Risk Assessment, Risk Prediction, and Effective Management of Risk Factors for Cardiovascular Diseases

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South Asians (Indians, Pakistanis, Bangladeshis, and Sri Lankans) have the highest incidence of coronary artery disease (CAD), compared to any other ethnic group in the world. According to World Health Organization estimates, India ranks number one in the list of countries with high incidence of type 2 diabetes (T2D). This number will double in the next two decades. Therefore, according to healthcare experts, early detection of the risk factors for CAD and T2D and effective management of these risks is a better choice than efforts to cure these complex metabolic disorders. Having said this, we have to question how early is early when it comes to the detection of risk for cardiometabolic diseases? Framingham Heart Studies from USA demonstrated that various risk factors such as hypertension, obesity, and lipid abnormalities enhance the risk of an individual for developing acute vascular events. Based on this concept, disease management through effective modulation of risk factors was developed. However, studies by Prof. Jay Cohen and associates at the University of Minnesota have emphasized that management of disease is better than the management of risk factors. In India, similar to the Framingham studies, careful record of the physical and vital statistics of the newborn child at Mission Hospital Mysore has revealed some staggering statics about how the cardiometabolic disorders evolve. Mission hospital Mysore has kept birth records with the vital statistics of all the children born from 1936. Medical Research Council (MRC) of the United Kingdom has taken advantage of this fact and established an epidemiological wing at this hospital to study the "Mysore Cohort." Their studies and that of others have revealed that more than 30% of the children

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born in India have low birthweight. Furthermore, these studies have shown that low birthweight children as they grow into adulthood develop cardiometabolic diseases (1). These observations combined with the observations made by the researchers of the Framingham Heart Study emphasize the need for early detection of risks for the development of hypertension, obesity, metabolic syndrome, T2D, heart disease, and stroke.

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Inflammation and alterations in the vascular function are some of the earliest signs of the pathogenesis of atherosclerosis and metabolic diseases. Since we do not perform routine medical check of the young adolescents, some of these alterations of vessel wall and their components go unnoticed for a long time. There is a great need for the development of methodologies that can be used to assess the vascular function and dysfunction. Cost-effective and specific assays need to be developed for following biomarkers, indicative of changes in the blood chemistry leading to altered signaling of the various modulating systems. Similarly, simple noninvasive devices need to be developed which can be used to determine altered compliance of the vascular system. For instance, availability of indigenously developed cost-effective assays for inflammatory cytokines, chemokines, and C-reactive proteins will encourage clinicians to use these assays for early detection of the chronic inflammation of the vessel wall, and to manage the inflammatory process. In the same way, if we can develop noninvasive devices to monitor the progression of the vessel wall disease, then plaque progression and regression could be monitored and appropriate management regimen can be introduced. Studies done at the University of Western Ontario, in the Robarts Research Laboratory by Prof. David Spence and Prof. Aaron Fenster have demonstrated the use of 3D ultrasound technology for monitoring the plaque volume of the carotid vessels (2–6). Their studies have

demonstrated the utility of this technique for following statin-induced reduction or regression of the plaque volume (5, 6).

Seventeen-point executive check up offered by the Rasmussen Cardiovascular Disease Prevention Center at the University of Minnesota includes the monitoring of the vascular dysfunction using cardiovascular profiler (CV Profilor) developed by the Hypertension Diagnostics Inc (Hypertension Diagnostics Inc, www.hdi.pulsewave. com). This instrument has been successfully used by the Minnesota Heart Institute, St. Paul, MN, to monitor early development of endothelial dysfunction in school children. The researchers have successfully demonstrated that by using this instrument, they could follow the effect of exercise on alterations in the vascular dysfunction.

In the current issue of the *Journal of Clinical and Preventive Cardiology,* we have an article titled "Relationship of arterial stiffness with hypertension and its management in a North-Indian urban population free of cardiovascular disease" by Kasliwal et al.(7). Hypertension is one of the leading causes of morbidity and mortality in India and the number of hypertensives in India will touch 200 million by 2020. Hypertension is responsible for 57% of all stroke death and 24% of all clinical complications with CAD. It is not only important to develop methodologies to detect subclinical prevalence of this vascular dysfunction but also equally important to find effective ways to monitor and manage hypertension. In the work presented by Kasliwal and the group in this journal, the authors have monitored vascular function in 144 individuals who were free of CV disease. In this study, individuals were subjected to clinical examination, biochemical investigations, and arterial stiffness assessment. Right and left brachial-ankle pulse wave velocity, carotid-femoral pulse wave velocity, and augmentation index were estimated using PeriScope® device (Genesis Medical Systems, Hyderabad), as measures of arterial stiffness. Of the 144 subjects, 101 (70.1%) were found to have hypertension. All arterial stiffness parameters were significantly elevated in patients with hypertension. Importantly, hypertensive patients with controlled BP (<140/90 mmHg) had less stiff arteries as compared to those with elevated BP levels, even if they were not previously known to be hypertensives. Moreover, all measures of arterial stiffness improved with control of BP. Based on these findings, the authors conclude that in north-Indian subjects without known cardiovascular disease, arterial stiffness is significantly increased among hypertensives and is positively correlated with both systolic and diastolic BP.

Although HDI instrument and Periscope® are available in the market, utility of these instruments for early detection of vascular dysfunction has not been adequately demonstrated in asymptomatic, apparently healthy populations. Significance of the study by Kasliwal et al. is that this is one of the first studies to demonstrate the usefulness of a noninvasive device for early detection of hypertension and its ill effects on the vasculature. More importantly, they also have demonstrated that alterations in the vascular function could be improved by the use of appropriate antihypertensive therapy. This is a very encouraging finding and can be meaningfully exploited as an incentive to the patient for complying with the treatment and as a counter-check mechanism for the treating physician to let him know that the therapy is producing desirable effects. However, further larger studies are needed to demonstrate how assessment of arterial function in routine clinical practice could improve cardiovascular outcome of patients presenting with hypertension. Nevertheless, this study once again draws our attention toward potential utility of a noninvasive device to effectively monitor hypertension in normal population and for the management of this silent disease with appropriate antihypertensive drugs.

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