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Longitudinal Biomarker Trends for Metabolic Risk Stratification in a Lifestyle-Based Obesity Programme

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Introduction:
Obesity is closely linked to metabolic syndrome and type 2 diabetes through disturbances in glucose regulation, lipid metabolism, and organ function. While lifestyle programmes often emphasise weight reduction, longitudinal biochemical monitoring is essential to identify individuals at higher metabolic risk and guide targeted intervention. This study evaluated changes in key clinical biomarkers within a structured lifestyle programme, focusing on metabolic risk stratification.

Methods:
This longitudinal observational study analysed health screening data from participants enrolled in the *Commit to Fit* lifestyle programme between January and June 2025. Serial measurements included fasting glucose, lipid profile, renal function (creatinine and estimated glomerular filtration rate), liver enzymes, and haemoglobin. Biomarkers were categorised using standard clinical reference ranges. Changes over time were analysed using paired comparisons, and associations between selected biomarkers were assessed using correlation analysis.

Results:
Most participants maintained stable glycaemic status, although a subgroup demonstrated persistent pre-diabetes and diabetes. Renal function improved significantly over six months, with fewer participants exhibiting elevated creatinine or reduced eGFR *($p = 0.01$)*. Improvement in eGFR was inversely associated with fasting glucose *($r = -0.41$, $p < 0.01$)*. Dyslipidaemia remained prevalent; while elevated low-density lipoprotein cholesterol decreased *($p = 0.04$)*, high total cholesterol persisted and was positively associated with fasting glucose *($r = 0.36$, $p = 0.02$)*. Aspartate aminotransferase improved *($p = 0.03$)*, while alanine aminotransferase, alkaline phosphatase, and haemoglobin showed no significant change.

Conclusions:
Longitudinal biomarker monitoring revealed heterogeneous metabolic responses within the obesity programme. Renal improvements contrasted with persistent dyslipidaemia and glycaemic risk. Incorporating biomarker-based risk stratification into lifestyle interventions may support earlier identification of metabolic syndrome and diabetes risk, enabling more targeted and clinically effective counselling.