

Socioeconomic Condition and Anaemia among the Mahishya Population of Southern West Bengal, India

Premananda Bharati¹, Rohini Ghosh² & Ranjan Gupta²

¹ *Anthropology and Human Genetics Unit, Indian Statistical Institute, 203 B.T.Road, Kolkata-700108, India*

² *Centre National De La Recherche (CNRS), UPR 2147, 44 rue de l'Amiral Mouchez, 75014 Paris, France*

ABSTRACT

A cross-sectional study was conducted among the Mahishya population of Chakpota village in Southern West Bengal to determine the relationship between socio-economic conditions and certain haematological parameters, haemoglobin level and haematocrit. Households were divided into high, middle and low socioeconomic groups on the basis of per capita income per year. The demographic data were collected from all the 255 households comprising 404 adult males and 383 adult females (above 20 years of age). Higher values in the parameters were observed among the males in all the three socioeconomic sub-groups. Significant differences in haemoglobin level and haematocrit of males were observed between the three socioeconomic groups ($p < .01$). On the contrary, insignificant differences in haemoglobin level and haematocrit were observed between the three socioeconomic groups among the females. Higher nutritional intake and lower parasitic infections may be responsible for the higher levels of the haematological parameters in the higher socioeconomic groups. Our study reveals that sex discrimination in food sharing seems to be the major cause for the gender difference in haemoglobin status in all the three economic groups. It is apparent from the study that cultural factors play an important role in determining the haemoglobin status at micro-level, even in high-income households.

INTRODUCTION

Iron deficiency affects more than 3.5 billion people in the developing world (UNICEF UNU/WHO/MI, 1999). In both men and women, the prevalence of anaemia was highest among those with severe undernutrition (ACC/SCN, 2000). Haematological parameters like haemoglobin (Hb) and haematocrit (Hct), are generally known to be affected by socioeconomic conditions, especially via nutrition, as the nutritional status, by and large, depends upon the socioeconomic condition and the cultural norms (Pai & Theophilus, 1974; Page, Friedlaender & Moellering, 1977; Devadas, Vijayalakshmi & Chandy, 1980; Kaur, Sagar & Khirwar 1982). The factor that needs to be considered is the income elasticity effect in relation to iron (ACC/SCN, 1991) which shows significant correlation between energy and iron intake (Narasinha, 1991). In India, the rural population are mostly subjected to low bio-availability of iron because of the cereal based diet and chronic blood loss from hookworm infestations which results in anaemia

(Malville, 1991). Several studies on intra-household food allocation shows that women get less food than men relative to their nutritional needs (Carloni, 1981; Hamilton, Popkin & Spicer, 1984; Haaga & Mason, 1987; Chen, Huq & D'Souza 1995). Unequal access to food, heavy work demands, nutritional deficiencies including iron, makes Indian women susceptible to illness, and anaemia (Seshadri, 1997). While malnutrition in India is prevalent among all segments of the population, poor nutrition among women begins in infancy and continues throughout their lifetime (Chatterjee, 1990; Desai, 1994). Female members in a family typically, are the last to eat. Thus, if there is not enough food they are the ones to suffer most (Horowitz & Kishwar 1985).

Ascorbic acid and meat enhances the absorption of iron. Low intake of ascorbic acid and meat, due to low income reduces the absorption of iron. This setting results in widespread iron deficiency anaemia. The state of anaemia deteriorates further because of high incidence of parasitic infestations as a consequence of poor environment and personal sanitation (Seshadri, 1997).

In view of the above, the present study strives to examine whether there exists any relationship between the economic condition and haematological parameters like haemoglobin and haematocrit, where below normal levels are indicative of anaemia.

SUBJECTS AND METHODS

The Mahishya is a Hindu caste population inhabiting the districts of the state of West Bengal, India. The Mahishyas of Chakpota, the study village, is an agrarian society (cultivators of own land represent 3.83 % of all workers, while agricultural labourers are 75.48% of the total work force). Chakpota mostly consists of the Mahishya population (nearly 99%). The study area is located in the Howrah district, of West Bengal. Chakpota is situated about 5 km from Amta town and connected by a non-metal road, which is usable by motor vehicles. The town of Amta is located about 45 km from Kolkata City and is connected by a reasonably good public transport system. Amta town has better educational and health facilities.

All the 255 Mahishya households in the village surveyed comprised 404 adult males and 383 adult females. The Mahishya households in the Chakpota village were grouped into the following three socioeconomic groups on the basis of per capita income per year.

- Low-income Rs. 600.00 (USD 60.00) or less
- Medium- income from Rs. 601.00 to Rs. 1200.00 (USD 60.10-120.00) and
- High- income Rs. 1201.00 (USD 120.10) or more

A per capita income of Rs. 1201.00 (USD 120.10) or more per year is conventionally considered as the poverty line (World Bank, 1978). The methodology used in the study has been published previously (Majumdar *et al.*, 1985; Bharati, 1989).

Diet

Dietary data were collected from 241 households. Each of the households surveyed was visited for three consecutive days, twice daily, prior to cooking where food items to be cooked for each meal were weighed in a Salter pan type balance. Food consumed outside the home by members of a household, households members not taking meals at home, or guests taking meals in the household during the investigation were also recorded. The nutrient value of each food item consumed by each family member (adult and children) per consumption unit was calculated according to Gopalan, Rama Sastri & Balasubramanian (1989). Food distributed among the family members was also recorded.

Intestinal parasites

Faeces specimens were collected from 382 household members of both sexes. The following methods were followed for collection and examination of faecal specimens. Children below 15 years were given one laxative and adults (>15 years) were given two laxative tablets on the night before collection. The subjects were asked to defecate on a sheet of paper and about 2 gms of the soft portion of the stool were collected and sent to the laboratory. The samples were examined under the microscope in physiological saline suspension for vegetative or trophozoite stages. Iodine smear preparations were used for the examination of cystic stage. The Wallis-Malloy flotation method was followed for examination of helminthic ova (Kolmer, Spanlding & Robinson, 1951).

Blood samples

Blood specimens were collected by finger pricking from 276 (146 males and 130 females) Mahishya adults aged 20 years and above. All the household members were contacted and willing adults were recruited into the study. Blood samples from 146 households were collected taking a pair of male and female from each household. Sixteen females refused to give blood and only the males of those households were considered. Haemoglobin level was estimated immediately after collecting the blood specimens, using a Sahli's haemoglobinometer. The haematocrit value (HCT) was measured by collecting blood in heparinised micro-capillaries (length 75 mm, internal diameter 1mm) and spinning them down shortly after collection in a haematocrit centrifuge. The cut-off points of haemoglobin level was classified according to WHO (1968) and De Maeyer (1989).

Descriptive statistics were used. ANOVA was used to calculate significant differences between the various socioeconomic groups.

RESULTS

Basic statistics pertaining to haemoglobin level, haematocrit value and anaemic status of the three economic groups by sex are presented in Tables 1 and 2.

Haemoglobin level and haematocrit (HCT)

The mean haemoglobin level is highest among the Higher Economic Stratum (HES) males (14.1) and lowest in the Middle Economic Stratum (MES) males, whereas the Low Economic Stratum (LES) males have higher mean haemoglobin value than the MES and lower than the HES (Table 1). Significant differences in haemoglobin concentration were observed among the males of the three socioeconomic groups. Surprisingly, the LES females had highest mean haemoglobin level, followed by HES and MES and the difference in haemoglobin concentration between the three economic groups was not significant. The range in haemoglobin value for women ranged from 5.0-16.0 gm/dl. The males had a higher haemoglobin value than the females.

The haematocrit value (HCT) indicates almost the same trend, as observed in haemoglobin concentration (Table 1). The HES males had highest HCT value (44.69), followed by LES (42.71) and MES (41.16). Differences in HCT values of the males among the three socioeconomic groups were found to be significant. The LES females had the highest HCT value, followed by HES and MES and the difference observed among the three economic sub-groups was insignificant. The haematocrit value among the women ranged from 24.0–45.0. The males had higher HCT values than the females in all the three economic groups.

Table 1. Haemoglobin concentration, haematocrit values and anaemia among males and females of the Mahisya population in the three socioeconomic groups

	LES			MES			HES			P value
	N	Mean	sd	N	Mean	Sd	N	Mean	sd	
Haemoglobin concentration										
Males	32	12.0	±1.8	62	12.7	±1.0	52	14.1	±1.1	0.00
Females	37	11.9	±1.1	52	11.6	±1.3	41	11.7	±1.3	.572
Haematocrit value										
Males	32	42.7	±3.7	62	41.2	±5.0	52	44.7	±3.1	0.00
Females	37	38.5	±2.6	52	37.3	±3.3	41	37.6	±3.3	.254

Table 2. Anaemia in males and females of the Mahisya population in the three socioeconomic groups

	LES		MES		HES	
	N	%	N	%	N	%
Males						
Hb (<13 gm/dl)	15	46.88	28	45.16	5	9.62
Hb (≥13 gm/dl)	17	53.13	34	54.84	47	90.38
Females						
Hb (<12 gm/dl)	19	51.35	31	59.62	19	46.34
Hb (≥12 gm/dl)	18	48.65	21	40.38	22	53.66

WHO (1968) classification, males, Hb <13.gm/dl, females < 12gm/dl

Anaemic status

Table 2 shows the percentage distribution of anaemia by sex as determined from the haemoglobin level and haematocrit estimation in the study groups. It is evident that the

percentage of anaemia in females is higher compared to males in all the three economic groups. Anaemia in males is more frequent in the LES group compared to MES and HES groups. In the case of females, the incidence of anaemia is more in MES, followed by LES and HES.

Dietary Consumption

The highest mean intake per consumption unit of most of the nutrients (Table 3) was observed among the HES households, followed by MES and LES.

Parasitic Infections

Figure 1 indicates the prevalence of various intestinal helminthes and protozoan infections among the three economic sub-groups. Except for trichuris, oxyuris, giardia and Entamoeba histolitica infections, a lower percentage of other parasitic infections was observed among the HES households. Respondents from the LES and MES had a higher prevalence rate of parasitic infections compared to the HES households.

Table 3. Nutrient intake for the three different economic groups (converted into per consumption unit)*

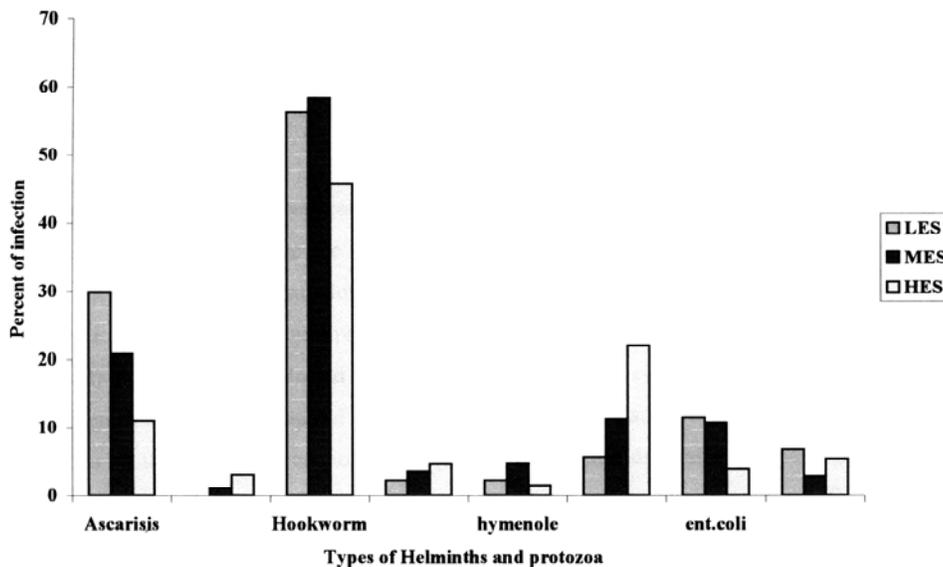
Food groups	Low (N=74)		Middle (N=104)		High (N=63)	
	Mean	Sd	Mean	sd	Mean	sd
Calorie (k.cal)	2430	365	2925	469	3747	628
Carbohydrate (g)	504.6	71.2	589.9	84.9	708.2	113.6
Vegetable protein (g)	58.4	12.5	63.7	13.8	75.9	18.2
Animal protein (g)	4.1	5.2	7.6	8.2	21.6	12.2
Total Protein (g)	62.5	10.0	76.3	12.6	97.5	15.2
Fat (g)	17.9	5.8	28.9	16.0	58.4	26.5
Iron (g)	45.8	12.9	53.1	13.7	57.6	16.7
Vit B1 (mg)	2.2	0.5	2.5	0.5	2.5	0.5
Vit B2 (mg)	0.8	0.3	0.9	0.3	1.3	0.3
Nicotinic Acid (mg)	26.1	3.7	30.3	4.4	30.3	4.4
Vit C (mg)	152.7	147.1	181.8	141.0	179.5	108.0
Folate (µg)	45.7	10.9	53.2	11.6	57.6	13.7

*The nutrient intakes were estimated by using food tables from Gopalan et al. (1989)

DISCUSSION

Association of income with the hamatological parameters like haemoglobin level and haemotocrit values is apparent from the study, i.e. as we move from the lower economic households to the higher ones; the haemoglobin level increases among the males. Higher nutritional intake, especially iron and lower incidence of parasitic infections like ascariasis and hookworm infections among the HES may be responsible for significant differences in mean haemoglobin, haemotocrit and anaemia, compared with the MES and LES. But females have a higher percentage of anaemia, lower haemoglobin and haemotocrit than the males in all the three economic groups. This indicates that income has minimal or no effect on haemoglobin status among the females of all the three economic groups. Moreover, the females were more anaemic

than the males in all the three economic groups. In the higher income group, a significant difference in anaemic status was observed between the males and females. Low purchasing power of food in the LES and MES may have contributed to the insignificant difference in anaemic status between the males and females, in spite of the presence of unequal food sharing in the families (Bharati, 1983). In the high income group, though there is availability of food, yet the difference was significant due to the food-sharing pattern. Unequal food sharing may be the reason of this difference. In various Indian societies, it has been found that large sex discrimination exists in sharing of food (Basu *et al.*, 1986a; 1986b; Khan *et al.* 1995). A study by Basu *et al.* (1987) on food sharing revealed that there exists difference in food sharing among the adult males and females in the households of Chakpota village. The gender difference in anaemia may be due to the fact that adult females experience regular blood loss due to menstruation as well as repeated delivery in addition to their malnourishment, which is due to gender bias in intra-household food sharing (Bharati, 1983). Moreover, they are also exposed to diseases due to the insanitary conditions of the environment; they have to wash utensils and clothing in the polluted pond water which may cause disease and in turn affect the haematological parameter (Bharati, 1983). Thus, it is clear from the study that cultural factors play an important role in determining haemoglobin status at micro-level, even in high-income households.



LES- Low Economic Stratum, MES- Middle Socioeconomic Stratum, HES- High Socioeconomic stratum

Figure 1. Prevalence of helminths and protozoal infections among the three economic groups

An intensive study on the effects of detailed cultural factors including status of women and sharing of food and food taboos, will provide for a better understanding of gender differences in haemoglobin and haemotocrit levels. Studies with rigorous design are needed to elucidate the relationship between cultural factors and development of anaemia. This may in turn shed light on the intricate physiological mechanisms, as this study is unable to unravel and identify the confounding variables that may mask the biological pathways.

ACKNOWLEDGEMENTS

We are indebted to the people of Chakpota village for their help and co-operation particularly to Mr. Nimai Manna, Mr. Gunadhar Majhi and Mr. Ganesh Khanra. Thanks are due to the authorities of the Indian Statistical Institute for financial support; to the District Magistrate, Howrah district and to the Block Development Officer, Amta Block, for organizational help. Finally Professor A. Basu's guidance in conducting this study is deeply appreciated.

REFERENCES

- ACC/SCN (1991). Micronutrient intakes, incomes and prices. *SCN News* 7: 23-25.
- ACC/SCN (2000). 4th report on the World Nutrition Situation: Nutrition Throughout the Life Cycle. Geneva: WHO.
- Basu A, Mukhopadhyay S, Majumdar PP, Roy SK, Mukhopadhyay B, Bharati P & Gupta R (1986a). Food practices in contrasting populations anthropological studies of the Lepchas, Sherpas, Oraons and Mahishyas of West-Bengal, India. In: Proceedings of the XIII International Congress of Nutrition. Taylor TG & Jenkins NK (eds.). London: John Libbey.
- Basu A, Roy SK, Mukhopadhyay B, Bharati P, Gupta R & Majumdar PP (1986 b). Sex bias in the intra-household food distribution: roles of ethnicity and other socioeconomic characteristics. *Cur Anth* 27: 536-539.
- Basu A, Mukhopadhyay S, Majumdar PP, Roy SK, Mukhopadhyay B, Bharati P & Gupta R (1987). Food practices in contrasting populations: an anthropological study of Sherpas, Lepchas, Oraons and Mahishyas of West Bengal. *Soc Sci Inf* 26: 847-868.
- Bharati P (1983). A study on the relationship between socioeconomic condition, nutrition and health in a Mahishya population sample. PhD Thesis in Anthropology, University of Calcutta, Kolkata, India.
- Bharati P (1989). Variation in adult body dimensions in relation to economic condition among the Mahishyas of West-Bengal, India. *Ann Hum Biol* 16: 529-541.
- Carlson AS (1981). Sex disparities in the distribution of food within rural households. *Food and nutri* 7: 3-12.
- Chatterjee M (1990). Indian women: their health and economic productivity. World Bank, Discussion Papers 109. Washington DC.
- Chen L C, Huq E & D'Souza S (1995). Sex bias in the family allocation of food and healthcare in rural Bangladesh. In: Selected readings in the cultural, social and behavioural

- determinants of health. Caldwell JC & Santow G (Eds.). Health Transition Series No. 1. Australian National University, Canberra.
- DeMaeyer EM (1989). Preventing and controlling iron deficiency anaemia through primary health care: a guide for health administrators and program manager. Geneva: World Health Organization.
- Desai S (1994). Gender inequalities and demographic behaviour. India.
- Devadas RP, Vijayalakshmi P & Chandy A (1980). Nutritional status of the expectant mothers and their offspring. *Ind J Nutri Diet* 17: 275-280.
- Gopalan C, Rama Sastri BV & Balasubramanian SC (1989). Nutritive value of Indian foods. Hyderabad: National Institute of Nutrition.
- Haaga JG & Mason JB (1987). Food distribution within the family: evidence and implication for research and programs. *Food Policy* 12: 146-160.
- Hamilton S, Popkin BM & Spicer D (1984). Women and nutrition in the Third World countries. Praeger Special Studies. New York: Bergin and Garvey Publishers.
- Horowitz B & Kishwar M (1985). Family life-the unequal deal. In: Search of Answers: Indian Women's Voices from Manushi. Kishwar M & Vanita R (Eds). London.
- Kaur YP, Sagar V & Khirwar SS (1982). Nutritional ecology and food consumption pattern of expectant mothers in selected villages and suburbs of Hissar. *Ind J Nutri Diet* 19: 50-58.
- Khan ME, Anker R, Ghosh Dastidar SK & Bairathi S (1995). Inequalities between men and women in nutrition and family welfare services: an in-depth enquiry in an Indian village. In: Selected Readings in the Cultural, Social and Behavioural Determinants of Health. Caldwell JC & Santow G (eds.). Health Transition Series No. 1. Australian National University, Canberra.
- Kolmer JA, Spanlding EH & Robinson HW (1951). Approved laboratory technique. New York: Appleton Century Crofts, Inc.
- Majumdar PP, Bharati P, Banerjee DC & Basu A (1985). Dietary status of Mahishyas of Chakpota: Inter and intra economic group variations. *Eco Food Nutri* 17: 231-251.
- Malville NJ (1991). Haemoglobin concentration and working capacity of non-pregnant rural women of the Katmandu valley of Nepal. *Am J Hum Biol* 3: 337-387.
- Narasingha RBS (1991). Double fortification of salt with iron and iodine to control anemia and goiter. *Proc Nutri Soc India* 37: 153-166.

Socioeconomic Condition and Anaemia among the Mahishya Population of Southern West Bengal, India

- Page LB, Friedlaender J & Moellering RC (Jr.) (1977). Culture, human biology and disease in the Solomon Islands. In: Population Structure and Human Variation. Harrison GA (ed.). pp. 143-163. Cambridge: Cambridge University Press.
- Pai RN & Theophilus F (1974). Haemoglobin values of girls aged 10-20 years from different socio-economic levels in Madras. *Ind J Nutri Diets* 11: 284-288.
- Seshadri S (1997). Nutritional anaemia in South Asia. In: Malnutrition in South Asia: a regional profile. S Gillespie (ed.). No.5, pp. 75-124. UNICEF. ROSA Publication.
- UNICEF/UNU/WHO/MI (1999). Preventing iron deficiency in women and children: background and consensus on key technical issues and resources for advocacy, planning and implementing National Programs. Geneva: WHO.
- World Bank (1978). India. World Bank Staff Working Paper No. 279. The World Bank, Washington.
- World Health Organization (WHO) (1968). Nutritional anaemia. WHO Technical Report Series No.405. Geneva: WHO.