Perspective

Personalized Diabetes Drug Dosing: Optimizing Therapy for Individual Needs

Introduction

Diabetes management has evolved significantly with the development of diverse pharmacologic agents targeting multiple metabolic pathways. Despite standardized treatment algorithms, patient responses to antidiabetic medications vary widely due to differences in genetics, age, body composition, renal function, comorbidities, and lifestyle. Personalized diabetes drug dosing aims to tailor medication type and dosage to the individual patient, maximizing therapeutic benefit while minimizing adverse effects. This patient-centered approach represents a key component of precision medicine in endocrinology [1-3].

Discussion

Individual variability in drug metabolism and sensitivity plays a central role in determining optimal dosing. Factors such as renal and hepatic function significantly influence drug clearance, particularly for medications like metformin, insulin, and certain oral agents. In patients with chronic kidney disease, dose adjustments are essential to avoid accumulation and toxicity while preserving glycemic control [4,5].

Pharmacogenomics is an emerging tool in personalized dosing. Genetic differences can affect drug transporters, metabolizing enzymes, and receptor sensitivity, influencing both efficacy and side-effect profiles. For example, variations in genes related to metformin transport or sulfonylurea metabolism may partially explain differing therapeutic responses. While routine genetic testing is not yet standard practice, ongoing research suggests its potential role in refining individualized dosing strategies.

Technological advancements further support personalized dosing. Continuous glucose monitoring provides real-time glycemic data, enabling precise titration of insulin and other agents based on daily glucose patterns. Smart insulin pens and automated insulin delivery systems adjust dosing according to dynamic glucose fluctuations, reducing both hyperglycemia and hypoglycemia. These tools allow clinicians and patients to move beyond static dosing regimens toward responsive, data-driven adjustments.

Patient characteristics and preferences also guide individualized dosing decisions. Elderly individuals or those at high risk for hypoglycemia may benefit from conservative titration strategies. Conversely, patients with obesity or marked insulin resistance may require higher or combination dosing approaches. Shared decision-making ensures that treatment intensity aligns with patient goals, lifestyle, and capacity for adherence.

Conclusion

Personalized diabetes drug dosing reflects a shift from uniform treatment protocols to individualized therapeutic strategies. By integrating clinical factors, emerging genetic insights, and real-time glucose data, healthcare providers can optimize medication selection and dosage for each patient. This tailored approach enhances glycemic control, reduces adverse events, and improves overall treatment satisfaction. As precision

Hannah Lee*

Dept. of Pharmacology, Pacific Biomedical University, South Korea

*Author for correspondence:

hannah.lee@pbu.kr

medicine continues to advance, personalized dosing will remain central to effective and sustainable diabetes management.

References

1. Verma AK, Prakash S (2020) Impact of COVID-19 on environment and society. J Biosci 9:7352-7363.

2. Sim MR (2020) The COVID-19 pandemic: Major risks to healthcare and other workers on the front line. Occup Environ Med 77:281-282.

3. Ornell F, Halpern SC, Kessler FHP, Narvaez JCM (2020) The impact of the COVID-19 pandemic on the mental health of healthcare professionals. Cad Saude Publica 36:1-6.

4. Dirette DP (2020) Occupational therapy in the time of COVID-19. DOAJ 8:1-4.

5. Hoel V, von Zweck C, Ledgerd R (2021) The impact of Covid-19 for occupational therapy: Findings and recommendations of a global survey. World Fed Occup Ther Bull 1-8.