

## Probiotics and Gut Microbiota: A New Horizon in Pediatric Chronic Kidney Disease

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**D**ear Editor, with interest, we read Nori et al. review entitled "Probiotics in Women and Pediatrics Health: A Narrative Review" published in Al-Anbar Medical Journal volume 19, issue 1, 2023 [1]. The review discussed the role of probiotics in pediatric health, including gastrointestinal, respiratory, psychological, and neurological diseases.

We believe that the role of gut microbiota (GM) and modulating them by probiotics in pediatric chronic kidney diseases (CKD) is worth mentioning. GM application in CKD can yield encouraging outcomes as summarized in Figure 1. Such endeavors would furnish valuable insights into novel probiotic strains and their potential benefits for renal disease in pediatrics [2].

Examining GM in pediatric CKD is an emerging field of research. Alterations in GM composition and function have been linked to various pediatric diseases through the production of metabolites, regulation of immune responses, and modulation of inflammation [3, 4].

Identifying a specific GM signature or marker may indicate the presence or progression of CKD, thus allowing timely interventions to prevent disease progression [2]. Furthermore, different GM profiles may respond differently to medications or dietary treatments, allowing for customized treatment strategies based on an individual's unique GM; in addition, GM alteration may be a non-invasive method to evaluate treatment efficiency and disease progression [5]. Nevertheless, it is crucial to acknowledge that investigations into the diagnostic utilization of GM in pediatric PKD are currently nascent.

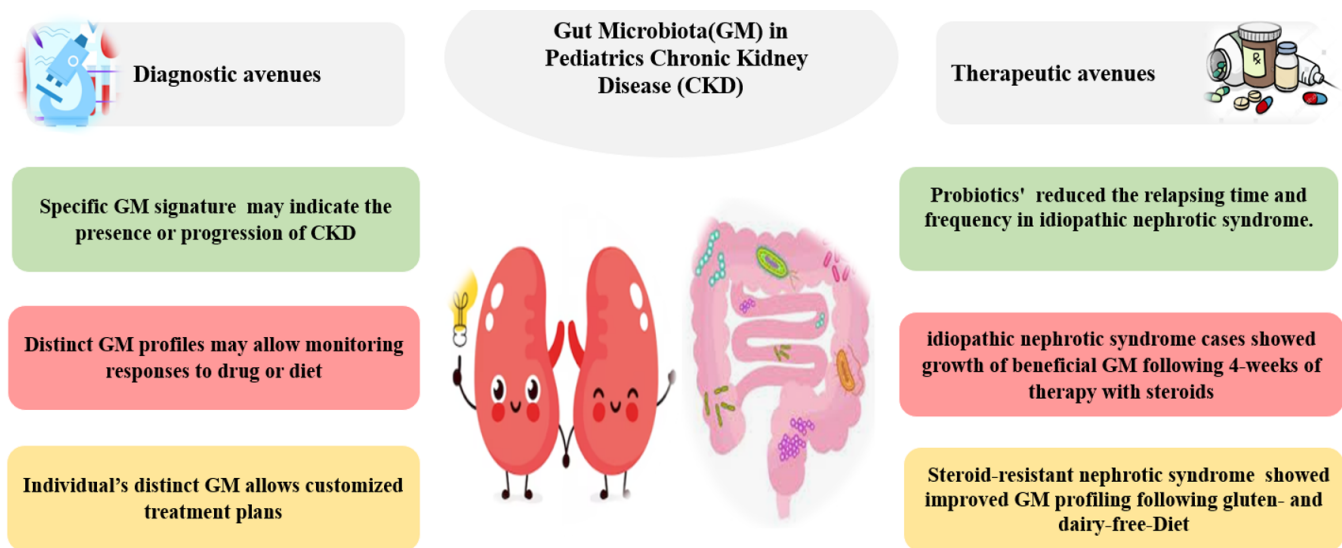
Recent work discussed modulating GM via probiotics in children with idiopathic nephrotic syndrome (INs). Probiotics' beneficial effect was confirmed by reducing the relapsing time and frequency [6]. Yamaguchi et al.'s result confirms the same beneficial effect and discusses an increased growth of beneficial GM and T-Regulatory cells (T-reg) in the blood as an underlying mechanism for the immunomodulatory role of probiotics [7]. Qiu et al.'s results declare a disturbed GM composition among newly diagnosed INs children, suggesting GM's role in INs pathogenesis. Furthermore, the authors confirm increased levels of beneficial GM following treatment as well as an increase in the proportion of T-reg [8].

Another study noticed increased growth of beneficial GM following 4-weeks of therapy with steroids (a common drug used in inducing remission) among cases with idiopathic nephrotic syndrome [9]. Children with steroid-resistant nephrotic syndrome (SRNS) showed improved GM profiling following dietary modification (gluten- and dairy-free-Diet) for 4 weeks. The authors proposed that this diet had anti-inflammatory and immunomodulatory effects as the T-reg cells showed a 4-fold increase [7]. The modulation of T-reg and TH-17 equilibrium plays a crucial role in the development of renal inflammation. Consequently, probiotic administration may yield advantageous outcomes by influencing the kidney-gut axis through immune regulatory mechanisms [2]. Furthermore, apart from the association between GM and pediatric renal diseases, there is also a correlation between the urine microbiome and conditions such as urinary tract infections, vesicoureteral reflux, and neurogenic bladder. Nevertheless, the impact of GM on these diseases remains poorly understood [10].

In conclusion, GM and its modulation through probiotics present a promising frontier in pediatric CKD research. This innovative approach could potentially lead to the development of novel, personalized treatment strategies and non-invasive diagnostic tools, thereby enhancing patient outcomes.

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**Figure 1.** The main diagnostic and therapeutic roles of the gut microbiota in children with chronic kidney disease.

#### ETHICAL DECLARATIONS

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##### Ethics Approval and Consent to Participate

None.

##### Consent for Publication

None.

#### Availability of Data and Material

None.

#### Competing Interests

The authors declare that there is no conflict of interest.

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#### Authors' Contributions

Kassim MAK, Pantazi ACP, and Naser MHNN were equally responsible for the conception and literature review. (MAKK) wrote and drafted the manuscript. All authors have read and agreed on the final version of the manuscript.

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