

How to Cite:

Hanfi, H., Ahmad, W., Singh, A., Ibrahim, M., Ilyaseen, A., Iqbal, N., Ali, A., Basit, A., & Khan, S. A. (2024). Antibiotic prophylaxis for preventing surgical site infections after abdominal surgery: A systematic review. *International Journal of Health Sciences*, 8(S1), 705–716.
<https://doi.org/10.53730/ijhs.v8nS1.14902>

Antibiotic prophylaxis for preventing surgical site infections after abdominal surgery: A systematic review

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Abstract---Surgical site infections (SSIs) pose severe burden in healthcare, specially in laparoscopic surgeries, leading cause in spiraling morbidity, mortality, and healthcare costs. Although, preventative measures are of great significance including aseptic technique and surgical site decolonization, antibiotic prophylaxis (SAP) remains pivotal. Nonetheless, issues regarding antimicrobial resistance compel towards meticulous approach. The reason to improve this strategy is to enhance SAP practices for laparoscopic

surgery by evaluating different antibiotics, their administration time and duration of prophylaxis. Conducting a thorough examination on the basis of vast studies results in effective SAP implications to rule out laparoscopic surgeries leading to reduce SSI effort and safety of patient. Our research put great significance on customized approaches to SAP. We would like to emphasize the importance of considering the various factors such as the kind of procedure, patient-specific risks, and the risk of concerns regarding antimicrobial resistance. It is vital to address this so that individualized strategies may yield the best results. In addition, we recognize SAP as a part of a cohesive whole, preventing SSIs holistically, as it complements other preventive measures, such as surgical site antiseptics and glycemic control, RCS. The value of the review is the confirmed efficiency of SAP in SSI reduction, although it is necessary to carry out a multiplier procedure. In addition to SAP, surgical techniques, postoperative care, and proper stewardship after administration outside the operative suite are needed. It is also important for health professionals to work together to develop evidence-based SAP protocols adoptable to local resistant strains and patient-specific factors. High-quality studies in diverse populations, exploration of cost-effectiveness, and development of standardized SAP protocols are warranted to optimize patient outcomes. To sum up this discussion, this chronological review gives esteemed awareness into improving SAP procedures for laparoscopic surgery. By amalgamating evidence-based guidelines and promoting effective antibiotic management, physicians and surgeons can contribute to reducing SSIs and ameliorate patient safety worldwide.

Keywords---Surgical Site Infections (SSIs), Antibiotic Prophylaxis, Abdominal Surgery, Perioperative care.

Introduction

Surgical site infections (SSIs) are vital issues following abdominal surgery (Tomsic et al., 2020). It is leading to increased morbidity, mortality, and lost of health of patient (Nel, 2014). As considering the precautionary measures like aseptic management and sterilizing the surgical area are crucial. Moreover, the use of antibiotics to curb SSIs is significant (Halawi et al., 2018). Nonetheless, issues related to misuse of antibiotics that lead to resistance in microbes need more subtle solutions (Fymat, 2017). This categorically analyzed paper finds out optimizing SAP for abdominal surgery. Critically evaluation of several antimicrobial agents, their inoculation time and its effectiveness are discussed in order to curb SSIs (Reinbold et al., 2017). This comprehensive analysis will be based on a wide range of studies to identify the most effective SAP practices specific to abdominal surgery. This information will be epitome in order to reduce SSI as well as to enhance patient health. Nonetheless SAP is only a single portion to check SSI (Nthumba et al., 2022). This article will also show how SAP impose its impact with other precautions for example surgical sites antibiotics and glycemic controls go enhance patient results. In addition to this,

this article will further address the infection with suitable and sane use of antibiotics. With critically evaluating the improvement of SAP, information is provided that promote safety of patients as well as sane use of antibiotics.

The crux of this review is to provide deep rooted analysis of SAP for surgery. Although current surgical procedure has its own significance , we try to determine result oriented SAP practices. This will lead to lessen SSIs as well as put great significance on antibiotic overview which is the most important element of today's healthcare system

Literature Review

Surgical Site Infections (SSIs) are the main issues in the after math of surgical procedure, results in patient' despair, deaths and high cost of health (Cotton, 2018). Despite the antiseptic measure and other methods for sterilize, use of antibiotic is still crucial in order to avoid SSIs (Liu et al., 2018). Nonetheless, the fear of antimicrobial resistance owing to unchecked usage of antibiotics required a thought provocative strategy.

This well organized review addresses this critical need by focusing on recalculating SAP procedure especially for abdominal surgery (Jacobs, 2016). The purpose is to calculate the efficacy of SAP in general as well as all the research and findings to achieve several goals (Schuts et al., 2016).

Researcher declared that SAP as an integral component of SSI prevention. It will also highlight interaction of SAP with other measures like scrubbing of surgical site (Gajakosh, 2018). This will results in the best method in order to prevent SSI. Another research described that efficient and result oriented SAP procedure on the basis of its functionalities and risk factor (Otaigbe, 2023). The encompasses the targeted SAP in specified functionalities and patient criteria.

Further research investigated the prior knowledge including the previous knowledge while considering new information as well as all the unknown aspects. Thus avoiding the repetition. Along with that it provide new methodology to enhance healthcare profession interest to stick to the SSI (John et al., 2015). This will also provide the solutions on overwhelming challenges in practical field. Additional, (Weber et al., 2017) discussed the efficacy of SAP procedures that might be different on the basis of surgery. This will lead to acknowledge the variation in risk related to surgery and bacterial contamination.

Moreover, (Albahri et al., 2023) delve into challenges and solution I order to adhere with best practice in vast health related field. This publication will enlightened the post operative care and complications recognizing the significance of SSIs prevention and finally this will reveal the cost effectiveness in several SAP. This review can be helpful for healthcare decision making as well as aiding them to choose cost effective and best antibiotic thus reduce SSI

So inducing all the key components and inculcating new way to improve surgical procedures this review has a potential and valuable resource to rejuvenated SAP thus leading towards better results in surgical procedure and effective use of

antibiotics along with more comprehensive approach in order to prevent SSIs worldwide.

Materials and Methodology

Main purpose of this review is to enhance antibiotic prophylaxis applications especially for controlling surgical site infections (SSIs) in surgical procedures. This includes effective SAP criteria its injection time and duration of effectiveness. Furthur more, it is vital to seek SAP as comprehensive SSI prevention strategy along with other preventive methods and to sort out other issues regarding antimicrobial resistance.

Types of database	Keywords	Search strategy	Filter Used	No of records
PubMed	Antibiotic prophylaxis	“Antibiotic Prophylaxis” AND “Preventing Surgical Site Infections” AND “Abdominal surgery”	Full text Research Articles,10 years humans	764
PMC	Surgical site infections	((“Antibiotic Prophylaxis” AND “Preventing Surgical Site Infections” AND “Abdominal surgery”))	Full text Research Articles,10 year humans	384
Google scholar	Abdominal surgery	“Antibiotic Prophylaxis” AND “Preventing Surgical Site Infections” AND “Abdominal surgery” AND “Systematic Review” AND (“Last 10 years”)	Full text Research Articles,10 year humans	543
Science Direct	Prevention strategies	“ANTIBIOTIC PROPHYLAXIS” AND “PREVENTING SURGICAL SITE INFECTIONS” AND “ABDOMINAL SURGERY” AND “SYSTEMATIC REVIEW” AND (“LAST 10 YEARS”)	Full text Research Articles,10 year humans	652

Other comprehensive research work was also conduct on other plate from like PUBMED, PMC, GOOGLE SCHOLAR, and SCIENCE DIRECT. This methodology also imparts vital information linked with antibiotic prophylaxis, preventing surgical site infection and surgery. Various screening procedure were considered including past 10 years.

SNO	Title	Citations	Findings	Conclusion
1	Antibiotic Prophylaxis for Preventing Surgical Site Infections	(Khoshbin et al., 2015)	SAP is crucial for preventing SSIs. Bundle includes measures for proper SAP administration.	Proposed bundle facilitates evidence-based interventions for SAP, encouraging institutional safety culture.
2	Surgical Antibiotic Prophylaxis: A Proposal for a Global Bundle	(Sartelli et al., 2024)	Various guidelines support SAP for reducing SSIs.	Collaboration and interdisciplinary approach are vital for effective SAP administration.
3	Antibiotic prophylaxis for surgical procedures	(Brocard et al., 2021)	SAP can reduce SSIs compared to placebo. Intraoperative SAP may lower SSI risk.	High-quality systematic reviews are needed for diverse populations and settings.
4	Surgical site infection prevention: a review	(Seidelman et al., 2023)	Several strategies reduce SSI rates, including avoiding razors, decolonization, and maintaining normothermia.	Appropriate dosing, timing, and choice of antimicrobial prophylaxis are recommended for SSI prevention.
5	Surgical site infections in gastroenterological surgery	(Matsuda et al., 2023)	SSIs are common and costly complications. Evidence-based preventative strategies are crucial for prevention.	Guidelines specific to local healthcare systems are essential for effective SSI prevention.
6	Implementation Interventions in preventing SSIs	(Tomsic et al., 2020)	Audit and feedback, organizational culture, and reminders are commonly used implementation interventions.	Standard bundles of interventions are applied in abdominal Surgery to prevent SSIs.
7	Antibiotic prophylaxis against surgical site infection	(Al Riyees et al., 2021)	Antibiotic prophylaxis reduces SSI risk in open hernia repair, particularly in mesh repair patients.	Further well-designed trials are needed to confirm the benefits of antibiotic prophylaxis in hernia repair.
8	Strategies to prevent surgical site infections	(Ariyo et al., 2019)	Practical recommendations are provided for acute-care hospitals to implement SSI prevention efforts effectively.	Collaboration among healthcare organizations is crucial for successful implementation of

SNO	Title	Citations	Findings	Conclusion
				SSI prevention strategies.
9	Prevention of surgical site infection	(Kirby & Mazuski, 2009)	Prevention is crucial for reducing morbidity and mortality. A ten-step approach emphasizes evidence-based strategies.	Orthopedic surgeons can use a ten-step approach to effectively prevent surgical site infections.
10	Post-operative nursing activities to prevent wound complications	(Tobiano et al., 2024)	Negative wound pressure therapy and surgical site infection bundles are common interventions. Nurses play a delegated role in postoperative wound care.	Exploring independent nursing interventions can improve wound outcomes and leverage nurses' professional role.

The results of various studies were examined carefully to check the efficacy of SAP in preventing SSIs after surgery. Data retrieved from such studies were carefully examined and categorized in order to evaluate different SAP practices while noticing risk factor and antimicrobial resistance. The results depict from this data are assumed to give evidence based knowledge in re configuring SAP practices in order to improve patient outcomes along with promoting antibiotic stewardship

Quality assessment tools were utilized to findout the risk of bias in the included studies. This include analyzing factors such as study design, methodology, participant selection, outcome measurement, and reporting. Studies of biasness were critically examined, and their influence on the overall findings of the review was considered during data synthesis and analysis.

This review shed light on studies include human having surgery, irregardless of their physical aspects and their surgical procedure. Studies also include all sort of surgeries in addition to variety of patient population and clinical situation

For the search strategy and selection criteria, we employed a through method to ensure the infusion of related studies while upholding methodological precision. Inclusion criteria based on full-text research articles released within the last decade, concentrate on human subjects undergoing surgery. Targeting studies is highly evaluate the effectiveness of antibiotic prophylaxis in order to control surgical site infections (SSIs), with a keen interest in outcomes related to SAP regimens, timing of administration, and duration of prophylaxis. This meticulous method allowed us to consider the latest evidence and explore multifaceted SAP practices in the context of abdominal surgery

On the flip side, in order to maintain the integrity of the review exclusion criteria were applied judiciously. Studies not related to antibiotic prophylaxis in order to prevent SSIs following abdominal surgery were eliminated. Further more, studies having any discrepancies could compromise the reliability of results were excluded to maintain the authenticity of the synthesized evidence. Sticking to

these precise criteria, only high-quality studies leading to the purposeful perception were included in the review, thus ameliorate the soundness of our findings and conclusions. Data related to study characteristics, SAP interventions, SSI outcomes, and key findings were extracted . Data extraction was performed thoroughly to make sure that is accurate and consistent through out studies.

To make sure the effectiveness and validity of methods and findings Each included study underwent a quality assessment. Quality assessment tools were applied to assess the risk of bias and ensure the reliability of the evidence synthesized in the review.

To identify common themes, patterns, and discrepancies, data synthesis involved summarizing and integrating the findings from the included studies . Quantitative data were scrutinized by utilizing appropriate statistical methods, while qualitative data were orchestrated on theme base. To draw evidence-based conclusions regarding optimal SAP practices the synthesized data were then used for preventing SSIs, after abdominal surgery.

Ethical considerations were crucial in reviewing the process to make sure the responsible conduct of research involving human subjects. This includes ethical guidelines and regulations about research conduct, confidentiality, and informed consent.

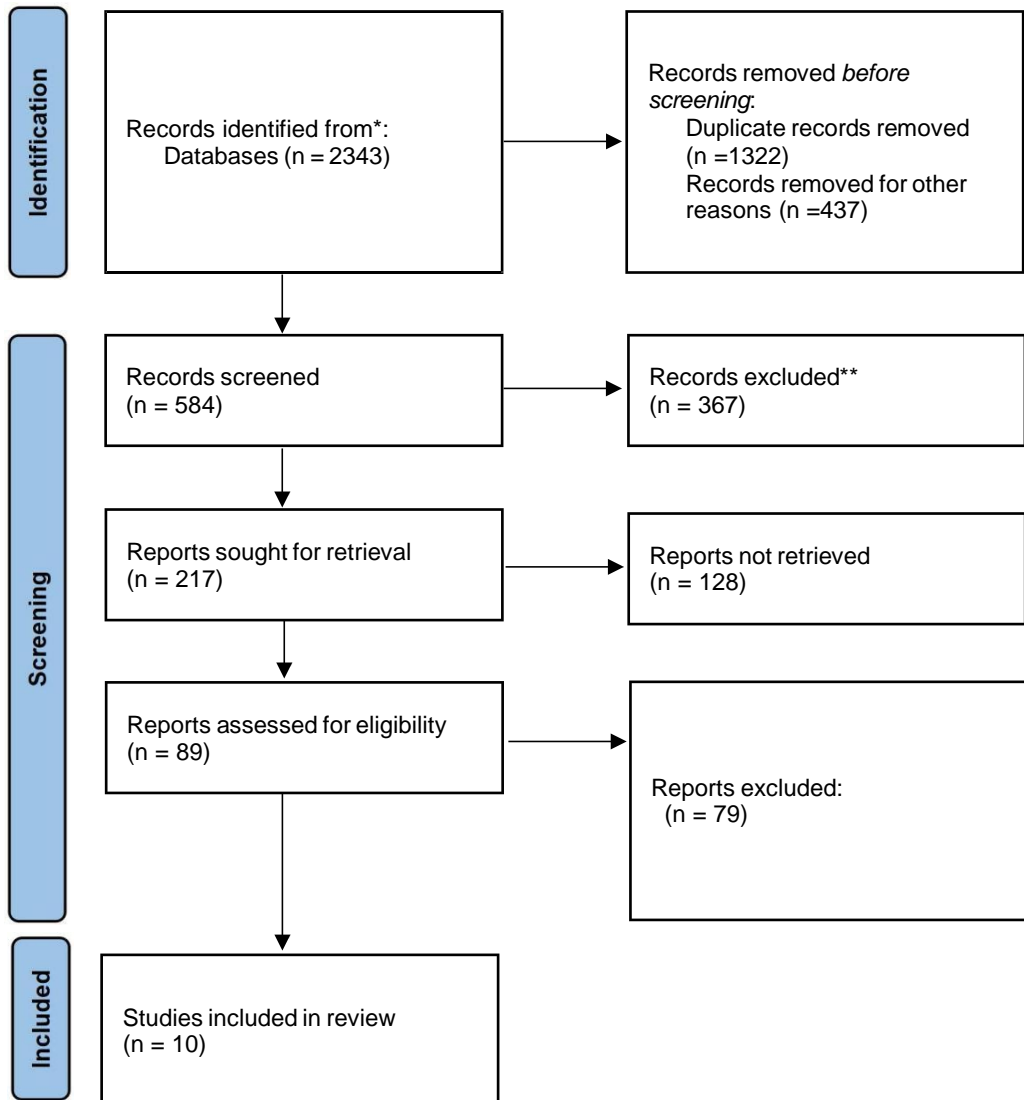
The review also has a few limitations, including biases in the studies included, change in study methodologies, and limitations to systematic reviews. While discussing the results and outputs of the publication, many limitations were included to make sure the final conclusions were sorted out correctly.

To conclude, this systematic review covers a full picture of antibiotic prophylaxis in preventing surgical site infections after abdominal surgery. Through synthesis of evidence from the different literature, the final output has identified the best practices for SAP. The systematic review adds and supports the global picture to reduce SSIs and promote responsible antibiotic stewardship.

Results and Discussion

SSIs are the worst aftermath of surgery, result in spiraling death rate and deterioration of health. Despite the precautionary measures such as aseptic condition , antibiotic are still having great signification in combating SSIs. Nonetheless, antimicrobial resistance still a cause of great concern owing to inappropriate use of antibiotics and should be given pronounced importance.

PRISMA FLOW CHART



From: Page, MJ, McKenzie, JE, Bossuyt, PM, Boutron, I, Hoffmann, TC, Mulrow, CD, et al. The PRISMA 2020 statement: an up dated guide line for reporting systematic reviews. *BMJ* 2021;372:n71.doi:10.1136/bmj.n71

This review deals with promoting SAP specially for surgery with existing methodology in preventing SAP procedure. This review points out the forges SAP considering following

- **Procedure Type:** The choice of antibiotic treatment may vary depending on the type of surgery (open versus laparoscopic) and the particular organ or tissue being operated on. For instance, procedures involving the gastrointestinal tract, which typically have a higher bacterial presence, may necessitate more comprehensive antibiotic coverage compared to less

contaminated surgeries.

- **Patient Risk Factors:** Conditions such as diabetes, obesity, and malnutrition can impact the likelihood of contracting SSIs. Patients with these conditions may find it advantageous to adapt SAP strategies, such as extending the duration of prophylaxis or choosing antibiotics tailored to combat the particular pathogens linked to their commodities..
- **Antimicrobial Resistance:** The review stressed the need to select antibiotics with low resistance profiles in a healthcare-specific manner. By doing so, there is a lower chance that an antibiotic to which certain bacteria cause an infection will be selected. As a result, it contributes to antibiotic stewardship and is a strategy to prevent emerging resistant strains.
- **Surgical site sterilization:** for the SSI to be reduced proper sterilization has to be done before surgical proceedings
- **Glycemic control:** Healing and reduction of SSIs will be achieved after a good glycemic control.
- **Surgical technique:** Proper surgical correction technique and healing reduces SSI.
- **Postoperative Care:** Proper Handling and sterilization of the wound will reduce the SSI.

The review also show great concern antimicrobial resistance due to unchecked use of antibiotic. It focused on the importance of using SAP meticulously and adhere to the established instructions to make sure its effectiveness while reduces the sprouting of resistant pathogens. This forced the need for cooperation among surgeons, infectious disease specialists, and microbiologists to develop and implement evidence-based SAP protocols forged to specific methods. The review acknowledged limitations inherent to systematic reviews, including potential publication bias and variations in study methodologies. Additionally, the review identified areas requiring further investigation:

- **High-quality studies:** To establish optimal SAP practices at global level, more research is required, especially in diverse populations and healthcare procedures. This could focus on various trials or studies considering specific patient subgroups or procedures with limited existing data.
- **Cost-effectiveness:** to inform resource allocation various cost effective method could explore in several SAP strategies. It is more valuable for surgeons and physicians to reduce the cost associated in order to minimize SSI
- **Standardized protocols:** Forging a new SAP protocol that adhere to specific surgical procedure could lead to improve patient results but these protocols should be based on evidence, follow resistance pattern and be acclimated to patient specific risk. By considering this, health related workers can contribute to a global effort to reduce SSIs and improve patient safety following abdominal surgeries and requires a multifaceted approach that optimizes SAP practices while considering SSI prevention, promotes responsible antibiotic usage, and leverages the combined effectiveness of various preventative measures.

Conclusion

To summarize, this systematic review provides precious awareness into improving antibiotic prophylaxis (SAP) methods in order to avoid surgical site infections (SSIs) after abdominal surgery. By making evidence from a vast range of studies, the review finds out result oriented SAP regimens, optimum time of drug administration, and duration of prophylaxis, leading to global efforts to improve patient safety as well as minimize healthcare costs linked with SSIs.

The review underline the significance of customizing SAP approaches to individual patient and procedural factors. It acknowledge the strategies of one-size-fits-all is insufficient, focusing the need to give importance of type of procedure, risk factors, and local antimicrobial resistance patterns when tailoring SAP protocols. By accepting this methods, healthcare professionals can acknowledge patient outcomes as well as reducing the risk of antimicrobial resistance.

Along with that , the review gives significance to SAP as integral part of a SSI prevention strategy. It underscore the synergistic effects of combining SAP with other preventative measures such as surgical site antiseptics, glycemic control, and meticulous surgical technique and by doing this the incidence of SSIs will greatly reduce and improve overall patient care.

The review also deals with antimicrobial resistance, advocating for responsible antibiotic stewardship in SAP administration. Sanely use of antibiotics and strictly follow the guidelines, healthcare professionals can minimize the risk of resistance while maintaining the effectiveness of SAP in preventing SSIs.

the review identifies several areas for future research while considereing limitation come along with systemic view. More advanced studies in diverse populations and settings are required to build optimal SAP practices worldwide. Furthermore, exploring the cost-effectiveness of different SAP strategies and developing standardized protocols tailored to specific abdominal procedures can further enhance patient outcomes and healthcare resource allocation.

While acknowledging the limitations inherent to systematic reviews, such as potential publication bias and variations in study methodologies, the review identifies several areas for future research.

In essence, this systematic review serves as a comprehensive resource for healthcare professionals seeking to optimize SAP practices for preventing SSIs after abdominal surgery. By integrating evidence-based recommendations and promoting responsible antibiotic stewardship, healthcare providers can contribute to reducing SSIs, improving patient safety, and advancing the quality of surgical care on a global scale.

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