Research Article

The Influence of Antibiotic Stewardship Program on Indoor Patients in Asia. A SystematicReview

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Abstract:

Background: Antibiotic resistance is a growing global threat driven by antibiotic overuse. Antibiotic stewardship programs (ASPs) are a key strategy to optimize antibiotic prescribing and combat resistance.

Objective: To systematically review the impact of ASPs on clinical and economic outcomes among hospitalized patients in Asia.

Methods: We searched PubMed, Google Scholar, and PakMediNet for studies published in 2017-2021 that quantified ASP outcomes. Studies on costs, antibiotic use, length of stay, and mortality were included.

Results: 18 studies met inclusion criteria. 13 (72%) reported decreased costs after ASP implementation, with net savings of up to $12,829 USD per patient. All studies showed reduced antibiotic use, especially carbapenems. 8 (44%) found shorter lengths of stay and 10 (56%) reported lower mortality rates with ASPs.

Conclusions: ASPs improve clinical outcomes and reduce costs and antibiotic resistance in Asian hospitals. More research is needed on ASP knowledge and implementation in outpatient, primary, and secondary care settings.

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INTRODUCTION:

Antibiotic resistance is a worldwide threat. Multi-drug resistant bacteria are gaining importance, as they are becoming the source of infections in all patients of all age groups and causing deaths. According to CDC, 23000 deaths occur in the USA per year due to infections caused by MDR[(1)]. Antibiotic stewardship program is the best way to supervise the usage of already present antibiotics, other ways to kill bacteria, and to develop alternatives. WHO has explained the requirement to involve professionals, civil society, and multiple organizations, to consider the local factors that drive substandard use in different

healthcare settings[2]. Guidelines and recommendations for the proper implementation of ASPs have already been published. The objective is to make a systematic review to update, evaluate, and broadly summarize the clinical and economic impact of ASPs including the work on pediatric patients in Asia.

ASP aims to improve patient clinical outcomes, to decrease antimicrobial resistance and healthcare cost by promoting fair use of antibiotics. Some core elements of ASP include leadership commitment, physicians check, medical expertise, and education of doctors and patients. ASP may require extra sources, like hospital personnel as well as equipment so that it can be effective. The costs related to these extra sources can be a potential hindrance where ASP is not implemented yet.

MATERIALS AND METHODS:

The Prisma checklist was used as a protocol to conduct this systematic review. The inclusion criteria were articles from the last 5 years (2017-2021), articles with quantitative statistics, grey literature and published articles, and full-length articles only. The exclusion criteria were articles on outdoor/ community infections, non-English articles, articles on antifungals / antivirals, animal/ agriculture articles, and studies from non-Asiancountries.

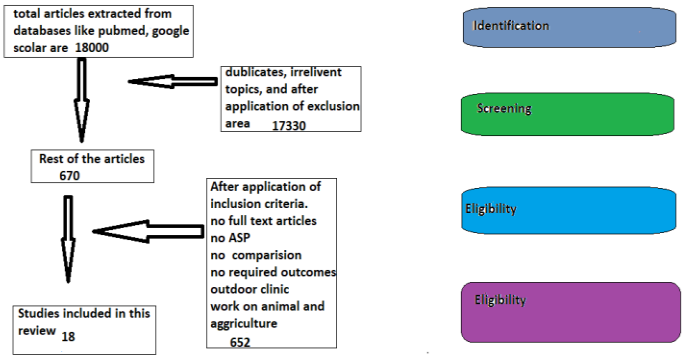
The information sources searched were Google Scholar, PubMed, and PakMediNet on 15-6-2021. Boolean operators were used in the search strategy with keywords including "antibiotic stewardship program", "Asia", "antimicrobial consumption", and "cost". Additional searches used the terms "ASP ANDmortality rate" and "ASP AND length of hospital stay". After searching the databases, 18,000 articles appearedinitially. Applying filters and exclusions left 670 articles, and after applying inclusion criteria and other factors, 18 total studies were selected for review.

Data collected from each study included the year, country, study design, and outcomes in the form of pre and post-ASP implementation. The outcomes gathered were cost, length of hospital stay, antibiotic consumption, duration of therapy, and mortality rate. Statistical significance such as p-values and confidence intervals were noted when provided.

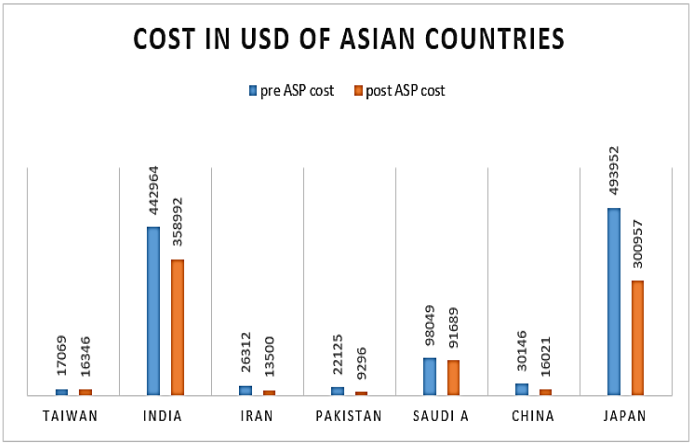
RESULTS:

This review is done by taking the articles of the last 5 years. A total of 18000 articles were extracted from different databases which are google scholar, PubMed, and PakMedinet. After removing duplicate, irrelevant articles, and applying inclusion and exclusion criteria, articles which are taken for review are 18. Cost is estimated by almost 13 out of 18 (72%) articles (1,2,3,4,5,7,8,10,11,12,13,14,18). All the articles studied (100%) give statistics about antimicrobial consumption mostly in the form of daily defined doses per 1000 patients. Antibiotic consumption differs according to the antibiotics like consumption of colistin decreases post-implementation of ASP while linezolid consumption increases. Length of stay is explained in almost 8 out of 18 (44%) studies (3,4,6,11,12,14,15,16). The mortality rate is studied in 10 out of 18 studies which is 58% (1,3,4,5,10,-12,13,14,15,16). 2 out of 18 studies give information about the Clostridium difficult infection. (4,18). 12 out of 18 studies give information on more than two

variables. 2 studies compare the outcomes in pediatrics, showing a decreasing trend in cost, length of stay, and infection rate. We did this review to get the quantitative results of a total of 18 studies which are from Asian countries, between 2017- 2021.

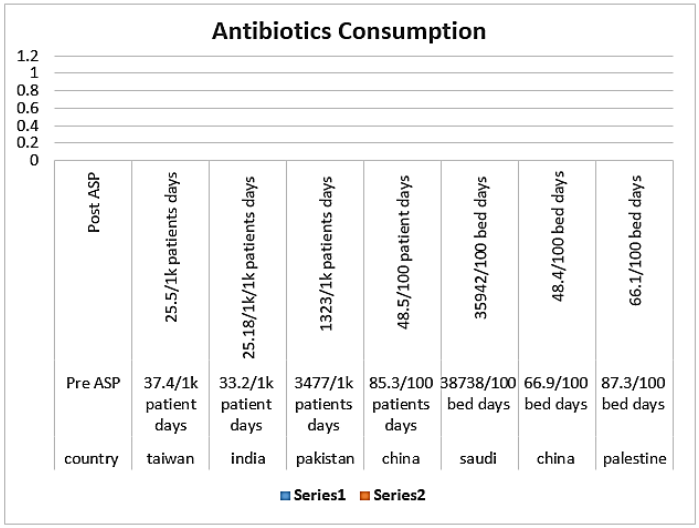


13 studies explained the difference in cost before and after the implementation of the antibiotic stewardship program in indoor patients between 2017-2021. Almost all the studies give the information, showing the prominent decrease in cost after the application of the antibiotic stewardship program. A study done in Pakistan in 2018 showed cost in US$ before ASP was 22125UD$ decreased to 9296US$, and there is a net saving of 12829US$ after the implementation of ASP (5). This cost reduction is due to the decreased usage of antibiotics, early de-escalation of antibiotics, and switch from IV to oral regimen.

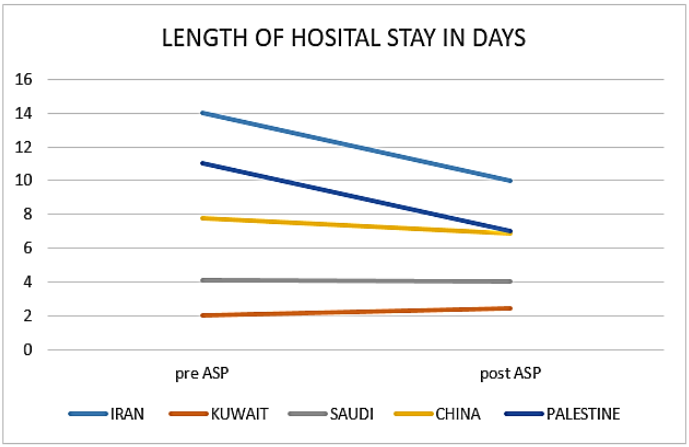


Consumption of the antibiotic is explained in all 18 studies. Consumption of different antibiotics is studied in different studies. One antibiotic is carbapenem and its group of antibiotics are observed in almost all studies. There is a strong reduction in antibiotic consumption after the ASP. A study Education of physicians, pharmacists, and patients is the tool used to make awareness regarding the benefits of judicious usage of antibiotics. In some studies, a multidisciplinary team is formed to check and teach about the different aspects of ASP which are related to antibiotic consumption, on a regular or weakly basis. An audit and feedback strategy is mostly used to do the follow-up. Consumption of antibiotics is mostly given in daily defined doses per 1000 patient days. One study provides consumption in the form of days of therapy as an interquartile range and some give percentage data to show a decreased usage of antibiotics.

In the above-given chart, the results of antibiotic consumption of seven different studies are combined and compared (1,3,5,8,10,14,15). This chart mentions the improvement in antibiotic consumption after the implementation of the antibiotic stewardship program.



Seven out of 18 studies mentioned the length of hospital stay in days and 9 studies provide information regarding the mortality rate. The result we assess in this systematic review is the decrease in length of hospital stay and mortality rate, but not much significant. Length of stay is somehow related to cost as decreased stay in hospital will preserve resources and save money.



In the above-shown chart, it can be seen that the length of hospital stays of the patients decreased after the implementation of the antibiotic stewardship program (3,6,12,14,15).

The infection of clostridium defficile is an infection that is caused by excessive exposure to the antibiotic. 2 out of 18 studies provide information regarding pseudomembranous colitis (4,18). According to studies, there is a decrease in the chances of having clostridium difficile infection after ASP.

DISCUSSION:

This systematic review of 18 recent studies from Asia Found ASPs consistently improved clinical and economic outcomes in hospitalized patients. Cost savings ranged from $1,000 to $12,000 per patient (1-5,7,8,10-14,18]), likely due to reduced antibiotic use and shorter lengths of stay (3,4,6,11-15). Mortality also decreased with ASPs in most studies (1,3-5,10,12-16). The reductions in antibiotic use align with findings from systematic reviews in the US and Europe that ASPs can decrease antibiotic consumption by 22-36% (19,20).

There was some heterogeneity in study settings and methods. Most focused on adult populations and carbapenem use, while only two examined pediatric ICUs (6,9). The sustainability and long-term impacts of ASPs need further study, as most follow-up periods were less than 2 years. Additionally, the optimal personnel and interventions for ASPs in low-resource settings need to be determined.

Limitations of this review include the focus on recent studies (past 5 years) and English language articles only, which restricts generalizability. Publication bias toward positive findings may have affected results. The quality of included studies was not assessed. Outpatient and community settings were not addressed. Most studies centered on adult populations and carbapenem use, thus findings may not apply to children or overall antibiotic use. Follow-up periods were limited, with most <2 years, reducing conclusions on long-term ASP impacts. While demonstrating ASP benefits in Asia, high-quality research in broader populations and settings is still needed to optimize implementation as part of comprehensive antimicrobial stewardship globally.

CONCLUSION:

In this systematic review, it is concluded that there is a strong reduction in cost per patient in the indoor patient department. A significant amount of money can be saved after the implementation of ASP. After ASP

mortality rate decreases as well as the length of hospital stay. It helps the state economically as individual institutions to make a better policy. Patients will improve physically as well as mentally. More research work is required on: the knowledge, attitude, and practice of ASP among doctors and the community, in addition, to the education of ASP among medical personnel, community, ASP implementation in outdoor tertiary care hospitals, in primary and secondary healthcare units.

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