

diabetik.

B. Simpulan

Pada penelitian ini didapatkan hubungan antara tingginya rasio kadar FGF 21 serum terhadap kadar Klotho serum dengan kejadian dan derajat retinopati diabetik pada pasien DM tipe 2.

C. Saran

Rasio kadar FGF 21 serum terhadap kadar Klotho serum dapat dijadikan prediktor terhadap kejadian dan beratnya derajat retinopati diabetik pada pasien DM tipe 2.

Daftar Pustaka

1. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2014;37:81-90.
2. Kementerian Kesehatan RI. Infodatin tetap produktif, cegah, dan atasi Diabetes Melitus 2020. *Pus Data dan Inf Kementeri Kesehat RI*. 2020:1-10.
3. Saeedi P, Petersohn I, Salpea P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract*. 2019;157.
4. Sinclair SH, Schwartz SS. Diabetic Retinopathy An Underdiagnosed and Undertreated Inflammatory, Neuro-Vascular Complication of Diabetes. *Front Endocrinol (Lausanne)*. 2019;10:1-14.
5. Ansari P, Tabasumma N, Snigdha NN, et al. Diabetic Retinopathy: An Overview on Mechanisms, Pathophysiology and Pharmacotherapy. *Diabetology*. 2022;3(1):159-175.
6. Violetta L, Kartasasmita AS, Supriyadi R, et al. Circulating Biomarkers to Predict Diabetic Retinopathy in Patients with Diabetic Kidney Disease. 2023:1-13.
7. Frudd K, Sivaprasad S, Raman R, et al. Diagnostic circulating biomarkers to detect vision-threatening diabetic retinopathy: Potential screening tool of the future? *Acta Ophthalmol*. 2022;100(3):e648-68.
8. Wang J, Liu Y, Liu Y, et al. The multiple roles of fibroblast growth factor diabetic nephropathy. *J Inflamm Res*. 2021;14:5273-5290.
9. Li S, Xia N, Han L. Association between serum fibroblast growth factor 21 level and sight-threatening diabetic retinopathy in Chinese



- patients with type 2 diabetes. *BMJ Open Diabetes Res Care*. 2021;9(1).
10. Lin Y, Xiao YC, Zhu H, et al. Serum fibroblast growth factor 21 levels are correlated with the severity of diabetic retinopathy. *J Diabetes Res*. 2014.
 11. Wang YS, Ye J, Cao YH, et al. Increased serum/plasma fibroblast growth factor 21 in type 2 diabetes mellitus: A systematic review and meta-analysis. *Postgrad Med J*. 2019;134-139.
 12. Wong CW, Wong TY, Cheng CY, et al. Kidney and eye diseases: Common risk factors, etiological mechanisms, and pathways. *Kidney Int*. 2014;85(6):1290-1302.
 13. Tang A, Zhang Y, Wu L, et al. Klotho's impact on diabetic nephropathy and its emerging connection to diabetic retinopathy. *Front Endocrinol*. 2023;14:1-17.
 14. Ji B, Wei H, Ding Y, et al. Protective potential of klotho protein on diabetic retinopathy: Evidence from clinical and in vitro studies. *J Diabetes Investig*. 2020;11:162-169.
 15. Corcillo A, Fountoulakis N, Sohal A, et al. Low levels of circulating anti-ageing hormone Klotho predict the onset and progression of diabetic retinopathy. *Diabetes Vasc Dis Res*. 2020;17.
 16. Galicia-Garcia U, Benito-Vicente A, Jebari S, et al. Pathophysiology of type 2 diabetes mellitus. *Int J Mol Sci*. 2020;21:1-34.
 17. Kazi AA, Blonde L. Classification of Diabetes Mellitus. 2001;21.
 18. Lotfy M, Adeghate J, Kalasz H, et al. Chronic Complications of Diabetes Mellitus: A Mini Review. *Curr Diabetes Rev*. 2016;13:3-10.
 19. Randa SE, Alaa MZ, Aldalati JSA. Diabetic Retinopathy: Breaking the Barrier. *Physiol Behav*. 2018;176:139-148.
 20. Sharma A. Retina and Vitreous. *Mindmaps Ophthalmol*. 2019:245-284.
 21. Grigoryan EN. Self-Organization of the Retina during Eye Development , Retinal Regeneration In Vivo , and in Retinal 3D Organoids In Vitro. 2022.
 22. Cells E, Fresta CG, Fidilio A, et al. A New Human Blood – Retinal Barrier Model Based on. *Int J Mol Sci*. 2020;21(1636):1-17.
 23. Rudraraju M, Narayanan SP, Somanath PR. Regulation of blood-retinal barrier cell-junctions in diabetic retinopathy. *Pharmacol Res*. 2020;161.
 24. Wang W, Lo ACY. Diabetic retinopathy: Pathophysiology and treatments. *Int J Mol Sci*. 2018;19.
 25. Wong TY, Sun J, Kawasaki R, et al. Guidelines on Diabetic Eye Care: The International Council of Ophthalmology Recommendations for Screening, Follow-up, Referral, and Treatment Based on Resource Settings. *Ophthalmology*. 2018;125(10):1608-1622.
 26. Smith EJ, Sun JK, Stitt AW. Diabetic retinopathy: Current understanding, mechanisms, and treatment strategies. *JCI Insight*. 2017;2:1-13.



27. Kusuha S, Fukushima Y, Ogura S, et al. Pathophysiology of diabetic retinopathy: The old and the new. *Diabetes Metab J*. 2018;42:364-376.
28. Ornitz DM, Itoh N. The fibroblast growth factor signaling pathway. *Wiley Interdiscip Rev Dev Biol*. 2015;4(3):215-266.
29. Gómez-Sámano MÁ, Grajales-Gómez M, Zuarth-Vázquez JM, et al. Fibroblast growth factor 21 and its novel association with oxidative stress. *Redox Biol*. 2017;11:335-341.
30. Phan P, Saikia BB, Sonaila S, et al. The saga of endocrine fgfs. *Cells*. 2021;10.
31. Fisher FM, Maratos FE. Understanding the Physiology of FGF21. *Annu Rev Physiol*. 2016;78:223-241.
32. Suzuki M, Uehara Y, Motomura-Matsuzaka K, et al. β klotho is required for fibroblast growth factor (FGF) 21 signaling through FGF receptor (FGFR) 1c and FGFR3c. *Mol Endocrinol*. 2008;22:1006-1014.
33. Aaldijk AS, Verzijl CRC, Jonker JW, et al. Biological and pharmacological functions of the FGF19 and FGF21 coreceptor beta klotho. *Front Endocrinol (Lausanne)*. 2023;14.
34. Lee BC. Retinal degeneration in a Klotho-overexpressing mouse. 2006.
35. Kokkinaki M, Abu-Asab M, Gunawardena N, et al. Klotho regulates retinal pigment epithelial functions and protects against oxidative stress. *J Neurosci*. 2013;33:16346-16359.
36. Fang J, Luo C, Zhang D, et al. Correlation between diabetic retinopathy and diabetic nephropathy: a two-sample Mendelian randomization study. *Front Endocrinol (Lausanne)*. 2023;14(November):1-11.
37. Kato S, Takemori M, Kitano S, et al. Retinopathy in older patients with diabetes mellitus. *Diabetes Res Clin Pract*. 2002;58(3):187-192.
38. Heidari Z, Hasanpour M. The serum fibroblast growth factor 21 is correlated with retinopathy in patients with type 2 diabetes mellitus. *Diabetes Metab Syndr Clin Res Rev*. 2021;15.
39. Mousavi Z, Bonakdaran S, Sahebkar A, et al. The relationship between serum levels of fibroblast growth factor 21 and diabetic retinopathy. *Excli J*. 2017;16:1249-1256.
40. Farooq M, Khan AW, Kim MS CS. The Role of Fibroblast Growth Factor (FGF) Signaling in Tissue Repair and Regeneration. *Cells*. 2021;10:3-20.
41. Tomita Y, Fu Z, Wang Z, et al. Long-acting FGF21 inhibits retinal vascular leakage in in vivo and in vitro models. *Int J Mol Sci*. 2020;21.
42. Fisher FM, Maratos-Flier E. Understanding the Physiology of FGF21. *Annu Rev Physiol*. 2016;78:223-241.
43. Teghamati A, Momeni A, Abdollahi A, et al. Serum fibroblast growth factor 21 concentrations in type 2 diabetic retinopathy patients. *Ann Endocrinol*. 2016;77:586-592.
44. Siddu A, Maggi DC. Klotho: A new therapeutic target in diabetic



- retinopathy? *World J Diabetes*. 2023;14:1027-1036.
45. Hua S, Liu Q, Li J, et al. Beta-klotho in type 2 diabetes mellitus: From pathophysiology to therapeutic strategies. *Rev Endocr Metab Disord*. 2021;22(4):1091-1109.

