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IMMUNE RESPONSES TO SOME HEALTH ISSUES: A REVIEW

***[1,2]Ahmed Farhan Shallal**

[1]College of Medicine, University of Sulaimani, Sulaymaniyah, Kurdistan Region, Iraq.

[2]College of Science, University of Raparin, Sulaymaniyah, Kurdistan Region, Iraq.

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***Corresponding Author**

Ahmed Farhan Shallal

College of Medicine, University of Sulaimani, Sulaymaniyah, Kurdistan Region, Iraq.

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ABSTRACT

The immune response is a meticulously structured network of natural and adaptive processes essential for maintaining host health, preventing infections, regulating inflammation, and preserving tissue homeostasis. Dysregulation of immune responses facilitates the onset of various pathological illnesses, including infectious diseases, autoimmune disorders, metabolic abnormalities, and cancers. This study offers a thorough examination of contemporary developments in immunology and their consequences for human health. Principal subjects encompass immunomodulatory drugs and biomarkers pertinent to immune control, the therapeutic promise of medicinal flora and edible fungi, and the burgeoning application of nanotechnology in augmenting immune responses and facilitating targeted medication administration. This paper also examines contemporary medical difficulties connected with immunological function, including chemotherapy-induced anemia, iron insufficiency, chronic renal disease, COVID-19, and autoimmune thyroid disorders. The special focus is on blood-related biomarkers, leukocyte activity, vitamin D levels, inflammatory indicators, genetic factors and their importance in the diagnosis, prognosis and therapy of diseases. Recent molecular, microbiological, nutritional and clinical research provides evidence for the intricate interplay between immunological pathways, environmental impacts, lifestyle factors and treatment interventions. Together, these findings underscore the need for integrated multidisciplinary approaches to understand immune regulation and to develop novel ways for disease prevention, diagnosis and therapy. Further research into immunomodulation, biomarker discovery and precision medicine is anticipated to enhance healthcare outcomes and open the

way for tailored therapeutic strategies.

KEYWORDS: Immune response, Immunomodulation, Biomarkers, Medicinal plants, Infectious diseases.

1. INTRODUCTION

The immune system is a crucial component in maintaining host health, safeguarding the organism against infectious pathogens, malignant cells, and environmental threats. It consists of a complex interaction of innate and adaptive immune responses that work together to identify, neutralise, and eradicate harmful chemicals while maintaining tissue homeostasis. Dysregulation of immune responses can result in viral illnesses, chronic inflammatory disorders, autoimmune conditions, and metabolic abnormalities, rendering immunological research a crucial domain of contemporary biomedical science.[1] Recent breakthroughs in immunology have significantly enhanced our understanding of immunomodulation and its therapeutic applications. Biological agents have become essential instruments for modulating immune responses in several therapeutic contexts, including autoimmune illnesses, inflammatory disorders, and cancer immunotherapy. These pharmaceuticals influence immune cell function, cytokine synthesis, and signalling pathways, resulting in improved disease management and patient outcomes.[1] Nutritional therapy utilising vitamins and essential minerals exhibit notable immunomodulatory effects, leading to improved immune function and reduced risks of obesity and metabolic disorders.[2] Notwithstanding significant advancements in prevention and treatment methods, infectious diseases remain a critical global health issue. The development of antibiotic resistance in bacterial pathogens, especially β-lactamase-producing species like *Klebsiella spp*., has exacerbated challenges in infection management and treatment. The molecular characterisation of resistant bacteria may yield valuable insights into resistance mechanisms and facilitate the development of effective surveillance and therapy strategies.[3] Simultaneously, advancements in viral diagnostic tools, ranging from traditional culture-based methods to molecular and genomic technologies, have transformed the detection, monitoring, and management of viral infections, facilitating earlier diagnosis and improved clinical decision-making.[4] Additionally, fungal infections are becoming a bigger problem, particularly for those with compromised immune systems. The innate and adaptive immune components interact intricately in the host immune response to pathogenic fungi, and current therapeutic approaches are changing to counteract the rise in fungal infections and antifungal resistance. The creation of novel therapeutic strategies and

the enhancement of patient care depend on an understanding of these immune pathways.[5] Natural products are highly regarded as sources of immunomodulatory and therapeutic compounds. Cultivated edible mushrooms are abundant in bioactive constituents, including polysaccharides, proteins, phenolic compounds, and antioxidants, which have well-documented immunostimulatory, anti-inflammatory, antibacterial, and anticancer effects. The biological activities indicate the potential of mushrooms as functional foods and supplementary therapeutic agents for enhancing human health and immunological function.[6,7] The necessity for integrated approaches to understand host-pathogen interactions, immune regulation, and therapy development is highlighted by the growing amount of data from immunological, microbiological, molecular, and nutritional investigations. In the era of precision medicine, further research in these interconnected fields is crucial to improving disease prevention, diagnosis, and treatment strategies. Recent breakthroughs in nanotechnology offer tremendous opportunity in modulating the immune system in conjunction with established methods. The role of nanotechnology-based drug delivery systems in improving immune responses and promoting tissue regeneration, thereby opening up new avenues for precise and targeted therapy of various diseases.[8-10]

2. Immunomodulators and Immunomodulatory

Immunomodulators are substances that modify the body's immunological response regarding its magnitude, kind, duration, or efficacy. These chemicals may originate from both internal and external sources. The modulation of immune responses in persons with renal failure is significantly affected by many factors. This study examines how these markers can assist in addressing renal impairment issues. The findings indicate that concentrating on these markers may improve immune response and overall care of individuals with renal failure.[11] The therapeutic qualities of a species called *Ganoderma lucidum* influence the activation of natural killer cells. This study examines the fungus's known uses as well as its evolving functions in the realm of modern immunotherapy. According to the research, *Ganoderma lucidum* may improve NK cell function, which could be a promising treatment for a number of immune-related illnesses and malignancies.[12] Immunological pathways and biomarkers linked to them are significantly impacted by the decisions we make about our treatments, diets, and lifestyles. This study outlines the complex relationships between these elements in regulating immune responses and their potential application in the management or prevention of a range of illnesses. The results highlight the necessity of combining specialised therapy approaches, healthy eating, and lifestyle modifications to optimise immune responses.[13] The

immune system's modulation is impacted by various elements, including leukocytes, vitamin D, phytochemicals, nanotechnology, and biomarkers. The essay elucidates the significance of these components in preserving immunological homeostasis, their prospective application in illness treatment, and their therapeutic functions in augmenting overall health.[14] The health benefits of truffles, a type of edible mushroom, are discussed. The investigation highlights the beneficial properties of truffles which include their rich levels of antioxidants, vitamins and minerals. The statistics suggest that truffles may be very useful in improving overall health and may have an impact on preventive medicine.[15] In order to investigate the connections between various lifestyle trends and their effects on immunological responses and biological measures in rat experiments, researchers are undertaking a thorough investigation. The findings revealed significant variations in these metrics based on living circumstances, which offer crucial information on how behavioural and environmental factors impact health at the immunological and biochemical levels.[16,17]

3. Medicinal Plants: Therapeutic and Medical Significance

The antibacterial activity of quercus species and their galls have been revealed in a research. The study was concerned with the defensive characteristics of these plant-derived chemicals against a number of harmful bacterial species. Results revealed that extracts of both quercus and gall were considerably inhibitive to the growth of some bacterial strains. The finding shows the potential of quercus as a natural source of antibacterial compounds, stressing its medical relevance in the treatment of bacterial diseases.[18] Studies have shown that mint extract is efficient against various kinds of dangerous bacteria. The study concluded that mint extract has significant inhibitory capabilities against many bacterial strains and could serve as a useful natural treatment option for bacterial illnesses. The results demonstrate a feasible pathway for novel antibiotics, therefore increasing the utilisation of plant-derived antimicrobial strategies.[19] The antibacterial activity of pomegranate extracts demonstrated that pomegranate extracts have strong antibacterial activity against a range of bacterial strains, confirming the view that pomegranate is an important natural source of antimicrobial chemicals. This paper underscores the need of studying the phytochemical variables for their therapeutic potential in the treatment of bacterial diseases.[20] In the context of antibiotic resistance, the interaction between bacterial structure and extended-spectrum beta-lactamases (ESBLs). Research suggests that the growth of ESBLs in bacteria strengthens their resistance to antibiotics, posing problems for medical procedures. The authors stress how important it is to understand these cooperative relationships in order to create more effective strategies for

treating bacterial infections.[21]

4. Contemporary Medical Issues

The study thoroughly examines the prevalence of anemia brought on by chemotherapy in adult populations as well as the many treatment options available to address this health issue. The study also examines therapeutic options, such as iron supplements and erythropoiesis-stimulating medications, and emphasises how common anemia is in chemotherapy patients. These results underscore the significance of prompt diagnosis and suitable treatment in enhancing chemotherapy patients' quality of life.[22] A significant concern is the widespread occurrence of iron deficiency among female athletes in the Sulaymaniyah District. This analysis elucidates significant risk variables, including rigorous exercise routines, nutritional practices, and menstrual cycles. The results underscore the necessity for dietary modifications and meticulous monitoring of iron levels to enhance the health and athletic performance of female athletes.[23] An examination of the iron status among female athletes in the Sulaymaniyah District was performed. The study identified a notable frequency of iron shortage and underscored the necessity for enhanced dietary control and iron supplementation to optimise sports performance and mitigate health complications associated with iron deficiency.[24] In patients with chronic renal disorders, the dialysis procedure significantly alters the molecular makeup of certain blood and electrolyte components. According to the research, dialysis causes significant changes in blood element concentrations and electrolyte statuses, including sodium balance and red blood cell counts. These results highlight how important it is to closely monitor these indicators for effective treatments and how to improve the care of patients receiving dialysis for chronic renal disorders.[25] The efficacy of dialysis and associated complications are significantly affected by variations in blood flow rates using low- and high-flux membranes. The analysis indicates that elevated blood flow rates correlate with enhanced dialysis outcomes, however they may also heighten the risk of some adverse events. This work provides significant insights on optimising dialysis techniques to improve patient outcomes and reduce treatment hazards.[26] The approach accounts for the infection rates and demographic features that shape the pandemic’s impact in these locales. The results highlight the importance of public health measures and strategies to reduce the spread of the virus in these areas, especially to protect at-risk populations.[27] An examination has focused on the Raparin district's COVID-19 occurrence. The investigation examined the spread of SARS-CoV-2 by assessing factors such as infection rates and demographic information. The information demonstrated the concerning state of the pandemic in the region and highlighted

the critical need for customised health measures to stop the virus's spread. This academic investigation improves understanding of the geographic distribution of COVID-19, which informs regional public health campaigns.[28] An analysis clarifies the causes of COVID-19's spread and explains the virus's prevalence in Iraq's Raparin administrative zone. This investigation emphasises a thorough examination of the social, demographic, and health-related factors that worsen the pandemic's result in the surrounding context. The data highlights the critical role of launching effective public health initiatives to reduce the spread of the infection.[29] The present study describes a number of genetic techniques used to harvest and examine chromosomal units. This investigation provides valuable insights into the methods used to assess chromosomal patterns, which are essential for deciphering genetic disorders and honing diagnostic skills. Additionally, it discusses the implications of these techniques in the field of genetic research and their potential uses in applied chemistry and the pharmaceutical sector.[30] Investigating Hashimoto's thyroiditis, a disorder that damages the thyroid gland through autoimmune reactions, reveals both hereditary and epigenetic components. The investigation highlights the potential significance of these indicators in terms of diagnosis, prognosis, and treatment approaches by elucidating how specific genetic markers and epigenetic modifications contribute to the beginning and progression of the illness.[31]

5. Blood-Related Biomarkers

A study on the effect of tobacco consumption on different inflammatory biomarkers and biochemical parameters in male population. The study discovered that such markers changed dramatically, indicating that smoking is linked to increased inflammation and disruption of essential metabolic processes throughout the body. The findings add to the evidence of the association between tobacco smoking and an increased risk of some diseases and indicate the harmful health impacts of tobacco smoking.[32] According to documentation, hookah usage is prevalent among Salahaddin University students. The study revealed that a significant portion of students use hookahs, raising concerns about the potential health risks associated with this practice. The analysis's findings highlight the urgent need for preventative measures and awareness campaigns to slow the growth of hookah use among college students.[33] The importance of enhancing the immune system by increasing leukocytes, often known as white blood cells, is discussed. This study highlights the significant role of leukocytes in potentiating immune responses and gives useful insights into potential treatment strategies to enhance immune responses against viral infections.[34] Immune system changes that occur

during pregnancy. This essay describes how the immune system adapts during pregnancy to protect both the growing foetus and the mother. Immune responses must be altered to provide a safe environment for foetal development and to prevent infectious illnesses. This study emphasises how important it is to comprehend immune responses during pregnancy in order to improve the health of expectant mothers and their unborn children.[35] Researchers are assessing how specific vitamin D levels affect some immunological markers in male subjects. The study demonstrated that variations in vitamin D availability had a significant impact on immune system function. It made clear how crucial the proper dosage of vitamin D is for controlling immune responses.[36] Erythrocyte sedimentation rate assessments in both healthy and diseased groups depend on the selection of various anticoagulants and the duration of blood preservation. The study focused on how anticoagulant selection and storage duration affect ESR readings, offering helpful insights into laboratory techniques for precise ESR measurement in various patient populations.[37] In a cohort of Kurdish patients from Iraq, investigators conducted an extensive study on the inversion genotyping of the intron 1 and 22 of the factor VIII gene by using the IS-PCR method. The study yielded valuable insights into genetic differences relevant to haemophilia, particularly in the Kurdish population, and emphasised the critical role of genetic testing in the advancement of haemophilia A diagnosis and management.[38] The prevalence of anemia among children in the Kurdistan Region of Northern Iraq's Ranya District has been investigated. The analysis revealed a high rate of anemia in the region, highlighting the critical need for public health initiatives aimed at reducing nutritional deficiencies and promoting children's health in this area.[39] Among the different factors involved in the pathophysiology of male infertility, sperm DNA integrity is significantly associated with immunological characteristics. The study found that infertility was connected with poor sperm DNA integrity and certain immune abnormalities. These results indicate that an integrated study of sperm DNA integrity with immune system functioning may give us significant insights into the fundamental causes of male infertility, therefore improving diagnostic and therapeutic strategies.[40] The study clarifies how these biomarkers' concentrations can provide important insights into the immunological and physiological changes that occur in people who are having reproductive difficulties. The findings show that immunological tests are crucial for the identification and treatment of reproductive disorders.[41] Nutritional methods are evaluated in relation to several immunological and metabolic markers. Research indicates that using a variety of eating techniques may improve metabolic and immune system performance, suggesting that making thoughtful food choices may improve health outcomes. These findings suggest that dietary

changes are a practical strategy for treating metabolic diseases and enhancing immunological function.[42]

CONCLUSION

Improving human health and managing illness requires an understanding of immunological responses. Numerous factors, such as diet, lifestyle, natural products, biomarkers, and contemporary therapeutic techniques, have an impact on immune function, as the studies covered in this review show. Immunology, molecular biology, and medical diagnostics developments have improved our capacity to comprehend disease causes and find efficient treatments. In addition to supporting the creation of more individualized healthcare approaches, ongoing study in these fields will help prevent, diagnose, and treat a variety of illnesses.

REFERENCES

1. Shallal AF. Association of immunomodulation with biological agents: A review. World J Pharm Res., 2026; 15(6): 849-860.
2. Al-Attar S, Shallal AF. Integrated effects of vitamins B6 and C with selected minerals in enhancing immunomodulatory and reducing obesity risk in rats. Univ Thi-Qar J Sci., 2026; 13(1): 121-131.
3. Guma MA, Jubier OJ, Shallal AF, Nasser BM, Alisawi O. Molecular identification and antibiotic resistance evaluation of two β-lactamase genes in *Klebsiella* species isolated from Euphrates River in Iraq. Egypt J Med Microbiol, 2026.
4. Ahmed SA, Qader Abde S, Shallal AF. Advances in viral diagnostics: From conventional methods to molecular and genomic technologies. Batna J Med Sci., 2026; 13(3): 294-305.
5. Shallal AF, Razaq CH, Ahmed AS, Ahmed S. Host immune responses to pathogenic fungi and contemporary therapeutic strategies, 2026.
6. Shallal AF, Ibrahim KSM, Owaid MN. Therapeutic and immunological activities of the cultivated edible mushrooms. In: Owaid MN, Tan YS, Phan CW, editors. Mushroom Production. Singapore: Springer Nature, 2026; 209-225.
7. Owaid MN, Tan YS, Phan CW. Mushroom Production. Singapore: Springer Nature, 2026.
8. Shallal AF, Akram M, Muslim RF, Owaid MN, Yaseen OQ, Chishti MA. Bone tissue engineering using nanotechnology-based drug delivery system. In: Advances in Nanotechnology-Based Drug Delivery Systems. Elsevier, 2022; 177–196.

9. Talukdar AD, Sarker SD, Patra JK. Advances in Nanotechnology-Based Drug Delivery Systems. Elsevier, 2022.
10. Shallal AF, Owaid MN. Challenges and hazards associated with nanotechnology in agriculture. In: Advances in Nanotechnology-Based Drug Delivery Systems. Elsevier, 2022; 399–414.
11. Shallal AF. Immunomodulatory Pathways of Some Biomarkers in Individuals with Renal Failure. Aro-The Scientific Journal of Koya University, 2025; 13(2): 326–33.
12. SHALLAL AF, RAZAQ CH, OWAID MN. Immunomodulatory Effects of Ganoderma lucidum on NK Cells: From Traditional Use to Modern Immunotherapy. Journal of Macrofungi, 2025; 1(1): 14–29.
13. Shallal AF. Modulation of Immune Pathway and Biomarkers: Impacts of Lifestyle, Nutrition, and Therapeutic Interventions. World Journal of Pharmaceutical Research, 2025; 14(24): 419–30.
14. Shallal AF. Immune System Modulation: The Roles of Leukocytes, Vitamin D, Plant Extracts, Nanotechnology, and Biomarkers in Disease and Health. World Journal of Pharmaceutical Research, 2026; 15(3): 250–63.
15. SHALLAL AF, ABDULLAH SM, RAZAQ CH. The Significance of Truffles for Human Health. Journal of Mycology and Truffle, 2026; 1(1): 1–11.
16. Shallal AF, Abdulla JE, Shakor JK. Stimulating and boosting the immune system by increasing the number of white blood cells (leukocytes) to prevent and treat some viral infections. Prensa Med Argent, 2020; 106(5): 236.
17. Khezri S, Shallal AF, et al. Assessment of variations in particular immunological and biochemical markers in rats under a standard and non-standard lifestyle. Iranian J Pharm Sci., 2024; 20(1): 12–21.
18. Hassan SM, Hamad AK, Dawid F, Shallal AF. Antibacterial activity of Oak and Oak gall extracts. Ann Trop Med Public Health, 2020; 23(11): 231112.
19. Hamad AK, Hassan SM, Shallal AF. Effect of Mint extract on some pathogenic Bacteria. J Raparin Univ, 2017; 4(11): 45.
20. Hassan SM, Hamad AK, Shallal AF. The effect of pomegranate extracts on bacteria. J Raparin Univ, 2018; 5(15): 5–18.
21. Hamadamin HZ, Shallal AF, Qader IN. Synergistic role of extended-spectrum beta-lactamases (ESBL) and bacterial structure on antibacterial drugs. Jabirian J Biointerface Res Pharm Appl Chem., 2024; 1(1): 26–36.

22. Ali S, Farhan A, Qader I, Mohammed S. Chemotherapy-induced anemia in adults: incidence and treatment. J Bursa Fac Med., 2024; 2(2): 34–49.
23. Hassan MG, Arif GH, Shallal AF, Raouf AMA, et al. Prevalence and risk factors of iron deficiency among female athletes in Sulaymaniyah District, Kurdistan Region of Iraq. ACTA MEDICA IRANICA, 2025.
24. Marouf GH, Getta HA, Shallal AF, Raouf AMA. Assessment of iron status among female athletes in Sulaymaniyah District/Kurdistan Region of Iraq. Biomed J Sci Tech Res., 2024; 59(3): 51582–51588.
25. Abdulla JE, Shakor JK, Shallal AF, Kheder R. Effect of dialysis on some hematological and electrolyte parameters in chronic kidney patients. Ann Trop Med Public Health, 2020; 23(11): 9–13.
26. Abdulla JE, Shakor JK, Shallal AF. The effect of blood flow rates on dialysis adequacy and complications in both low and high flux membrane. EurAsian J Biosci, 2020; 14: 1039–1043.
27. Shallal AF, Qadir OH, Kheder RK, Abdulla JE, Shakor JK, Isa RA. Prevalence of SARS-CoV-2 (COVID-19) in north of Iraq. Ann Trop Med Public Health.
28. Shallal AF, Qadir OH, Kheder RK, Abdulla JE, Shakor JK, Isa RA. Prevalence of SARS-CoV-2 (COVID-19) in Raparin district. Ann Trop Med Public Health, 2020; 23: 23–117.
29. Abdulla JE, Shakor JK, Shallal AF, Mohammed R, Mahmud B, Awlla B, Salih H. Prevalence of COVID-19 and its determinants in Raparin administrative area/Iraq: a survey study. Pielęgniarstwo w Opiece Długoterminowej/Long-Term Care Nursing, 2024; 9(2): 60–70.
30. Qadir AS, Shallal AF, Qader IN. Genetic methods for isolating and reading chromosomes. Jabirian J Biointerface Res Pharm Appl Chem., 2024; 1(3): 6–15.
31. Abdalrahman SS, Smail HO, Shallal AF. Genetic and epigenetic markers in Hashimoto's thyroiditis. Int J Epigenetics, 2025; 5(1): 1.
32. Shallal AF. The changes in some inflammatory markers and biochemical aspects during smoking in males. Communities, 2020; 1: 4.
33. Shalaw FA, Abdulla JE, Shallal AF, Hamedon TR. Prevalence of smoking hookah (shisha) among students of Salahaddin University. EurAsian J Biosci, 2020; 14(1).
34. Shallal AF, Abdulla JE, Shakor JK, et al. Stimulating and boosting the immune system by increasing the number of white blood cells (leukocytes) to prevent and treat some viral infections. Prensa Med Argent, 2020; 106(5): 236.

35. Shalal AF, Kheder RK, Faraj TA, Hussen BM. Immune modulations during gestation periods. Teikyo Med J., 2022; 45(3): 5995–6002.
36. Shallal AF, Kheder R, Hussein SH, et al. Effect of variation in vitamin D concentration on some immunological markers in single males. Prensa Med Argent, 2020; 106(4).
37. Shallal AF, Ibrahim ZH, Kheder R, Hussein SH, Hassan SM, Khalil OA. Effect of different types of anticoagulants and storage period on the erythrocyte sedimentation rate in healthy and unhealthy people. Biomed Res., 2020; 31: 9–12.
38. Qadir OH, Agi E, Bolhassani A, Saraji AA, Namvar A, Alizadeh S, Shallal AF. Genotyping of intron 1 and 22 inversion of factor VIII gene using IS-PCR in Kurdish patients of Iraq. EurAsian J Biosci, 2020; 14: 1181–1185.
39. Ibrahim ZH, Shallal AF, Hussein SH, Ibrahim RH, Mustafa BK, Abdullah SM, Hamad AK. Prevalence of anemia among children of Ranya District: Kurdistan Region, Northern Iraq. EurAsian J Biosci, 2020; 14(2).
40. Mageed SN, Hamashareef SR, Shallal AF. Detection of sperm DNA integrity and some immunological aspects in infertile males. ARO-The Sci J Koya Univ, 2022; 10(1): 116–122.
41. Shallal SF, Shallal LH, Eyüpoğlu V. Immuno-physiological assessment for some biomarkers of patients with reproductive disorders. Pielęgniarstwo w Opiece Długoterminowej/Long-Term Care Nursing, 2024; 9(1): 42–54.
42. Shallal AF, Ali DS, Eyüpoğlu V. Ameliorative Role of Diet in some Immunological and Metabolic Indicators. J Univ Anbar Pure Sci., 2023; 17(1).