

## **Lipid Accumulation Product (LAP) Index as Predictor Tool for Metabolic Syndrome**

Metabolic syndrome (MetS) is now considered as an emerging public health issue due to increased mortality and multiple morbidities across the globe. It can be defined as constellation of various conditions which can occur in combination leading to increased risk of coronary artery diseases, stroke, diabetes mellitus (DM), fatty liver and other adverse health conditions. Though there is variation in diagnostic criteria decided by different international bodies like NCEP ATP-III, IDF, WHO; features like increased waist circumference (WC), raised triglyceride (TG) are common component to all criteria<sup>1,2</sup>. Each component has been revealed as an independent risk for cardiovascular disease (CVD) events or DM incidence but three or more combination of factors with diagnosis of MetS increase the chance of developing severe CVD events and DM in future.

If we look at the evidences of different studies done globally which revealed an increased trend of prevalence and incidence of MetS<sup>2,3</sup>. One of the recent study explored increased trend of MetS from 32.5% to 36.9% in US population from 2011 to 2016<sup>4</sup>. Trend varies with age, sex and ethnicity. This study showed in women from 31.7% to 36.6%, adult male (20-39 years) from 16.2% to 21.3%. MetS was found to have increased trend from 19.9% to 26.2% in Asian ethnicity and 32.9% to 40.4% in Hispanic. one in five in young, half of adult with age 60 and above are found to have MetS. Prevalence is found to be raised with increasing age 24% in adult over 20 years and 44% by age 50 years. Prevalence of MetS varies not only due to different ethnic origin but also by using different tools of standard criteria fixed by different international bodies<sup>2-5</sup>.

Considering the etiopathology of MetS, insulin resistance (IR) plays central role whatever the genetic and family history are there. Expression of the disease will be revealed due to unhealthy food habit and less physical activities<sup>2,5,6</sup>. These interaction leads to overweight and obesity, particularly central or visceral fat accumulation, hence IR and subsequent MetS. Specific distribution and functional changes of visceral

fat cell are thought to play role. Inflammatory cytokines and adipokines and leptin released from adipocyte are the postulated mechanism for IR. Until recent surrogate markers like BMI, WC, IR are studied and practiced to predict MetS<sup>5-7</sup>. Positive correlation were found for increased IR as well as MetS with high BMI, increased WC and hight-waist ratio<sup>6-8</sup>.

In 1905, Khan HS proposed lipid accumulation product (LAP) as a new index for better predictive value for MetS using WC and serum TG together based on population-based study NHANES III<sup>9</sup>. LAP is inexpensive tool which reflect lipid accumulation. IR, waist circumference, atherogenic lipid, endothelial dysfunction are postulated as central role in MetS. First two are the prime factors in the pathogenesis. Obesity, particularly visceral obesity is closely related to IR. IR, even in non-obese may increase the tendency to develop MetS and CVD. Expensive, complex, time consuming euglycemic hyper insulinemic clamp study is considered as the gold standard to evaluate IR but simple HOMA-IR is used in epidemiology survey. Some clinical parameter like BMI, waist circumference are usually used to identify IR but such indices are not so much satisfactory, can not distinguish lean and fat tissue, nor reflect lipid accumulation nor distribution nor functional abnormalities. Measurement of WC can not reflect sufficiently visceral fat or even are unable to distinguish subcutaneous adipose tissue from visceral adipose tissue<sup>7,8,10</sup>. LAP index were tested on different populations, non-diabetes population, healthy population as well as PCOS. LAP were revealed as simple, accurate, stronger predictive index to recognize IR, MetS and CVD risk in non-diabetic population as well as healthy people of different ethnicity. It has effective index with higher sensitivity and specificity than BMI, WC predicting CVD<sup>10-14</sup>. A recent paper published in current issue of the Journal of Bangladesh College of Physicians and Surgeons (JBCPS) evaluating sensitivity, specificity, positive predictive value and negative predictive value of LAP in detection of MetS

in male study subjects were 70.45%, 78.57%, 72.09% and 77.19% respectively and in females these values were 20.45%, 96.43%, 81.82% and 60.67% respectively, highlighting its utility in Bangladeshi population.

ATTICA, a prospective Caucasian population based cohort study, showed incidence of CVD in 317 cases (15%) in 3042 adults after 10 years follow up with baseline LAP. These findings support a positive association between LAP and long term CVD incidence<sup>15</sup>. More over LAP index was found to predict the incidence of CVD better than BMI, WC, waist-hip, waist-height ratio in other studies<sup>7,15</sup>. Similarly, utilizing clinical and laboratory finding together visceral adiposity Index (VAI) can be used as a novel marker of fat distribution and function as is found by LAP index. Exploring as moderate to high accuracy with high sensitivity and specificity we can also consider VAI as low cost and easily available screening marker of MetS<sup>16</sup>.

In conclusion, MetS is increasing as a silent epidemic globally, as well as, in Bangladesh due to rapid economic growth and life style changes. CVD and DM are running after as a consequence. Early, rapid with high accuracy and low-cost screening predictive index like LAP can help to identify the risk component and to take preventive strategies.

*(J Bangladesh Coll Phys Surg 2022; 40: 1-2)*

DOI: <https://doi.org/10.3329/jbcps.v40i1.57050>

### **Prof. Md. Faruque Pathan**

*Professor*

*Department of Endocrinology and Metabolism,  
BIRDEM General Hospital and*

*Director, BIRDEM Academy, Dhaka, Bangladesh*

*Email: [pathan279@yahoo.com](mailto:pathan279@yahoo.com)*

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