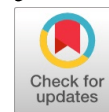


# Assessment of Awareness Regarding Paracetamol-Containing Medicine Toxicity Among Syrians

Ali Dawa, Fatima Belouneh, Ayat Abboud



**Abstract:** This study aimed to assess Syrians' awareness of paracetamol toxicity. An online survey was shared on social media, and in-person interviews were conducted in June 2025. A total of 114 valid responses were collected. The questionnaire had three sections: demographic information, participants' knowledge of the paracetamol treatment plan, and their perceptions of its risks and toxicity. The results showed that most participants (70.3%) knew that daily paracetamol intake is unnecessary. Additionally, 60.7% believed that paracetamol should only be used when needed, especially for pain. The findings also indicated that 73% of participants do not take paracetamol for long periods without understanding the cause of their pain. However, 13.5% admitted to taking it despite being unaware of the pain's origin, assuming it might be psychological rather than physical. In such cases, using paracetamol is unnecessary and could cause adverse effects. Although paracetamol is an over-the-counter (OTC) medication, 76.6% of participants reported using it without medical consultation. It can lead to serious side effects, such as liver toxicity, especially if misused. However, 33% of respondents were unaware that paracetamol could cause such complications due to uncontrolled use.

**Keywords:** Paracetamol, Toxicity, Survey, Awareness, Syrians.

**Abbreviations:**

OTC: Over-The-Counter

Previous studies have shown that humanitarian crises often lead to increased self-medication practices [13], which can pose serious health risks [14]. This study is essential for several reasons [15]. First, medications containing paracetamol are readily available in Syrian pharmacies [16]. Second, many pharmaceutical products contain this substance [17]. Third [18], there is a lack of local information on awareness of the drug's toxicity [19]. Fourth, complex health conditions motivate many individuals to self-medicate [20]. This study aims to evaluate the Syrian public's awareness of paracetamol, focusing on its recommended dosages, potential side effects, and toxicity risks [21]. A specific questionnaire has been distributed to a representative sample of the Syrian population from diverse geographic and demographic backgrounds [22]. This research aims to address a significant gap in public health knowledge in Syria regarding the safe use of paracetamol-based medications, ultimately helping to reduce health issues caused by improper use.

## I. INTRODUCTION

Acetaminophen, also known as paracetamol [1], is one of the most commonly used analgesics [2] and antipyretic medications [3], recognised for its effectiveness [4] and over-the-counter availability in most countries [5]. It is generally safe when taken properly [6]. Exceeding the maximum recommended daily dose of 4 grams for adults [7], even slightly [8], can cause acute liver toxicity [9]. In Syria [10], where the country faces significant health and economic challenges [11], it is increasingly important to assess public knowledge about over-the-counter drugs [12].

## II. METHODS

This questionnaire was distributed through a structured electronic Google Form in June 2025. The main goal of the study was to evaluate the knowledge, attitudes, and practices related to paracetamol among Syrians and to assess their awareness of its dosage, toxicity, and side effects. The questionnaire was shared via popular social media platforms, including Facebook and WhatsApp. Additionally, face-to-face interviews were conducted in streets and public spaces to reach a diverse segment of the population, especially university students and young adults. A total of 114 complete and valid questionnaires were collected for analysis. The study sample included individuals from various age groups, professional backgrounds, and educational levels. While the study mainly focused on university students and graduates, it also involved individuals working in the public sector. The questionnaire was divided into three main sections: demographic details, evaluation of participants' knowledge about the therapeutic use of paracetamol, and their perceptions of its risks and toxicity.

In the demographic section, participants provided information about their gender, age group (ranging from under 18 to over 60 years), and current occupation [23]. The second section examined individuals' behavior regarding paracetamol use

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and aimed to measure the frequency and intensity of this practice [24]. Participants were asked how many times per day they usually take it, from once to more than five times, and whether they would repeat the dose if there were no improvement [25].

The types of health conditions for which paracetamol is used were also recorded, including headache, joint and bone pain, muscle pain, and stomach or intestinal pain [26]. This section also included questions about the usual timing of intake and whether participants experienced any side effects after the usual dose [27]. In the third part of the study, the sources of information and the motivations behind choosing to use paracetamol were evaluated [28]. Participants were asked to identify the primary source of pharmaceutical knowledge, whether it was a pharmacist, personal experience, family and friends, or medical advice from doctors, and to assess their awareness and beliefs about the safety and risks of using the drug without consulting medical agents [29]. Participants were questioned about their understanding of the risks associated with random paracetamol use, their knowledge of the maximum allowable daily dose (ranging from 2 to more than 10 tablets per day), and their awareness of the dangers of combining another painkiller with paracetamol [30]. Additionally, the questionnaire assessed participants' knowledge of using paracetamol over extended periods without identifying the source of pain, as well as awareness that paracetamol is available in multiple pharmaceutical forms with different dosages [31]. Each response was analyzed using descriptive statistical methods [32]. Percentages and frequencies were calculated for all categorical variables to provide a clear overview of prevailing habits and beliefs [33]. Since many questions offered multiple-choice options, particularly those related to symptoms being treated [34], the results were also presented visually using charts to highlight common patterns and facilitate an understanding of participants' behaviours and attitudes toward paracetamol use among Syrians [35].

## III. RESULTS

### A. Demographic Data of Participants

A total of 114 participants completed the questionnaire. As shown in Table 1, females constituted the majority of the sample at 71.4%, compared to 28.6% males. The most represented age group was 18 to 25 years, accounting for 49.5%, followed by the 36 to 45 age group at 18.9%, and the 46 to 60 age group at 16.2%. Regarding occupational status, 46.4% of participants identified as students, while pharmacists represented 7.1%, and employees made up 22.3% of the sample. In terms of educational level, 63.9% reported being university students, whereas 6.2% were high school students. These demographic features indicate that the sample was primarily composed of young individuals, making it a suitable group for studying and assessing public awareness and behaviors related to paracetamol use [36].

**Table I: Demographic Characteristics of Participants**

| Demographic Data         |               |
|--------------------------|---------------|
| Characteristics          | Percentages % |
| <b>Gender</b>            |               |
| Female                   | 71.40%        |
| Male                     | 28.60%        |
| <b>Age (Years)</b>       |               |
| >18                      | 3.60%         |
| 18-25                    | 49.50%        |
| 26-35                    | 9%            |
| 36-45                    | 18.90%        |
| 46-60                    | 16.20%        |
| 60<                      | 2.70%         |
| <b>Work</b>              |               |
| Student                  | 46.40%        |
| Employee                 | 22.30%        |
| Doctor                   | 1%            |
| Pharmacist               | 7.10%         |
| Others                   | 23.20%        |
| <b>Educational Level</b> |               |
| School student           | 6.20%         |
| College student          | 63.90%        |
| Master, PhD              | 3.10%         |
| Others                   | 26.80%        |

The questionnaire was distributed to 200 participants to study individuals' opinions and tendencies regarding herbal medications. Results showed that 66.5% of the participants were female, while 33.5% were male. The 18–25 age group represented the most significant portion (63.5%), followed by the 26–35 age group (17.5%). Regarding education level, the majority (82%) held university degrees, 12.5% had completed secondary education or less, and 5.5% had postgraduate studies. Regarding occupational status, most respondents were students (62%), followed by employees (15.5%), then unemployed individuals (12.5%), and freelancers (10%). Additionally, 54.5% of participants lived in city areas. 45.5% lived in rural areas. Around 41.5% were working or studying in the medical or health field.

### B. Participant's Knowledge of the Therapeutic Use of Paracetamol

Table 2 presents clear indicators of the widespread use of paracetamol among the studied sample. A total of 60.7% of participants reported using paracetamol when experiencing any pain, while 55% admitted to repeating the dose if they did not feel improvement. This reflects a habitual medication pattern that may indicate ongoing dependence, exceeding temporary or occasional use. Additionally, 10.8% of participants reported consuming more than two paracetamol tablets per day, with intake reaching up to five tablets. This suggests usage beyond safe limits, even though most did not report any noticeable side effects [37]. While only a few experienced adverse effects, such behavior poses a potential health risk [38], especially concerning an increased likelihood of liver toxicity due to overdose [39]. In terms of symptoms treated with paracetamol, headaches topped the list at 92%, followed by joint and bone pain (21.4%), muscle pain (10.7%), and stomach and intestinal pain (6.3%). This pattern highlights the widespread reliance on paracetamol as a quick therapeutic solution



for various common complaints. Regarding usage habits, 60.9% of participants reported taking paracetamol immediately upon feeling pain, while 48.2% preferred to take it after meals. Only 4.5% admitted to taking it on an empty stomach, a practice that, although limited, is not considered medically ideal. Overall, these results highlight a notable discrepancy between participants' awareness of proper paracetamol use and their actual behaviour [40]. Despite a certain level of knowledge, daily practices reveal the need for targeted educational initiatives aimed at promoting responsible usage and reducing the risks associated with the misuse of this widely used medication [41].

**Table II: Results of Participants' Perceptions of the Risks and Toxicity Associated with Paracetamol**

| Questions                                                                    | Percentages % |
|------------------------------------------------------------------------------|---------------|
| <b>Do you take paracetamol when you feel pain?</b>                           |               |
| Yes                                                                          | 60.70%        |
| No                                                                           | 4.50%         |
| Maybe                                                                        | 34.80%        |
| <b>What type of pain and symptoms did you experience?</b>                    |               |
| Headache (cephalalgia)                                                       | 92%           |
| Arthralgia and bone pain                                                     | 21.40%        |
| Myalgia (muscle pain)                                                        | 10.70%        |
| Abdominal and intestinal pain                                                | 6.30%         |
| Other                                                                        | 5.40%         |
| <b>How do you administer paracetamol?</b>                                    |               |
| On an empty stomach                                                          | 4.50%         |
| Before meal                                                                  | 2.70%         |
| After meal                                                                   | 48.20%        |
| Immediately upon pain onset                                                  | 60.90%        |
| <b>What is your daily dosage intake?</b>                                     |               |
| One tablet                                                                   | 17.10%        |
| 2-5 tablets                                                                  | 10.80%        |
| More than that                                                               | 1.80%         |
| I don't necessarily take it daily                                            | 70.30%        |
| <b>In case of no improvement, do you repeat the dose?</b>                    |               |
| Yes                                                                          | 55%           |
| No                                                                           | 24.30%        |
| Maybe                                                                        | 20.70%        |
| <b>After taking your usual dose, did you experience any adverse effects?</b> |               |
| Yes                                                                          | 2.75%         |
| No                                                                           | 94.50%        |
| Maybe                                                                        | 2.75%         |

### C. Participants' Perceptions of the Risks and Toxicity Associated with Paracetamol

Table 3 illustrates the participants' awareness of the risks associated with paracetamol use. It was found that 76.6% of them consume it without consulting any medical source, a behavior primarily attributed to its easy accessibility and the prevailing perception of its relative safety. In contrast, 10.8% reported consulting friends or relatives, 9% turned to pharmacists, and only 8.1% consulted a physician before using it. A total of 57.7% of participants demonstrated knowledge of the recommended time interval between doses. However, 12.5% admitted to taking another analgesic alongside paracetamol, and an additional 11.6% indicated that they might do the same. This dual usage reveals a clear gap between theoretical knowledge and actual practice in medication use, increasing the risk of drug interactions and potential side effects or health complications [42].

**Table III: Results of Participants' Perceptions of the Risks and Toxicity Associated with Paracetamol**

|                                                                                                           | Percentages % |
|-----------------------------------------------------------------------------------------------------------|---------------|
| <b>Do you take paracetamol after consulting?</b>                                                          |               |
| A doctor                                                                                                  | 8.10%         |
| A pharmacist                                                                                              | 9%            |
| Friends or relatives                                                                                      | 10.80%        |
| Without consulting anyone                                                                                 | 76.60%        |
| <b>Are you aware of the risks associated with indiscriminate paracetamol use?</b>                         |               |
| Yes                                                                                                       | 56.30%        |
| No                                                                                                        | 33%           |
| Maybe                                                                                                     | 10.70%        |
| <b>Do you take paracetamol chronically without identifying the underlying cause of your pain?</b>         |               |
| Yes                                                                                                       | 13.50%        |
| No                                                                                                        | 73%           |
| Maybe                                                                                                     | 13.50%        |
| <b>Based on your knowledge, what is the permitted daily dosage?</b>                                       |               |
| 2-4 tablets                                                                                               | 72.70%        |
| 4-8 tablets                                                                                               | 20%           |
| 8-10 tablets                                                                                              | 6.40%         |
| More than 10 tablets                                                                                      | 0.90%         |
| <b>Do you know the required time interval between doses?</b>                                              |               |
| Yes                                                                                                       | 57.70%        |
| No                                                                                                        | 34.20%        |
| Maybe                                                                                                     | 8.10%         |
| <b>Do you combine other analgesics with paracetamol?</b>                                                  |               |
| Yes                                                                                                       | 12.50%        |
| No                                                                                                        | 75.90%        |
| Maybe                                                                                                     | 11.60%        |
| <b>Are you aware that paracetamol comes in multiple pharmaceutical formulations with varying dosages?</b> |               |
| Yes                                                                                                       | 70.60%        |
| No                                                                                                        | 23.90%        |
| Maybe                                                                                                     | 5.50%         |

Regarding awareness of the associated risks, 56.3% of participants reported being aware of the dangers of consuming paracetamol [43]. The results also revealed discrepancies in knowledge of the permissible daily dose: 72.7% stated that the dose should not exceed four tablets per day, whereas 20% admitted to taking eight tablets, and 6.4% reported taking up to ten tablets daily. These levels approach toxic doses that pose a direct threat to health, especially to liver function. Moreover, 13.5% of participants reported continued use of paracetamol over extended periods without knowing the actual cause of the pain, with repeated dosing done automatically and without awareness of the potential consequences of this behavior. Notably, 23.9% of participants were unaware that paracetamol is available in multiple pharmaceutical forms and believed it exists only in tablet form. This indicates a lack of basic information about the diversity of paracetamol administration routes [44]. In general, these results reflect the widespread, over-the-counter use of paracetamol to address daily health complaints [45], coupled with a concerning tendency to use it without consulting a doctor or having sufficient awareness of the risks [46]. These findings proved the importance of reinforcing health education programs to emphasize the safe and responsible use of paracetamol [47]. These programs may mitigate the adverse effects associated with unregulated paracetamol use [48].



## IV. DISCUSSION

This study aimed to assess the level of Syrian knowledge about paracetamol toxicity. The findings reveal that paracetamol is widely used in Syrian society. It has become a common element in health practices, showing a firm reliance on it as a first-line pain relief method without direct medical supervision. The results indicated that 76.6% of participants take paracetamol without consulting medical agents, highlighting a prevalent trend of self-medication and limited dependence on official pharmaceutical sources [49]. This behavior is linked to easy access to the drug without a prescription and the widespread perception of its safety among many individuals [50]. However, such confidence can be misleading if people lack accurate knowledge about safe dosage limits and potential complications [51]. In this context, it is concerning that 12.5% of participants reported using paracetamol with other analgesics, while 11.6% said they might do so occasionally. This pattern of unregulated use could significantly increase the risk of liver toxicity [52], especially when active compounds with similar mechanisms are unknowingly combined [53]. Although 56.3% of participants understood the dangers of random paracetamol use, 33% reported having no such awareness, highlighting a clear gap in health education regarding the safe use of this medication. Furthermore, the results showed inconsistent knowledge about the maximum daily dose: 72.7% stated it should not exceed four tablets per day, while 20% admitted to taking up to eight tablets, and 6.4% reported consuming as many as ten tablets daily, a level approaching toxicity and risking liver damage [54]. Additionally, 13.5% of participants reported taking paracetamol over extended periods without understanding the cause of their pain, reflecting a concerning trend of habitual or psychological self-medication [55]. This could lead to dose buildup and a higher risk of toxicity. Moreover, 23.9% were unaware that paracetamol comes in multiple pharmaceutical forms, believing it only exists as tablets [56]. This indicates limited awareness of pharmaceutical variations and their impact on dosage and administration [57]. Overall, these findings reveal excessive and unregulated paracetamol use without sufficient reliance on trusted medical sources [58]. Many participants had basic awareness of the risks, but it was not often translated into safe practices [59]. This emphasizes the need for targeted educational programs that reach all population groups, focusing on closing the gap between awareness and practice, improving understanding of correct dosing, and clarifying the dangers of excessive or combined use of medications containing paracetamol [60].

## V. CONCLUSION

This study highlights the widespread use of paracetamol among Syrians. While many participants demonstrated relatively good knowledge about the safe daily dosage and some aspects of the drug's toxicity, this understanding did not always translate into safe medication practices. The findings revealed that many individuals take paracetamol without consulting a healthcare professional, tend to repeat the dose if they do not see improvement, and sometimes combine it with other pain relievers, risking liver toxicity and other health issues. Additionally, there was a noticeable lack

of awareness about the different forms of paracetamol, reflecting a general deficiency in public health education. These results underscore the need for a comprehensive approach, including health awareness campaigns that clearly explain safe usage limits and the dangers of excessive or unregulated intake. Strengthening the role of pharmacists and promoting responsible pharmaceutical counselling are also crucial to reducing such practices, mainly since many rely on their advice instead of consulting a doctor. Furthermore, improving access to healthcare, particularly in densely populated or underserved areas, could help decrease reliance on self-medication. In conclusion, this study encourages the establishment of national health strategies to promote the rational use of paracetamol and raise public awareness about the risks of medicine misuse, including the use of over-the-counter drugs, to foster more informed and responsible pharmaceutical habits within Syrian society.

## DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

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- **Author's Contributions:** The authorship of this article is contributed equally to all participating individuals.

## REFERENCES

1. Isbera, M., Abbood, A., & Ibrahim, W. (2016). Weight and Content Uniformity of Warfarin Sodium Half Tablets. *Research Journal of Pharmacy and Technology*, 9(3):215-218. DOI: <https://doi.org/10.5958/0974-360X.2016.00039.1>
2. Abbood, A., & Layka, R. (2017). Weight and content uniformity Study of captopril half-tablets. *Research Journal of Pharmacy and Technology*, 10(6):1621-1626. DOI: <https://doi.org/10.5958/0974-360X.2017.00285.2>
3. Chbani D, Abbood A, & Alkhayer M. (2018). Determination of Nitrite and Nitrate Ion levels in some types of processed meats marketed locally. *Research Journal of Pharmacy and Technology*, 11(4):1442-1447. DOI: <https://doi.org/10.5958/0974-360X.2018.00269.X>
4. Abbood, A., Malek, Z., Al-Homsh, Y., & Thallaj, N. (2022). In vitro Study for Antibiotic resistance of bacteria causing Urinary Tract Infection from Syrian adults. *Research Journal of Pharmacy and Technology*, 15(10):4727-2. DOI: <https://doi.org/10.52711/0974-360X.2022.00794>
5. Abbood, A., Malek, Z., & Thallaj, N. (2022). Antibiotic resistance of urinary tract pathogens in Syrian children. *Research Journal of Pharmacy and Technology*, 15(11):4935-9.



- DOI: <https://doi.org/10.52711/0974-360X.2022.00829>.
6. Abbood, A. (2018). Determination of phenolic content and antioxidant activity of some cosmetic creams available in the Syrian market. *Journal of Chemical and Pharmaceutical Sciences*, 11:280-3. DOI: <https://doi.org/10.30558/jchps.20181104006>.
  7. Zreka, G.H., Diab, D.A., Abboud, A. (2016). Determination of Protein and fat oxidation levels in imported infant formula available in Syria. *International Journal of Pharmacy and Pharmaceutical Sciences*, 8:169-72. <https://journals.innovareacademics.in/index.php/ijpps/article/view/9899>
  8. Abbood, A. (2023). Optimization of the Imaged cIEF Method for Monitoring the Charge Heterogeneity of Antibody-Maytansine Conjugate, *Journal of Analytical Methods in Chemistry*, Article ID 8150143, 10 pages. DOI: <https://doi.org/10.1155/2023/8150143>.
  9. Abbood, A. (2024). Study of formulation effects on the charge variant profile of antibody-maytansine conjugates by the ICIEF method. *Acta Pharm. Sci*, 62 (2): 288-300. DOI: <https://doi.org/10.23893/1307-2080.APS6219>.
  10. Thallaj, N. (2024). Advancements in Pharmaceutical Science: Synthesis and Application of Molecular Cages Integrating N-Heterocyclic Carbenes for Enhanced Stability and Functionality. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-1, pages 6-19. DOI: <https://doi.org/10.54105/ijapsr.A4063.05011224>.
  11. Abbood, A. (2024). Monitoring the charge variant profile of antibody-tomaymycin conjugates by icIEF method, *Acta Pharm. Sci*, 62 (1), 226-239. DOI: <https://doi.org/10.23893/1307-2080.APS6215>.
  12. Asaad, R.A. & Abdullah, S.S. (2018). Breast Cancer Subtypes (BCSs) Classification according to Hormone Receptor Status: Identification of Patients at High Risk in Jableh- Syria. *Research Journal of Pharmacy and Technology*, 11(8): 3703-3710. DOI: <https://doi.org/10.5958/0974-360X.2018.00680.7>.
  13. Asaad, R.A. (2017). Hormone Receptor Status and its Relation to C-Reactive Protein and other Prognostic Factors in Breast Cancer in Jableh, Syria. *Research Journal of Pharmacy and Technology*, 10(9):3003-3010. DOI: <https://doi.org/10.5958/0974-360X.2017.00532.7>.
  14. Labban, L., & Thallaj, N. (2019). The Effect of Magnesium Supplementation on HbA1c Level and Lipid Profile Among Type 2 Diabetics. *Acta Scientific Nutritional Health*, 3,10, 7-12. DOI: <https://doi.org/10.31080/ASNH.2019.03.0435>.
  15. Labban, L., Thallaj, N., & Malek, Z. (2019). The implications of E-cigarettes or "vaping" on the nutritional status. *Journal of Medical Research and Health Sciences*, 2, 11, 784-787. DOI: <https://doi.org/10.15520/jmrhs.v2i11.128>.
  16. Labban, L., Thallaj, N., & Labban, A. (2020). Assessing the Level of Awareness and Knowledge of the COVID-19 Pandemic among Syrians. *Archives of Medicine*, 12, 2:8, 1-5. DOI: <https://doi.org/10.36648/1989-5216.12.2.309>.
  17. Morkus, R., & Abbood, A. (2024). A Survey of the Awareness and Practices of Antibiotic Use Among College Undergraduates and Graduates in Latakia. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-3, pp: 1-6. DOI: <https://doi.org/10.54105/ijapsr.C4039.04030424>.
  18. Thallaj, N. (2025). Analyzing Charge Variant Profiles of Monoclonal Antibodies Conjugated to Cytotoxic Agents. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-3, pages 20-25. DOI: <https://doi.org/10.54105/ijapsr.C4071.05030425>.
  19. Thallaj, N. (2025). Biomimetic Synthesis and Phytochemical Analysis of Lodopyridone: Insights into 4-Pyridone Derivatives and Thiopeptide Antibiotics. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-3, pages 9-19. DOI: <https://doi.org/10.54105/ijapsr.B4069.05030425>.
  20. Thallaj, N. (2022). Microwave-Assisted Synthesis of Oxadiazole and Thiazolidine Derivatives. *Indian Journal of Advanced Chemistry*, 1, 3, 2022. 10-14. DOI: <https://doi.org/10.54105/ijac.d2015.102222>.
  21. Thallaj, N. (2022). Quick Review of Chemistry Related to the [Fe]-Hydrogenases. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, 2,4, 1-15. DOI: <https://doi.org/10.54105/ijapsr.C4016.062422>.
  22. Thallaj, N. (2022). A Short Review of Some Examples of the Binding of Fullerenes C60 to Transition Metal Complexes. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, 2, 6, 1-12. DOI: <https://doi.org/10.54105/ijapsr.C4015.102622>.
  23. Thallaj, N. (2023). Review of a Few Selected Examples of Intermolecular Dioxigenases Involving Molecular Oxygen and Non-Heme Iron Proteins. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, 3, 2, 1-18. DOI: <https://doi.org/10.54105/ijapsr.C4011.023223>.
  24. Thallaj, N. (2023). A Brief Overview of the General Characteristics and Reactivity Towards Dioxygen of the Ferrous Tris (2-Pyridylmethyl Amine) Series Complexes is Presented. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, 3, 3, 1-18. DOI: <https://doi.org/10.54105/ijapsr.C4012.043323>.
  25. Labban, L., Kudsi, M., Malek, Z., & Thallaj, N. (2020). Advances in Medical, Dental and Health Sciences, 3, 3,45-48. DOI: <https://doi.org/10.5530/amdhs.2020.3.11>.
  26. Thallaj, N. (2024). Detecting Antioxidant Behavior for Phenolic Content of Some Beauty Care Creams in the Syrian Market. *Indian Journal of Advanced Chemistry*, vol. 2, no. 1, pp. 10-14. DOI: <https://doi.org/10.54105/ijac.C2013.041322>.
  27. Deeb, A., & Abbood, A. (2025). Survey of Knowledge of Pharmacy Students and Pharmacists Regarding Artificial Intelligence in Lattakia. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-4, pages 9-14. DOI: <https://doi.org/10.54105/ijapsr.D4075.05040625>.
  28. Wanous, O., & Abbood, A. (2025). Knowledge, Attitude, and Practice of Self-Medication in Syria. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-5.
  29. Al-Ali, O., Habib, O., & Abbood, A. (2025). A Questionnaire Study of Knowledge, Attitude, and Practices of Herbal Medications Among Syrians. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-5. DOI: <https://doi.org/10.54105/ijapsr.D4077.05050825>.
  30. Salloum, R., Baddour, F., & Abbood, A. (2024). A Questionnaire to Evaluate Undergraduate Students' Consumption and Awareness of Non-Steroidal Anti-Inflammatory Medications in Syria. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-4, pages 1-6. DOI: <https://doi.org/10.54105/ijapsr.C4041.04040624>.
  31. Zamboua, R., & Abbood, A. (2024). Survey of Knowledge About the Interaction Between Food and Medications Among the Syrian Population. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-4, pages 22-28. DOI: <https://doi.org/10.54105/ijapsr.D4044.04040624>.
  32. Mahfouz, H., Assaf, A., & Abbood, A. (2024). Survey of Usage and Awareness of Ibuprofen Among the Syrian Population. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-5, pages 23-28. DOI: <https://doi.org/10.54105/ijapsr.E4048.04050824>.
  33. Antakly, R., Najjar, F., & Abbood, A. (2024). Statistical Overview of Drug Shortage in Syria. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-1, pages 1-5. DOI: <https://doi.org/10.54105/ijapsr.A4059.05011224>.
  34. Abbood, A. (2024). Insights into Therapeutic Peptides and their Quality Control. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-1, pages 16-27. DOI: <https://doi.org/10.54105/ijapsr.A4059.05011224>.
  35. Abbood A. Overview of Analytical Methods for Characterizing the Charge Heterogeneity of Antibody-Drug Conjugates. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-5, August 2024, pages 16-22. DOI: <https://doi.org/10.54105/ijapsr.E4047.04050824>.
  36. Nouria, R., & Abbood, A. (2024). Assessment of Knowledge About High Blood Pressure Among Syrians. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-6, pages 28-32. DOI: <https://doi.org/10.54105/ijapsr.F4053.04061024>.
  37. Malek, Z., Abbood, A., & Thallaj, N. (2022). "Xi'an Shiyu Daxue Xuebao (Ziran Kexue Ban)." *Journal of Xi'an Shiyu University, Natural Sciences*, 302-312. <https://doi.org/10.17605/OSF.10/K56XY>.
  38. Al-Sarouky, R., Al-Kara, R., Habib, R., & Abbood, A. (2024). Assessment of Use and Awareness of Diclofenac in Syria. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-4 Issue-6, pages 1-6. DOI: <https://doi.org/10.54105/ijapsr.F4052.04061024>.
  39. Asaad, R.A. (2023). The association between Triglyceride-Glucose index and Hypertension status (stages and phenotypes) in Type II Diabetes Mellitus. *Research Journal of Pharmacy and Technology*, 16(6): 2963-2968. DOI: <https://doi.org/10.52711/0974-360X.2023.00489>.
  40. Asaad, R.A. (2022). Evaluation of adiposity phenotypes: lipid accumulation product index, visceral adipose index, and body roundness index as predictor markers for metabolic syndrome development in type 2 diabetes mellitus. *Bulletin of Pharmaceutical Sciences. Assiut*, 45(2): 097-1107.

DOI: <https://doi.org/10.21608/bfsa.2022.149592.1423>.

41. Asaad, R.A. (2018). Lymph Node Ratio (LNR) as a predictive factor in addition to pN staging in Syrian breast cancer patients at diagnosis. *Research Journal of Pharmacy and Technology*. 11(3):933-940. DOI: <https://doi.org/10.5958/0974-360X.2018.00173.7>.
42. Asaad, R.A. (2023). Relative Fat Mass (RFM) assesses Whole Body Fat (WBF) and predicts Cardiovascular Metabolic Disorders as a novel obesity marker in the Syrian population. *Research Journal of Pharmacy and Technology*, 16(9):4399-5. DOI: <https://doi.org/10.52711/0974-360X.2023.00719>.
43. Thallaj, N. (2022). Design and Synthesis of Ligands Tetra dents Substituted with Halogens in  $\alpha$ - $\alpha$ - $\alpha$ - $\alpha$ -Position and Conjugation with Riboflavin (Bioconjugates): Conjugate ligands Type TPA's with Flavonoids as an Electron Mediator. *Biomedicine and Chemical Sciences*, 1(2), 47–56. DOI: <https://doi.org/10.48112/bcs.v1i2.85>.
44. Thallaj, N., Alrasho, J. F., & Sofi, F. K. (2024). Advancements in Antiviral Therapeutics: A Comprehensive Review of Hepatitis C Virus and Novel Flavone Leads. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, 5(1), 28-40. DOI: <https://doi.org/10.54105/ijapsr.A4064.05011224>.
45. Thallaj, N. (2023). *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)* 2023. 3, 3,1-10. DOI: <https://doi.org/10.54105/ijapsr.C4012.043323>
46. Thallaj, N. (2024). *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, 4, 1,32-52. DOI: <https://doi.org/10.54105/ijapsr.A4036.124123>.
47. Thallaj, N. (2022). Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/ *Journal of Xi'an Shiyou University, Natural Sciences Edition*, 65, 06. 289-301. DOI: <https://doi.org/10.17605/OSF.IO/W8RS5>.
48. Thallaj, N. (2022). Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/ *Journal of Xi'an Shiyou University, Natural Sciences Edition*, 65, 06. 313-328. DOI: <https://doi.org/10.17605/OSF.IO/K8RFE>
49. Thallaj, N. (2022). Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/*Journal of Xi'an Shiyou University, Natural Sciences Edition*, 65, 7, 169-184. DOI: <https://doi.org/10.17605/OSF.IO/7F23D>
50. Thallaj, N. (2022). Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/*Journal of Xi'an Shiyou University, Natural Sciences Edition*, 65, 7, 110-142. DOI: <https://doi.org/10.17605/OSF.IO/KZRDJ>.
51. Thallaj, N. (2022). *Indian Journal of Advanced Chemistry*, 2, 1, 10-14. DOI: <https://doi.org/10.54105/ijac.C2013.041322>.
52. Abbood, A. (2025). Overview of the Role of Chromatographic Modes in Pharmaceutical Peptide Analysis. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-2, pages 22-29. DOI: <https://doi.org/10.54105/ijapsr.B4068.05020225>.
53. Abbood, A. (2025). Mixed Mode Chromatographic Stationary Phases in Pharmaceutical Peptide Analysis. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-3, pages 33-40. DOI: <https://doi.org/10.54105/ijapsr.C4073.05030425>
54. Abbood, A. (2025). Analysis of Charge Variant Profiles in Antibody Conjugates. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5 Issue-3, pages 26-32. DOI: <https://doi.org/10.54105/ijapsr.C4072.05030425>
55. Abbood, A. (2025). Role of Charge HILIC Stationary Phases in Pharmaceutical Peptide Analysis. *International Journal of Advanced Pharmaceutical Sciences and Research (IJAPSR)*, Volume-5, Issue-3, pages 1-8. DOI: <https://doi.org/10.54105/ijapsr.C4074.05040625>.
56. Darraj, R., Haroun, M., Abbood, A., & Al Ghorabi, I. (2025). Extraction of Methylparaben and Propylparaben using Magnetic Nanoparticles. *Clinical Medicine And Health Research Journal*, Volume-5 Number-1, Page 1145-1167. DOI: <https://doi.org/10.18535/cmhrj.v5i1.450>.
57. Hasan, B., & Asaad, R. (2023). White Blood Cell and Platelet Counts as Simple and Inexpensive Markers for Determination of the Metabolic Syndrome among Patients with Type 2 Diabetes Mellitus. *Research Journal of Pharmacy and Technology*, 16(2): p. 786-790. DOI: <http://doi:10.5958/0974-360X.2023.00135>.
58. Ghassan, A., Asaad, R., & Abedallah, N. (2024). Impact of Letrozole treatment on lipid profile in postmenopausal women with hormone receptor-positive early Breast Cancer: A prospective study. *Bulletin of Pharmaceutical Sciences. Assiut University*, 47 (1): 363-374. DOI: <http://doi:10.21608/BFSA.2023.230365.1874>.
59. Al Khleif, M., Alzoubi, N. A., Shannan, G., Malek, Z., & Thallaj, N. (2025). Exploring Circadian Rhythms: A Comprehensive Study on Sleep Patterns and Disorders in Syrian Society. *Am J Biomed Sci & Res*. 2025 26(2). DOI: <https://doi.org/10.34297/AJBSR.2025.26.003416>.
60. Shannan, G., Malek, Z., & Thallaj, N. (2025). Advancements in Monomolecular Multimodal Platforms for Cancer Theranostics. *Am J Biomed Sci & Res*. 27(3).

DOI: <https://doi.org/10.34297/AJBSR.2025.27.003569>.

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