetrics and gynaecological surgeries in a tertiary care set up. Int J Reprod Contracept Obstet Gynecol. 2013;2(4):631-9.
11. Shittu AO, Kolawole DO, Oyedepo EA. A study of wound infections in two health institutions in Ile-Ife, Nigeria. Afr J Biomed Res. 2002;5(3).
12. Narula H, Chikara G, Gupta P. A prospective study on bacteriological profile and antibiogram of postoperative wound infections in a tertiary care hospital in western Rajasthan. J Fam Med Prim Care. 2020;9(4):1927-34.
13. Berríos-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(8):784-91.
14. Brockington I. Diagnosis and management of post-partum disorders: a review. World Psychiatr. 2004;3(2):89.
15. Cooper RA. Surgical site infections: epidemiology and microbiological aspects in trauma and orthopaedic surgery. Int Wound J. 2013;10(s1):3-8.
16. Yin D, Liu B, Chang Y, Gu H, Zheng X. Management of late-onset deep surgical site infection after instrumented spinal surgery. BMC Surg. 2018;18:1-6.

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