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Does recent migration explain elevated blood pressure? A study among migrants in Delhi, India

Hypertension has emerged as a major public health problem in developing countries. The association between urbanization and blood pressure is well-known. However, studies dealing with immediate impact of migration are limited in developing countries[1–3]. Here, we have tried to explore the differences between recent-migrants and settled-migrants with regard to hypertension.

The settled-migrants (who have settled and are residing in Delhi since at least 10 years) were sampled from a resettlement colony in South Delhi (Dakshinpuri extension, Dr Ambedkar Nagar) while the recent-migrants (who had migrated to the city of Delhi from rural villages within the last two years, this being their first migration) were selected from slums (Prabhu Basti, Indira Camp, Khirki Gaun) and work sites (construction work sites at Chirag Dilli and South District Office complex construction work site at Saket). Sample size was estimated according to Lwanga and Lemeshow[4]. With a confidence level of 95% and an absolute precision of ten percentage points on either side of the true value of the difference between the proportions, the estimated sample size was 193 in each group[4]. The sample size was rounded-off to 200 in each group. Five blocks of the resettlement colony were selected randomly for the sample of settled-migrants. In each block, four streets from four directions were selected. In each street, two random points were chosen, and from each random point five individuals (both men and women) were selected randomly in order to attain a minimum sample of 200 individuals. The eligibility criteria for participation were that the subject should belong to the migrant group and residing in Delhi since a minimum of 10 years; he/she should be aged 20 years or more. The recent-migrants were selected from three slums and in addition, due to non-availability of eligible respondents during the daytime, we visited two construction work sites where they work. This approach has been adopted to attain a minimum sample of 200 individuals. In each slum, community leaders and members were contacted to identify the newly migrated individuals. The identified individuals who were aged 20 years and above were contacted and after confirming that they had migrated within two years from rural villages and that it was their first migration, they were consi-

Table 1. Distribution of blood pressure (BP, mean ± SD) and prevalence of hypertension among recent- and settled-migrants

	Recent-migrants			Settled-migrants			t/χ^2 for inter-group difference	
	Male Mean ± SD	Female Mean ± SD	t/χ^2 for sex difference[$]	Male Mean ± SD	Female Mean ± SD	t/χ^2 for sex difference[$]	Male	Female
Systolic BP (SBP)	122.83 ± 10.70	120.92 ± 14.70	1.103[NS]	130.76 ± 17.20	125.10 ± 14.60	2.678*	4.012***	2.165*
Diastolic BP (DBP)	81.04 ± 6.20	78.80 ± 6.30	2.681*	80.74 ± 5.10	79.19 ± 4.10	2.455**	0.395[NS]	0.541[NS]
SBP (age-adjusted)	122.83 ± 10.7	120.82 ± 14.4	1.179	130.77 ± 14.1	125.09 ± 13.3	3.088**		
DBP (age-adjusted)	81.04 ± 6.2	78.80 ± 6.6	2.681**	80.79 ± 4.7	79.19 ± 4.0	2.723**		
Prevalence of hypertension	*n* (%)	*n* (%)		*n* (%)	*n* (%)			
Normal	31 (25.6)	40 (37.7)	3.88[NS]	13 (13.0)	30 (23.8)	5.38[NS]	6.15*	5.42[NS]
Prehypertension	69 (57.0)	50 (47.2)		62 (62.0)	75 (59.5)			
Hypertension stage 1	18 (14.9)	14 (13.2)		15 (15.0)	15 (11.9)			
Hypertension stage 2	3 (2.5)	2 (1.9)		10 (10.0)	6 (4.8)			
Total hypertensives	21 (17.4)	16 (15.1)		25 (25.0)	21 (16.7)			
Age-adjusted prevalence of hypertension								
Normal	31 (25.6)	39 (36.8%)	3.65[NS]	13 (13.0%)	34 (27.0%)	6.96*	6.93*	3.74[NS]
Prehypertension	69 (57.0)	54 (50.9%)		73 (73.0%)	80 (63.5%)			
Hypertension	21 (17.4)	13 (12.3%)		14 (14.0%)	12 (9.5%)			
Prevalence of hypertension in below and above 40 years of age								
< 40 years	16 (15.7)	11 (11.7%)	0.56[NS]	4 (6.8%)	3 (3.8%)	0.17[NS]	2.73[NS]	3.85*
≥ 40 years	5 (26.3)	5 (35.7%)	0.04[NS]	21 (51.2%)	18 (39.1%)	1.28[NS]	3.28[NS]	0.05[NS]
χ^2 for difference between two age groups	0.63[NS]	3.66[NS]		25.48***	26.32***			

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$; [NS]Not significant; SD, Standard deviation.
[$]Chi-square test based on 3 × 2 tables.

dered for the study. At the work sites also the same was confirmed in addition to their habitation in slums. Those who had migrated from other urban areas were not included for the study. Pregnant women and those suffering from overt illnesses were not included in the study. Thus, a total of 226 settled-migrants (100 men and 126 women) and 227 recent-migrants (121 men and 106 women) were sampled. The Ethics Committee of the All India Institute of Medical Sciences (AIIMS), New Delhi approved the study protocol. The purpose of the study was explained, and consent was taken from all the participants before data collection. None of the participants declined to participate in the study. The data were collected during November 2006–March 2007.

A minimum of three blood pressure (BP) readings were taken from each participant in a seated position using the mercury sphygmomanometer, according to the standard procedure[5]. Prior to measuring BP, the participants were allowed to sit for a minimum of 5 min, and questioned to ensure that they had not engaged in any vigorous physical work, smoked or chewed tobacco, or consumed any beverage during the preceding 30 min and had not eaten for at least an hour. The participants were asked for any past history of hypertension, and about any past or current treatment received. The mean of the three readings was considered for further data analyses. Hypertension was defined as systolic BP (SBP) ≥140 or diastolic BP (DBP) ≥ 90 mm Hg or self-reported current antihypertensive medication use[6]. The data were entered and analysed using SPSS v 13.0 (SPSS Inc., Chicago, IL, USA). The analyses included descriptive statistics of SBP and DBP, and frequency distribution of various categories of BP. The tests of significance used were *t*-test and chi-square test, and a *P* value of less than 0.05 was considered as the minimum level of significance. Logistic regression analysis was carried out by taking hypertension status as the dependent variable and age, sex and migration status (recent and settled-migrant) as covariates. Also, separate linear regression analyses were carried out to reveal the influence of age on BP. Linear regression analyses were carried out for SBP and DBP separately for each sex in each group, separately. Based on the regression equations obtained, the SBP and DBP data were adjusted for age, and then age-adjusted means and distribution of BP categories were obtained.

Recent-migrants were younger than settled-migrants. This is not surprising as people generally migrate to urban areas mainly during their late teens and 20s; the migration history of settled-migrants also confirmed the same. Men possessed higher BP levels than women with significant sex differences, except for SBP in recent-migrants (Table 1). Higher BP levels as well as prevalence were noticed among settled-migrants, with a few exceptions. The groups differed with regard to SBP, but not DBP. Among recent migrants, 21 men (17.4%) and 16 women (15.1%) were hypertensive, while among settled-migrants it was 25 men (25%) and 21 women (16.7%). A greater proportion of individuals fell in the prehypertension category in both the groups. The proportion of people with prehypertension was higher among settled-migrants (62 men (62%) and 75 women (59.5%)) compared to recent migrants (69 men (57%) and 50 (47.2%) women). The group differences were significant for men but not women. It was further observed that

Table 2. Results of logistic regression analysis of hypertension by age, sex and migration status

Variable	Coefficient ± SE	Significance	Odds ratio (95% CI)
Constant	–5.57 ± 0.97	0.00	
Age	0.10 ± 0.01	0.00	1.11 (1.07–1.14)
Sex	–0.25 ± 0.26	0.35	0.78 (0.05–1.31)
Migration status	0.56 ± 0.29	0.05	1.75 (0.99–3.10)

R^2 of the model = 0.186. SE, Standard error; CI, Confidence interval.

hypertension was prevalent in younger recent-migrants and older settled-migrants than their age-matched counterparts. Linear regression analyses (for SBP and DBP separately in each group and sex) revealed significant influence of age on both SBP and DBP among both men and women of settled-migrants, and women of recent migrants. However, age did not show any significant influence on either SBP or DBP among recent-migrant men. Based on the regression equations obtained, the BP data were adjusted for the influence of age, and categorization of individuals was done. After adjusting the BP data for the influence of age, settled-migrants continued to exhibit higher means of BP. However, recent-migrants outnumbered settled-migrants with regard to hypertension status, with significant differences among men. Logistic regression analysis revealed that age and migration status (recent migration) exerted significant influence on hypertension status and explained 18.6% of the variation (Table 2).

Hypertension is prevalent in the urban areas, and the economically disadvantaged people are at the risk of hypertension. The age-adjusted prevalence of hypertension revealed that migration to urban areas is an important contributor to increasing prevalence of hypertension as recent-migrants outnumbered settled-migrants with regard to hypertension. Logistic regression analysis confirmed the influence of recent migration on hypertension status. Several other studies also reported higher prevalence of hypertension among the urban population compared to rural inhabitants[1–3,7,8]. A recent study has shown heterogeneity of hypertension within a city and highlighted that the social and spatial disparities of hypertension are associated with urbanization[7]. Dash *et al.*[3] have reported significantly higher prevalence of hypertension among a tribal population of Orissa living in a city compared to their rural tribal counterparts. Poulter *et al.*[1] and Sobngwi *et al.*[2] have reported raised levels of BP amongst recent migrants to urban areas. The present study also confirms the influence of migration on BP. It concludes that living in urban areas is associated with hypertension and migration to urban areas is in itself a risk factor for developing hypertension. Further large-scale studies may be taken up to address the issue of migration and hypertension in the current Indian scenario.

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