

AT THE CROSSROADS OF CHEMICAL PATHOLOGY AND BARIATRICS

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Obesity afflicts a high number of individuals worldwide. Also, looking further into the local situation in Malta, there are alarming national statistics with regards to Maltese prevalence of obesity. This in turn poses a significant burden on health care given obesity is associated with multiple co-morbidities. Notable examples include type 2 diabetes, dyslipidemia, atherosclerosis, non-alcoholic steatohepatitis and sleep apnoea. When dietary, exercise and pharmacological regimes fail, certain patients may meet the criteria for Bariatric surgery which usually encompass those with morbid obesity having a BMI greater or equal to 40kg/m² or a BMI greater or equal to 35kg/m² which is medically complicated. Bariatric surgery has the potential to result in remission of type 2 diabetes.

During my bariatrics attachment at Mater Dei Hospital with Mr Benedict Axisa's bariatric team between October to November 2018 I had the pleasure of meeting the bariatric multidisciplinary assessment team which involved the surgical team, psychologist, dietician, anaesthetic teams, members of the sleep apnoea studies team and nursing teams who provide holistic patient management. The lead bariatric dietician and lead psychologist also host joint support groups on Mondays. During my attachment the Health Promotion and Disease Prevention Directorate and the European Association for the Study of Obesity (EASO) hosted a training course for health care professionals in the management of adult obesity which was very well received.

This short article looks further into relevant biochemical blood tests at the crossroads of chemical pathology and bariatrics. Standard biochemical laboratory tests such as lipid panels, LFTs and HbA1c, amongst others, guide general assessment and management of obesity. Clinical biochemistry tests may also be used to rule out secondary causes of obesity such as for example Cushing's syndrome, hypothyroidism and polycystic ovarian syndrome. These could include TFTs and a urinary 24-hour collection for free cortisol and hormonal assessments including LH, FSH and testosterone levels. Post-operative assessment of micronutrient and vitamin deficiencies may also rely on clinical biochemistry laboratory input. These deficiencies are even more likely to occur in malabsorptive procedures.

Certain other substances that are found in a person's blood may serve as biomarkers to guide diagnosis, management and occasionally help make prognostications. A brief literature review was conducted on PubMed articles in October 2018 taking as inclusion criteria articles having concurrently both the terms 'biomarker' and 'bariatric' in the title. Six publications are outlined below. This in turn looks at the crossroads of bariatrics and chemical pathology from a more academic perspective.

The body has various apolipoproteins that participate in lipoprotein metabolic pathways. Apolipoprotein C3 (Apo-CIII) has been described as acting as an inhibitor of lipoprotein lipase and hepatic lipase and is known to play a role in the regulation of metabolism of

triglycerides. Apo-CIII glycoisoforms after bariatric surgery were assessed in relation to glycomic changes. Bariatric surgery appears to alter the isoform distribution in the direction of the non-obese.¹ Most health care professionals know of *Helicobacter pylori* and its association with gastric ulceration and gastritis. Biomarkers such as *Helicobacter pylori* antibodies, basal and stimulated gastrin-17 and pepsinogen I and II have also been investigated as potential replacements of preoperative esophagogastroduodenoscopy for bariatric surgery, where they showed promise as surrogate markers.² The complement pathways such as the classical and alternative pathways are well known for their role in immune regulation. Plasma complement factor 3 showed a strong association with post-bariatric surgery insulin resistance.³ Epithelial intermediate filament proteins or cytokeratins are useful for immunohistochemistry and tumour detection diagnostics. In 2008 levels of cytokeratin 18 fragments have been suggested to potentially be useful as a novel biomarker of non-alcoholic fatty liver disease (NAFLD) in bariatric patients.⁴ The receptor for advanced glycation end products or RAGE has been implicated in various diseases. The soluble form of RAGE (sRAGE) has been investigated in various clinical scenarios for associations and diagnostic utility. sRAGE may help identify those individuals who are expected to gain greater benefit from bariatric surgery.⁵ Neutrophil gelatinase-associated lipocalin or NGAL is a newer marker for the diagnosis of kidney disease and in general

has been advocated as playing a role in the earlier detection of kidney injury. A paper was also written in 2013 about the putative benefit of using urinary NGAL in earlier detection of acute kidney injury in specifically bariatric patients.⁶


A separate literature review was again conducted via PubMed database this time expanding inclusion criteria to the terms 'biomarker' and 'obesity' in the title. This in turn yielded a far more extensive range of published papers in the literature. To date numerous papers were published detailing potential associations between biomarkers and obesity.

Leptin has been extensively studied as a hormone that regulates hunger together with energy consumption. Adiponectin is an adipokine produced by adipose tissue and plays a role in glucose and fatty acid metabolism. Larsen et al. suggest that the leptin to adiponectin (L:A) ratio can be used as a surrogate marker to uncover at an earlier stage metabolic derangements in obese individuals.⁷ In another publication Tacke et al. discussed adipokine Wnt1 inducible signalling pathway protein 1 (WISP-1)/CCN4 as a potential novel obesity biomarker.⁸ N-Acylethanolamines play various roles in energy expenditure. Fanelli et al. wrote about the usefulness of N-Acylethanolamine profiling in obesity.⁹ Identification of miRNA biomarkers as a differentiation factor between obesity and metabolic syndrome would provide greater insights into pathophysiology. O'Neill et al. identified miR-758-3p, as related to cholesterol efflux regulatory protein/

ATP-binding cassette transporter expression, which could aid diagnosis of developing metabolic syndrome in the setting of obesity.¹⁰

Other interesting assessment methods have also been reported such as the measurement of the islet amyloid polypeptide, amylin, via the use of an amperometric immunoassay screen-printed carbon electrode and electropolymerized carboxylated polypyrrole.¹¹ In keeping with this, the

immunohistochemical expression of PGC1 alpha was assessed from fat tissue specimens collected during bariatric surgery to elucidate patterns. The authors concluded that PGC1alpha may potentially constitute a therapeutic and preventive marker in obesity-related comorbidities.¹²

This is just a snapshot of some implicated biomarkers since other candidate substances have been described earlier in the literature. 

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