

11.BÖLÜM

KALITSAL METABOLİK HASTALIKLAR

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GİRİŞ

Kalıtsal metabolik hastalıklar (KMH), bir enzimin veya kofaktörünün yokluğundan veya anormalliğinden kaynaklanan ve bir metabolitin birikmesine veya eksikliğine yol açan hastalıklardır. İntrauterin hayattan erişkinlik dönemine kadar her yaşta görülebilirler⁽¹⁻³⁾. Kalıtsal metabolik hastalıkların her biri tek başına 100.000 canlı doğumda 1'den az insidansı olan nadir bozukluklardır. Ancak, topluca ele alındığında, insidans 800-2500 canlı doğumda 1'e yaklaşabilir. Metabolik hastalık belirti ve bulgularının erken tanınması, hızlı bir şekilde değerlendirilmesi, tedavi ve takip için tecrübeli bir merkeze yönlendirilmesi prognozu olumlu yönde etkiler. Tanıda gecikme, akut metabolik dekompanseasyon, ilerleyici nörolojik hasar veya ölüme neden olabilir^(1, 2).

PATOGENEZ VE SINIFLANDIRMA

Metabolik bozukluklar çeşitli mekanizmalardan kaynaklanabilir. Çoğu metabolik hastalık, bir metabolik yolun bir basamağını bozan tek bir enzim eksikliğinden kaynaklanır^(3, 4).

Metabolik hastalıkların çoğu otozomal resesif, ancak birkaçı X'e bağlı resesif (ornitin karbamoiltransferaz eksikliği) kalıtım şekline sahiptir⁽¹⁻⁴⁾. Çoğu KMH'nin fetüsün sağlığı ve gelişimi üzerinde etkisi yoktur, çünkü plasental perfüzyon, enzim defektinin neden olduğu sistemik metabolik bozuklukları düzeltebilir⁽²⁻⁴⁾. Hastaların çoğunun doğum kilosu normaldir ve doğumda genel durumları iyidir⁽¹⁾. Ancak, hücresel enerji üretimindeki bazı defektler (ör. mitokondriyal bozukluklar), doğumda fiziksel malformasyonlara veya fetal yaşamda ciddi hasara neden olabilir. Lizozomal depolanma hastalıklarında (LDH), ciddi semptomlar doğumdan bir süre sonra ortaya çıkmaya da, defektli enzimin substratının hücre içi birikimi fetal yaşamda etkilerini gösterilebilir^(1, 4).

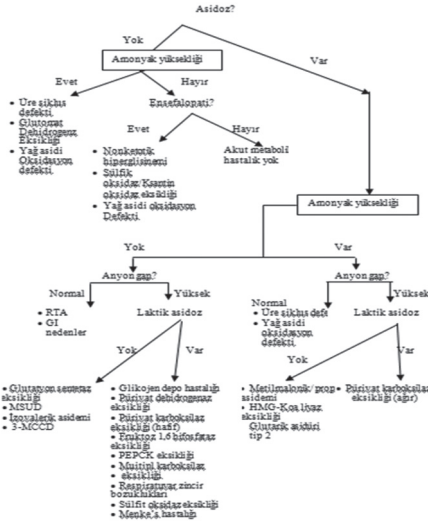
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KAYNAKLAR

1. Sutton, V. R. (2016). Inborn errors of metabolism: metabolic emergencies. UpToDate. Waltham, Ma: Wolters Kluwer. Available at: <http://www.uptodate.com/contents/inborn-errors-of-metabolism-metabolic-emergencies>. Accessed April, 21.
2. Jones SA, Wraith JE (2012). Inborn errors of metabolism in the neonate. Janet M RENNIE (Ed.), J. M.. Rennie & Robertson's Textbook of Neonatology E-Book: (906-918). Expert Consult: Online and Print. Elsevier Health Sciences.
3. Saudubray JM, Craigen WJ, Cazorla AG,(2018). Principles of Inborn Errors of Metabolism. Kline, M. W., Blaney, S. M., Giardino, A. P., Orange, J. S., Penny, D. J., Schutze, G. E., ... & Rudolph, C. D. (Eds) Rudolph's Pediatrics (23rd ed., pp.1906-1958). McGraw Hill Professional.
4. Saudubray, J. M., & Garcia-Cazorla, À. (2018). Inborn errors of metabolism overview: pathophysiology, manifestations, evaluation, and management. *Pediatric Clinics*, 65(2), 179-208.
5. Leonard JV, Morris AA. Diagnosis and early management of inborn errors of metabolism presenting around the time of birth. *Acta Paediatr.* 2006 Jan;95(1):6-14.
6. Mansouri A, Fromenty B, Durand F, et al. Assessment of the prevalence of genetic metabolic defects in acute fatty liver of pregnancy. *Journal of hepatology*, 1996;25(5), 781.
7. Walter JH. Inborn errors of metabolism and pregnancy. *Journal of inherited metabolic disease*, 2000; 23.3: 229-236.
8. Calvo M, Artuch R, Macia E, et al. Diagnostic approach to inborn errors of metabolism in an emergency unit. *Pediatric emergency care*, 2000;16(6), 405-408.
9. Weiner DL. Metabolic emergencies. In: *Textbook of pediatric emergency medicine*, 5th ed, Fleisher GR, Ludwig S, Henretig FM (Eds), Lippincott, Williams and Wilkins, Philadelphia 2006. p.1193.
10. Saudubray JM, Chappentier C. Clinical phenotypes: Diagnosis/algorithms. In: *Metabolic and molecular bases of inherited disease*, Scriver CR, Beaudet AL, Sly WS, Valle D (Eds), McGraw-Hill, New York 2001. p.1327.
11. Cleary MA, Green A. Developmental delay: when to suspect and how to investigate for an inborn error of metabolism. *Archives of disease in childhood*, 2005; 90.11: 1128-1132.
12. Buonocore, G., Bracci, R., & Weindling, M. (Eds.). (2018). *Neonatology*. doi:10.1007/978-3-319-29489-6.
13. Al-Hussaini A, Faqeh E, El-Hattab AW, et al. Clinical and molecular characteristics of mitochondrial DNA depletion syndrome associated with neonatal cholestasis and liver failure. *J Pediatr.* 2014;164:553–559, e551–552.
14. Cormier-Daire V, Chretien D, Rustin P, et al. Neonatal and delayed-onset liver involvement in disorders of oxidative phosphorylation. *J Pediatr.* 1997;130:817–822.
15. Mindikoglu AL, King D, Magder LS, et al. Valproic acid-associated acute liver failure in children: case report and analysis of liver transplantation outcomes in the United States. *J Pediatr.* 2011;158:802–807.
16. Kelly DA, Portmann B, Mowat AP, et al. Niemann-Pick disease type C: diagnosis and outcome in children, with particular reference to liver disease. *J Pediatr.* 1993;123:242–247.
17. Feillet F, Merten M, Battaglia-Hsu SF, et al. Evidence of cataplerosis in a patient with neonatal classical galactosemia presenting as citrin deficiency. *J Hepatol.* 2008;48:517–522.

18. Gimovsky AC, Luzi P, Berghella V. Lysosomal storage disease as an etiology of nonimmune hydrops. *Am J Obstet Gynecol.* 2015;212:281–290.
19. Roth, KS. Inborn errors of metabolism: the essentials of clinical diagnosis. *Clin Pediatr.* 1991;30(3):183.
20. Van Maldergem L, Jauniaux E, Fourneau C. Genetic causes of hydrops fetalis. *Pediatrics.* 1992;89(1), 81–86.
21. Stone DL, Sidransky E. Hydrops fetalis: lysosomal storage disorders in extremis. *Advances in pediatrics.* 1999;46, 409–440.
22. Saudubray JM, Chappentier C. Clinical phenotypes: Diagnosis/algorithms. In: *Metabolic and molecular bases of inherited disease*, Scriver CR, Beaudet AL, Sly WS, Valle D (Eds), McGraw-Hill, New York 2001. p.1327.
23. Cleary MA, Green A. Developmental delay: when to suspect and how to investigate for an inborn error of metabolism. *Archives of disease in childhood.* 2005;90(11), 1128–1132.
24. Leijser LM, de Vries LS, Rutherford MA, et al. Cranial ultrasound in metabolic disorders presenting in the neonatal period: characteristic features and comparison with MR imaging. *AJNR Am J Neuroradiol.* 2007;28:1223–1231.
25. van der Knaap MS, Valk J (2005) *Pattern recognition in white matter disorders.* Springer, Berlin, pp 881–904.
26. Poretti A, Blaser SI, Lequin MH, et al. Neonatal neuroimaging findings in inborn errors of metabolism. *J Magn Reson Imaging* 2013;37:294–312.
27. Hansen L, Lind-Thomsen A, Joshi H J, et al. A glycogene mutation map for discovery of diseases of glycosylation. *Glycobiology.* 2014;25(2), 211–224.
28. Flanagan SE, Xie W, Caswell R, et al. Nextgeneration sequencing reveals deep intronic cryptic ABCC8 and HADH splicing founder mutations causing hyperinsulinism by pseudoexon activation. *Am J Hum Genet.* 2013;92:131–136.
29. Stanley CA, Lieu YK, Hsu BY, et al. Hyperinsulinism and hyperammonemia in infants with regulatory mutations of the glutamate dehydrogenase gene. *N Engl J Med.* 1998;338:1352–1357.
30. Clayton PT, Eaton S, Aynsley-Green A, et al. Hyperinsulinism in short-chain L-3-hydroxyacyl-CoA dehydrogenase deficiency reveals the importance of betaoxidation in insulin secretion. *J Clin Invest.* 2001;108:457–465.
31. Enns GM, Berry SA, Berry GT. Survival after treatment with phenylacetate and benzoate for urea-cycle disorders. *N Engl J Med.* 2007;356:2282–2292.
32. Tuchman M, Lee B, Lichter-Konecki U, et al. Cross-sectional multicenter study of patients with urea cycle disorders in the United States. *Mol Genet Metab.* 2008;94:397–402.
33. Burton KB. Inborn errors of metabolism in infancy: a guide to diagnosis. *Pediatrics* 1998;102:e69.
34. Häberle J. Clinical and biochemical aspects of primary and secondary hyperammonemic disorders. *Archives of biochemistry and biophysics.* 2013;536(2), 101–108.
35. Hsia YE. Transient neonatal hyperamoniemia: squeezing an iceberg into a pigeon hole. *Hepatology* 2005;6:1426–1428.
36. Coskun T (2014). Hiperamonemi. Turgay Coşkun, Murat Yurdakök (Eds). *Yenidoğanda Kalıtsal Metabolik Hastalıklar* (s. 67–82). Ankara: Güneş Tıp Kitabevleri.
37. Bejsovec M, Kulenda Z, Ponca E. Familial intrauterine convulsions in pyridoxine dependency. *Arch Dis Child.* 1967;42:201–207.

38. Akman CI, Yu J, Alter A, Engelstad K, et al. Diagnosing glucose transporter 1 deficiency at initial presentation facilitates early treatment. *J Pediatr.* 2016;171:220–226.
39. Swanson MA, Coughlin CR Jr, Scharer GH, et al. Biochemical and molecular predictors for prognosis in nonketotic hyperglycinemia. *Ann Neurol.* 2015;78:606–618.
40. Applegarth DA, Toone JR. Nonketotic hyperglycinemia (glycine encephalopathy): laboratory diagnosis. *Mol Genet Metab.* 2001;74:139–146.
41. Marsden D, Barshop BA, Capistrano-Estrada S, et al. Anabolic effect of human growth hormone: management of inherited disorders of catabolic pathways. *Biochemical Medicine, Metabolism and Biology.* 1994;52, 145–154.
42. Pammi, M., & Gokulakrishnan. G. (2017). Genetics. In C. J. Fernandes, M. Pammi & L. Katakam (Eds.), *Guidelines for Acute Care of the Neonate* (25th ed., pp. 77–86). Houston, Texas.



Şekil 1. Metabolik hastalıklara yaklaşım (42 numaralı kaynaktan uyarlanmıştır)