

# World Journal of *Diabetes*

*World J Diabetes* 2024 September 15; 15(9): 1829-2000



**EDITORIAL**

- 1829 Exploring the genetic basis of childhood monogenic diabetes  
*Sanyal D*
- 1833 New therapy for metabolic syndrome: Gut microbiome supplementation  
*Qureshi W, Dar MA, Rather MY*
- 1837 MicroRNA-630: A potential guardian against inflammation in diabetic kidney disease  
*Al Madhoun A*
- 1842 Link between periodontitis and diabetic retinopathy: Inflammatory pathways and clinical implications  
*Zhao Y, Shen QQ*
- 1847 Macrophage modulation with dipeptidyl peptidase-4 inhibitors: A new frontier for treating diabetic cardiomyopathy?  
*Mohammadi S, Al-Harrasi A*
- 1853 Inflammatory markers, oxidative stress, and mitochondrial dynamics: Repercussions on coronary artery disease in diabetes  
*Tatmatsu-Rocha JC, Mendes-Costa LS*

**FIELD OF VISION**

- 1858 Rapid correction of chronic hyperglycemia and bone remodeling, warning against overdoing  
*Dardari D, Segurrence B*

**REVIEW**

- 1862 Selection of dialysis methods for end-stage kidney disease patients with diabetes  
*Hu YH, Liu YL, Meng LF, Zhang YX, Cui WP*

**MINIREVIEWS**

- 1874 Gut microbiome: A revolution in type II diabetes mellitus  
*Jeyaraman M, Mariappan T, Jeyaraman N, Muthu S, Ramasubramanian S, Santos GS, da Fonseca LF, Lana JF*

**ORIGINAL ARTICLE****Case Control Study**

- 1889 Platelet indices as predictors of poor glucose regulation in type 2 diabetes mellitus adults at Bishoftu General Hospital, Ethiopia  
*Regassa DA, Berihun GA, Habtu BF, Haile WB, Nagaash RS, Kiya GT*

**Retrospective Study**

- 1903** Non-linear relationship between age and subfoveal choroidal thickness in Chinese patients with proliferative diabetic retinopathy  
*Lei CY, Xie JY, Ran QB, Zhang MX*

**Basic Study**

- 1916** Corilagin alleviates podocyte injury in diabetic nephropathy by regulating autophagy *via* the SIRT1-AMPK pathway  
*Lou Y, Luan YT, Rong WQ, Gai Y*
- 1932** cNPAS2 induced  $\beta$  cell dysfunction by regulating KANK1 expression in type 2 diabetes  
*Yin YB, Ji W, Liu YL, Gao QH, He DD, Xu SL, Fan JX, Zhang LH*
- 1942** Molecular mechanisms of Buqing granule for the treatment of diabetic retinopathy: Network pharmacology analysis and experimental validation  
*Yang YF, Yuan L, Li XY, Liu Q, Jiang WJ, Jiao TQ, Li JQ, Ye MY, Niu Y, Nan Y*
- 1962** Dexmedetomidine ameliorates diabetic intestinal injury by promoting the polarization of M2 macrophages through the MMP23B pathway  
*Lu M, Guo XW, Zhang FF, Wu DH, Xie D, Luo FQ*
- 1978** Bone marrow-derived mesenchymal stem cell-derived exosome-loaded miR-129-5p targets high-mobility group box 1 attenuates neurological-impairment after diabetic cerebral hemorrhage  
*Wang YY, Li K, Wang JJ, Hua W, Liu Q, Sun YL, Qi JP, Song YJ*

**ABOUT COVER**

Peer Review of *World Journal of Diabetes*, Tao-Hsin Tung, PhD, Researcher, Director, Epidemiologist, Evidence-based Medicine Center, Taizhou Hospital of Zhejiang Province Affiliated to Wenzhou Medical University, Taizhou 317000, Zhejiang Province, China. dongdx@enzemed.com .

**AIMS AND SCOPE**

The primary aim of *World Journal of Diabetes (WJD, World J Diabetes)* is to provide scholars and readers from various fields of diabetes with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

*WJD* mainly publishes articles reporting research results and findings obtained in the field of diabetes and covering a wide range of topics including risk factors for diabetes, diabetes complications, experimental diabetes mellitus, type 1 diabetes mellitus, type 2 diabetes mellitus, gestational diabetes, diabetic angiopathies, diabetic cardiomyopathies, diabetic coma, diabetic ketoacidosis, diabetic nephropathies, diabetic neuropathies, Donohue syndrome, fetal macrosomia, and prediabetic state.

**INDEXING/ABSTRACTING**

The *WJD* is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Current Contents/Clinical Medicine, Journal Citation Reports/Science Edition, PubMed, PubMed Central, Reference Citation Analysis, China Science and Technology Journal Database, and Superstar Journals Database. The 2024 Edition of Journal Citation Reports® cites the 2023 journal impact factor (JIF) for *WJD* as 4.2; JIF without journal self cites: 4.1; 5-year JIF: 4.2; JIF Rank: 40/186 in endocrinology and metabolism; JIF Quartile: Q1; and 5-year JIF Quartile: Q2.

**RESPONSIBLE EDITORS FOR THIS ISSUE**

Production Editor: *Yu-Xi Chen*; Production Department Director: *Xu Guo*; Cover Editor: *Jia-Ping Yan*.

**NAME OF JOURNAL**

*World Journal of Diabetes*

**ISSN**

ISSN 1948-9358 (online)

**LAUNCH DATE**

June 15, 2010

**FREQUENCY**

Monthly

**EDITORS-IN-CHIEF**

Lu Cai, Md. Shahidul Islam, Michael Horowitz

**EDITORIAL BOARD MEMBERS**

<https://www.wjgnet.com/1948-9358/editorialboard.htm>

**PUBLICATION DATE**

September 15, 2024

**COPYRIGHT**

© 2024 Baishideng Publishing Group Inc

**INSTRUCTIONS TO AUTHORS**

<https://www.wjgnet.com/bpg/gerinfo/204>

**GUIDELINES FOR ETHICS DOCUMENTS**

<https://www.wjgnet.com/bpg/GerInfo/287>

**GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH**

<https://www.wjgnet.com/bpg/gerinfo/240>

**PUBLICATION ETHICS**

<https://www.wjgnet.com/bpg/GerInfo/288>

**PUBLICATION MISCONDUCT**

<https://www.wjgnet.com/bpg/gerinfo/208>

**ARTICLE PROCESSING CHARGE**

<https://www.wjgnet.com/bpg/gerinfo/242>

**STEPS FOR SUBMITTING MANUSCRIPTS**

<https://www.wjgnet.com/bpg/GerInfo/239>

**ONLINE SUBMISSION**

<https://www.f6publishing.com>

## New therapy for metabolic syndrome: Gut microbiome supplementation

Waseem Qureshi, Maqsood Ahmad Dar, Mohd Younis Rather

**Specialty type:** Endocrinology and metabolism

**Provenance and peer review:** Invited article; externally peer reviewed.

**Peer-review model:** Single blind

**Peer-review report's classification**

**Scientific Quality:** Grade C

**Novelty:** Grade C

**Creativity or Innovation:** Grade C

**Scientific Significance:** Grade B

**P-Reviewer:** Liu T

**Received:** March 14, 2024

**Revised:** May 21, 2024

**Accepted:** June 21, 2024

**Published online:** September 15, 2024

**Processing time:** 165 Days and 23.1 Hours



**Waseem Qureshi**, Hospital Administration, Government Medical College, University of Kashmir, Jammu and Kashmir, Srinagar 190010, India

**Maqsood Ahmad Dar**, Department of Medicine, Government Medical College, University of Kashmir, Jammu and Kashmir, Srinagar 190010, India

**Mohd Younis Rather**, Multidisciplinary Research Unit, Government Medical College, University of Kashmir, Jammu and Kashmir, Srinagar 190010, India

**Corresponding author:** Waseem Qureshi, Doctor, FRCP, FRCPE, MBBS, MD, Chief Physician, Doctor, Professor, Superintendent, Hospital Administration, Government Medical College, University of Kashmir, Gole Market-10, Jammu and Kashmir, Srinagar 190010, India. [qureshiwaseem786@gmail.com](mailto:qureshiwaseem786@gmail.com)

### Abstract

The gut microbiota is important in the development and progression of metabolic illnesses such type 2 diabetes, cardiovascular disease (CVD), and obesity. This diverse community of microorganisms controls a variety of physiological functions, including metabolism, inflammation, and immune response. Understanding these interactions has resulted in novel therapeutic options, including microbiome supplementation. The gut microbiome is extremely susceptible to dietary changes, which can alter its makeup and function, influencing metabolite synthesis that affects host health. Certain metabolites, such as butyrate and propionate, have been proven to protect against metabolic illnesses, whereas trimethylamine has been linked to CVD. Prebiotics, probiotics, synbiotics, and postbiotics are being investigated by researchers as ways to change the gut microbiome and boost metabolic health. Despite advances in therapy and lifestyle adjustments, the prevalence of metabolic syndrome is increasing, emphasizing the need for new medicines.

**Key Words:** Probiotics; Prebiotics; Synbiotics; Postbiotics; Microbiome; Type 2 diabetes mellitus; Cardiovascular disease; Obesity

©The Author(s) 2024. Published by Baishideng Publishing Group Inc. All rights reserved.

**Core Tip:** The gut microbiota plays a crucial role in the onset and progression of metabolic conditions like type 2 diabetes, cardiovascular disease, and obesity. This diverse microbial community regulates various physiological functions, including metabolism, inflammation, and immune response. Understanding these interactions has led to innovative therapeutic approaches, such as microbiome supplementation. Dietary changes significantly impact the composition and function of the gut microbiome, influencing metabolite production that directly impacts host well-being. Certain metabolites like butyrate and propionate exhibit protective effects against metabolic disorders, while trimethylamine is associated with cardiovascular risk. Researchers explore prebiotics, probiotics, synbiotics, and postbiotics as potential avenues to modulate the gut microbiome and enhance metabolic health. Despite therapeutic advancements and lifestyle modifications, the prevalence of metabolic syndrome continues to rise, underscoring the urgent need for novel treatments.

**Citation:** Qureshi W, Dar MA, Rather MY. New therapy for metabolic syndrome: Gut microbiome supplementation. *World J Diabetes* 2024; 15(9): 1833-1836

**URL:** <https://www.wjgnet.com/1948-9358/full/v15/i9/1833.htm>

**DOI:** <https://dx.doi.org/10.4239/wjd.v15.i9.1833>

## INTRODUCTION

The complex relationship between the gut microbiome and metabolic health has received a lot of attention in recent years, revolutionizing our understanding of the pathogenesis and potential treatment options for metabolic disorders like type 2 diabetes, cardiovascular disease (CVD), and obesity. The gut microbiota, a varied population of bacteria living in the intestines, orchestrates a wide range of physiological processes such as metabolism, inflammatory regulation, and immune response. This symbiotic link between the host and its microbial residents has prompted research into new therapeutic techniques, with microbiome supplementation appearing as a viable option. Dietary composition has emerged as a critical modulator of gut microbiota composition and function, with research showing that dietary alterations, particularly between animal-based and plant-based diets, have a significant impact on the microbiome and subsequent host physiology. The gut microbiota has a substantial impact on metabolic processes such as glucose metabolism, lipid control, and insulin sensitivity by producing metabolites like short-chain fatty acids (SCFAs), bile acids, and other bioactive compounds. While some microbial metabolites, such as butyrate and propionate, have been shown to protect against metabolic illnesses, others, such as trimethylamine, have been linked to the development of ailments such as atherosclerosis and CVD. This delicate equilibrium emphasizes the need of regulating the gut flora to improve metabolic health. Researchers are looking into different ways to modify the gut microbiota, such as prebiotics, probiotics, synbiotics, and postbiotics. Prebiotics, such as inulin and fructooligosaccharides (FOS), preferentially increase the growth of beneficial bacteria, increasing SCFA synthesis and strengthening the gut barrier. Probiotics, on the other hand, bring helpful bacteria strains into the gut, whereas synbiotics mix prebiotics with probiotics to achieve synergistic results. Postbiotics, or metabolites created by probiotics, provide another option for intervention in metabolic syndrome. Recent research has presented persuasive evidence for gut microbiota supplementation's therapeutic potential in the management of metabolic syndrome. Supplementation with probiotics, prebiotics, or a combination of the two has been demonstrated to improve key metabolic indicators while also changing the gut microbial makeup. These findings demonstrate the potential of addressing the gut microbiome as a key role in metabolic homeostasis. However, while the findings are encouraging, more research is needed to understand the underlying biological mechanisms and long-term consequences of gut microbiota supplements. Personalized therapy techniques, taking into account individual differences in gut microbiota composition and metabolic phenotype, are critical for improving therapeutic outcomes. Collaboration across disciplines is critical for increasing our understanding and integrating results into clinical practice, ushering in a new era of precision medicine in metabolic health therapy. Despite positive results, difficulties remain, including the need for standardized methodology and large-scale trials to overcome inconsistent findings and fully realize the medicinal potential of microbiome supplements.

## GUT MICROBIOME

The gut microbiome, comprising a diverse community of bacteria residing in the intestines, has emerged as a crucial player in the development and progression of metabolic disorders such as type 2 diabetes mellitus (T2DM), CVD, and obesity[1]. The gut microbiota, which contains billions of microorganisms, regulates a variety of physiological functions such as metabolism, inflammation, and immunological response. Understanding these intricate relationships has led to new paths for therapeutic approaches, with microbiome supplementation appearing as a promising option[2]. The gut microbiome is extremely sensitive to dietary composition, with research indicating that changing diets, such as animal-based *vs* plant-based diets can drastically alter the gut microbiota's composition and function. This, in turn, can alter the formation of metabolites that affect host physiology, such as SCFAs, bile acids, and other bioactive substances[3]. Certain metabolites produced by the gut microbiota, such as butyrate and propionate, have been proven in studies to protect against metabolic disorders such as type 2 diabetes and CVD. These metabolites promote colon health, increase insulin sensitivity, and regulate lipid metabolism. However, other metabolites, such as trimethylamine, can cause atherosclerosis,

thrombosis, and CVD, emphasizing the intricate interplay between the gut microbiota and metabolic health[4]. To modify the gut microbiome and promote metabolic health, researchers are investigating the use of prebiotics, probiotics, synbiotics, and postbiotics. Prebiotics such as inulin, lactulose, and FOS preferentially enhance the development of beneficial bacteria such as *Bifidobacterium* and *Lactobacillus*, resulting in the synthesis of SCFAs and increased gut barrier integrity[5]. Despite advancements in conventional treatments and lifestyle modifications, the prevalence of metabolic syndrome continues to rise, underscoring the urgent need for innovative therapeutic strategies. Recent research has shed light on the pivotal role of the gut microbiota in metabolic health, offering new avenues for intervention[6]. A compelling study published in the *World Journal of Diabetes* presents evidence for the therapeutic potential of gut microbiota supplementation in managing metabolic syndrome[7]. The supplementation with probiotics, prebiotics, or their combination led to significant improvements in key metabolic parameters, including glucose metabolism, lipid profile, and blood pressure. Moreover, analyses of gut microbiome composition revealed favorable changes following supplementation, characterized by an increase in beneficial microbial species and a reduction in pathogenic taxa. These findings have profound implications for the treatment of metabolic syndrome. Targeting the gut microbiome, a central player in metabolic equilibrium, through supplementation approaches offers a novel strategy to address the underlying mechanisms of metabolic dysfunction[8]. The observed enhancements in metabolic markers underscore the therapeutic potential of modulating gut microbiota composition in managing metabolic syndrome. Importantly, the safety and tolerability profile of gut microbiota supplementation suggests its potential as an adjunct or complementary therapy to existing interventions[9]. While the results of this study are promising, further research is warranted to elucidate the molecular mechanisms underlying gut microbiota supplementation in metabolic syndrome. Future investigations should explore the long-term effects of supplementation and potential synergies between probiotics and prebiotics. Additionally, personalized treatment approaches, considering individual variations in gut microbiome composition and metabolic phenotype, are essential for optimizing therapeutic outcomes. Collaborative efforts across diverse disciplines, including microbiology, endocrinology, and nutrition, are crucial for advancing our understanding of the gut microbiome-metabolic axis and translating these findings into clinical practice. Moving forward, continued research is essential to refine supplementation protocols, deepen our mechanistic understanding, and ultimately enhance outcomes for individuals with metabolic syndrome. This heralds a new era of precision medicine, where harnessing the power of the gut microbiota holds promise for personalized and effective metabolic health therapies. Furthermore, innovative therapies targeting gut microbiome-host interactions are being explored to attenuate the progression of T2DM and CVD. While microbiome supplementation has encouraging results, more study is needed to prove its clinical usefulness. Studies have occasionally produced contradictory or misleading results, emphasizing the need for more comprehensive and standardized methodologies to studying the gut microbiota. Furthermore, research on the benefits of certain strains of probiotics is limited, emphasizing the significance of strain-specific study[10].

---

## CONCLUSION

The rapidly expanding field of study into the gut microbiome's impact in metabolic health has revealed new pathways for therapeutic intervention and personalized treatment options. Researchers discovered intriguing opportunities for modifying the microbiome to optimize metabolic health after meticulously investigating the intricate links between food composition, gut microbiota composition and activity, and metabolic outcomes. The therapeutic potential of gut microbiota supplementation, which includes prebiotics, probiotics, synbiotics, and postbiotics, has been demonstrated by compelling evidence of changes in key metabolic parameters and beneficial modifications in gut microbial composition. These findings highlight the gut microbiome's critical involvement in metabolic homeostasis and its potential as a therapeutic target in metabolic syndrome and related illnesses. While the possibilities appear intriguing, more research is needed to understand the underlying mechanisms, optimize supplementation procedures, and assure long-term efficacy and safety. Addressing issues such as methodology standardization, investigating strain-specific effects, and incorporating personalized treatment techniques will be critical for progressing the discipline and converting research findings into clinical practice.

---

## FOOTNOTES

**Author contributions:** Qureshi W spearheaded the research and analysis, delving into the intricate relationship between metabolic syndrome and the gut microbiome, while also exploring emerging therapies; Dar MA and Rather MY provided invaluable insights from diverse perspectives, enriching the discourse with their expertise in biotechnology, microbiology, endocrinology, and therapeutic interventions. Together, our collaborative efforts synthesized complex scientific findings into a cohesive narrative, shedding light on the potential of gut microbiome supplementation as a novel therapeutic avenue for metabolic syndrome.

**Conflict-of-interest statement:** The authors declare that they have no conflicts of interest related to the publication of this editorial. This includes any financial, personal, or professional relationships that could influence the content or interpretation of the manuscript.

**Open-Access:** This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Noncommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

**Country of origin:** India

**ORCID number:** Waseem Qureshi [0000-0002-0063-6557](https://orcid.org/0000-0002-0063-6557); Mohd Younis Rather [0000-0001-8928-6479](https://orcid.org/0000-0001-8928-6479).

**S-Editor:** Qu XL

**L-Editor:** A

**P-Editor:** Zhao YQ

---

## REFERENCES

---

- 1 **Iatcu CO**, Steen A, Covasa M. Gut Microbiota and Complications of Type-2 Diabetes. *Nutrients* 2021; **14** [PMID: [35011044](https://pubmed.ncbi.nlm.nih.gov/35011044/) DOI: [10.3390/nu14010166](https://doi.org/10.3390/nu14010166)]
- 2 **Ghosh TS**, Shanahan F, O'Toole PW. The gut microbiome as a modulator of healthy ageing. *Nat Rev Gastroenterol Hepatol* 2022; **19**: 565-584 [PMID: [35468952](https://pubmed.ncbi.nlm.nih.gov/35468952/) DOI: [10.1038/s41575-022-00605-x](https://doi.org/10.1038/s41575-022-00605-x)]
- 3 **Cronin P**, Joyce SA, O'Toole PW, O'Connor EM. Dietary Fibre Modulates the Gut Microbiota. *Nutrients* 2021; **13** [PMID: [34068353](https://pubmed.ncbi.nlm.nih.gov/34068353/) DOI: [10.3390/nu13051655](https://doi.org/10.3390/nu13051655)]
- 4 **Mayorga-Ramos A**, Barba-Ostria C, Simancas-Racines D, Guamán LP. Protective role of butyrate in obesity and diabetes: New insights. *Front Nutr* 2022; **9**: 1067647 [PMID: [36505262](https://pubmed.ncbi.nlm.nih.gov/36505262/) DOI: [10.3389/fnut.2022.1067647](https://doi.org/10.3389/fnut.2022.1067647)]
- 5 **Ji J**, Jin W, Liu SJ, Jiao Z, Li X. Probiotics, prebiotics, and postbiotics in health and disease. *MedComm (2020)* 2023; **4**: e420 [PMID: [37929014](https://pubmed.ncbi.nlm.nih.gov/37929014/) DOI: [10.1002/mco2.420](https://doi.org/10.1002/mco2.420)]
- 6 **Wang S**, Ju D, Zeng X. Mechanisms and Clinical Implications of Human Gut Microbiota-Drug Interactions in the Precision Medicine Era. *Biomedicines* 2024; **12** [PMID: [38255298](https://pubmed.ncbi.nlm.nih.gov/38255298/) DOI: [10.3390/biomedicines12010194](https://doi.org/10.3390/biomedicines12010194)]
- 7 **Xu YW**, Tian J, Song Y, Zhang BC, Wang J. Metabolic syndrome's new therapy: Supplement the gut microbiome. *World J Diabetes* 2024; **15**: 793-796 [PMID: [38680700](https://pubmed.ncbi.nlm.nih.gov/38680700/) DOI: [10.4239/wjd.v15.i4.793](https://doi.org/10.4239/wjd.v15.i4.793)]
- 8 **Mutalub YB**, Abdulwahab M, Mohammed A, Yahkub AM, Al-Mhanna SB, Yusof W, Tang SP, Rasool AHG, Mokhtar SS. Gut Microbiota Modulation as a Novel Therapeutic Strategy in Cardiometabolic Diseases. *Foods* 2022; **11** [PMID: [36076760](https://pubmed.ncbi.nlm.nih.gov/36076760/) DOI: [10.3390/foods11172575](https://doi.org/10.3390/foods11172575)]
- 9 **Zhao LY**, Mei JX, Yu G, Lei L, Zhang WH, Liu K, Chen XL, Kołat D, Yang K, Hu JK. Role of the gut microbiota in anticancer therapy: from molecular mechanisms to clinical applications. *Signal Transduct Target Ther* 2023; **8**: 201 [PMID: [37179402](https://pubmed.ncbi.nlm.nih.gov/37179402/) DOI: [10.1038/s41392-023-01406-7](https://doi.org/10.1038/s41392-023-01406-7)]
- 10 **Antony MA**, Chowdhury A, Edem D, Raj R, Nain P, Joglekar M, Verma V, Kant R. Gut microbiome supplementation as therapy for metabolic syndrome. *World J Diabetes* 2023; **14**: 1502-1513 [PMID: [37970133](https://pubmed.ncbi.nlm.nih.gov/37970133/) DOI: [10.4239/wjd.v14.i10.1502](https://doi.org/10.4239/wjd.v14.i10.1502)]





Published by **Baishideng Publishing Group Inc**  
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

**Telephone:** +1-925-3991568

**E-mail:** [office@baishideng.com](mailto:office@baishideng.com)

**Help Desk:** <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

