

# Knowledge, Attitudes, and Practices of Obstetricians in Managing Postpartum Surgical Site Infections in India: A Cross-sectional Survey

BRIAN BENJAMIN<sup>1</sup>, KRUNAL DALAL<sup>2</sup>, RAMIYA RAVINDRANATH<sup>3</sup>, PUJA NIJHARA<sup>4</sup>

## ABSTRACT

**Introduction:** Caesarean section and surgical procedures during vaginal delivery are significant contributors to Surgical Site Infections (SSIs). SSIs are associated with extended hospitalisation and increased financial and clinical burden. Antibiotic prophylaxis, chlorhexidine skin preparation, clipper-based hair removal, and vaginal cleansing with povidone-iodine are recommended preventive measures. Topical agents, mupirocin and antiseptics are increasingly used, but adoption remains inconsistent in countries like India due to limited training, resources and varying protocols.

**Aim:** To assess the Knowledge, Attitudes and Practices (KAP) of obstetricians in India for the prevention and management of post-partum SSIs.

**Materials and Methods:** A descriptive cross-sectional survey was conducted at GlaxoSmithKline (GSK), Mumbai, India, which included 200 obstetricians across metro, tier 1 and tier 2 cities in India between May 2024 and August 2024. Participants were obstetricians practising in India with at least 5 years of experience, spending 70% or more of their time in patient care, handling a minimum of 20 deliveries per month, having treated at least 3 SSI cases in the month prior to the survey, and

residing in one of 12 selected cities. Data on the knowledge, attitudes and beliefs and practices followed by the obstetricians for the prevention and management of post-partum SSIs were collected using a 7-item questionnaire through face-to-face computer-assisted personal interviews. Statistical analyses were primarily explorative and descriptive and were performed using R software (version 4.3.1 or higher).

**Results:** Among the 200 participants, 105 (52.5%) practiced in large hospitals, 58 (29%) in multispecialty hospitals, and 37 (18.5%) in standalone maternity clinics. The average clinical experience was 17 years. In the knowledge assessment, 144 (72%) of participants scored between 50-90%, while 56 (28%) scored below 50%; none scored above 90%. The most common knowledge gaps were related to the appropriate duration of topical antibiotic use, bacterial coverage, and indications for antiseptics versus antibiotics.

**Conclusion:** The present study reveals that while obstetricians generally follow consistent practices for managing post-partum SSIs, significant gaps remain, especially in the use of topical antiseptics and antibiotics, highlighting the need for standardised guidelines and targeted training to ensure evidence-based care and better maternal outcomes.

**Keywords:** Antiseptic prophylaxis, Caesarean section, Infection control, Surgical wound infection, Topical administration

## INTRODUCTION

Caesarean Section (CS) is one of the most frequently performed surgical procedures globally, with its prevalence steadily increasing [1,2]. In India, CS accounted for 21.5% of all deliveries in 2021, rising from 16.7% in 1999, with rates exceeding 50% in private healthcare settings [1,2]. This trend underscores a growing population at risk for post-operative complications, particularly SSIs, the most common and preventable causes of maternal morbidity. The pooled global incidence of post-CS SSIs is 5.63% [3], with Indian studies reporting 3% to 15% [4-6]. Women undergoing vaginal deliveries are also susceptible to SSIs, especially after procedures like episiotomy.

The SSIs prolong hospital stays, increase healthcare costs, and elevate maternal and neonatal morbidity and mortality [7]. A study by Hirani S et al., found that the costs of managing patients with SSIs are three times the cost of managing surgical patients with no infections [4].

The SSIs have a multifactorial aetiology, involving both intrinsic (age, nutrition, co-morbidities, pre-operative status, endogenous contamination, etc.) and extrinsic (post-surgical care, secondary contamination by healthcare provider, perioperative hygiene, antibiotic prophylaxis, etc.) factors [8,9]. Most SSIs are caused by gram-positive and gram-negative species, including *Staphylococcus aureus*, *Enterococcus*, *Klebsiella pneumoniae*, *Pseudomonas*

*aeruginosa*, *Escherichia coli*, etc. Occasionally, the causative organism is identified as multidrug-resistant [8,10].

Clinical practice recommendations for the prevention and management of SSIs include antibiotic prophylaxis, chlorhexidine skin preparation, hair removal with clippers, and vaginal cleansing with povidone-iodine. In addition to these systemic measures, topical agents such as mupirocin-based antibiotics and chlorhexidine or povidone-iodine antiseptics are increasingly preferred for both prophylaxis and treatment [11]. These agents offer advantages, including high local drug concentration, minimal systemic absorption, and improved patient compliance. However, their use remains inconsistent, particularly in low- and middle-income countries like India, due to variable training, resource constraints, and institutional protocols [12]. Concerns about local adverse reactions, poor skin penetration, and antimicrobial resistance further contribute to the ongoing debate.

Despite these challenges, the growing interest in topical strategies reflects a critical need to optimise SSI prevention in obstetric care, especially given the rising CS rates. This necessitates the importance of evaluating current practices and knowledge among obstetricians to inform standardised, evidence-based guidelines tailored to the Indian healthcare context [13,14].

Presently in India, there is significant variability in the awareness, perceptions, and practices among obstetricians concerning the utilisation of topical antiseptics and antibiotics (including both antiseptics and antibiotics) for managing post-partum surgical wounds, encompassing both prophylaxis and treatment [14].

In order to reduce the variability in management of these frequent events, the knowledge, attitudes and practices of obstetricians in India regarding the utilisation of topical antiseptics and antibiotics in preventing and managing post-partum surgical site infections were investigated in this study. The primary objective of the study included the evaluation of obstetricians' KAP surrounding the use of topical antiseptics and antibiotics for the management of post-partum SSIs. The study specifically aimed to assess the understanding of appropriate indications, dosage, and duration; identify factors influencing obstetricians' attitudes, such as resistance concerns and patient compliance; and examine their prescribing and administration practices.

## MATERIALS AND METHODS

A descriptive cross-sectional survey was conducted at GlaxoSmithKline (GSK), Mumbai, India, between May 2024 to August 2024 with a target to include at least 200 obstetricians across four zones in India (metro cities and cities in tiers 1 and 2). The study was approved by the Royal Pune Independent Ethics Committee (registration no. ECR/45/Indt/MH/2013/RR-19). Informed consent was obtained from each obstetrician before participation, with clear communication about the voluntary nature of the study and the right to withdraw at any time. To ensure data privacy, all identifiable information was pseudo-anonymised, and data were stored securely in compliance with applicable data protection regulations. Participants were also required to disclose any potential conflicts of interest before beginning the survey.

**Inclusion criteria:** Obstetricians were included if they fulfilled the following criteria:

- practising in India, spending at least 70% of time in patient care
- had at least 5 years of experience,
- had handled a minimum of 20 deliveries per month.
- had treated at least 3 cases of SSIs in the month before the survey was conducted.
- resided and practised in one of the cities: Metro: Mumbai, Delhi, Kolkata and Chennai; Tier 1: Ahmedabad, Lucknow, Patna and Calicut; Tier 2: Rajkot, Chandigarh, Guwahati, and Madurai.

**Exclusion criteria:** Obstetricians were excluded if:

- The participant had membership of advisory boards, formulary committees, or other external boards that could have influenced or made recommendations related to the use of any pharmaceutical company's products and/or other business operations.
- The participant was an individual who made purchasing decisions or had responsibility for allocating or influencing funds.
- The participant held a position that influenced the pharmaceutical business, including financial interests.
- The participant had relationships, commitments, or financial interests that might have compromised or appeared to compromise their relationship with any pharmaceutical company.
- The participant had a close family member who had the influences listed above.

**Sample size calculation:** The sample size was calculated using a web-based calculator - Raosoft Web. given the general descriptive

and non inferential nature of the study design, the sample size was based on logistical considerations to provide reasonable estimates for the primary and secondary outcomes. Authors hypothesised that the correct response distribution percentage will likely fall between 60-90%, with a range of 70-80% being more plausible. Based on feasibility, a sample size of 200 was considered.

## Study Procedure

A web-based questionnaire comprising 7 main questions with multiple closed-ended sub-questions and 64 Likert-style statements (ranging from "strongly agree" to "strongly disagree") was designed by the study team following a comprehensive literature search tailored to the study objectives [15-18]. The questionnaire comprised 25 statements on knowledge, 14 statements on attitudes and beliefs and 25 statements on practices followed by the obstetricians. In order to assess the level of knowledge, a 5-point Likert scale was utilised, which ranged from "strongly agree" to "strongly disagree". For each statement, 1 point was assigned for the correct response, and 0 points were assigned for every incorrect response. The responses for all questions were matched and ranked against pre-defined correct responses from the literature. The obtainable points ranged between 0 (all responses incorrect) and 25 (all responses correct) for knowledge. The overall knowledge of the obstetrician is presented as % of obstetricians with scores >90% (accurate responses to most or all questions), % of obstetricians with scores between 50 to 90% (partially accurate responses), and % of obstetricians with scores <50% (mostly inaccurate responses).

Additional questions (n=13) were included to assess the eligibility of the participant to participate in the study. The questionnaire was developed using best practices for survey instrument development.

The questionnaire underwent a rigorous validation process involving five domain experts, including obstetricians, a microbiologist, and infectious disease specialists. Each item was evaluated for relevance, clarity, and alignment with the study objectives. The Content Validity Index (CVI) was calculated for each item, with a minimum threshold of 0.80 considered acceptable. The average CVI across all items confirmed the instrument's validity. Additionally, a pilot test was conducted in 10% of the target population of obstetricians (n=20) to assess comprehension and usability, leading to minor refinements before full deployment. The results were included in the final analysis.

Participants were randomly selected within the country by a trusted third-party vendor engaged for the study from their pre-identified lists. The survey employed face-to-face Computer-Assisted Personal Interviewing (CAPI), allowing for real-time clarification, reducing response errors, and enhancing data reliability by minimising bias and improving participant comfort. Each of the CAPI sessions lasted between 20 and 30 minutes.

An online Informed Consent Form (ICF) informing the voluntary nature of the survey and containing a confidentiality statement was shared with each participant. Once consent was received, the survey was conducted using the CAPI method following the predefined questionnaire. All participants were blinded to the sponsor's identity. An honorarium, which was aligned with the local fair market value and, as per applicable local jurisdiction, was paid to the participants. All the collected data were checked for completeness and validity. Incomplete responses were identified and excluded from the analysis.

## STATISTICAL ANALYSIS

Statistical analyses were primarily explorative and descriptive and were performed using R software (version 4.3.1 or higher). Demographic data are presented as numbers and percentages, and quantitative responses are presented as tables and graphs. The overall attitude and practice of obstetricians were summarised using counts and percentages of responses.

## RESULTS

**Demographics and participant characteristics:** A total of 200 obstetricians participated in the study, with 80 from metro cities, 72 from tier 1 cities, and 48 from tier 2 cities. Of these 105 (52.5%) practised in large hospitals with more than 100 beds, 58 (29%) in multispecialty hospitals, and 37 (18.5%) in standalone maternity clinics. The participants had a mean of 17 years of clinical experience and consulted an average of 638 patients per month. On average, they performed 61 deliveries per month, of which 41% were CS. Among vaginal deliveries, 37% involved episiotomy. The mean number of SSIs managed in the month before the survey was 5.5 [Table/Fig-1].

**Knowledge and beliefs of obstetricians:** Knowledge scores revealed that 144 (72%) of participants scored between 50-90%, while 56 (28%) scored below 50%. Notably, no participant achieved

Questions	Response	Overall (N=200) n (%)
Please select the type of set-up you practice in	Large hospitals (>100 beds)	105 (52.5)
	Multispecialty centre/set-up (<100 beds)	58 (29.0)
	Standalone maternity centre/set-up	37 (18.5)
Please choose the type of hospital set-up that you majorly practice in	Private	121 (60.5)
	Public	79 (39.5)
For how many years have you been practicing after finishing your residency?	Mean	17.0
	Median	17.0
	SD	7.22
	Mode	20.0
	Min, Max	5.0, 38.0
What percentage of your time do you dedicate to seeing and treating patients?	Mean	86.1
	Median	85.0
	SD	8.65
	Mode	80.0
	Min, Max	70.0, 100.0
On an average, how many patients do you consult in a month?	Mean	637.7
	Median	500.0
	SD	1071.37
	Mode	500.0
	Min, Max	150.0, 15000
On an average, how many deliveries do you supervise in a month?	Mean	61.1
	Median	38.0
	SD	100.62
	Mode	30.0
	Min, Max	20.0, 900.0
On an average, How many of these deliveries would be vaginal deliveries?	Mean	35.7
	Median	20.0
	SD	64.74
	Mode	20.0
	Min, Max	2.0, 600.0
On an average, How many of these deliveries would be LSCS deliveries?	Mean	25.4
	Median	15.5
	SD	37.65
	Mode	15.0
	Min, Max	4.0, 300.0
On an average, How many of these vaginal deliveries would have episiotomy?	Mean	13.3
	Median	7.0
	SD	21.26
	Mode	5.0
	Min, Max	2.0, 185.0

How many Surgical Site Infections (SSIs) cases have you managed in the last one month?	Mean	5.5
	Median	5.0
	SD	7.04
	Mode	4.0
	Min, Max	3.0, 100.0

**[Table/Fig-1]:** Summary of participants' clinical experience.

a score above 90%, indicating a moderate level of knowledge with room for improvement [Table/Fig-2a].

Zone	Scores category	Overall (N=200) n (%)
Overall	<50%	56 (28.0)
	50 to 90%	144 (72.0)
	>90%	0
Metro (n=80)	<50%	16 (20.0)
	50 to 90%	64 (80.0)
	>90%	0
Tier 1 (n=72)	<50%	22 (30.6)
	50 to 90%	50 (69.4)
	>90%	0
Tier 2 (n=48)	<50%	18 (37.5)
	50 to 90%	30 (62.5)
	>90%	0
p-value (Metro vs. Tier 1)	0.1335	
p-value (Metro vs. Tier 2)	0.0300	
p-value (Tier 1 vs. Tier 2)	0.4292	

**[Table/Fig-2a]:** Knowledge and beliefs of obstetricians; (a) Score in knowledge questions.

A majority of obstetricians agreed or strongly agreed that topical antiseptics are effective for prophylaxis 172/200 (86%) and treatment 167/200 (83.5%) of superficial post-partum SSIs. Similarly, 163/200 (81.5%) believed in the efficacy of topical antibiotics for prophylaxis. However, concerns were expressed regarding patient compliance and the risk of antimicrobial resistance due to irrational use. Participants also reported relying on clinical experience to guide the selection of topical antibiotics, particularly in the absence of confirmed microbial aetiology. Most supported the use of bacterial culture testing to inform treatment decisions and emphasised the importance of adhering to recommended durations of topical antibiotic use. While participants disagreed that all topical antibiotics are equally effective, they generally agreed that these agents provide adequate bacterial coverage [Table/Fig-2b].

### Practices Followed by Obstetricians

**Practices to prevent and treat SSIs in post-partum patients:** Among the 200 respondents, 92 agreed and 21 strongly agreed that they do not routinely prescribe antibiotic prophylaxis for women undergoing episiotomy. This practice was more prevalent in tier 1 city, 51/72 (70.8%) and tier 2 cities 29/48 (60.4%) compared to metro cities 33/80 (41.3%). In contrast, most of the participants reported prescribing routine antibiotic prophylaxis for third or fourth-degree perineal tears.

A total of 164/200 (82%) of obstetricians agreed or strongly agreed with administering intravenous antimicrobial prophylaxis before lower segment caesarean section (LSCS), with the highest adherence observed in metro cities 76/80 (95%), followed by tier 1 52/72 (72%) and tier 2 36/48 (75%) cities. The majority also recommended sterile saline for wound cleansing within 48 hours post-surgery and emphasised patient education on hygiene and adherence to prescribed antibiotics [Table/Fig-3a].

	I believe that topical antiseptics are efficacious for prophylaxis of post-partum SSIs	I believe that topical antiseptics are efficacious to treat clean superficial post-partum SSIs.	I believe that topical antibiotics are efficacious for prophylaxis of post-partum SSIs.	I believe that topical antibiotics are efficacious to treat clean superficial incisional post-partum SSIs	I believe all topical antibiotics are similar in efficacy.	I believe that all topical antibiotics have adequate bacterial coverage.	I believe that use of either topical antiseptics or topical antibiotics pose challenges with patient compliance.	I believe that irrational use (under-prescribing, over-prescribing, and incorrect prescribing) of either topical antiseptics or topical antibiotics lead to the development of antimicrobial resistance in post-partum patients.	I believe that patients who receive prophylactic antibiotic (IV) coverage during C-section deliveries do not need topical antibiotics post-operation.	I rely only on my clinical experience to decide which topical antibiotic to prescribe for the treatment of post-partum SSIs.	I believe that conducting bacterial culture test for determining appropriate topical antibiotics, especially when the infection's cause is uncertain or there are concerns about antibiotic resistance is crucial.	I give systemic antibiotics based on my clinical experience to all my post-partum patients including those with clean wounds	I believe that topical antibiotics should be used for recommended duration as per the label.	I believe educating patient on use of topical antibiotics for wound care to prevent and manage SSIs is important.
Strongly disagree	1	0	0	0	4	4	2	3	2	1	0	0	0	0
Disagree	5	2	8	13	50	32	16	9	28	18	7	11	6	1
Neither agree nor disagree	22	31	29	28	50	41	43	17	55	33	33	32	26	24
Agree	119	99	110	98	68	83	109	113	77	94	103	108	120	105
Strongly agree	53	68	53	61	28	40	30	58	38	54	57	49	48	70

[Table/Fig-2b]: Attitude and beliefs for topical antiseptics and topical antibiotics to prevent (prophylaxis) and treat SSIs in post-partum patients.

**Practices for suspected SSIs in post-partum LSCS patients:** All participants reported routinely inspecting surgical wounds for signs of infection. Most also agreed or strongly agreed with assessing comorbidities 167/200 (83.5%) and other risk factors, such as age, hygiene, and nutritional status 185/200 (92.5%) before initiating treatment. Common practices included sending wound samples for bacterial culture, prescribing broad-spectrum oral antibiotics, and using topical antiseptics (e.g., chlorhexidine or povidone-iodine) and antibiotics (e.g., neomycin, metronidazole, mupirocin). Treatment regimens were typically adjusted based on culture results, and patients were advised to complete the full course of topical therapy and return for follow-up [Table/Fig-3b].

**Practices for suspected SSIs in post-partum episiotomy patients:** Management practices for suspected SSIs following episiotomy were consistent with those for LSCS patients. All participants reported inspecting wounds for infection, and similar treatment protocols were followed [Table/Fig-3c].

**Factors and Barriers in Prescribing Topical Agents**

The most influential factors guiding the choice of topical agents were drug safety 122/200 (61%) and efficacy 119/200 (59.5%), followed by patient co-morbidities, type of delivery, and compliance.

In contrast, availability of the drug 32/200 (16%), hospital protocol 48/200 (24%), ease of application 48/200 (24%), and cost of the drug 52/200 (26%) were less frequently cited as decision-making factors [Table/Fig-4].

Barriers to prescribing topical agents included perceived limited efficacy of topical drugs 94/200 (47%), high cost 78/200 (39%), and insufficient clinical evidence 66/200 (33%). Patient compliance 37/200 (18.5%) and drug availability 41/200 (20.5%) were considered less significant barriers [Table/Fig-4].

Knowledge gaps were also identified, with 93/200 (46.5%) of participants citing a lack of clarity regarding bacterial coverage, dosage, and duration of topical antibiotics. Additionally, 85/200 (42.5%) reported uncertainty about the safety and efficacy of topical antiseptics and antibiotics. When asked about the preferred sources for clinical information, 102/200 (51%) favoured medical conferences, CMEs, and webinars, while 93/200 (46.5%) relied on medical representatives. Hospital protocols were the least preferred source 11/200 (5.5%) [Table/Fig-5].

**DISCUSSION**

The present study provides a comprehensive evaluation of the knowledge, attitudes, and practices of obstetricians in India

	I don't give routine antibiotic prophylaxis for women with episiotomy.	I prescribe routine antibiotic prophylaxis for women with a third or fourth-degree perineal tear.	I prescribe i.v. Surgical Antimicrobial Prophylaxis (SAP) before LSCS.	I recommend using sterile saline for wound cleansing up to 48 hours after surgery for clean wounds.	I educate my post-partum patients on good practices like keeping the dressing clean, maintaining personal hygiene and use of prescribed antibiotics to prevent SSIs.
Strongly disagree	16	0	1	0	0
Disagree	49	9	5	22	3
Neither agree nor disagree	22	29	30	27	19
Agree	92	96	102	104	89
Strongly agree	21	66	62	47	89

[Table/Fig-3a]: Practices followed by obstetricians. (a) Practices to prevent and treat SSIs in post-partum patients.

	I check the condition of the wound for any signs of the infection.	I check for existing co-morbidities to (Diabetes, atopic dermatitis, hypertension etc.) before giving any recommendation for treatment.	I consider other risk factors (age, hygiene, malnutrition etc.) for the patient.	I send the sample for bacterial culture/microbiological test.	I prescribe a broad-spectrum oral antibiotic.	I prescribe a topical antiseptic solution (CHD/povidone iodine) to clean the wound.	I prescribe one of the topical antibiotics (neomycin, metronidazole, mupirocin etc.) to the patient.	On receipt of culture report, I change the topical antibiotic as needed.	I recommend continuing usage of topical agents for the recommended duration (as per label).	I ask the patient to follow up if symptoms of the infection persist.
Strongly disagree	0	0	0	0	0	2	2	2	0	0
Disagree	0	2	2	4	2	7	2	7	2	2
Neither agree nor disagree	6	31	13	32	30	25	22	25	27	27
Agree	107	74	86	103	107	105	102	105	118	106
Strongly agree	87	93	99	61	61	61	72	61	53	65

**[Table/Fig-3b]:** Practices for suspected cases of SSIs - LSCS patients.

	I check the condition of the wound for any signs of the infection.	I check for existing co-morbidities (Diabetes, atopic dermatitis, hypertension etc.) before giving any recommendation for treatment.	I consider other risk factors (age, hygiene, malnutrition etc.) for the patient.	I send the sample for bacterial culture/microbiological test.	I prescribe a broad-spectrum oral antibiotic.	I prescribe a topical antiseptic solution (CHD/povidone iodine) to clean the wound.	I prescribe one of the topical antibiotics (neomycin, metronidazole, mupirocin etc.) to the patient.	On receipt of culture report, I change the topical antibiotic as needed.	I recommend continuing usage of topical agents for the recommended duration (as per label).	I ask the patient to follow up if symptoms of the infection persist.
Strongly disagree	0	0	0	0	0	1	1	0	0	0
Disagree	0	2	4	5	3	1	2	3	1	1
Neither agree nor disagree	8	36	14	29	30	25	19	25	21	26
Agree	110	77	99	108	100	106	117	90	123	98
Strongly agree	82	85	83	58	67	67	61	82	55	75

**[Table/Fig-3c]:** Practices for suspected cases of SSIs - episiotomy patients.

Factors	Overall (N=200) n (%)
<b>Which of the following factors do you consider while deciding topical agents for post-partum wound care?</b>	
Drug safety profile	122 (61.0)
Drug efficacy profile	119 (59.5)
Patient co-morbidities like AD, GDM, Diabetes etc.	99 (49.5)
Type of delivery (LSCS vs vaginal)	93 (46.5)
Patient compliance	87 (43.5)
Condition of wound (if suspected infection or not)	75 (37.5)
Causative microorganism	57 (28.5)
Guidelines recommendation	57 (28.5)
Bacterial coverage of topical agents	56 (28.0)
Concerns on resistance development	55 (27.5)
Cost of drug	52 (26.0)
Ease of application	48 (24.0)
Hospital protocol	48 (24.0)
Availability of the drug in the set-up (hospital/ clinic/ pharmacy)	32 (16.0)
<b>What are the reasons/barriers for not prescribing topical agents (antiseptics and antibiotics) to all post-partum patients (LSCS and Episiotomy)</b>	
Limited efficacy vs oral/i.v. antibiotics	94 (47.0)
High cost of topical agents	78 (39.0)
Paucity of clinical studies establishing efficacy of topical antiseptics and antibiotics	66 (33.0)
Hospital/set-up protocols	64 (32.0)

Not substantial effect on wound healing	61 (30.5)
Fear of developing resistance in patients	58 (29.0)
Clinical guidelines (e.g. WHO)	55 (27.5)
Absence of any risk factors for post-partum SSIs	46 (23.0)
Availability in the set up	41 (20.5)
Patient compliance	37 (18.5)
<b>Areas that reflect need-gaps in prevention and management of post-partum SSIs with respect to topical agents</b>	
Lack of awareness on usage of topical antiseptics and antibiotics	60 (30.0)
Lack of clear guidelines on usage of topical antiseptics and antibiotics	82 (41.0)
Lack of clarity on safety and efficacy of topical antiseptics and antibiotics	85 (42.5)
Lack of clarity on usage of different topical antibiotics with respect to bacterial coverage, dosage, and duration	93 (46.5)
Lack of clarity on clear advantages that topical antiseptics and antibiotics offer	81 (40.5)
Lack of clarity on usage indication for topical antiseptics and antibiotics	46 (23.0)
Lack of evidence based practical guidance document	53 (26.5)
Lack of best practices sharing (CMEs or medical education)	27 (13.5)
Lack of patient awareness and education	37 (18.5)
Lack of adequate resources in setups such as government hospitals (such as short supply of medications, unavailability of culture sensitivity testing facility, improper sterilisation of operation theatre, etc.)	36 (18.0)

**[Table/Fig-4]:** Influencing factors, barriers and knowledge gaps for using topical agents

Factors	Overall (N=200) n (%)
What are the knowledge sources that are likely to have the highest impact on your treatment approach and practices?	
Medical conferences/CMEs/ Webinars	102 (51.0)
Medical Representatives	93 (46.5)
Medical journals	72 (36.0)
National/International guidelines	67 (33.5)
Discussions with other Obstetricians/microbiologists	65 (32.5)
Experience with patient outcomes	65 (32.5)
Online medical portal	37 (18.5)
Reference Textbooks	31 (15.5)
Local scientific bodies/groups	29 (14.5)
Data from local trials	28 (14.0)
Hospital protocol	11 (5.5)

**[Table/Fig-5]:** Knowledge sources for improving treatment practices. WHO=World Health Organisation

regarding the management of post-partum SSIs, with a particular focus on the use of topical antiseptics and antibiotics. The findings reveal a consistent approach to clinical practice across geographic areas, yet also highlight critical gaps in knowledge and variability in specific practices that warrant attention.

The participating obstetricians in the study reported that a mean of 41% of all deliveries were performed through CS. This exceeds the national estimate of 21.5% [1] and may indicate an even higher prevalence and faster growth in rates of CS deliveries, consequently, a higher rate of SSIs. This underscores the urgency of optimising SSI prevention strategies in obstetric care.

While most obstetricians demonstrated moderate knowledge (50-90% scores), none achieved high proficiency (>90%), indicating a gap in understanding the utilisation of topical agents in SSI management. These findings are consistent with prior KAP studies conducted in both Indian and international settings [19-22], which similarly reported suboptimal knowledge levels among healthcare providers managing SSIs. Data regarding the usage of topical agents in the literature is inconsistent. Systematic reviews and meta-analyses have shown the effectiveness of topical antibiotics for the management of SSIs, however, the absolute benefit was found to be modest [23-25]. These inconsistencies in the evidence may explain the gaps in knowledge of the participants. A comprehensive training and knowledge-sharing initiative for optimum utilisation of topical agents may be beneficial for improving the clinical practice for prevention of SSIs.

The study also challenges current assumptions about prescribing behaviour. For example, more than half of all obstetricians did not prescribe routine prophylaxis for patients with episiotomy. Aligning with the World Health Organisation (WHO) recommendations, which do not recommend the utilisation of antibiotic prophylaxis in women with episiotomy [26]. This finding is further supported by a systematic review that did not find conclusive evidence to assess the clinical benefits or harms of routine antibiotic prophylaxis for episiotomy repair after vaginal delivery [27]. Another study conducted in India demonstrated a minor benefit in the antibiotic (0.5% incidence of infection) vs the no antibiotic group (2% incidence of infection), but these findings were not found to be significant ( $p$ -value=0.622) [28]. Considering the mixed evidence, further evidence is desirable to bridge this gap in knowledge and practice.

In the present study, drug safety and efficacy emerged as the primary considerations in the selection of topical agents, with relatively less importance placed on cost, availability, and ease of use. While this prioritisation reflects a commendable focus on clinical outcomes, it may inadvertently neglect practical barriers that influence treatment adherence, particularly in resource-constrained settings. Various

factors have been identified which influence medication adherence, such as the ease of use, duration and cost of the treatment, socio-economic variables (health literacy, substance use disorders), among others [29]. Inappropriate use and non adherence to antibiotic treatment may result in increased antimicrobial resistance [30,31]. It is important that the obstetricians be appropriately educated regarding the methods to maximise adherence and treatment compliance. In order to achieve these objectives, a comprehensive training program for both the patients and the obstetricians may be beneficial.

The findings suggest a need for a holistic approach to prescribing practices, which integrates clinical efficacy with contextual feasibility. Educating obstetricians on the importance of these factors is crucial. A structured training program aimed at enhancing awareness among healthcare providers, alongside patient education initiatives, may serve to improve adherence and optimise treatment outcomes. Such interventions could play a pivotal role in mitigating the risk of antimicrobial resistance and ensuring the effective use of topical therapies in diverse clinical settings.

The present study has many strengths. To begin with, the observations from the study provide several actionable insights. The CAPI methodology applied in this study minimises the likelihood of the respondents searching for answers via the internet or other sources or being influenced by answers to subsequent questions, thereby providing spontaneous responses. The present study had a comprehensive, quantitative question list for assessing the obstetricians' knowledge, developed after an extensive literature search. Findings from this knowledge questionnaire indicate that there is an unmet need to develop effective training materials for educating obstetricians regarding the use of topical agents.

### Limitation(s)

Generalisability is a potential limitation of the current study because participants were recruited through a panel. The obstetricians included in the survey are from different cities with different healthcare infrastructure and insurance scenarios. There are differences in beliefs between the metro, tier 1 and tier 2 cities. Responses are all self-reported by the obstetricians and are not validated against other sources.

### CONCLUSION(S)

The present study identifies that, largely, the clinical practices followed by obstetricians for prevention and management of post-partum SSIs are consistent, a significant deviation exists. The current study identified that there is a gap in knowledge of the obstetricians with regard to the usage of topical antiseptics and antibiotics, which calls for the development of a comprehensive training program designed to standardise management. Finally, cost, availability and ease of use of the topical agents should be considered while prescribing topical agents as these directly impact adherence and may result in inadequate treatment and suboptimal outcomes. Addressing these gaps through structured training and standardised, evidence-based guidelines is essential. Future efforts should focus on evaluating the effectiveness of topical agents and promoting adherence to uniform protocols to improve maternal outcomes and reduce SSI burden.

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**Authors' contribution:** BB: Conceptualisation, data curation, formal analysis, funding, methodology, project administration, resources, software, supervision, validation, visualisation, writing - original draft, and writing - review and editing. KD: Methodology, validation, visualisation, writing - original draft, and writing - review and editing. RR: Formal analysis, funding, methodology, validation, visualisation, writing - original draft, and writing - review and editing. PN: Data curation, formal analysis, methodology, validation, visualisation, writing - original draft, and writing - review and editing.

## REFERENCES

- Pandey AK, Raushan MR, Gautam D, Neogi SB. Alarming trends of cesarean section—Time to rethink: Evidence from a large-scale cross-sectional sample survey in India. *J Med Internet Res*. 2023;25:e41892.
- IIT Madras Study finds an increase in number of C-section deliveries across India between 2016 and 2021 [Internet]. [cited 2024 Oct 16]; Available from: <https://pib.gov.in/pib.gov.in/Pressreleaseshare.aspx?PRID=2016771>
- Farid Mojtahedi M, Sepidarkish M, Almukhtar M, Eslami Y, Mohammadianamiri F, Behzad Moghadam K, et al. Global incidence of surgical site infections following caesarean section: A systematic review and meta-analysis. *J Hosp Infect*. 2023;139:82-92.
- Hirani S, Trivedi NA, Chauhan J, Chauhan Y. A study of clinical and economic burden of surgical site infection in patients undergoing caesarian section at a tertiary care teaching hospital in India. *PLoS One* 2022;17:e0269530.
- Prajapati V, Modi KP. Study of surgical site infection in patients undergoing caesarean section at tertiary care center, Gujarat. *Int J Reprod Contracept Obstet Gynecol*. 2022;11:844-48.
- Gupta S, Manchanda V, Sachdev P, Kumar Saini R, Joy M. Study of incidence and risk factors of surgical site infections in lower segment caesarean section cases of tertiary care hospital of north India. *Indian J Med Microbiol*. 2021;39:01-05.
- Sandall J, Tribe RM, Avery L, Mola G, Visser GH, Homer CS, et al. Short-term and long-term effects of caesarean section on the health of women and children. *Lancet Lond Engl*. 2018;392:1349-57.
- Muqtadir AA, Mandevwad G, Rajkumar HRV, Raturaj MK, Tipparthi SK, Reddy RS. Spectrum of surgical site infections at a tertiary care hospital in Hyderabad. *Indian J Microbiol Res*. 7:322-26.
- Garner BH, Anderson DJ. Surgical Site Infections: An Update. *Infect Dis Clin North Am*. 2016;30:909-29.
- Shah S, Singhal T, Naik R. A 4-year prospective study to determine the incidence and microbial etiology of surgical site infections at a private tertiary care hospital in Mumbai, India. *Am J Infect Control*. 2015;43:59-62.
- Kawakita T, Landy HJ. Surgical site infections after cesarean delivery: Epidemiology, prevention and treatment. *Matern Health Neonatol Perinatol*. 2017;3:12.
- Sayood S, Bielicki J, Gandra S. Tackling inappropriate antibiotic use in low-and middle-income countries. *Nat Med*. 2024;30(1):33-34.
- Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. *Am J Infect Control*. 1999;27:97-132; quiz 133-34; discussion 96.
- Chen PJ, Hua YM, Toh HS, Lee MC. Topical antibiotic prophylaxis for surgical wound infections in clean and clean-contaminated surgery: A systematic review and meta-analysis. *BJS Open*. 2021;5:zrab125.
- Sutherland R, Boon RJ, Griffin KE, Masters PJ, Slocombe B, White AR. Antibacterial activity of mupirocin (pseudomonic acid), a new antibiotic for topical use. *Antimicrob Agents Chemother*. 1985;27:495-98. Available from: <https://doi.org/10.1128/aac.27.4.495>.
- Lin WL, Wu LM, Nguyen THY, Lin YH, Chen CJ, Huang WT, et al. Topical Antibiotic Prophylaxis for Preventing Surgical Site Infections of Clean Wounds: A Systematic Review and Meta-Analysis. *Surg Infect (Larchmt)*. 2024;25:32-38. Available from: <https://doi.org/10.1089/sur.2023.182>.
- Tong QJ, Hammer KD, Johnson EM, Zegarra M, Goto M, Lo TS. A systematic review and meta-analysis on the use of prophylactic topical antibiotics for the prevention of uncomplicated wound infections. *Infect Drug Resist*. 2018;11:417-25. Available from: <https://doi.org/10.2147/IDR.S151293>.
- Arora A, Bharadwaj P, Chaturvedi H, Chowbey P, Gupta S, Leaper D, et al. A review of prevention of surgical site infections in Indian hospitals based on global guidelines for the prevention of surgical site infection, 2016. *Journal of Patient Safety and Infection Control*. 2018;6(1):01-12.
- Patil VB, Raval RM, Chavan G. Knowledge and practices of health care professionals to prevent surgical site infection in a tertiary health care centre. *Int Surg J*. 2018;5:2248-51.
- Brisibe S, Ordinioha B, Gbeneolol PK. Knowledge, attitude, and infection control practices of two tertiary hospitals in Port-Harcourt, Nigeria. *Niger J Clin Pract*. 2014;17:691-95.
- Abou El-Enein NY, El Mahdy HM. Standard precautions: A KAP study among nurses in the dialysis unit in a University Hospital in Alexandria, Egypt. *J Egypt Public Health Assoc*. 2011;86:03-10.
- Ayed A, Fashafsheh I, Eqtait F. Knowledge and Practice of Nursing Staff towards Infection Control Measures in the Palestinian Hospitals. *J Educ Pract*. 2015;6(4):79-91.
- Tong QJ, Hammer KD, Johnson EM, Zegarra M, Goto M, Lo TS. A systematic review and meta-analysis on the use of prophylactic topical antibiotics for the prevention of uncomplicated wound infections. *Infect Drug Resist*. 2018;11:417-25.
- Heal CF, Banks JL, Lepper P, Kontopantelis E, van Driel ML. Meta-analysis of randomized and quasi-randomized clinical trials of topical antibiotics after primary closure for the prevention of surgical-site infection. *Br J Surg*. 2017;104:1123-30.
- Heal CF, Banks JL, Lepper PD, Kontopantelis E, van Driel ML. Topical antibiotics for preventing surgical site infection in wounds healing by primary intention. *Cochrane Database Syst Rev*. 2016;11:CD011426.
- Currie S. WHO Recommendations for Prevention and Treatment of Maternal Peripartum Infections. 2015; Available from: <https://www.ncbi.nlm.nih.gov/books/NBK327079/>.
- Bonet M, Ota E, Chibueze CE, Oladapo OT. Antibiotic prophylaxis for episiotomy repair following vaginal birth. *Cochrane Database Syst Rev*. 2017;2017:CD012136.
- Tandon AN, Dalal AR. A Randomized, Open-labelled, Interventional Study to Evaluate the Incidence of Infection with or Without Use of Prophylactic Antibiotics in Patients of Episiotomy in a Normal Vaginal Delivery. *J Obstet Gynecol India*. 2018;68:294-99.
- Zschocke I, Mrowietz U, Lotzin A, Karakasli E, Reich K. Assessing adherence factors in patients under topical treatment: Development of the Topical Therapy Adherence Questionnaire (TTAQ). *Arch Dermatol Res*. 2014;306:287.
- Almomani BA, Hijazi BM, Awwad O, Khasawneh RA. Prevalence and predictors of non-adherence to short-term antibiotics: A population-based survey. *PLoS ONE*. 2022;17:e0268285.
- Sorensen SV, Baker T, Fleurence R, Dixon J, Roberts C, Haider S, et al. Cost and clinical consequence of antibiotic non-adherence in acute exacerbations of chronic bronchitis. *Int J Tuberc Lung Dis Off J Int Union Tuberc Lung Dis*. 2009;13:945-54.

### PARTICULARS OF CONTRIBUTORS:

- Medical Lead, Department of General Medicine, GSK, Mumbai, Maharashtra, India.
- Head, Department of Medical Affairs, GSK, Mumbai, Maharashtra, India.
- Associate Director, Department of Statistics, GSK, Mumbai, Maharashtra, India.
- Medical Lead, Department of Infectious Diseases, GSK, Mumbai, Maharashtra, India.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Brian Benjamin,  
Medical Lead, Department of General Medicine, GSK, Mumbai- 400030,  
Maharashtra, India.  
E-mail: [bernard.b.benjamin@gsk.com](mailto:bernard.b.benjamin@gsk.com)

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