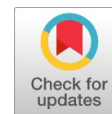


# A Survey of the Awareness and Practices of Antibiotic use Among College Undergraduates and Graduates in Latakia

Rita Morkous, Ayat Abboud



**Abstract:** Antibiotic resistance has become a global health crisis, posing a significant threat to our ability to treat bacterial infections. Over the years, the overuse and misuse of antibiotics in both humans and animals have contributed to the development of antibiotic-resistant bacteria. This leads to longer and more complicated treatment courses, increased healthcare costs, and in some cases untreatable infections. In this study, a survey was conducted on antibiotic use among college undergraduates and graduates in Latakia. The age of 42.2% of participants was 20–25 years. More than half of the participants were male (55.9%). Most responses were from college undergraduates 51%, either of final-year students or graduates. Most of them had used antibiotics with prescriptions. The highest rate of antibiotic use was for sore throat treatment (47.1%). Most participants completed the antibiotic courses and their symptoms improved (70.6%). Black and red pills remained effective for most patients (67.6%). 68.6% of the participants would consult a doctor if symptoms did not improve after taking antibiotics. 62.7% of the participants didn't give antibiotics to a family member when they were sick. 52.9% of the participants reserve antibiotics for use when necessary. Half of the participants would take the leftover antibiotics in case of respiratory diseases. The results didn't show a good level of knowledge about antibiotic use among college undergraduates and graduates in Latakia. This study encourages the improvement of the public knowledge and their attitudes towards the appropriate use of antibiotics.

**Keywords:** Survey, Antibiotics, Resistance, Awareness, Practice.

## I. INTRODUCTION

The rise of antibiotic resistance poses a grave global threat to public health. In recent years, we have witnessed a dramatic surge in the number of antibiotic-resistant bacteria, making it increasingly difficult for healthcare professionals to effectively treat bacterial infections [1]-[7][35]. This problem is not confined to a specific country or region; it is a worldwide concern that demands immediate attention [8]-[13][36]. According to the World Health Organization, antibiotic resistance was the direct cause of 1.27 million

deaths worldwide in 2019 [14].

The consequences of antibiotic resistance are far-reaching and alarming. This not only prolongs the illness and increases the risk of complications, but it also leads to higher healthcare costs. In some unfortunate cases, we are faced with infections that are resistant to all available antibiotics, leaving individuals without effective treatment options [12]-[24][37]. For example, carbapenems are antibiotics used to treat infections caused by bacteria that are resistant to many antibiotics. Unfortunately, *E coli*, *Klebsiella pneumoniae*, and *Enterobacter cloacae* have shown high resistance to carbapenems in recent years [25], [26]. An alarming example of drug-resistant bacteria is *Staphylococcus aureus* which is resistant to methicillin. *S. aureus* is considered the leading bacteria causing deaths due to antibiotic resistance in 34 countries [27], [28]. The rapid spread of antibiotic resistance is largely attributed to the misuse and overuse of antibiotics. While these drugs have undoubtedly saved countless lives, their inappropriate use, such as taking antibiotics to treat viral infections or not completing the full course of treatment, contributes to the development of resistance. Additionally, the widespread use of antibiotics in agricultural practices, particularly in animal husbandry, further increases this problem.

Developing strategies to address antibiotic resistance is crucial in combating this global health crisis. One of the key areas that needs attention is education. It is imperative to raise awareness among health professionals, patients, and the general public about the appropriate use of antibiotics. This includes educating them on the importance of completing the full course of antibiotics, not sharing antibiotics with others, and not pressuring healthcare providers to prescribe antibiotics for viral infections. Various studies and various organizations conducted surveys to evaluate the knowledge, awareness, and practices of the public of antibiotic use [29]-[33]. Overall, these surveys showed a poor understanding of appropriate antibiotic use. A study performed by Davis *et al.* demonstrated that although 89% of patients correctly believed that antibiotics were effective in treating bacterial infections from bacteria, 53% incorrectly believed that antibiotics were effective in treating viral infections [8]. In this study, a questionnaire on antibiotic use was conducted to demonstrate knowledge, awareness, and practices related to antibiotic use among college undergraduates and graduates in Latakia.

Manuscript received on 07 March 2024 | Revised Manuscript received on 18 March 2024 | Manuscript Accepted on 15 April 2024 | Manuscript published on 30 April 2024.

\*Correspondence Author(s)

**Rita Morkous**, Student, Faculty of Pharmacy, University of Tishreen, Latakia, Syria. Email: [ritamorkos123@gmail.com](mailto:ritamorkos123@gmail.com), ORCID ID: 0009-0007-9067-5288

**Ayat Abboud\***, Department of Medicinal Chemistry and Quality Control, Faculty of Pharmacy, University of Tishreen, Latakia, Syria. Email: [ayatabboud@tishreen.edu.sy](mailto:ayatabboud@tishreen.edu.sy), ORCID ID: 0000-0001-8387-3875

© The Authors. Published by Lattice Science Publication (LSP). This is an open access article under the CC-BY\*999-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

II. METHODS

The study was conducted from September 2023 to February 2024 using an online survey on Google Forms. The study participants were students and graduates of Latakia universities and institutes. The online questionnaire was distributed via social networks (Facebook and WhatsApp). A total of 200 complete responses were collected.

The questionnaire was divided into three sections: demographics, practices, and knowledge of participants related to antibiotic use.

Participant data in the questionnaire were based on age, and educational level: institute students, and college undergraduates. or graduated and place of residence: rural or urban. Regarding age, participants were divided into four groups: >20 years old, 20-25 years old, 26-30 years old, and >30 years old. Participants were asked whether they were attending or graduating from medical or non-medical faculty and their study year: preparatory, first year, second year, third year, fourth year, or fifth year.

The second part of the questionnaire related to the practices of participants about antibiotic use. We asked if the participants used antibiotics self-treatment or only under a doctor's prescription. The participant was to precise the reasons for antibiotic use: cough, cold, flu, sore throat, or only for prevention, the doctor diagnoses the illness and prescribes the antibiotic. We asked how the participant took the antibiotics: finishing the treatment course and the symptoms disappeared, finishing the treatment course and the symptoms stayed, not finishing the treatment course and the symptoms disappeared. Another question was asked to the participants about amoxicillin capsules, known to patients in Syria as the red and black pill. The answer to this question was yes, I benefit when I take it with a short period of illness, or no, I benefit when I take it with a long period of illness. The participants were also asked about what they would do if their symptoms did not improve after taking the antibiotic: see a doctor, see a pharmacist, browse the Internet, take advice from family and relatives, or not ask anyone. Other questions included: if someone in the family of the participant gets sick, does he usually give them antibiotics? Does he usually keep a stock of antibiotics at home for emergency use? and does he use the remaining antibiotics for respiratory diseases?

Participants' knowledge about antibiotics was assessed through a set of questions with options: yes, no, or I don't know. The questions included: for any of the following diseases are antibiotics effective? do antibiotics kill bacteria? can antibiotics be used to treat viral diseases? do antibiotics treat all infectious diseases? can excessive use of antibiotics cause antibiotic resistance? can taking antibiotics cause allergic reactions? will the effectiveness of the antibiotic decrease if it is stopped before the treatment course is finished? The participants were asked if they would take antibiotics to get better more quickly when they got colds. The participant expects his doctor to prescribe antibiotics if he has symptoms of the common cold.

III. RESULTS

A. Demographic Data of Participants

Table-I: Summary of Demographic Data of Participants in the Survey

Demographic Data	
Characteristics	Percentages % (Number)
<b>1. Gender</b>	
Female	44.10%
Male	55.90%
<b>2. Age (Years)</b>	
>20	7.80%
21-25	42.20%
26-30	32.40%
>30	17.60%
<b>3. Residence</b>	
City	77.50%
Village	22.50%
<b>4. Study</b>	
College Undergraduates	51%
Institute Student	5.90%
Graduate	28.50%
Higher Education Student	8.80%
Higher Education Graduate	5.90%
<b>5. Academic Year</b>	
<b>Preparatory</b>	6.90%
First	11.80%
Second	0%
Third	8.80%
Fourth	14.70%
Fifth	12.70%
Graduate	36.30%
<b>6. College</b>	
Medical	28.40%
Non-Medical	12.70%

A total of 102 responses were collected in the study. Demographic characteristics of study participants are summarized in Table-I. Most participants were between 20 and 25 years old, representing 42.2%. The number of participants, based on gender, was 55.9% males and 44.1% females. Most of the participants live in the city 77.5%.

When asked about academic level, most of the answers were from college undergraduates 51%, which is the group that interests us, so the questionnaire was directed to them to highlight the problem of antibiotic resistance and how to reduce it. Most of the answers are either for final-year students or graduates, most of whom are medical college students (so it is assumed that they know about the problem of antibiotic resistance and are also trying to reduce it in their surroundings at least).

B. Practices Data of Participants

Table-II: Summary of Practice Data of Participants in the Survey

Percentages %	
<b>1. Antibiotic usage</b>	
Self-Treatment	
Under Doctor Prescription	
<b>2. Reasons for Antibiotic usage</b>	
Cold	45.70%



Cough	20%
Flu	14.30%
Sore Throat	51.40%
Only for Prevention	0%
The Doctor Diagnoses the Illness and Prescribes the Antibiotic	30%
Other Reasons:	
Tonsillitis	1.40%
Sinusitis	1.40%
<b>3. How the Participants Took the Antibiotics</b>	
Finishing the Treatment Course and the Symptoms Disappeared	81.40%
Finishing the Treatment Course and the Symptoms Stayed	5.70%
Not Finishing the Treatment Course and the Symptoms Disappeared	14.30%
<b>4. Usage of Participants of Amoxicillin Capsules, known in Syria as the Red and Black Pill</b>	
Yes, I benefit when I Take it with a Short Period of Illness	31.40%
No, I benefit when I Take it with a Long Period of Illness	68.60%
<b>5. What would they do if their Symptoms did not Improve after Taking the Antibiotic?</b>	
See a doctor	71.40%
See a pharmacist	38.60%
Browse the Internet	4.30%
Take Advice from Family and Relatives	2.90%
Do not ask Anyone	4.30%
<b>6. If Someone in the Family of the Participant Gets Sick, does the Participant usually give them Antibiotics?</b>	
Yes	70%
No	22.90%
I Don't Know	7.10%
<b>7. Does the Participant usually Keep a Stock of Antibiotics at Home for Emergency use?</b>	
Yes	40%
No	58.60%
I don't Know	1.40%
<b>8. Does the Participant use the Remaining Antibiotics for Respiratory Diseases?</b>	
Yes	50%
No	31.40%
I don't Know	18.60%

The answers showed that most participants take antibiotics without a prescription (Table-II). Sore throat accounts for the highest incidence of antibiotic use (51.4%), followed by cold (45.7%). Most participants took the full dose of antibiotics and their symptoms improved (81.4%).

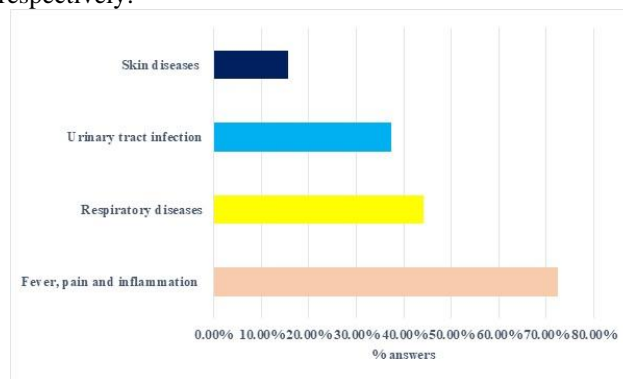
When asked about an antibiotic commonly used in Syria and known under black and red pills: black and red pills were effective for most patients (68.6%), but with a long period of illness. Regarding the question about what the participant would do if his symptoms did not improve after taking antibiotics: most of the participants would go to the doctor then (71.4%).

Most participants gave antibiotics to one of their family when he became ill (70%). Most participants do not keep antibiotics to use when necessary (58.6%). If there are antibiotics remaining, half participants would take them in case of respiratory diseases (50%).

**C. Knowledge Data of Participants**

72.5% of participants answered that antibiotic are effective for the treatment of fever, pain, and inflammation as shown in Fig. 1. 44.1% responded that antibiotic are effective for the treatment of respiratory diseases, while only 37.3% and 15.7% answered that antibiotics are effective for the treatment of fever urinary tract infections and skin diseases

respectively.



**Fig. 1. Responses to the Question: for any of the Following Diseases are Antibiotics Effective?**

A set of questions (with options: yes, no, or I don't know) was used to evaluate participants' knowledge about antibiotics (Table-III). Majority of participants correctly answered that 'antibiotics kill bacteria' (67.6%), excessive use of antibiotics could cause antibiotic resistance (71.6%), taking antibiotics could cause allergic reactions (74.5%), antibiotics cannot be used to treat viral diseases (52.9%), the effectiveness of the antibiotic will decrease if it is stopped before the treatment course is finished (65.7%). Only 33.3% of participants expect to get better more quickly when they get colds if they take antibiotics. Finally, 34.3% of participants expect their doctor to prescribe antibiotics if he has symptoms of the common cold.

**Table-III: Summary of Knowledge Data of Participants in the Survey**

Percentages %	
<b>1. Do Antibiotics Kill Bacteria?</b>	
Yes	67.60%
No	17.60%
I don't know	14.70%
<b>2. Could Antibiotics be used to Treat Viral Diseases?</b>	
Yes	29.40%
No	52.90%
I don't know	17.60%
<b>3. Do Antibiotics Treat all Infectious Diseases?</b>	
Yes	29.40%
No	41.20%
I don't know	29.40%
<b>4. Excessive use of Antibiotics Causes Antibiotic Resistance?</b>	
Yes	71.60%
No	7.80%
I don't know	20.60%
<b>5. Can Taking Antibiotics Cause Allergic Reactions?</b>	
Yes	74.50%
No	7.80%
I don't know	17.60%
<b>6. Will the Effectiveness of the Antibiotic Decreases if it is Stopped before the Treatment Course is Finished?</b>	
Yes	65.70%
No	10.80%
I don't know	23.50%
<b>7. Will the Participants Take Antibiotics to Get Better More Quickly when they Get Colds?</b>	
Yes	33.30%
No	56.90%
I don't know	9.80%





8. Does the Participant Expect his doctor to Prescribe Antibiotics if he has Symptoms of the Common Cold?	
Yes	34.30%
No	48%
I don't know	17.60%

#### IV. DISCUSSION

This study aimed to evaluate the practices and knowledge of antibiotic use among college undergraduates and graduates in Latakia.

The results showed that most participants used antibiotics without a prescription. Sore throat and the common cold are the most commonly reported conditions. These results agree with other results obtained in other surveys [25]-[34]. For example, a survey on knowledge, attitudes, and practices towards antibiotic use was conducted among prospective antibiotic prescribers in Serbia [31]. Results demonstrated that the most common reason for self-treatment with antibiotics reported by all student groups was sore throat. Fortunately, most participants complete the antibiotic treatment courses. Black and red pills (amoxicillin widely used among Syrians. As a result, bacteria can develop resistance to amoxicillin. Feedback shows that this antibiotic is still effective.

Participants not only took antibiotics without a prescription but also gave them to their families. In addition, they also use the remaining antibiotics to treat respiratory diseases. Most participants did not reserve antibiotics for use when needed. Furthermore, the results of the present study are encouraging due to the good level of knowledge about antibiotics.

#### V. CONCLUSION

The results showed that college undergraduates and graduates don't have a good level of knowledge about antibiotic use almost most of them have taken antibiotics without a prescription. Fortunately, they complete the antibiotic treatment courses. The results of our study are encouraging to improve the general public's knowledge and to enhance their attitudes toward the appropriate use of antibiotics.

#### DECLARATION STATEMENT

Funding	No, I did not receive
Conflicts of Interest	No conflicts of interest to the best of our knowledge.
Ethical Approval and Consent to Participate	No, the article does not require ethical approval and consent to participate with evidence.
Availability of Data and Material	Not relevant.
Authors Contributions	All authors have equal participation in this article.

#### REFERENCES

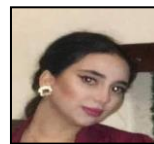
- Ventola CL. The antibiotic resistance crisis: part 1: causes and threats. *P T*. 2015 Apr;40(4):277-83. PMID: 25859123; PMCID: PMC4378521.
- Abushaheen MA, Muzaaheed, Fatani AJ, Alosaimi M, Mansy W, George M, Acharya S, Rathod S, Divakar DD, Jhugroo C, Vellappally S, Khan AA, Shaik J, Jhugroo P. Antimicrobial resistance, mechanisms and its clinical significance. *Dis Mon*. 2020 Jun;66(6):100971. doi: 10.1016/j.disamonth.2020.100971. Epub 2020 Mar 20. PMID: 32201008. <https://doi.org/10.1016/j.disamonth.2020.100971>

- Darby, E.M., Trampari, E., Siasat, P. et al. Molecular mechanisms of antibiotic resistance revisited. *Nat Rev Microbiol* 21, 280–295 (2023). <https://doi.org/10.1038/s41579-022-00820-y>.
- Tang KWK, Millar BC, Moore JE. Antimicrobial Resistance (AMR). *Br J Biomed Sci*. 2023 Jun 28;80:11387. doi: 10.3389/bjbs.2023.11387. PMID: 37448857; PMCID: PMC10336207. <https://doi.org/10.3389/bjbs.2023.11387>
- Chen L, Kumar S, Wu H. A review of current antibiotic resistance and promising antibiotics with novel modes of action to combat antibiotic resistance. *Arch Microbiol*. 2023 Oct 20;205(11):356. doi: 10.1007/s00203-023-03699-2. PMID: 37863957. <https://doi.org/10.1007/s00203-023-03699-2>
- Agyeman WY, Bisht A, Gopinath A, Cheema AH, Chaludiya K, Khalid M, Nwosu M, Konka S, Khan S. A Systematic Review of Antibiotic Resistance Trends and Treatment Options for Hospital-Acquired Multidrug-Resistant Infections. *Cureus*. 2022 Oct 5;14(10):e29956. doi: 10.7759/cureus.29956. PMID: 36381838; PMCID: PMC9635809. <https://doi.org/10.7759/cureus.29956>
- Lucinda J. Bessa, Mona Shaaban, Rustam Aminov. Editorial: Insights in antimicrobials, resistance & chemotherapy: 2022. *Front. Microbiol.*, 19 October 2023 Sec. Antimicrobials, Resistance, and Chemotherapy Volume 14 - 2023 | <https://doi.org/10.3389/fmicb.2023.1310156>
- Davis ME, Liu TL, Taylor YJ, Davidson L, Schmid M, Yates T, Scotton J, Spencer MD. Exploring Patient Awareness and Perceptions of the Appropriate Use of Antibiotics: A Mixed-Methods Study. *Antibiotics (Basel)*. 2017 Oct 31;6(4):23. doi: 10.3390/antibiotics6040023. PMID: 29088074; PMCID: PMC5745466. <https://doi.org/10.3390/antibiotics6040023>
- Abdelazeem M Algammal, Helal F Hetta, Amr Elkesh, Dalal Hussien H Alkhalifah, Wael N Hozzein, Gaber El-Saber Batiha, Nihal El Nahhas & Mahmoud A Mabrok (2020) Methicillin-Resistant Staphylococcus aureus (MRSA): One Health Perspective Approach to the Bacterium Epidemiology, Virulence Factors, Antibiotic-Resistance, and Zoonotic Impact, Infection and Drug Resistance, 13:, 3255-3265, DOI: 10.2147/IDR.S272733. <https://doi.org/10.2147/IDR.S272733>
- Cherny SS, Nevo D, Baraz A, Baruch S, Lewin-Epstein O, Stein GY, Obolski U. Revealing antibiotic cross-resistance patterns in hospitalized patients through Bayesian network modelling. *J Antimicrob Chemother*. 2021 Jan 1;76(1):239-248. doi: 10.1093/jac/dkaa408. Erratum in: *J Antimicrob Chemother*. 2021 Jan 1;76(1):282. PMID: 33020811. <https://doi.org/10.1093/jac/dkaa408>
- Lozano-Huntelman NA, Singh N, Valencia A, Mira P, Sakayan M, Boucher I, Tang S, Brennan K, Gianvecchio C, Fitz-Gibbon S, Yeh P. Evolution of antibiotic cross-resistance and collateral sensitivity in Staphylococcus epidermidis using the mutant prevention concentration and the mutant selection window. *Evol Appl*. 2020 Feb 25;13(4):808-823. doi: 10.1111/eva.12903. PMID: 32211069; PMCID: PMC7086048. <https://doi.org/10.1111/eva.12903>
- Anning, A.S., Baah, E., Buabeng, S.D. et al. Prevalence and antimicrobial resistance patterns of microbes isolated from individuals attending private diagnostic centre in Cape Coast Metropolis of Ghana. *Sci Rep* 12, 14282 (2022). <https://doi.org/10.1038/s41598-022-18595-w>. <https://doi.org/10.1038/s41598-022-18595-w>
- Kathia UM, Munir T, Fateh F, Ahmad A, Amjad A, Afzal MF. Antimicrobial Resistance Patterns: Review of the Antibiogram of a Surgical Unit in a Public Tertiary Care Hospital of Pakistan. *Cureus*. 2020;12(10):e11159. Published 2020 Oct 25. doi:10.7759/cureus.11159/. <https://doi.org/10.7759/cureus.11159>
- Mendelsohn Emma, Ross Noam, Zambrana-Torrel Carlos, Van Boeckel T. P., Laxminarayan Ramanan, Daszak Peter. 2023 Global patterns and correlates in the emergence of antimicrobial resistance in humans. *Proc. R. Soc. B*. 2902023108520231085 <http://doi.org/10.1098/rspb.2023.1085>. <https://doi.org/10.1098/rspb.2023.1085>
- Isbera M, Abbood A, Ibrahim W. Weight and Content Uniformity of Warfarin Sodium Half Tablets. *Research Journal of Pharmacy and Technology*. 2016; 9(3):215-218. doi: 10.5958/0974-360X.2016.00039.1 <https://doi.org/10.5958/0974-360X.2016.00039.1>

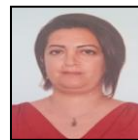


16. Abbood A, Layka R. Weight and content uniformity Study of captopril half-tablets. *Research Journal of Pharmacy and Technology*. 2017;10(6):1621-1626. doi: 10.5958/0974-360X.2017.00285.2. <https://doi.org/10.5958/0974-360X.2017.00285.2>
17. Chbani D, Abbood A, Alkhayer M. Determination of Nitrite and Nitrate Ions levels in some types of processed meats marketed locally. *Research Journal of Pharmacy and Technology*. 2018;11(4):1442-1447. doi: 10.5958/0974-360X.2018.00269.X. <https://doi.org/10.5958/0974-360X.2018.00269.X>
18. Abbood A, Malek Z, Al-Homsh Y, Thallaj N. In vitro Study for Antibiotic resistance of bacteria causing Urinary Tract Infection from Syrian adults. *Research Journal of Pharmacy and Technology*. 2022;15(10):4727-2. doi: 10.52711/0974-360X.2022.00794. <https://doi.org/10.52711/0974-360X.2022.00794>
19. Abbood A, Malek Z, Thallaj N. Antibiotic resistance of urinary tract pathogens in Syrian children. *Research Journal of Pharmacy and Technology*. 2022;15(11):4935-9. doi: 10.52711/0974-360X.2022.00829. <https://doi.org/10.52711/0974-360X.2022.00829>
20. Abbood A. Determination of phenolic content and antioxidant activity of some cosmetic creams available in Syrian market. *Journal of Chemical and Pharmaceutical sciences*. 2018;11:280-3. <https://doi.org/10.30558/jchps.20181104006>
21. Zreka GH, Diab DA, Abboud AY. Determination of Protein and fat oxidation levels in imported infant formula available in Syria. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2016;8:169-72.
22. Abbood A, Optimization of the Imaged cIEF Method for Monitoring the Charge Heterogeneity of Antibody-Maytansine Conjugate, *Journal of Analytical Methods in Chemistry*, 2023, Article ID 8150143, 10 pages. <https://doi.org/10.1155/2023/8150143>
23. ABBOOD A, Monitoring the charge variant profile of antibody-tomaymycin conjugates by icIEF method, *Acta Pharm. Sci.* 2023, 62 (1), 226-239. <https://doi.org/10.23893/1307-2080.APS6215>
24. Abbood A, Aldiab D, HPLC determination of caffeine in some beverages and pharmaceutical dosage forms available in Syrian market, *Journal of Chemical and Pharmaceutical Sciences* 3 (10), 1174-1179
25. Mogasale, V.V., Saldanha, P., Pai, V. et al. A descriptive analysis of antimicrobial resistance patterns of WHO priority pathogens isolated in children from a tertiary care hospital in India. *Sci Rep* 11, 5116 (2021). <https://doi.org/10.1038/s41598-021-84293-8>
26. Elshamy AA, Aboshanab KM. A review on bacterial resistance to carbapenems: epidemiology, detection and treatment options. *Future Sci OA*. 2020;6(3):FSO438. Published 2020 Jan 27. doi:10.2144/fsoa-2019-0098. <https://doi.org/10.2144/fsoa-2019-0098>
27. Antimicrobial Resistance Collaborators. The burden of antimicrobial resistance in the Americas in 2019: a cross-country systematic analysis [published correction appears in *Lancet Reg Health Am*. 2023 Nov 10;28:100632]. *Lancet Reg Health Am*. 2023;25:100561. Published 2023 Aug 8. doi:10.1016/j.lana.2023.100561. <https://doi.org/10.1016/j.lana.2023.100561>
28. Rungelrath V, DeLeo FR. Staphylococcus aureus, Antibiotic Resistance, and the Interaction with Human Neutrophils. *Antioxid Redox Signal*. 2021;34(6):452-470. doi:10.1089/ars.2020.8127. <https://doi.org/10.1089/ars.2020.8127>
29. Zaykova K, Nikolova S, Pancheva R, Serbezova A. A survey of knowledge, attitudes and use of antibiotics among Bulgarian population. *Biotechnology & Biotechnological Equipment*. 2002;36(1): 933-941. DOI: 10.1080/13102818.2022.2145237. <https://doi.org/10.1080/13102818.2022.2145237>
30. Al-Taani GM, Karasneh RA, Al-Azzam S, Bin Shaman M, Jirjees F, Al-Obaidi H, Conway BR, Aldeyab MA. Knowledge, Attitude, and Behavior about Antimicrobial Use and Resistance among Medical, Nursing and Pharmacy Students in Jordan: A Cross Sectional Study. *Antibiotics (Basel)*. 2022 Nov 5;11(11):1559. doi: 10.3390/antibiotics11111559. PMID: 36358214; PMCID: PMC9686822. <https://doi.org/10.3390/antibiotics11111559>
31. Horvat O, Petrović AT, Paut Kusturica M, Bukumirić D, Jovančević B, Kovačević Z. Survey of the Knowledge, Attitudes and Practice towards Antibiotic Use among Prospective Antibiotic Prescribers in Serbia. *Antibiotics*. 2022; 11(8):1084. <https://doi.org/10.3390/antibiotics11081084>
32. Kosiyaporn H, Chanvatik S, Issaramalai T, et al. Surveys of knowledge and awareness of antibiotic use and antimicrobial resistance in general population: A systematic review. *PLoS One*. 2020;15(1):e0227973. Published 2020 Jan 16. doi:10.1371/journal.pone.0227973. <https://doi.org/10.1371/journal.pone.0227973>
33. Tompson AC, Manderson L, Chandler CIR. Understanding antibiotic use: practices, structures, and networks. *JAC Antimicrob Resist*. 2021;3(4):dlab150. Published 2021 Oct 4. doi:10.1093/jacamr/dlab150 <https://doi.org/10.1093/jacamr/dlab150>
34. Davis ME, Liu TL, Taylor YJ, et al. Exploring Patient Awareness and Perceptions of the Appropriate Use of Antibiotics: A Mixed-Methods Study. *Antibiotics (Basel)*. 2017;6(4):23. Published 2017 Oct 31. doi:10.3390/antibiotics6040023. <https://doi.org/10.3390/antibiotics6040023>
35. Rustemeyer, J., & Busch, A. (2022). Combined Techniques for Bilateral Maxillary and Nasal Reconstruction After Ablative Surgery for Adenoid Cystic Carcinoma. In *International Journal of Advanced Medical Sciences and Technology (Vol. 2, Issue 2, pp. 1–6)*. <https://doi.org/10.54105/ijamst.b3024.02222>
36. Goel, Dr. R. (2022). Effect of Drug Resistance on the Pathogenicity and Virulence of Salmonella Typhimurium. In *Indian Journal of Advanced Zoology (Vol. 2, Issue 2, pp. 1–3)*. <https://doi.org/10.54105/ijz.d2905.101422>
37. Chauhan, Mr. D. K., & Sharma, Dr. N. (2023). Phytochemical and Biological Activity of Rice Bran: A Review. In *International Journal of Advanced Pharmaceutical Sciences and Research (Vol. 4, Issue 1, pp. 1–11)*. <https://doi.org/10.54105/ijapsr.a4030.124123>

## AUTHORS PROFILE



**Rita Morkous**, Undergraduate Student, Fifth year in pharmaceutical chemistry and quality control department at faculty of Pharmacy, Tishreen University, Latakia, Syria. Pharmacy student at Tishreen University and registration date at the university during 2019 and 2024. ICDL certificate in 2024. Highlights: Board theoretical experience in analytical methods, synthesis of organic compounds, pharmaceutical preparations, medicinal chemistry principles, TLC methods, high liquid performance methods, Gc methods, UV/visible spectrophotometer principles, electrochemical techniques, IR and NMR specters, extraction methods, gel electrophoresis methods, capillary electrophoresis methods, quality control of solid dosage forms, quality control of liquid dosage forms, quality control of semi-solid dosage forms, GMP, GLP, sampling, Food chemistry.



**Ayat Abbood**, Professor in pharmaceutical chemistry and quality control department, Tishreen University  
- Ph.D. in pharmacy in the field of drug control (2006-2010, university Paris-11, France)  
- Master 2 Research: Research and Analytical Development (2005-2006, university Paris-11, France)  
- Professional Master 1: Quality Control of Medicines and Other Health Products (2004-2005, university Paris-11, France)  
- Bachelor's degree in Pharmacy and Medicinal Chemistry (1996-2000, Tishreen University, Latakia)  
Head of Medicinal Chemistry and Quality Control -Faculty of Pharmacy -Tishreen University (2021 until now) - - Head of Pharmacy Department - College of Pharmacy and Health Sciences - Al-Manara University (3 years) - Dean of Pharmacy Faculty –Al-Jazeera University (one year).

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the Lattice Science Publication (LSP)/ journal and/ or the editor(s). The Lattice Science Publication (LSP)/ journal and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

