IJIMM, Volume 3, Issue 4, 2025 ISSN: 2995-5319
http://medicaljournals.eu/index.php/IJIMM/issue/view/3

INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Bacteriological and Antibiotic-Resistant Features of Respiratory Infections in Children

Madinakhon Mo'minova Abdulkhaq qizi

Assistant professor at the department of microbiology, virology and immunology, Tashkent medical academy, e-mail; madinaxon9898@icloud.com

Abstract: In children, viral pathogens are more likely than in adults to cause respiratory tract infections (RTI). Compared to adults with RTI, surprisingly little is known about the usage of antibiotics in children. In order to prioritize the target age group for antibiotic stewardship initiatives, this prospective study sought to identify antibiotic overuse in children and adults with RTI using an expert panel reference standard. As a result, research on host indicators that could distinguish between bacterial and non-bacterial infections is gaining momentum. A significant worldwide public health issue is antibiotic resistance in common respiratory infection-causing bacteria, including Moraxella catarrhalis, Haemophilus influenzae and Streptococcus pneumoniae. Whether or whether antibiotics are medically necessary for a certain ailment, their use leads to the emergence of resistant microorganisms. Members of the American Academy of Pediatrics (AAP) and the CDC recently released guidelines for the prudent use of antibiotics in common pediatric respiratory infections, such as tonsillopharyngitis, sinusitis, otitis media, and the common cold, in an effort to slow the spread of drug-resistant bacteria. The CDC/AAP guidelines for treating these conditions are reviewed in this article, along with the findings of clinical practice studies that attempted to enhance the prudent use of antibiotics. The significant misuse of antibiotics in RTI patients is confirmed by this worldwide prospective investigation. Children are more likely to have a viral infection, whereas adults with viral RTI are more likely to abuse antibiotics. All of these results point to the necessity of efficient measures to reduce antibiotic misuse in RTI patients of all ages.

Keywords: Use of antibiotics, infectious diseases, pulmonary disorders, and respiratory tract infections, Moraxella catarrhalis, Haemophilus influenza, Streptococcus pneumoniae.

Introduction. One of the most common reasons people attend the emergency department (ED) is acute respiratory tract infections (RTIs), which are frequently brought on by viral infections. Studies based on national statistics indicate that the issue of antibiotic misuse in RTI is most prevalent in adults, despite the fact that viral infections are more common in children. Unfortunately, using clinical judgment alone to distinguish between bacterial and viral illnesses is frequently impossible. Antibiotic resistance is becoming more common as a result of antibiotic misuse. Every year, 25,000 individuals in Europe pass away from diseases caused by bacteria resistant to antibiotics, which is expected to cost €1.5 billion [1,2,3,4]. As a result, research into host indicators that might distinguish bacterial infections from non-bacterial ones is accelerating. Based on novel host- or pathogen-related biomarkers, a prospective, global study called the "TAILORED Treatment" (TTT) project was created to create a multi-parametric model for differentiating between bacterial and viral infections. This study used an expert panel reference standard to diagnose each patient as there isn't a gold standard for diagnosing bacterial infections. The majority of research assessing antibiotic misuse rates uses national datasets and uses broad codes, like the International Classification of Diseases, to categorize diseases. Contradictory analysis may arise from the application of recommendations for evaluating antibiotic usage [5,6,7]. One benefit of using an expert panel as the reference standard is that it allows for more accurate percentages of antibiotic overuse by examining each patient's unique results (such as bacterial or viral illness). Using an expert panel reference standard, the current prospective investigation seeks to identify antibiotic overuse in children and adults with RTI. The analysis of new diagnostic techniques to distinguish between bacterial and viral infections will be greatly aided by this study [7-

11]. Globally, ARTIs caused over 2.38 million fatalities in 2016. According to estimates, AMR causes 25,000 deaths in the EU each year, with societal expenditures of about 1.5 billion euros as a result. AMR is predicted to kill about 10 million people worldwide each year by 2050, with 390,000 Europeans and significantly higher percentages of Asian (4,730,000) and African (4,140,000) populations expected to be impacted. Furthermore, it has been projected that common antibiotic treatments would no longer be effective, which would make infections more challenging to manage and treat [12-16]. New strategies are required for the future because of the increasing prevalence of ARTIs and the growing rates of AMR. The idea of "prehabilitation," which includes immunonutrition, may be crucial in preventing and counteracting RTIs if they do occur. The term "interventions that can help to improve patient's health in advance of being exposed to a physiological stressor so they are then better able to cope with that stress" is another accurate definition of prehabilitation. The potential use of immunonutrition as a useful tool in traditional medicine is explained in this narrative mini-review. It focuses on vitamin D and ARTIs, for which there is growing evidence [17-21].

The main purpose of the presented analytical manuscript is to conduct a brief review of the literature on the bacteriological and antibiotic-resistant properties of respiratory infections in children.

The bacterial isolates' profile of antimicrobial resistance. Amoxicillin and ampicillin were the antimicrobial agents with the highest level of resistance. Ciprofloxacin, ceftazidime, piperacillin-tazobactam, and cephalexin also showed high levels of resistance. The majority of the antibiotics used, including cephalexin (100.0%), piperacillin-tazobactam (100.0%), ciprofloxacin (97.5%), and ceftazidime (80.0%), were highly resistant to Pseudomonas species. However, it showed low levels of resistance to gentamicin (7.0%), cefuroxime (6.0%), and amikacin (0.0%). In contrast to gentamicin (0.0%), amikacin (2.0%), and cefuroxime (14.2%), Klebsiella species exhibited greater resistance to cephalexin (94.0%), ciprofloxacin (92.0%), piperacillin-tazobactam (84.0%), and ceftazidime (78.8%) [1,2,5,8,9]. The isolates of Streptococcus pneumoniae showed low resistance to gentamicin (0.0%), amikacin (6.0%), and cefuroxime (10.0%), but high resistance to piperacillin-tazobactam (100.0%), cephalexin (80.0%), and ceftazidime (70.0%). The isolates of Streptococcus pyogenes showed minimal resistance to gentamicin (0.0%), amikacin (0.0%), and cefuroxime (0.0%), and significant resistance to ciprofloxacin (100.0%), ceftazidime (91.7%), and cephalexin (83.3%). The isolates of Staphylococcus aureus showed the lowest resistance to gentamicin (0.0%), amikacin (0.0%), and cefuroxime (0.0%), but the highest resistance to ciprofloxacin (92.0%), ceftazidime (89.0%), and piperacillin-tazobactam (67.0%). Isolates in mixed infections showed 100.0% resistance to piperacillin-tazobactam, ceftazidime, and ciprofloxacin [11,12,13,14,15].

Immunity, infection, and nutrition. There are many different ways that nutrients promote the immune system's function, and a healthy immunological response depends on having a sufficient and balanced supply of nutrients. Innate responses, the body's early defenses, and adaptive responses, which create immunological memory, make up the immune system, which defends the body against infectious invaders. Immunity, infection, and nutrition are known to be correlated in both directions, with modifications to one having an effect on the others. Every stage of the human immune response is influenced and supported by micronutrients, which include vitamins and minerals. Consequently, immunosuppression and increased vulnerability might arise from deficits in one or more micronutrients that impact both innate and adaptive immunity [7-14].

About half of all oral antibiotic prescriptions in the UK are for upper and lower respiratory tract infections, which are among the most prevalent infections worldwide. An international issue that is growing in importance is the overuse of antibiotics and the rise of "superbugs" that are immune to their effects. In light of this, there is growing interest in the possible use of immunonutrition as a form of "prehabilitation" to combat bacterial infections and lessen an excessive dependence on antibiotics [15-18]. With an emphasis on vitamin D, this narrative mini-review provides an overview of the state of the art regarding the functions of specific nutrients in regulating immune function. Since vitamin D supplements seem to lower the incidence of acute respiratory tract infections, they may be useful in lowering the overuse of antibiotics. To investigate this area further, funding for top-notch experiments is required [19-24]. In light of these findings, recommendations for vitamin D consumption should

take immune function into account in addition to bone, dental, and muscle health. A population with higher vitamin D intake would have fewer illnesses, infections that are less severe, and a lower need for antibiotics. The designs of the RCTs that make up the present body of data vary greatly, with notable variations in the amount of vitamin D administered, the frequency of dosing, and the length of treatment. To elucidate issues of dosage, dosing schedule, and the precise association between vitamin D status and immunological and respiratory health in various demographic groups, including older adults and persons of diverse ethnicities, further clinical studies and meta-analytical techniques are therefore necessary [5-17].

Children's respiratory illnesses are frequently treated needlessly with antibiotics. Many viral illnesses in children are misdiagnosed as bacterial infections, which puts them at risk of receiving unnecessary antibiotic treatment. According to a recent Karolinska Institutet thesis on pediatric respiratory infections, viruses are more frequently responsible for severe respiratory infections than previously thought. It is hoped that the study will lead to new, more effective medications and diagnostic procedures, as well as a decrease in the use of antibiotics [20-24]. Doctoral student Samuel Rhedin discovered that viruses are a more frequent cause of respiratory infections than previously believed by comparing the viral flora of healthy children at child health centers with children receiving treatment for severe respiratory infections. In order to aid in the creation of more potent remedies for viral diseases, he also plotted the prevalence of various virus types. Samuel Rhedin, a PhD student and physician at the Department of Medicine at Karolinska Institutet in Solna, says, "Our results suggest that we need better treatments for viruses." They can assist in providing the pharmaceutical sector with the appropriate emphasis for the creation of novel antiviral medications. Parents may also be better informed about the condition's prognosis and transmissibility if they know which virus their child has [3-11].

Discussion. Clinicians find it challenging to treat respiratory infections because of the worrisome rise in resistance of respiratory bacterial pathogens to widely used medicines. This has resulted in the rise of infections brought on by bacteria that are resistant to antibiotics, which are linked to more treatment failures, hospital stays, significant health care costs, and fatalities. Amoxicillin and ampicillin were shown to have the greatest rates of resistance among the antibiotics examined in the study. Other antibiotics include ceftazidime, piperacillin-tazobactam, cephalexin, and ciprofloxacin all showed resistance levels [1,2,3,7,8,9]. According to a study done in Kenya, 72.0% of Gram-negative bacteria were found to be resistant to amoxicillin. Resistance to the same class of antimicrobial drugs was observed in an Iranian investigation. A high degree of microbiological resistance to ampicillin was reported by Imani. Their ability to curb the increase in antibiotic resistance depends on their ability to implement the CDC/AAP principles. The findings of clinical practice studies demonstrate that tenacity and education can result in the responsible administration of antibiotic therapy for pediatric respiratory infections. More comprehensive educational and behavior modification programs are needed to stop the overprescription of antibiotics and to slow the still-increasing problem of bacterial resistance. The isolates that were obtained shown resistance to common antibiotics such ampicillin, amoxicillin, ciprofloxacin, piperacillin, ceftazidime, piperacillin-tazobactam, and cephalexin. Bacterial respiratory infections were highly prevalent in the study area [11,12,13,14,15]. Therefore, in order to control respiratory infections in the study area, antimicrobial resistance needs to be regularly evaluated. The upper respiratory tract microbiome of children contained less AMR genes and gene classes than those of adults. In spite of this, more than half of the kids had detectable resistance genes, and kids under the age of two had more AMR genes than other kids. Beta-lactams are the most often prescribed antibiotics for children, and nearly half of the youngsters possessed resistance genes to these drugs. According to these results, even youngsters frequently have AMR organisms in their airways, and it is crucial to keep working to lower the burden of AMR in this group [18-22].

Conclusions. The application of the CDC/AAP principles is essential to their ability to control the rise in antibiotic resistance. Clinical practice study results show that perseverance and education can lead to the prudent use of antibiotic therapy for children respiratory infections. To prevent the

overprescription of antibiotics and to slow the still-increasing issue of bacterial resistance, more extensive educational and behavior change initiatives are required.

The study area had a high prevalence of bacterial respiratory infections, and the isolates that were acquired shown resistance to popular antibiotics such ampicillin, amoxicillin, ciprofloxacin, piperacillin, ceftazidime, piperacillin-tazobactam, and cephalexin. Antimicrobial resistance must thus be continuously monitored in order to manage respiratory infections in the research area.

Compared to adults, children's upper respiratory tract microbiome had less AMR genes and gene classes. In spite of this, children ages 2 and under had more AMR genes than other children, and more than half of the toddlers had detectable resistance genes. Resistance genes to beta-lactams, the most commonly given antibiotics for children, were present in nearly half of the youngsters. These results imply that even in children, AMR organisms are frequently found in the airways, and that ongoing efforts to lessen the burden of AMR in this population are crucial.

References.

1. an Houten CB, Cohen A, Engelhard D, Hays JP, Karlsson R, Moore E, et al. Antibiotic misuse in respiratory tract infections in children and adults-a prospective, multicentre study (TAILORED Treatment). Eur J Clin Microbiol Infect Dis. 2019 Mar;38(3):505-514. doi: 10.1007/s10096-018-03454-2.
2. Jacobs RF. Judicious use of antibiotics for common pediatric respiratory infections. Pediatr Infect Dis J. 2000 Sep;19(9):938-43. doi: 10.1097/00006454-200009000-00038.
3. Yodgorova N. T., Fayzullaeva Z. R., Sh M. F. Changes in the intestinal microflora in the baby and the ways of their correction //World Bulletin of Public Health. – 2022. – Т. 17. – С. 37-41.
4. Тахир Тухтаевич Адилбеков, Зулайхо Алимжоновна Маматова, Замира Рахматовна Файзулаева, Сайёра Саъдуллаевна Шукурова, Феруза Шоназаровна Тухтаева. Влияние физической нагрузки на систему" двигательное окончание-мышечное волокно" Молодой ученый, 2020, 9, 75-77.
5. Sadullaeva S., Fayzullaeva Z., Nazirova D. Numerical Analysis of Doubly Nonlinear Reaction-Diffusion System with Distributed Parameters //2020 4th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT). – IEEE, 2020. – С. 1-3.
6. Fayzullaeva Z. R., Yodgorova N. Bacteriological Methods Determination of the Respiratory Way in Chronic Infection //Eurasian Medical Research Periodical. – 2022. – Т. 15. – С. 47-50.
7. Файзуллаева З. и др. Фармакологические и микробиологические аспекты комплексного соединения никеля с пиридоксином и амидом никотиновой кислоты //Современные проблемы науки и образования. – 2016. – №. 2. – С. 4-4.
8. Файзуллаева З. Р. Иммунологические аспекты сахарного диабета при гнойновоспалительном заболевании: научное издание //Инфекция, иммунитет и фармакология. 2004; 1. – 2004. – Т. 158.
9. Файзуллаева З. Р. ФШ Маматмусаева Онкоген вирусларнинг хусусиятлари вестник тма2022, сони 10, 43-46http //repository. tma. uz/xmlui/handle/1/5642. – 1990.
10. Файзуллаева, З. Р., & Эгамбердиева, А. Р. (2022). Сравнительная оценка дисбактериоз кишечника у беременных женщин. Soatova MS, Karimova II, & Fayzullaeva ZR. (2021).
11. Changes in the mouth microbiocionosis of 5-6 year old children with dental caries. Archive of Conferences, 23(1), 243-248.
    Retrieved from https://conferencepublication.com/index.php/aoc/article/view/1042
12. Противомикробная активность экстракта дикорастущего лекарственного растения.Portulaca oleracea L. // Universum: химия и биология : электрон. научн. журн. Каюмов Х.Ю. [и др.]. 2020. 12(78). URL: https://7universum.com/ru/nature/archive/item/10995

13. Tuychiev, L. N., Nuruzova, Z. A., Mamatmusayeva, F. S., Yodgorova, N. T., & Fayzullayeva, Z. R. (2021). Microscopic composition of bile in children with convalescents of viral hepatitis" A" and" C".

14. Зухра Абдукадировна Нуврузова, Замира Рахматовна Файзуллаева, Багдагул Скендербековна Сейфуллаева. Ошқозон саратон касаллигининг келиб чиқишида эпштейн–барр вирусининг аҳамиятини ўрганиш. Academic research in educational sciences. 2021, 2(5), 855-862.

15. ИБ Шерматова, МГ Исмаилова, ЗР Файзуллаева. Антибактериальные свойства наночастиц серебра, полученных методом «ЗЕЛЕНОГО СИНТЕЗА». Фармацевтична наука та практика: проблеми, досягнення, Ф 24 перспективи розвитку= Pharmaceutical science and practice: problems, achievements, prospects: матер. II наук.-практ. інтернет-конф. з міжнар. участю, м. Харків, 27 квітня 2018 р./ред. кол.: ОФ Пімінов та ін.–Х.: НФаУ, 2018.–464 с. 390.

16. Fayzullayeva, Z., Akbar , A., & Abdusattarov, A. (2024). Dempfirlash hadiga, o‘zgaruvchan zichlikka ega diffuziya jarayonlarini modellashtirish: Dempfirlash hadiga, o‘zgaruvchan zichlikka ega diffuziya jarayonlarini modellashtirish. Modern problems and prospects of applied mathematics, 1(01). Retrieved from https://ojs.qarshidu.uz/index.php/mp/article/view/433

17. Fayzullayeva Zamira Raxmatovna, Yodgorova Nodira Turgunbaevna, Izzatullaeva Shahlokhon Inoyatullokhon Qizi, Tojalieva Munira Bakhodir Qizi. Microbiological methods for determination of respiratory tract microorganisms in chronic infection. Science and innovation. 2024. 3, Special Issue 54, 160-163.

18. ZR Fayzullaeva, L Sh Eshbekova. Modern methods of checking the characteristics of oncoviruses. Journal of healthcare and life-science research. 2023/12/16, 2(12), 132-136.

19. Mamatmusaeva, F. S., Nuruzova, Z. A., Aliev, S. R., Fayzullaeva, Z. R., & Yodgorova, N. T. (2023). Microscopic composition of bile in convalescent of viral hepatitis" A"," B" and" C" of children. Onomázein, (62 (2023): December), 1284-1295.

20. ЗР Файзуллаева. Роль патологии кишечника при беременности женщин. ББК 52.64 Авторский знак М59 Организаторы XI Всероссийской заочной научно-практической конференции с международным участием «Микробиология в современной медицине» Федеральное государственное бюджетное образовательное. 82.

21. НТ Ёдгорова, ЗР Файзуллаева, ФШ Маматмусаева. Оценка микрофлоры кишечника у грудничков при естественном и искусственном питании. ББК 52.64 я4 авторский знак М59 Организаторы X Всероссийской заочной научно-практической конференции с международным участием, посвящённой 100-летию со дня образования государственной санитарно-эпидемиологической службы России «Микробиология в. 2022, 39.

22. ЗР Файзуллаева, НТ Ёдгорова, ФШ Маматмусаева. Иммунологический и микробный ландшафт раны у больных гнойной инфекцией в состоянии сахарного диабета. ББК 52.64 я4 авторский знак М59 Организаторы X Всероссийской заочной научно-практической конференции с международным участием, посвящённой 100-летию со дня образования государственной санитарно-эпидемиологической службы России «Микробиология в. 2022, 100.

23. Sadullaeva, Sh, and Z. Fayzullaeva. "Investigation on Self-Similar Analysis of the Problem Biological Population Kolmogorov-Fisher Type System." International Journal on Orange Technologies, vol. 3, no. 11, 2021, pp. 20-24, doi:10.31149/ijot.v3i11.2371.

24. Victoria T Chu, Katrina Kalantar, Eran Mick et al. Antimicrobial Resistance in the Upper Respiratory Tract of Children Compared with Adults, Journal of the Pediatric Infectious Diseases Society, Volume 12, Issue Supplement_1, November 2023, Pages S2–S3, https://doi.org/10.1093/jpids/piad070.005