

## Original Articles

# Are the urban poor vulnerable to non-communicable diseases? A survey of risk factors for non-communicable diseases in urban slums of Faridabad

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### ABSTRACT

**Background.** Non-communicable diseases have modifiable risk factors, which are easy to measure and can help in planning effective interventions. We established a community-based sentinel surveillance to estimate the prevalence and level of common risk factors for major non-communicable diseases as part of a joint Indian Council of Medical Research/WHO initiative.

**Methods.** This survey was done from February 2003 to June 2004 and included 1260 men and 1304 women 15–64 years of age living in urban slum areas of Ballabgarh block, Faridabad district, Haryana. A list of all slums in Ballabgarh block was obtained from the Municipal Corporation of Faridabad. Slums were selected by stratified cluster sampling. All households in the selected slums were visited and men and women interviewed in alternate households. The study instrument was based on the STEPS approach of WHO. It included questions related to tobacco use, alcohol intake, diet, physical activity, and history of treatment for hypertension and diabetes mellitus. Height, weight, waist circumference and blood pressure were measured. To estimate prevalence at the population level, age adjustment was done using the urban Faridabad population structure from the 2001 Census of India.

**Results.** The age-adjusted prevalence of smoking among men was 36.5% compared with 7% in women. *Bidi* was the predominant form of smoked tobacco used. The use of smokeless tobacco was reported by 10.2% of men and 2.9% of women. While 26% of men reported consuming alcohol in the past 1 year, none of the women did. The mean number of servings per day of fruits and vegetables was 2.7 for men compared with 2.2 for women. Overall, only 7.9% and 5.4% of men and women, respectively took  $\geq 5$  servings per day of fruits and vegetables.

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Women were more likely to be physically inactive compared with men (14.8% v. 55%); 67% of men and 22.8% of women reported mean physical activity  $> 150$  minutes per week. The mean body mass index (BMI) was lower in men than in women (20.9 v. 21.9 kg/m<sup>2</sup>). The prevalence of overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) was 16% among men and 21.9% among women. The prevalence of hypertension (blood pressure  $\geq 140/\geq 90$  mmHg or on an antihypertensive drug) was 17.2% in men and 15.8% in women.

**Conclusion.** The high prevalence of risk factors for non-communicable diseases across all age groups in this urban slum community indicates the likelihood of a high future burden of illness. Immediate action for prevention and control is required to prevent the situation from worsening.

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### INTRODUCTION

Non-communicable diseases (NCDs) are responsible for a high proportion of deaths and disabilities. WHO estimated that, in 2000, NCDs and mental disorders caused 59% of deaths and 46% of the global burden of disease.<sup>1</sup> Based on available trends, by 2020 NCDs are predicted to account for 73% of deaths and 60% of disease burden.<sup>2</sup> Much of the projected rise in NCDs is preventable, particularly those related to smoking, poor diet, physical inactivity and obesity. Economic development in wealthy countries was accompanied by the emergence of NCDs as the predominant health problem. As a result, NCDs are often referred to as ‘diseases of affluence’—a misleading term. A more accurate label is ‘diseases of urbanization’. Several studies from developing countries have shown increased levels of high blood pressure and the presence of other risk factors for NCDs in urban compared with rural populations.

In 2001, 28% of the total population in India was living in urban areas, which was projected to increase to about 50% (605–618 million) by 2021–25.<sup>3</sup> Demographic trends show that while the urban average growth rate stabilized at 3% over the past decade (1991–2001), the slum growth rate doubled. An alarming feature of the growth of the urban population is the proportion of people living in poverty; official estimates place it at 32%. Projections suggest that while the urban population will double in

the next 10 years, the urban poor will double in just 5 years.<sup>4</sup> It is evident that the urban poor have the worst of both worlds—they adopt a more urbanized lifestyle which places them at a higher risk for NCDs and have poor access to healthcare, partly related to their poor purchasing ability.

It is important to assess the prevalence of risk factors for NCDs in a community and monitor their trend over a period of time so as to identify areas for intervention as well as evaluate the effectiveness of interventions. The Indian Council of Medical Research (ICMR) and WHO Country Office, India jointly initiated sentinel surveillance centres in 5 sites, of which Ballabgarh was one. We present the results of the first survey documenting the prevalence of risk factors for NCDs among urban adult slum dwellers in Faridabad district, which is adjacent to Delhi and falls within the National Capital Region.

## METHODS

The survey protocol was based on the STEPS approach of WHO,<sup>5</sup> according to which a minimum sample of 250 individuals was to be interviewed for each 10-year age group. Five such age groups were included for both sexes (15–24 years, 25–34 years, 35–44 years, 45–54 years and 55–64 years). Thus, a total of 2500 individuals were to be interviewed. A list of all the slums in Ballabgarh block was obtained from the Municipal Corporation of Faridabad. The slums were selected from each of the 4 wards based on the probability proportion to size in Ballabgarh block. All the households were visited in the selected slums and men and women interviewed in alternate households. Within a household, a list was made of eligible members in the various age groups and as per gender requirements and one member selected randomly (using the last digit of the serial number of a currency note). After the selected slums were covered, the numbers in the age group 15–24 and the older age groups of 45–54 and 55–64 years were found to be insufficient. Therefore, additional areas were selected from the uncovered sampling units and in these areas only respondents for these age groups were recruited for interview.

The study instrument included a questionnaire based on the STEPS<sup>5</sup> approach of WHO, suitably modified and translated in the local language. This had 5 parameters related to tobacco and alcohol use, diet, physical activity and history related to treatment of hypertension and diabetes. According to the STEPS questionnaire physical activity was divided into 3 grades of vigorous, moderate and inactive continued for >10 minutes.

Vigorous activity was defined as activity that made the person feel breathless and have palpitations; moderate activity as not much breathlessness; and inactive or least active as no felt variation in heart rate and respiratory rate. These three grades of activity were measured separately under three domains—occupation (including housework for women), transport and leisure.

Height, weight and waist measurements were taken using SECA instruments. The weight was measured to the nearest 0.1 kg and height to the nearest 1 cm. The body mass index (BMI) was calculated. The weight instrument was regularly calibrated against a standard weight. Waist was defined as the mid-point between the lower margin of the rib and upper border of the iliac crest in the mid-axillary plane. The blood pressure was measured with a digital sphygmomanometer (OMRAN-MX2 with adult size cuff) and two recordings were taken in the sitting position at an interval of 5 minutes. If the difference in the readings was >10 mmHg, a third reading was taken. The mean of 2 (or 3) readings was taken as the final measurement. All measurements were taken at home.

Three men and women workers each were trained in a 3-day workshop at Ballabgarh to conduct the interviews, fill up the schedules and take various measurements. The site investigators (KA, SKK) had been previously trained in the STEPS methodology. Field-testing of the schedule was done in a different area with each worker covering around 50 houses. The investigators checked the filled formats and the problem areas were identified and re-training provided in these areas.

Data were collected from April 2003 to January 2004. Supervision of the survey was done from time to time by the investigators and the ICMR team. A re-training session was held for 1 day in the month of September 2003.

Each individual interviewed was explained in detail the purpose of the study and written informed consent was taken. The ethics committee of the All India Institute of Medical Sciences (AIIMS) approved the study. The common queries by the participants were answered by the field workers and those who wanted further information or were identified to have problems were referred to the Civil hospital, Ballabgarh which is run by AIIMS.

### Statistical analysis

Data entry was done in visual basic. An independent data entry operator re-entered 10% of the data and a discrepancy was detected in only 3.2% of cases. Data analysis was done using

## Definitions

*Current daily smokers:* Currently smoking cigarettes, *bidis* or *hookah* daily.

*Current daily smokeless tobacco users:* Currently using chewable tobacco products such as *gutka*, *naswar*, *khaini* or *zarda paan* daily.

*Current alcohol drinkers:* Report consuming alcohol within the past 1 year.

*One standard drink:* Equivalent to consuming 1 standard bottle of regular beer (285 ml), one single measure of spirits (30 ml) or one medium size glass of wine (120 ml).

*One serving of vegetable:* 1 cup of raw green leafy vegetables, ½ cup of other vegetables (cooked or chopped raw) or ½ cup of vegetable juice.

*One serving of fruit:* 1 medium size piece of apple, banana or orange, ½ cup of chopped, cooked, canned fruit or ½ cup of fruit juice, not artificially flavoured.

*Physical inactivity:* Less than 10 minutes of activity at a stretch during leisure, work or transport.

*Overweight:* Body mass index  $\geq 25$  kg/m<sup>2</sup>

*Obesity:* Body mass index  $\geq 30$  kg/m<sup>2</sup>

*Hypertension:* Blood pressure  $\geq 140/\geq 90$  mmHg or currently on antihypertensive drugs.

Source: WHO STEPS manual<sup>5</sup>

TABLE I. Prevalence (95% CI) of smoked tobacco use, smokeless tobacco use and alcohol consumption by age and sex

Age (in years)	Men (n=1258)			Women* (n=1304)	
	Tobacco use (%)		Alcohol consumption (%)	Tobacco use (%)	
	Smoked	Smokeless		Smoked	Smokeless
15–24	12.0 (7.9–16.0)	5.6 (2.7–8.4)	12.8 (8.6–16.9)	0	1.2 (0.1–2.5)
25–34	37.5 (31.5–43.5)	15.0 (10.5–19.4)	32.0 (26.2–37.8)	4.4 (2.0–6.7)	3.4 (1.3–5.4)
35–44	53.2 (46.9–59.3)	10.3 (6.5–14.0)	36.9 (30.9–42.9)	11.7 (7.7–15.6)	2.7 (0.7–4.7)
45–54	56.6 (50.3–62.7)	12.4 (8.2–16.4)	30.7 (24.9–36.4)	14.4 (10.0–18.7)	2.0 (2.5–3.7)
55–64	62.6 (56.6–68.5)	9.4 (5.8–13.0)	20.1 (15.1–25.0)	24.8 (19.4–30.1)	7.6 (4.2–10.9)
Age-adjusted prevalence†	36.5 (33.7–39.1)	10.2 (8.5–11.9)	25.9 (23.5–28.3)	7.0 (5.5–8.3)	2.7 (1.7–3.5)

\* none of the women reported alcohol consumption †Adjusted to urban Faridabad age strata (Census 2001)

SPSS version 11 (SPSS Inc., Chicago) and Stata version 8 (Statacorp, Texas).

Since the exact age and sex distribution of the slum population of Ballabgarh block was not available, the age distribution of the total urban population of Faridabad Municipal Corporation according to the 2001 Census of India<sup>6</sup> was used to calculate the weightage to be used to obtain the summary measure from the age- and sex-specific rates.

## RESULTS

Of the 2564 individuals interviewed for the study, 1304 were women; 114 women (4.4% of the sample) were found to be pregnant and were excluded from anthropometric examination. The mean (SD) number of years spent in school was 9.5 (4.5) years for men compared with 5.4 (4.9) years for women. Among men 7.5% had never attended school compared with 38.7% women. The main employment of men was clerical/medium business (37.6%) followed by the self-employed/skilled group (34.7%) whereas women were mainly housewives (89.6%).

### Tobacco use

Smoking was more prevalent among men (36.5%) compared with women (7%) (Table I). Among men, the use of smoked tobacco increased significantly from 12% in the 15–24 years age group to 37.5% in the 25–34 years age group (Fig. 1) and stabilized at around 50% after 35 years of age. The mean age of starting to smoke was 21 years for men (median 20 years) and 30.9 years for women (median 22 years). Among women, none of the respondents in the 15–24 years age group reported smoking and an increase was seen from 14.8% to 24.8% after the age of 54 years. The mean duration of smoking was 17.9 years for men and 12.8 years for women. *Bidi* was the predominant form of smoked tobacco used by both men and women (around 90%) followed by cigarettes (13.6%) among men and *hookah* (22%) among women.

The use of smokeless tobacco was reported by 10.2% of men and 2.9% of women. Trends across age were similar to those seen for the use of smoked tobacco. The predominant form of smokeless tobacco used by men was *khaini* (68.9%) followed by *gutkha* (31%), whereas among women *khaini*, *gutkha* and chewed tobacco were each used by about one-third.

### Alcohol consumption

About a quarter of the men (25.9%) reported consuming alcohol in the past 1 year and none of the women reported ever consuming alcohol (Table I). Only 12.8% of men in the 15–24 years age group consumed alcohol. This increased to 36.9% in the 34–45 years age group. Overall, 31.6% of men reported ever consuming alcohol and the difference between the prevalence of ever consumption

and current consumption of alcohol increased significantly after the age of 45 years (a difference of 2% in the 15–24 years age group compared with a difference of 13% in the 55–64 years age group). Among men respondents who had consumed alcohol in the past 1 year, 25% had consumed alcohol at least once a week and the mean number of drinks per drinking session was 3.2. Among those who reported alcohol consumption in the past 1 week (10.5%), the mean number of drinks consumed per day was 1.6; 11.8% of these consumed more than 4 standard drinks per day (high risk group) and 3.5% consumed more than 10 standard drinks per day (very high risk group).

### Dietary habits

The mean number of servings per day of fruits and vegetables for men was 2.7 compared with 2.2 for women (Table II). No significant trend was seen across age groups for both men and women except in the 55–64 years age group where it decreased. Overall, only 7.9% and 5.4% men and women, respectively, consumed a mean of  $\geq 5$  servings/day of fruits and vegetables. The mean number of servings of vegetables was greater than fruits across all age groups in both sexes. About 95% of the study population irrespective of sex reported the most commonly consumed type of oil to be refined/unhydrogenated oil. The next most common oil consumed was hydrogenated vegetable oil (2.1%) followed by butter or *ghee* (1.8%).

### Physical activity

Women were found to be more physically inactive compared with men (55% v. 14.8%; Table III). An increasing trend of physical inactivity with age was seen among men whereas among women,

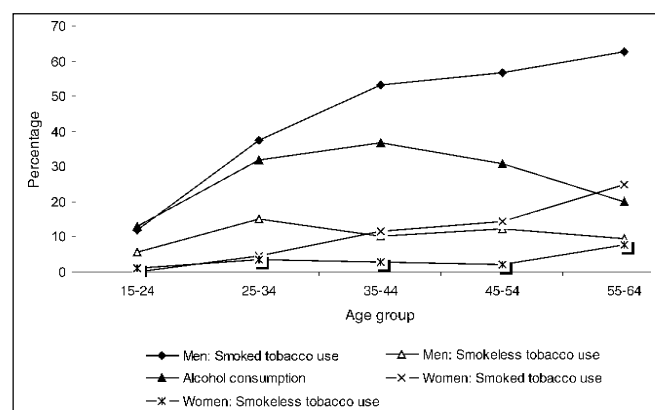


FIG 1. Age group-specific prevalence of tobacco and alcohol use. Y-axis shows the percentage of study population of both sexes smoking tobacco and consuming alcohol.

TABLE II. Daily intake of fruits and vegetables by age and sex

Age (in years)	Men (n=1258)		Women (n=1304)	
	Mean no. of servings (95% CI)	% consuming $\geq 5$ servings/day	Mean no. of servings (95% CI)	% consuming $\geq 5$ servings/day
15-24	2.6 (2.5-2.8)	5.6 (2.7-8.4)	2.1 (1.9-2.2)	3.2 (1.0-5.3)
25-34	3.0 (2.8-3.2)	9.5 (5.8-13.1)	2.5 (2.3-2.6)	9.9 (6.3-13.1)
35-44	2.8 (2.6-3.0)	9.8 (6.2-13.6)	2.4 (2.2-2.5)	4.2 (1.7-6.7)
45-54	2.4 (2.2-2.6)	8.6 (4.9-11.8)	2.2 (2.1-2.4)	4.1 (1.8-6.9)
55-64	1.9 (1.8-2.1)	4.2 (1.5-6.3)	1.4 (1.3-1.6)	1.3 (0-1.9)
Age-adjusted prevalence*	2.7 (2.6-2.8)	7.9 (6.3-9.3)	2.2 (2.2-2.3)	5.4 (4.1-6.5)

\* adjusted to urban Faridabad age strata (Census 2001)

extremes of age reported maximum physical inactivity and the 35-44 years age group reported the least physical inactivity. While 77.5% of men and 41.9% women reported any moderate activity, only 7.8% of men and 3.2% of women reported any vigorous activity. The mean duration of physical activity per day was 95.2 minutes for men and 54.1 minutes for women; 67% of men and 22.8% of women reported mean physical activity >150 minutes per week.

Among men, 7.4% reported any leisure time activity, 13.8% reported any work time activity and 81.6% reported any transport activity (Fig. 2). The percentage reporting leisure time activity was maximum at the extremes of age among men (11% in the 15-24 years and 55-64 years age groups compared with 5.1% for the 35-44 years age group). However, no such trend with age was seen among women. The mean activity per week by domain among men who reported being physically active in that domain was 323.77 minutes for work, 35.90 minutes for leisure and 202.13 minutes for transport time activity. The corresponding values reported by women were 74.10 minutes, 44.44 minutes and 52.51 minutes per week. Thus, although the majority of respondents of both sexes reported transport as the main domain of physical activity, it was lesser in terms of duration of physical activity.

**BMI and waist circumference**

The mean BMI was lower in men compared with women (20.9 kg/m<sup>2</sup> v. 21.9 kg/m<sup>2</sup>). This difference was observed across all age groups with the difference widening after the age of 35 years (Tables IV and V). Among both sexes, the mean BMI increased with age and declined only in the 55-64 years age group. The percentage of overweight men in the study population (BMI >25 kg/m<sup>2</sup>) was 16% and women 21.9%. This increased to 26.7% and 34%, respectively, if a cut-off of 23 kg/m<sup>2</sup> was used. Among

women, the prevalence of overweight increased significantly after 25 years of age and was 35% in the 35-44 years age group and 49.7% in the 45-54 years age group. Fewer women were overweight than men up to the age of 34 years after which there was a significant increase among women (Fig. 3). Also, 29% of men and 21.2% of women were underweight (BMI <18.5 kg/m<sup>2</sup>).

The mean waist circumference of men was 79 cm and of women 76.2 cm. In men the percentage with a waist circumference >102 cm was 3.5%, being maximum in the 45-54 years age group. The prevalence of waist circumference >88 cm was 20.6% in women, with the 45-54 years age group having the highest prevalence (45.5%).

**Blood pressure and diabetes**

A total of 22.4% men and 48.8% women reported having had a blood pressure measurement taken in the past 12 months and 3.9% of men and 9.5% of women reported having been diagnosed to be hypertensive in the past 12 months (Table VI). Only 2.1% of men

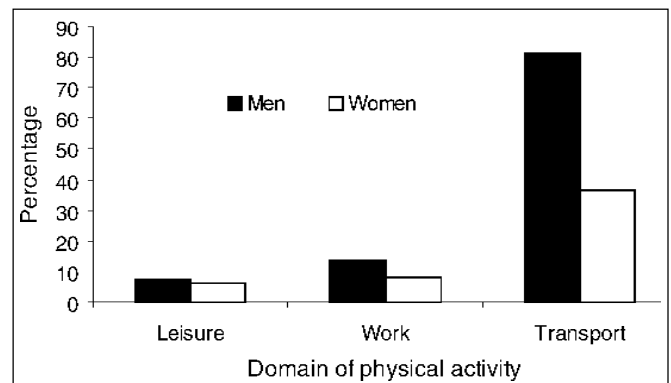


FIG 2. Percentage distribution of domain of physical activity by sex

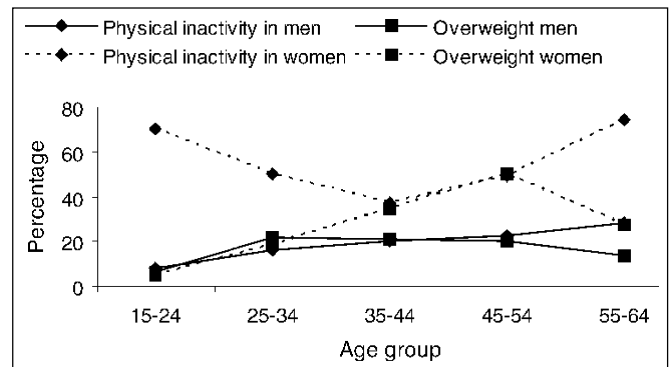


FIG 3. Prevalence of physical inactivity and overweight (BMI >25 kg/m<sup>2</sup>) according to age and sex

TABLE III. Percentage distribution (95% CI) of physical activity by age and sex

Age (in years)	Men (n=1258)			Women (n=1304)		
	Leisure	Work	Transport	Leisure	Work	Transport
15-24	10.9 (6.9-14.6)	7.3 (3.9-10.4)	90.1 (86.2-93.7)	5.1 (2.4-7.9)	0.7 (-0.3-1.9)	26.0 (20.5-31.4)
25-34	3.6 (1.2-5.8)	17.4 (12.6-22.0)	79.9 (74.8-84.8)	6.5 (3.5-9.1)	9.1 (5.8-12.3)	38.7 (33.1-44.2)
35-44	5.1 (2.4-7.9)	18.5 (13.8-23.4)	78.6 (73.4-83.6)	9.4 (5.7-12.9)	15.0 (10.7-19.5)	49.8 (43.6-55.9)
45-54	8.6 (4.9-11.8)	14.9 (10.6-19.6)	73.3 (67.7-78.8)	5.5 (2.7-8.4)	11.6 (7.6-15.5)	44.8 (38.5-51.0)
55-64	11.1 (6.8-14.4)	14.1 (10.1-18.9)	70.4 (64.8-76.1)	3.8 (1.0-5.3)	5.1 (2.7-8.4)	22.8 (17.1-27.6)
Age-adjusted total*	7.4 (5.8-8.7)	13.8 (11.9-15.7)	81.6 (79.3-83.6)	6.4 (5.0-7.7)	7.8 (6.4-9.3)	36.9 (34.2-39.4)

\* adjusted to urban Faridabad age strata (Census 2001)

TABLE IV. Percentage distribution of mean (95% CI) body mass index and waist circumference by age and sex

Age (in years)	Men (n=1257)				Women (n=1227)			
	Body mass index (kg/m <sup>2</sup> )		Waist circumference (cm)		Body mass index (kg/m <sup>2</sup> )		Waist circumference (cm)	
	Mean	≥25*	Mean	>102	Mean	≥25*	Mean	>102
15–24	19.5 (19.1–19.9)	6.3 (3.3–9.4)	72.2 (71.1–73.3)	0.5 (–0.3–1.1)	20.0 (19.6–20.3)	4.9 (2.1–7.4)	68.3 (67.2–69.4)	3.0 (0.6–5.3)
25–34	21.5 (21.0–22.0)	21.8 (16.6–26.8)	80.5 (79.1–81.9)	3.8 (1.5–6.3)	21.6 (21.2–22.1)	18.4 (14.1–23.0)	74.9 (73.6–76.2)	13.5 (9.3–17.5)
35–44	21.7 (21.2–22.1)	21.0 (15.9–26.0)	82.8 (81.5–84.1)	4.3 (1.8–6.9)	23.4 (22.8–24.0)	35.0 (29.1–40.9)	80.6 (79.0–82.1)	32.6 (26.8–38.5)
45–54	21.9 (21.4–22.4)	20.4 (15.3–25.3)	85.3 (83.9–86.6)	8.6 (4.9–11.8)	24.7 (24.1–25.3)	49.7 (43.3–55.9)	85.4 (83.8–87.0)	45.5 (39.5–52.0)
55–64	20.3 (19.9–20.8)	14.1 (10.1–18.9)	81.4 (79.9–82.7)	4.2 (2.0–7.3)	22.5 (21.9–23.1)	27.8 (24.4–29.3)	82.9 (81.2–84.6)	38.0 (31.5–43.6)
Age-adjusted rates†	20.9 (20.6–21.1)	16.0 (13.9–17.9)	79 (78.3–79.3)	3.5 (2.4–4.5)	21.9 (19.6–24.1)	21.9 (21.7–22.1)	76.2 (75.5–76.9)	20.6 (18.3–22.8)

\* overweight

†adjusted to urban Faridabad age strata (Census 2001)

TABLE V. Percentage distribution of body mass index in the study population

Category (kg/m <sup>2</sup> )	Men (n=1257)	Women (n=1304)
Underweight (<18.50)	29.0	21.2
Normal (18.50–24.99)	55.2	57.2
Pre-obese (25.00–29.99)	13.8	16.0
Obese ≥30		
Class I (30.00–34.99)	1.7	4.2
Class II (35.00–39.99)	0.3	0.9
Class III ≥40	0.1	0.5

and 4.2% of women were currently on antihypertensive drugs, indicating a treatment gap of around 50%.

The prevalence of hypertension (blood pressure ≥140/≥90 mmHg) was 17.2% in men and 15.8% in women (those currently on antihypertensive treatment were classified as hypertensive irrespective of their blood pressure values). In both sexes the prevalence of hypertension increased with age. The mean systolic blood pressure was 122.7 mmHg in men and 117.8 mmHg in women. The mean diastolic blood pressure was 75.6 mmHg in men and 74.2 mmHg in women.

The self-reported prevalence of diabetes mellitus over the past 1 year was 1.4% in men and 1.3% in women. The prevalence showed an increasing trend with age, more so in women. Only 9.5% of men and 12.5% of women reported having had their blood sugar levels measured in the past 1 year.

## DISCUSSION

Our study documents a high prevalence of risk factors for NCDs in an urban slum population of Haryana. Almost one-third of the study population had at least one risk factor. While data from these slums cannot be generalized to the rest of the country, it does

indicate that this segment of the population is also vulnerable to NCDs. A limited number of studies have been done to assess the prevalence of risk factors for NCDs in urban slum residents.<sup>12–15</sup>

The STEPS instrument focuses on collecting good quality data that is comparable across countries. The questions included in the core section can be collected easily under field conditions and have been validated for use across different countries. The assessment of diet and physical inactivity is the most difficult. The section on food asks questions about quantification, fruit and vegetable intake, and type of cooking medium used. The Global Physical Activity Questionnaire (GPAQ) used as a part of STEPS has been found to be a reliable and valid tool. This instrument assesses physical activity across three domains: work, transport and leisure.<sup>7</sup> However, measuring physical activity using the questionnaire imposes restrictions. We feel this instrument underestimates regular physical activity at work, especially housework and leisure time activity.

The National Family Health Survey-2 (NFHS-2) provides data on tobacco and alcohol use though the methods of assessment and age groups studied were different.<sup>8</sup> The reported smoked tobacco use among men and women in Haryana was 40.4% and 3.5%, respectively.

Different cut-off points have been used in different studies to indicate the risk from alcohol consumption, e.g. >30 g of absolute alcohol per day is quantified as moderate risk by the British Medical Association (1995)<sup>9</sup> and ≥40 g by English *et al.*<sup>10</sup> In our study, 36% of the population had ever consumed alcohol in the 7 days prior to the study. Most of them had consumed 1–40 g of ethanol (low risk). However, 4.4% of current drinkers had consumed >60 g of ethanol during the past 7 days, which put them in the high and very high risk groups. Gupta *et al.*<sup>11</sup> assessed the prevalence and pattern of alcohol use in men ≥45 years of age from the lower and lower-middle sections of the general population in Mumbai and showed that 18.8% currently consumed alcoholic

TABLE VI. Distribution of mean systolic and diastolic blood pressure (BP) and hypertension by age and sex

Age (in years)	Men (n=1258)			Women (n=1303)		
	Mean systolic BP (mmHg)	Mean diastolic BP (mmHg)	Hypertensive* (%)	Mean systolic BP (mmHg)	Mean diastolic BP (mmHg)	Hypertensive* (%)
15–24	120.2 (118.8–121.6)	71.8 (70.6–72.9)	8.4 (4.9–11.8)	114.7 (113.2–116.2)	71.3 (70.0–72.6)	7.2 (3.9–10.4)
25–34	120.9 (119.3–122.5)	75.1 (73.9–76.3)	13.4 (9.2–17.6)	111.8 (110.4–113.2)	72.0 (71.0–73.1)	8.0 (4.9–11.1)
35–44	121.6 (119.7–123.5)	77.9 (76.5–79.2)	20.6 (15.6–25.6)	116.5 (113.9–118.1)	75.5 (73.8–76.7)	15.1 (10.7–19.5)
45–54	129.5 (126.8–132.2)	80.8 (79.2–82.4)	33.0 (27.2–38.9)	130.8 (128.1–133.5)	81.1 (79.6–82.6)	38.8 (32.7–44.8)
55–64	134.3 (131.5–137.1)	78.8 (77.3–80.3)	38.1 (32.1–44.2)	143.5 (140.1–146.9)	81.9 (80.3–83.5)	58.0 (51.8–64.1)
Total	122.7 (121.8–123.6)	75.6 (75.0–76.1)	17.3 (15.1–19.3)	117.8 (116.7–118.7)	74.2 (73.5–74.7)	15.8 (13.8–17.8)

\*BP ≥140/≥90 (mmHg) and those on antihypertensive drugs

beverages. The highest number of those consuming alcohol was in the 55–59 years age group (21.5%). In our study, current consumption of alcohol was relatively higher in the younger age groups (36.9% of current consumers of alcohol were in the 35–44 years age group). This may have adverse economic implications for the community and the country.

The consumption of an inappropriate diet is associated with many NCDs. However, few Indian studies have quantified the consumption of fruits and vegetables in the general population. We found that >95% (96.9% men and 95.6% women) of respondents used refined vegetable oil for cooking.

For individuals, regular and adequate daily physical activity is an effective and powerful means of preventing chronic diseases; for nations, it can provide a cost-effective way of improving public health. We found that women were less active than men. Physical activity for transportation was low suggesting that motorized transport was the main mode of travel.

Our study shows that both undernutrition and overnutrition coexist in the same population. Mishra *et al.* found the prevalence of obesity in urban slums to be 15.6% in women and 13.3% in men.<sup>12</sup> A large cross-sectional study among men and women aged ≥35 years from in Mumbai found that 19% of men and 30% of women were overweight (BMI >25 kg/m<sup>2</sup>).<sup>13</sup>

Although hypertension is more prevalent in men as a group, the gap between men and women decreases as age advances. Among the older age groups, women had a higher mean blood pressure. Gurav *et al.* studied the prevalence of hypertension in the >35 years age group in an urban slum community in Mumbai<sup>14</sup> and found that 12% of men and 22.6% of women had a blood pressure ≥140/≥90 mmHg. In Delhi, Chadha *et al.*<sup>15</sup> observed that the mean blood pressure in the 25–64 years age group was 127.5 per 1000 (116.6 per 1000 in men and 136.8 per 1000 in women). Gupta reviewed the recent studies on prevalence of hypertension in different communities.<sup>16</sup> Using systolic blood pressure ≥140 and/or diastolic ≥90 mmHg as the criteria for hypertension they found a high prevalence of hypertension among urban adults in Jaipur (men 30%, women 33%), Mumbai (men 44%, women 45%), Thiruvananthapuram (31%, women 36%) and Chennai (14%). Our findings are similar.

### Conclusion

Our study shows a high prevalence of risk factors for NCDs in an urban slum of Haryana. The population residing in these slums is generally poor and thought to be at low risk for lifestyle diseases. Our results show that many risk factors were prevalent at levels higher than in urban areas. With little or no social and health systems to support them, this group needs urgent intervention. To tackle the emerging epidemic of NCDs the government has started the Integrated Disease Surveillance Programme (IDSP) to provide a rational basis for decision-making and implementing public health interventions.<sup>17</sup> The sampling design adopted for the IDSP has to ensure that it generates information for slums as well.

Combating NCDs requires action at the community, local and national levels. At the national level, framing appropriate policies for tobacco and alcohol control, and promotion of a good diet and

adequate physical activity is needed. Simultaneously, there is a need to reorient and strengthen the health system to address the challenge of NCDs. At the community level, we need to create an environment that promotes the adoption of healthy behaviours.

The results of our survey have been shared with the district-level authorities as well as the community. A community-based alliance called 'Friends of City' has been formed to carry out community-based activities with the technical support of our team.

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### REFERENCES

- 1 *Innovative care for chronic conditions: Building blocks for action. Global report. Noncommunicable diseases and mental health.* Geneva:World Health Organization; 2002. WHO/MNC/CCH/02.01, p. 15.
- 2 Murray CJL, Lopez AD (eds). *Global burden of disease: A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020.* Cambridge, Massachusetts:Harvard University Press; 1996.
- 3 Planning Commission. *9th Five-Year Plan (Vol. 2).* New Delhi:Government of India; 2002.
- 4 Catley-Carlson M, Silimperi D. *Health and environment in urban poor areas: Avoiding a crisis through prevention–environmental health program. Capsule Report, March 1996.* Available at [http://www.dec.org/pdf\\_docs/pnaby450.pdf](http://www.dec.org/pdf_docs/pnaby450.pdf) (accessed on 24 October 2005).
- 5 *STEPwise approach to surveillance (STEPS).* Geneva:World Health Organization. Available at <http://www.who.int/chp/steps/en/> (accessed on 24 October 2005).
- 6 Census 2001. *Census 2001 of district Faridabad (rural and urban).* Available at <http://www.faridabad.nic.in/census.htm> (accessed on 24 October 2005).
- 7 Armstrong T, Bull F. Development of the World Health Organization Global Physical Activity Questionnaire (GPAQ). *J Public Health* 2006;**14**:66–70.
- 8 Rani M, Bonu S, Jha P, Nguyen SN, Jamjoum L. Tobacco use in India: Prevalence and predictors of smoking and chewing in a national cross sectional household survey. *Tob Control* 2003;**12**:e4.
- 9 British Medical Association. *Alcohol: Guidelines on sensible drinking.* London:Blackwell/BMJ Books; 1995.
- 10 English DR, Holman CDH, Milne E, Winter MG. *The quantification of drug caused morbidity and mortality in Australia.* Canberra:Commonwealth Department of Human Services and Health, 1995.
- 11 Gupta PC, Saxena S, Pednekar MS, Maulik PK. Alcohol consumption among middle-aged and elderly men: A community study from western India. *Alcohol* 2003;**38**:327–31.
- 12 Misra A, Pandey RM, Devi JR, Sharma R, Vikram NK, Khanna N. High prevalence of diabetes, obesity and dyslipidaemia in urban slum population in northern India. *Int J Obes Relat Metab Disord* 2001;**25**:1722–9.
- 13 Shukla HC, Gupta PC, Mehta HC, Heber JR. Descriptive epidemiology of body mass index of an urban adult population in western India. *J Epidemiol Commun Health* 2002;**56**:876–80.
- 14 Gurav RB, Kartikeyan S. Levels of blood pressure in an urban community. *Bombay Hospital J* 2003. Available at [http://www.bhj.org/journal/2001\\_4301\\_jan/original\\_148.htm](http://www.bhj.org/journal/2001_4301_jan/original_148.htm) (accessed on 24 October 2005).
- 15 Chadha SL, Radhakrishnan S, Ramachandran K, Kaul U, Gopinath N. Prevalence, awareness and treatment status of hypertension in urban population of Delhi. *Indian J Med Res* 1990;**92**:233–40.
- 16 Gupta R. Trends in hypertension epidemiology in India. *J Hum Hypertens* 2004;**18**:73–8.
- 17 Integrated Disease Surveillance Programme (IDSP). Available at <http://www.whoindia.org/CDS/DiseaseSurveillance/IDSP/WHO%20Manual/Vol1/Ch1%20Introduction.pdf> (accessed on 24 October 2005).