CVD Risk Factor trend in India

Our serial cross sectional surveys (Survey 1 during 1991-1994 and survey 2 during 2010-2012) on community prevalence of CVD risk factors in Delhi- NCR demonstrated a marked rise in burden of most conventional CVD risk factors over the last two decades. Urban and rural prevalence of alcohol use, hypertension and diabetes increased with increases in age-standardized mean systolic blood pressure [(urban 124.3 to 132.2 mm Hg and rural 116.8 to 124.6 mmHg), diastolic blood pressure (urban74.9 to 84.1 mm Hg and rural 73.5 to 82.5 mmHg] and fasting glucose (urban 102.3 to 117.0 mg % and rural 83.9 to 105.0 mg %). The smoking prevalence increased in rural male population and remained unchanged among others. However, raised total cholesterol declined in urban population (details are given in tables 1&2).

Table: 1 CVD risk factor trend (Urban)

	Age standardized Prevalence (95% CI)					
	Survey 1	Survey 2	Survey 1	Survey 2	Survey 1	Survey 2
	Men	Men	Women	Women	Total	Total
Hypertension	23.3 (21.2, 25.4)	43.3 (40.1, 46.6)	23.7 (21.7, 25.7)	40.5 (37.6, 43.3)	23.5 (22.1, 24.9)	41.8 (39.7, 44.0)
Diabetes	12.7 (11.0, 14.4)	23.1 (20.0, 26.3)	11.9 (10.2, 13.5)	18.2 (15.7, 20.8)	12.3 (11.1, 13.5)	20.5 (18.5, 22.5)
Raised total Cholesterol (≥200mg/dl)	36.0 (33.4, 38.5)	30.5 (27.0, 34.0)	38.8 (36.4, 41.2)	34.0 (30.8, 37.1)	37.4 (35.6, 39.2)	32.4 (30.1, 34.7)
Smoking	29.1 (26.7, 31.5)	29.8 (26.8, 32.8)	2.5 (1.8, 3.3)	3.8 (2.6, 4.9)	14.8 (13.6, 16.1)	17.1 (15.3, 18.9)
Alcohol use	30.5 (28.0, 32.9)	50.1 (46.8, 53.4)	1.0 (0.5, 1.5)	0.2 (0.0, 0.5)	14.5 (13.3, 15.7)	24.8 (23.1, 26.6)

Table: 2 CVD risk factor trend (Rural)

	Age standardized Prevalence (95% CI)					
	Survey 1	Survey 2	Survey 1	Survey 2	Survey 1	Survey 2
	Men	Men	Women	Women	Total	Total
Hypertension	12.6 (10.6, 14.6)	32.1 (29.1, 35.1)	10.5 (8.8, 12.1)	24.8 (22.0, 27.6)	11.3 (10.5, 12.5)	28.5 (26.5, 30.6)
Diabetes	2.6 (1.4, 3.9)	12.1 (9.4, 14.9)	3.0 (1.7, 4.4)	7.1 (5.1, 9.1)	2.8 (1.9, 3.8)	9.4 (7.8, 11.1)
Raised total Cholesterol (≥200mg/dl)	16.7 (13.5, 19.8)	37.6 (33.5, 41.7)	16.4 (13.6, 19.3)	37.5 (33.8, 41.3)	16.1 (14.0, 18.2)	37.6 (34.9, 40.4)
Smoking	54.4 (51.3, 57.5)	66.7 (63.7, 69.8)	24.8 (22.5, 27.1)	24.9 (22.1, 27.6)	39.9 (37.8, 41.9)	49.2 (46.9, 51.6)
Alcohol use	15.0 (12.5, 17.5)	65.1 (62.0, 68.1)	0.5 (0.05, 0.9)	0.5 (0.01, 0.9)	7.2 (6.0, 8.4)	31.4 (29.7, 33.1)

Disparity in cardiovascular disease risk factors and socioeconomic gradient in India

The relationship between cardiovascular (CV) risk factors and socio-economic status (SES) is complex and different CV risk factors show apparently disparate relationship with SES. This could be due to the fact that In India the epidemiological transition (transition from the 'age of pestilence and famine' to the 'age of degenerative and man-made diseases') has occurred rapidly, so much so that both pre- and post-transitional conditions can co-exist in several communities. Tobacco use is the first of CV risk factors to show a reversal of social gradient. As the transition progresses, hypertension prevalence also increases rapidly in the poor SES group. Apart from lifestyle changes there are other reasons that could operate in increasing the risk of hypertension among the poor. First, the poor consume food high in salt. Second, the consumption of fruits and vegetable is low and consumption of locally brewed liquor is very high, all of which can increase blood pressure (BP). In fact, the Assam tea garden workers who are among most poor have been shown to have a high prevalence of hypertension due to high salt consumption[1]. Similarly, high prevalence rates of hypertension and metabolic syndrome are reported from remote rural areas in India[2-3]. Even in the tribal population in India, one in every two adults in the age group 25–64 years were reported or diagnosed to have hypertension[4]. This clearly indicates that CV risk factors affect individuals from the lowest socio-economic strata. Obesity or overweight is the last of the CV risk factors showing inverse social gradient even in countries experiencing advanced epidemiological transition. Notably, small increase in weight appears detrimental to Indians, potentially due to early life under-nutrition and other known biological reasons. Despite very low obesity prevalence in the Indian population compared with the US population, the prevalence of diabetes is at least 2-fold higher in the Indian population. Further, Indians are also known to have a high body fat percentage at any given BMI[5]. Therefore, the higher prevalence of obesity observed in high SES should not be a reason for curtailing public health efforts to contain CVD in India.

A systematic evaluation of the published literature, reveals that risk factors of CVD are prevalent in low SES groups at least to the same level as high SES groups, if not more. In a 10-year follow-up study in an urban South Indian population, the SES gradient for diabetes and CV risk factors changed dramatically, with a convergence of prevalence rates among people in the middle-income and lower-income groups[6]. In another serial epidemiological survey from Jaipur, prevalence of smoking, diabetes and dyslipidaemia increased more in low educational status groups as compared with higher educational groups[7]. Tobacco use has been consistently high among the low SES group, especially the smokeless forms of tobacco[8]. Overall the total cardiovascular risk, based on the well-accepted global cardiovascular risk assessment approach, was elevated in individuals in the low SES group[9, 10]. Furthermore, the proportion of individuals with optimal CV risk factors was lowest in individuals in the low education group[10]. The Sentinel Surveillance in Industrial population (SSIP) study[11], carried out in industrial settings, involving nearing 20,000 adults (both industrial employees and their family members), across 10 different sites demonstrated reversal of social gradient, which is also confirmed in community-based studies conducted in 11 different regions in India[12].

A study conducted in the urban areas of Chennai during 2000[13] (age group>=40) reported a higher prevalence of hypertension (54%) among low income group (monthly income < Rs 30000/annum and 40% prevalence among high-income group (monthly income ≥Rs 60000/annum).

Furthermore, as seen in the CREATE registry[14] from India, poor people who were admitted with an acute coronary syndromes (ACS) episode frequently miss out on evidence based treatments because neither the individual nor the public can pay for it, and they experience higher death rates within the first year or two after the attack. Available evidence indicates that both acute myocardial infarction (AMI) and stroke are more often seen in individuals from relatively poor SES. In a separate analysis of the INTERHEART South Asian population published by Joshi et al. in JAMA in 2007[15], low educational level was strongly associated with increased risk of AMI in native South Asians. If, in Pendekar et al.'s study[16], we combine the groups of those with lower than secondary school education and compare with those of higher levels of education, the inverse relationship of SES with CVD death becomes apparent. In fact, the stroke mortality trend does show a negative gradient in this population. We also know from the INTERHEART study that tobacco use, low fruits and vegetables intake and history of hypertension together contribute to nearly two-thirds of the population attributable risk for AMI[17]. This is also consistent with the GBD study which shows that the above-mentioned risk factors are among the top five risk factors for mortality as they lead to adult chronic diseases and contribute significantly to ischaemic heart diseases[18]. Therefore, it is biologically plausible that individuals from low SES are vulnerable to IHDs and stroke despite having normal body mass index (BMI).

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