# Burden of Anaemia in Rural and Urban Jat Women in Haryana State, India

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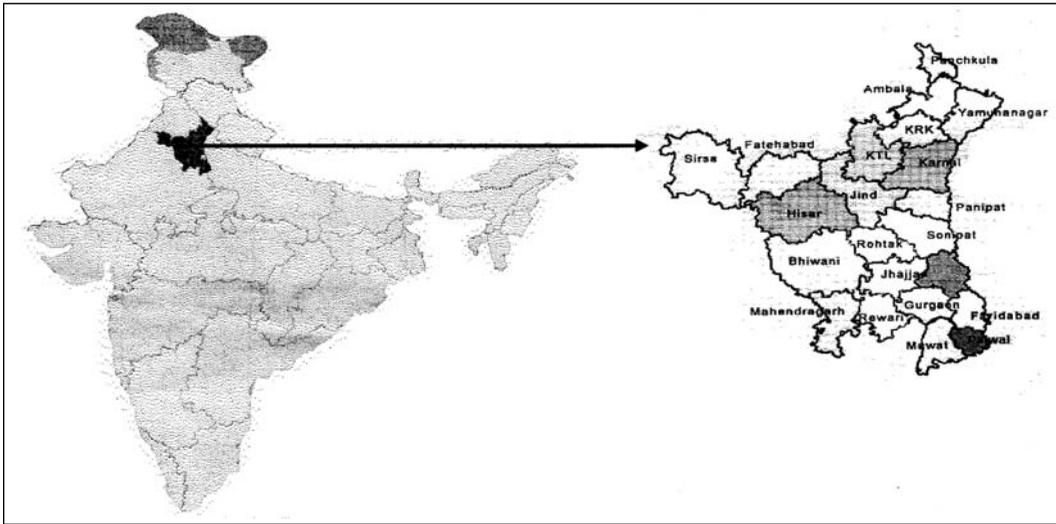
## ABSTRACT

A cross-sectional study was undertaken on 600 Jat women (rural=300, urban=300), aged 40 to 70 years from Haryana state in North India.  The aim of the study was to determine the prevalence of anaemia and the dietary intake of rural and urban middle-aged (40-59 years) and older (60 & above) Jat women.  The findings indicated that all the subjects exhibited a decline in the mean values of haemoglobin (Hb) concentration with  advancement in age. The mean blood Hb concentration of urban middle-aged and older women was 10.1±1.3g/dl and 9.91.4g/dl respectively, which was higher than their rural counterparts at all age groups, although the differences were statistically non-significant (*p*>0.05). The overall prevalence of anaemia reached 88.7% (rural women= 91.3%, urban women =86%). Daily dietary intake of rural and urban subjects was below the recommended dietary allowances. Physical performance of both groups of the women showed a decline with a decrease in Hb concentration. A significant and positive correlation of Hb status was observed with grip strength and vital capacity while  a negative association was witnessed with blood pressure and pulse rate in both the rural and urban women. Anaemia among these women may be attributed to inadequate dietary intake, illiteracy, and poor access to health services.

**Keywords**:  Anaemia, haemoglobin concentration,  Jat women, physical performance

## INTRODUCTION

Anaemia continues to be a major public health problem at all ages worldwide. In the adult population, anaemia is a risk factor for cardio-vascular health and early death. In addition, it also causes fatigue and leads to negative impact on cognitive and physical functions as well as on the quality of life (Gabrilove, 2005). Most of the existing studies (Gillespie & Johnston, 1998; Toteja *et al.,* 2006)  point out that anaemia among women causes increased risk of low birth weight, inadequate iron stores for the newborn, higher risk of maternal morbidity and mortality as well as a decline in mental concentration and physical activity. Although it was believed that a decline in haemoglobin levels might be a normal consequence of ageing, evidence has accumulated that anaemia does reflect poor health and increased vulnerability to adverse outcomes in older persons (Guralnik *et al.*, 2004). As the elderly population is rising, the prevalence of anaemia is also expected to rise sharply in the future. Prevalence of

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**Figure 1.** Map indicating the location of study area (Haryana)

anaemia in South Asia is among the highest in the world, reflecting overall high rates of malnutrition (Bentley & Griffiths, 2003). Numerous studies have evaluated prevalence of anaemia among pre-school children (Vendt *et al.*, 2007); adolescents (Kaur, Deshmukh & Garg, 2006; Goel & Gupta,2007); pregnant and lactating women ( Toteja *et al.*, 2006; Gautam *et al.*,2008); but there is a scarcity of information of this aspect on aged Jat woman. Therefore in the present research, an attempt has been made to gauge the prevalence of anaemia and dietary habits among middle aged and older Jat women residing in rural and urban areas of Haryana (North India) (Figure 1).

## METHODOLOGY

### Study location and people

Haryana is a state in northwest India inhabited by people of the Indo-Aryan and Indo-Dravidian type. Haryana's population is divided into a number of castes (jatis): Brahmins, the Rajputs, the Jats and the Ahirs. The Jats are the single largest group in the state. About 80% of the population is engaged in agriculture directly or indirectly, while the Jats in urban area are mainly engaged in trade, commerce, government, and private jobs. The people of Haryana are still conservative and they continue to follow old practices as a matter of custom. Jat women particularly from rural areas are married at an early age. However, the position of females residing in urban areas is changing with the spread of education, and social barriers against women are decreasing rapidly.

### Participants

The state of Haryana is divided into four divisions for administrative purpose. Seventy-five rural and an equal number of urban subjects were selected from each division by adopting a purposive sampling method. Thus a total of 600 apparently healthy women (300 rural and 300 urban) aged 40 to 70 years were included in the study, which was conducted in 2006-2007. Each subject was contacted individually at her residence. Age in years was obtained from the date of birth which the majority of the urban women could recall. However, for most of the rural women and some elderly urban women, their age had to be ascertained by association with some important events like age at marriage, age of the first child, and important festivals.

Care was taken to include only normal and healthy individuals, who were not suffering from any chronic disease or physical deformity. Pregnant and lactating women were also excluded from the study. Information regarding education, occupation, income, parity, family size and structure of the subjects was obtained by interviewing using a structured question-naire. Before the commencement of data collection, all the participants were explained about the nature of the study and their oral consent was obtained.

## Measurement of haemoglobin concentration

For hemoglobin estimation, 20$\mu$l of capillary blood was taken in a Hb pipette and transferred to a pre-numbered glass bottle containing 5ml Drabkins reagent. Hemoglobin estimation was done by the Cyanmethaemoglobin method using a photoelectric colorimeter with a green filter (500-570 nm wave length). According to WHO (1992) criteria for anemia is defined as a Hb level of less than 12g/dl in women.

## Measurements of physical performance

Hand grip strength (kg) of all the women was measured with hand grip dynamometer (Analogue model, range 0-100kg, make of Japan). Subjects were encouraged to exert their maximal grip. The subjects performed three grip tests with each hand. The best result was chosen for analysis. Vital capacity was gauged with Spirometer (PS-fr., range 1000-7000cm3). Systolic and diastolic blood pressure of each subject was taken using manual mercury Sphygmomanometer, after the subject had rested at least for 15-20 minutes. Three readings were recorded for each woman and the lowest value has been included in the study.

## Assessment of nutrient intakes

A 24-hour dietary recall method for three consecutive days was used to determine the

type and approximate quantity of food stuff consumed by each subject (Swaminathan, 2003). The amounts of food consumed were measured using standardised spoons, glasses and plates for measurement of the foodstuffs and compared with the Recommended Dietary Allowances (RDA) (ICMR, 1999) values for adult and aged Indian females. Questions related to their knowledge, attitude and practice (KAP) towards importance of different food groups (type and frequency of food consumption, amount of consumption of different foods) in their life as well as awareness about anemia (meaning, symptoms, causes and ill-effects of anemia) were also asked.

## Statistical analysis

All statistical analyses were undertaken using the Statistical Package for Social Sciences (SPSS) version 14.0. Student's *t*-test was used to find the magnitude of rural-urban difference at each age level. Pearson correlation was employed to determine bivariate relationships.

## RESULTS

### Prevalence of anaemia

Table 1 presents age-wise mean and standard deviation values for Hb concentration (g/dl) among rural and urban Jat women. In rural area, Hb concentration registered an average value of 10.5g/dl for the younger women (40-45 years) while the older group (66-70 years) showed mean Hb value of 9.4g/dl. The Hb concentration of urban women also showed a similar trend, decreasing from 10.6g/dl to 9.6g/dl for the younger and older age groups. Thus, Hb concentration of rural and urban subjects showed a decline as age progressed (Figure 2). There were no significant difference between Hb concentration of rural and urban subjects for each age gropup.

Table 2 shows that the rural women had a higher prevalence of anaemia compared to urban women. Among the former, only

**Table 1.** General characteristics of the participants

| Age group | Rural women | | | Urban women | |
|---|---|---|---|---|---|
| (in years ) | N | Mean ± S.D | t-value | N | Mean ± S.D |
| Adult women | | | | | |
| 40-45 | 50 | 10.48 ± 1.36 | -0.50 | 50 | 10.62 ± 1.42 |
| 46-50 | 50 | 10.10 ± 1.38 | -1.36 | 50 | 10.47 ± 1.28 |
| 51-55 | 50 | 9.95 ± 1.35 | -0.23 | 50 | 10.00 ± 1.09 |
| 56-60 | 50 | 9.78 ± 1.25 | -0.57 | 50 | 9.94 ± 1.39 |
| Older women | | | | | |
| 61-65 | 50 | 9.58 ± 1.35 | -1.27 | 50 | 9.91 ± 1.23 |
| 66-70 | 50 | 9.42 ± 1.60 | -0.65 | 50 | 9.62 ± 1.41 |
| Total | 300 | 9.89 ± 1.42 | -1.83 | 300 | 10.09 ± 1.34 |

**Table 2.** Number and percentage prevalence of anaemia (g/dl) among rural and urban Jat women

| Age group | Rural women (N=300) | | Urban women (N=300) | | Total women (N=600) | |
|---|---|---|---|---|---|---|
| (in years) | Normal | Deficient | Normal | Deficient | Normal | Deficient |
| Adult women | | | | | | |
| 40-45 | 9 (3%) | 41 (13.66%) | 13 (4.33%) | 37 (12.33%) | 22 (3.66%) | 78 (13%) |
| 46-50 | 6 (2%) | 44 (14.66%) | 11 (3.66%) | 39 (13%) | 17 (2.83%) | 83 (13.83%) |
| 51-55 | 4 (1.33%) | 46 (15.33%) | 3 (1%) | 47 (15.66%) | 7 (1.16%) | 93 (15.5%) |
| 56-60 | 4 (1.33%) | 46 (15.33%) | 5 (1.66%) | 45 (15%) | 9 (1.50%) | 91 (15.16%) |
| Older women | | | | | | |
| 61-65 | 2 (0.66%) | 48 (16%) | 5 (1.66%) | 45 (15%) | 7 (1.16%) | 93 (15.5%) |
| 66-70 | 1 (0.33%) | 49 (16.33%) | 5 (1.66%) | 45 (15%) | 6 (1%) | 94 (15.66%) |
| 40-70 | 26 (8.66%) | 274 (91.33%) | 42 (14%) | 258 (86%) | 68 (11.33%) | 532 (88.66%) |

8.7% had normal Hb values while 91.3% suffered various grades of anaemic conditions. Anaemia was also widely prevalent among urban women with only 14% showing normal Hb concentrations and 86% had Hb levels below 12 g/dl.

**Dietary intake**

Most of the subjects were vegetarians (95% in rural; 92% in urban women). Most of the rural women said they had 2 meals a day (69%), while most of the urban participants had 3 meals a day (62%).

Food intake of rural and urban Jat women with reference to the Recommended Dietary Allowances (RDA) for Indian women is shown in Figures 3 & 4. It is evident that the average dietary intake by the rural and urban middle-aged women (40–59 years) is below the recommended dietary allowances. Daily consumption of cereals was 337g/day in rural and 348g/day in urban women. Intake of fruits and vegetables was also quite low among rural middle-aged women (25g/day, 70g/day respectively) than their urban counterparts where corresponding figures were (44g/day, 85g/day respectively). Consumption of fats and oils, sugar and jaggery was more than the recommended amounts in rural middle aged women, whereas urban women consumed 21g/day sugar and jaggery and 20g/day fats
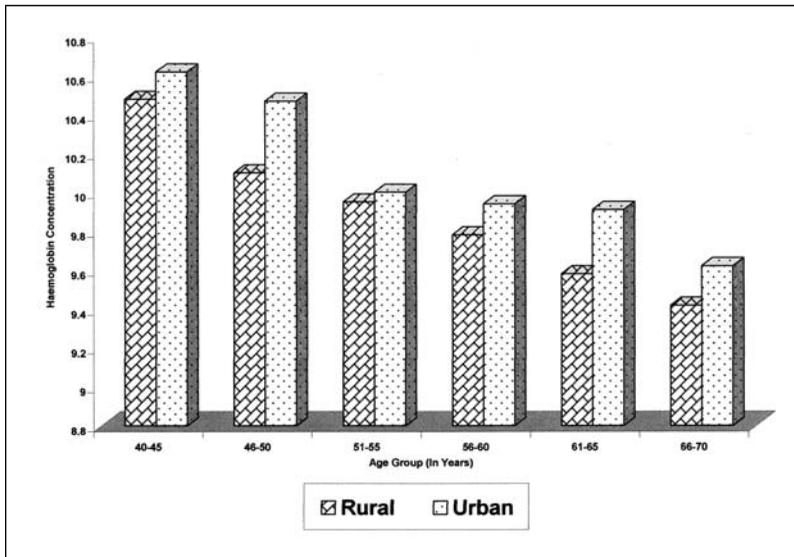
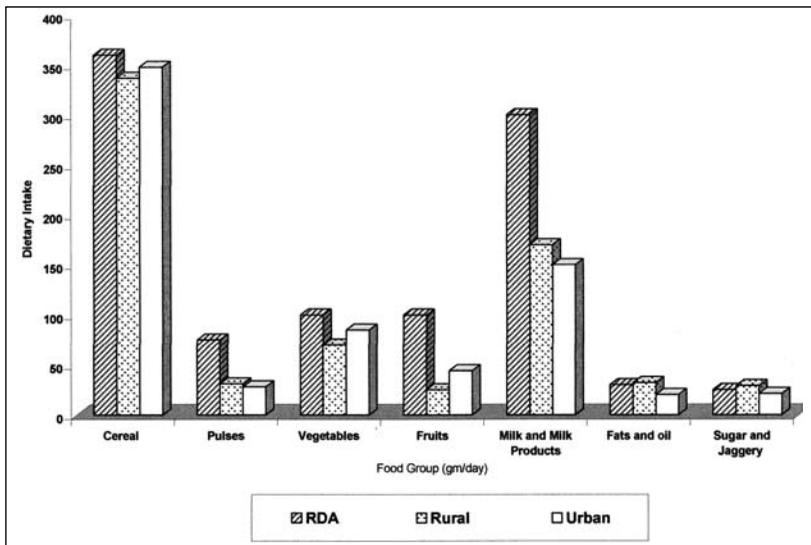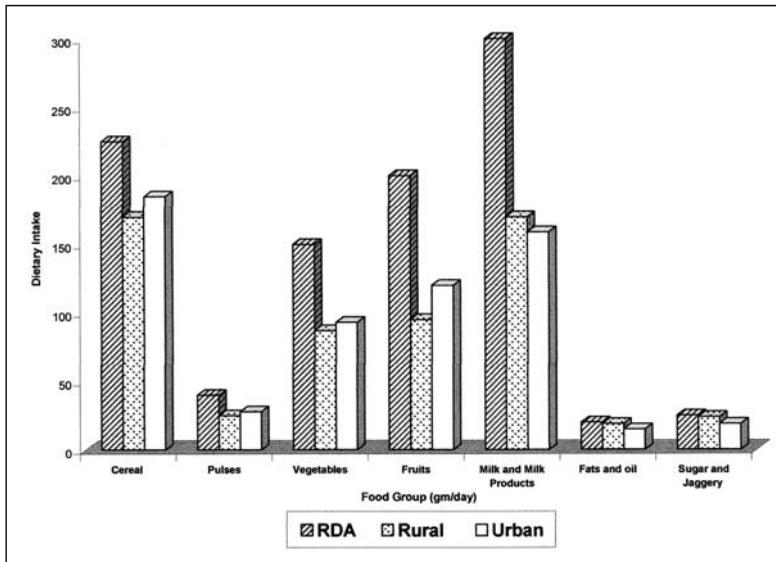**Figure 2.**  Haemoglobin concentration of rural and urban Jat Women



**Figure 3.**  Nutrient intake of rural and urban middle aged Jat women (40-59 years) with reference to Recommended Dietary Allowances (RDA)

along with oils. Average dietary intake of rural and urban older women (60 years & above) was found to be lower than the recommended dietary allowances. Consumption of milk and milk products among rural (170g/day) and urban (159g/day) women was below the recommended figures for these food stuff. Intake of fruits and vegetables was much lower than the recommended figures in both rural and urban older women.

The literacy level among rural women was low with 53% women having attended school, compared to 70% for urban women

**Figure 4.** Nutrient intake of rural and urban older Jat women ( 60 years & above) with reference to Recommended Dietary Allowances (RDA)

**Table 3.** General information and dietary habits of rural and urban Jat Women

| Particulars | Rural Jat women | | Urban Jat women | |
|---|---|---|---|---|
| | N | % | N | % |
| Education | | | | |
| Educated | 159 | 53% | 210 | 70% |
| Uneducated | 141 | 47% | 90 | 30% |
| Occupation | | | | |
| Working | 45 | 15% | 102 | 34% |
| Housewives | 255 | 85% | 198 | 66% |
| Type of diet | | | | |
| Vegetarian | 285 | 95% | 276 | 92% |
| Non-vegetarian | 15 | 5% | 24 | 8% |
| Frequency of consumption | | | | |
| 2 times/day | 207 | 69% | 105 | 35% |
| 3 times/day | 90 | 30% | 186 | 62% |
| 4 times/day | 3 | 1% | 9 | 3% |
| Awareness about anaemia | 78 | 26% | 195 | 65% |

(Table 3). The majority of the rural women were housewives (85%) compared to 66% in urban areas. A low proportion of the rural women (26%) had awareness about anemia whereas 65% of urban women understood the meaning, causes and ill-effects of anemia.

**Table 4:** Total correlation coefficient (r) showing association between haemoglobin status and various physiological variables of rural and urban Jat women

| Physiological Variables | Rural Jat Women N=300 | Urban Jat Women N=300 | Total Jat Women N=600 |
|---|---|---|---|
| Grip strength of dominant hand | 0.229 ** | 0.226** | 0.214** |
| Grip strength of non-dominant hand | 0.149** | 0.232** | 0.176** |
| Vital capacity | 0.204** | 0.176** | 0.197** |
| Systolic blood pressure | -0.216** | -0.027 | -0.104* |
| Diastolic blood pressure | -0.144** | -0.030 | -0.046 |
| Pulse rate | -0.001 | -0.120* | -0.043 |

**Relationship between haemoglobin levels and physical performance indexes**

Association between Hb status and various physiological variables of rural and urban women is shown in Table 4. In rural women, Hb status showed significant and positive correlation with dominant hand grip strength (r=0.229**), non-dominant hand grip strength (r=0.149**) and vital capacity (r=0.204**), whereas negative and strong association was witnessed with systolic blood pressure (r= -0.216**) and diastolic blood pressure (r=-0.144**). Pulse rate showed negative (r= -0.001) and non-significant correlation with Hb level. Urban participants also displayed positive and significant association between Hb status and dominant hand grip strength (r=0.226**), non-dominant hand grip strength (r=0.232**) and vital capacity (r=0.176**). Systolic blood pressure (r= -0.027) and diastolic blood pressure (r= -0.030) had negative and non-significant correlation with Hb level, while pulse rate (r= -0.120*) demonstrated negative and significant association. Likewise total correlation coefficient (r) of the combined rural and urban participants presented a strong and positive association between Hb status and grip strength of dominant (r=0.214**) as well as non-dominant hands (r=0.176**), vital capacity (r=0.197**) while negative association was observed with systolic (r= -0.104*), diastolic blood pressure(r= -0.046) and pulse rate(r= -0.043).

**DISCUSSION**

Anaemia is common in older adults and is an independent predictor for increased morbidity and mortality in several disease states (Woodman, Ferrucci & Guralnik, 2005). The overall prevalence of anaemia was 91.3% in rural and 86% among urban Jat women, showing a higher prevalence of anaemia among older women (97% rural, 90% urban) compared to middle-aged women (88.5% rural, 84% urban). Smith (2000) found the prevalence of anaemia to increase sharply after the age of 60 years. Guralnik *et al.* (2004) also stated that prevalence of anaemia in women doubles from 10% to 20% during 75-84 years to 85 years and older age groups. The World Health Organization's (1992) global estimates of anaemia prevalence average 56%, with a range of 35-75% depending on geographic location. According to the

National Family Health Survey-2 (2000), the prevalence of anaemia among all women in the India sample was 52%. Occurence of 100 % anaemia was observed among Munda women (a tribe) from Kolkata city (India) (Ghosh & Bharati, 2003).

In the present study, mean Hb level showed a decline with advancing age in both the rural and urban women. The overall Hb concentration was higher in the urban women than in their rural counterparts, although the differences were statistically non-significant in all age groups. Similar results have been reported by previous studies (Mitrache *et al.,* 2001; Argento *et al.,* 2008). This age-related decline in the mean Hb level of Jat women may be mainly attributed to consumption of poor quality and quantity of diet with increasing age. Data from NHANES III (1994) and other studies (Wurtman *et al.,* 1988; Rolls, Dimeo & Shide, 1995 ) also clearly demonstrated a linear decline in food intake from the age of 20 to 80 years.

In a multiethnic and geographically vast developing country like India, anaemia in women should be visualised from their economic and socio-cultural point of view. Both rural (95%) and urban (92%) Jat women were vegetarian. Verma, Chhatwal & Kaur (1998) observed that compared to non-vegetarians (38%), more vegetarians (65.9%) were anaemic. The diet consumed was relatively monotonous in rural and urban women and iron inhibitors like tea and fibrous food (wheat, cereal, whole legumes and green leafy vegetables) were often consumed by the participants. Daily intake of fruits, vegetables, milk and milk products was below the recommended level in both the rural as well as urban women. Most of the rural women were engaged in physical work in the fields and this may increase their need for energy and micronutrients including iron. Awareness about anemia was low among rural women (26%) compared to the urban subjects (65%). Elderly females had little knowledge about their nutritional needs because most of the rural (47%) and some urban women (30%) were not educated. Even the educated women were not aware of their nutritional requirements.

The subjects showed significant and positive correlation between their Hb levels and physical performance and blood pressure. Significant and negative correlation between Hb level and blood pressure was found in rural women, while urban women showed positive and significant correlation between grip strength and vital capacity with Hb level, and negative correlation with pulse rate and blood pressure. Steensma & Tefferi (2007) demonstrated the potential negative impact of a low Hb level on performance status, physiology and functional independence. Penninx, Guralnik & Onder (2003) displayed in their study a decreased physical performance and strength among anemic residents of the Chianti area of Italy. Individuals with haemoglobin level less than normal had less grip strength (Colin-Ramirez *et al.,* 2003; Brenda *et al.,* 2004), reduced work capacity (Gillespie, 1998), and comorbidity in chronic heart failure (Anand *et al.,* 2005; Komajda *et al.,* 2006). Beaton, Corey & Steel(1989) observed that a decrease in Hb reduces the availability of oxygen to the tissues, which in turn affects the cardiac output among subjects with Hb level below the normal value of 12g/dl.

The World Bank (1993) stated that improving women's overall nutrition status and their access to resources (income) in India will have the greatest impact on reducing anaemia. Bentley & Griffiths (2003) reported high rates of anaemia among Indian women which reflect their social and biological vulnerability in society and the household. Hence multi-sectoral pro-grammes and strategies to improve the health status and to impart proper nutrition education among rural and urban women are required.

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