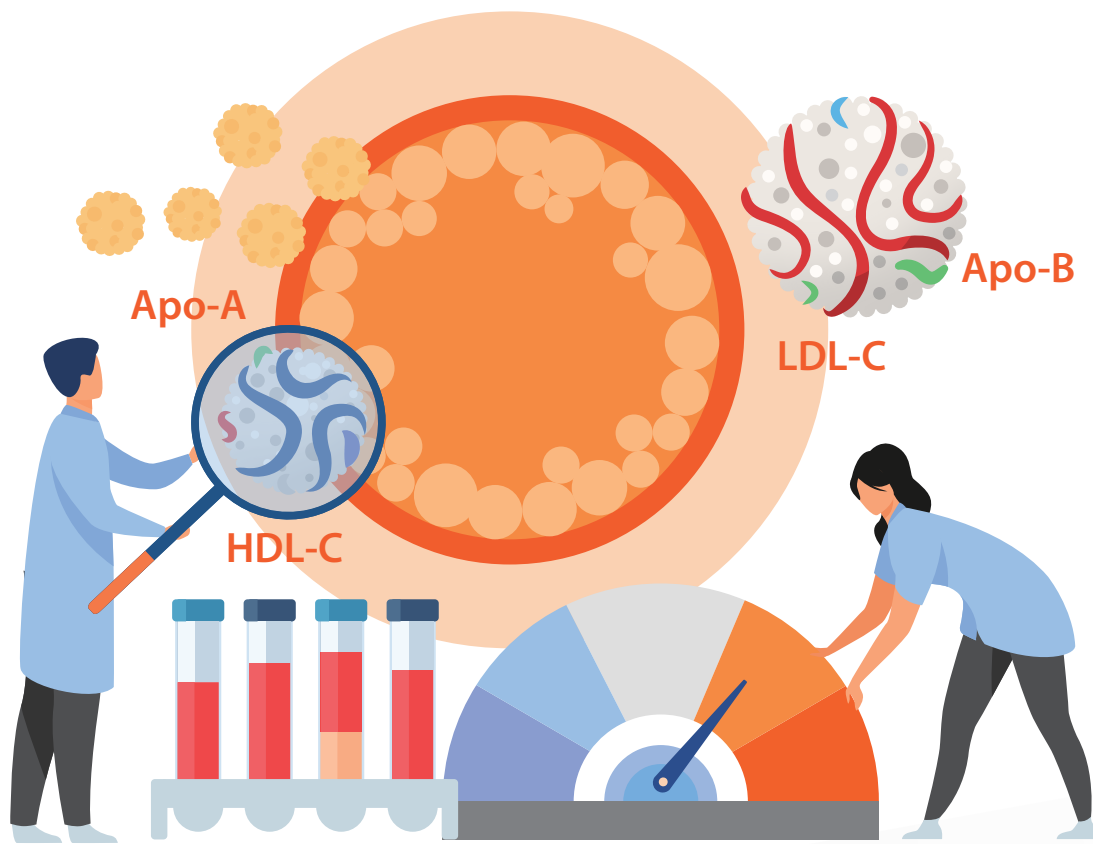
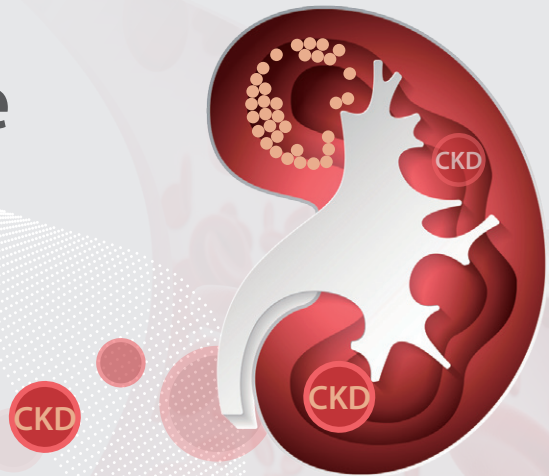


ChemBook

Issue 2 , Chapter 2



Clinical Significance of **Lipid Analysis** in CKD Management



It is widely accepted that laboratory investigation of lipid metabolism is clinically significant for estimating the risk of atherosclerotic cardiovascular disease (ASCVD) and guiding therapeutic decision-making. As recommended by the 2019 ESC/EAS Guidelines for the management of dyslipidaemias, plasma lipid analysis (e.g. TG, TC, HDL-C, LDL-C, apo B, Lp(a), etc.) and proper treatment are meaningful ways of reducing the risk of ASCVD events. [1]

| Recommendations | Class ^a | Level ^b |
|--|--------------------|--------------------|
| TC is to be used for the estimation of total CV risk by means of the SCORE system. | I | C |
| HDL-C analysis is recommended to further refine risk estimation using the online SCORE system. | I | C |
| LDL-C analysis is recommended as the primary lipid analysis method for screening, diagnosis, and management. | I | C |
| TG analysis is recommended as part of the routine lipid analysis process. | I | C |
| Non-HDL-C evaluation is recommended for risk assessment, particularly in people with high TG levels, DM, obesity, or very low LDL-C levels. | I | C |
| ApoB analysis is recommended for risk assessment, particularly in people with high TG levels, DM, obesity, metabolic syndrome, or very low LDL-C levels. It can be used as an alternative to LDL-C, if available, as the primary measurement for screening, diagnosis, and management, and may be preferred over non-HDL-C in people with high TG levels, DM, obesity, or very low LDL-C levels. | I | C |
| Lp(a) measurement should be considered at least once in each adult person's lifetime to identify those with very high inherited Lp(a) levels (>180 mg/dL(>430 nmol/L) who may have a lifetime risk of ASCVD equivalent to the risk associated with heterozygous familial hypercholesterolaemia. | IIa | C |
| Lp(a) should be considered in selected patients with a family history of premature CVD, and for reclassification in people who are borderline between moderate and high-risk. | IIa | C |

Apo=apolipoprotein; CV=cardiovascular; CVD=cardiovascular disease; DM=diabetes mellitus; HDL-C=high-density lipoprotein cholesterol; LDL-C=low-density lipoprotein cholesterol; Lp(a)=lipoprotein(a); SCORE = Systematic Coronary Risk Estimation; TC=total cholesterol; TG=triglyceride.

Figure 1. Guideline recommendations for lipid analysis

Chronic kidney disease (CKD) is one of the world's leading health problems. The estimated prevalence of CKD is 13.4% (11.7%-15.1%), and it is estimated that there are between 4.9 million and 7.1 million patients with end-stage kidney disease needing renal replacement therapy worldwide. [2]

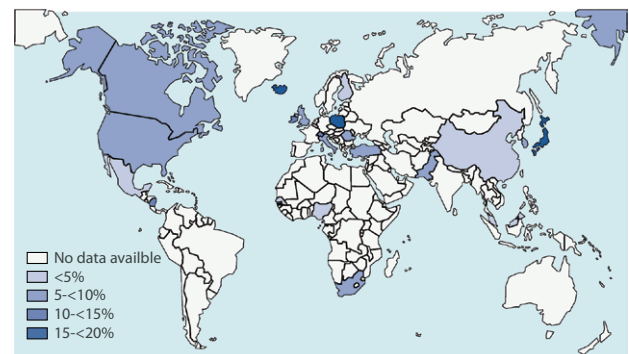
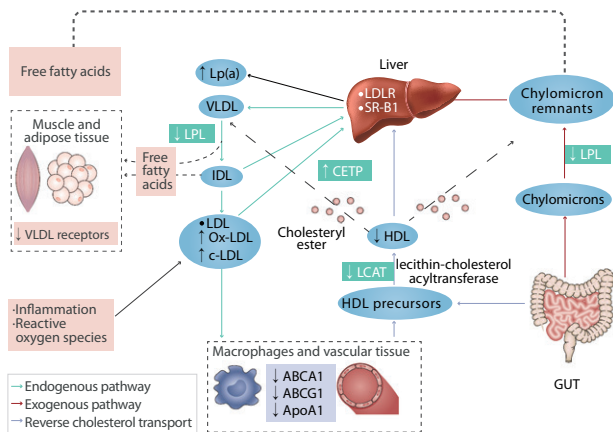


Figure 2. Prevalence of chronic kidney disease [3]

Most patients with CKD are at risk of accelerated cardiovascular disease and death, and many of the cardiovascular comorbidities could be related to dyslipidemia, even though there are significant differences in terms of population, the etiologies of renal damage, the stages of disease progression, and the therapeutic interventions. The level, composition, and quality of plasma lipids could be affected by the altered renal function. The characteristic lipid pattern in patients with CKD stage 3 or higher consists of hypertriglyceridemia, low levels of HDL cholesterol, low

levels of Apo A1 and variable levels of LDL cholesterol and total cholesterol. Lp(a) levels could also increase in association with CKD.^[1, 4]



Hypertriglyceridemia in CKD results from the delayed catabolism of triglyceride-rich lipoproteins. Apo A1 synthesis is reduced in patients with CKD, and the activation of LCAT by Apo A1 is also decreased. The maturation of HDL precursors is consequently affected. Increased Lp(a) is caused by post-translation modification of lipoproteins related to CKD.

Figure 3. Derangements in lipoprotein metabolism in chronic kidney disease^[4]

Consequently, because of the relationship between CKD and dyslipidemia, lipid evaluation is suggested to assist in managing the condition for many patients.

The Kidney Disease: Improving Global Outcomes (KDIGO) organization published its latest guidelines in 2013. As recommended in the clinical practice guidelines, all adults with newly identified CKD (including those treated with chronic dialysis or kidney transplantation) should be evaluated with a lipid profile (TG, TC, LDL-C, and HDL-C). Fasting lipid profile tests are suggested, especially for patients with known significant lipid abnormalities. Additionally, for some CKD patients under the age of 50, lipid analysis could help initiate statin therapy and identify any underlying secondary causes of severe hypercholesterolemia and/or hypertriglyceridemia.^[5]

For patients who have undergone kidney transplantation, dyslipidemias could be very common, which would put them at high risk of ASCVD and transplant arterial vasculopathy. It is recommended that these patients are assessed for their the risk of developing ASCVD, and a full lipid analysis is helpful. If the lipid profile

moves back to a more normal pattern and such changes are sustained, the risk of ASCVD could be significantly reduced.^[6, 7]

Conversely, unlike the LDL-C surveillance involved in managing most patients' treatment, lipid level monitoring is not suggested by the KDIGO work group (2013) in CKD patients with decreased GFR due to the lack of direct evidence. As low GFR is an independent risk factor to ASCVD, strict lipid-lowering therapy would not change medical management or reduce the risk of major cardiovascular events.^[5]

However, some trials have revealed that lowering LDL-C is of benefit, as it reduces the cardiovascular risk of CKD patients not requiring dialysis (including kidney transplant recipients), while other guidelines do suggest lipid monitoring to ensure the cholesterol reduction target is met.^[4] Therefore, lipid analysis has great potential in the management of CKD patients: in assessing adherence to statin treatment, changes in the renal replacement therapy modality, or concerns about the presence of a new secondary cause of dyslipidemia, and even assessing the 10-year cardiovascular risk in patients aged <50 years and not currently receiving a statin.^[5]

To sum up, lipid analysis plays a crucial role in the reduction of ASCVD risks, although lipid testing is quite complicated in patients with CKD, a common medical condition worldwide. All patients with newly identified CKD should undergo lipid analysis, and many of said patients could benefit from medical intervention based on lipid monitoring.

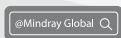


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