

STUDY OF HEALTH PROBLEMS AND NUTRITIONAL STATUS OF TEA GARDEN POPULATION OF ASSAM

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ABSTRACT

BACKGROUND: Assam is the highest tea producer state in the country. There is scarcity of reliable information on health and nutritional status among tea garden population of Assam to enable initiating public health response to their health needs. **AIMS:** To describe health problems and nutritional status among tea garden population of Assam. **SETTINGS AND DESIGN:** Community-based cross-sectional survey in eight randomly selected tea gardens of Dibrugarh district of Assam. **MATERIALS AND METHODS:** Socio-demographic and behavioral characteristics of participants were recorded. Health problems and nutritional status were assessed through medical examination, evaluation of medical records, anthropometry and laboratory investigations. **STATISTICAL ANALYSIS:** Percentage prevalence; Chi-square test was applied wherever applicable. **RESULTS:** Out of 4,016 participants, 1,863 were male and 2,153 were female. They were mostly illiterate, and nearly 52.9% (1,197 of 2,264) of adults were manual workers in the garden. Alcohol and oral tobacco use were common. Prevalence of underweight among children was 59.9% (357 of 596), and thinness among adults was 69.9% (1,213 of 1,735). Anemia was widespread. Worm infection (65.4%, 217 of 332); skin problems; respiratory infections, including tuberculosis; filariasis were present in a significant way. Children suffered more in various diseases. Major noncommunicable diseases like hypertension, stroke were emerging in the community and were associated with modifiable risk factors like alcohol and tobacco use. **CONCLUSION:** Health status of the population can be ameliorated through better hygienic practices, environmental sanitation, creating health awareness, nutritional intervention and overall improvement of socioeconomic conditions of the population.

Keywords: Health problems, noncommunicable diseases, tea garden population, undernutrition

INTRODUCTION

Reliable information on health problems of a population is an essential pre-requisite for formulating health care system to address

health needs. India is experiencing a health transition, which is posing a great challenge to its health system due to the changing health needs of the population. With the health transition, communicable and

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deficiency diseases are gradually receding while non-communicable diseases (NCD) are escalating in India. Various socio-demographic factors, nutritional improvement, improvement in health infrastructures including eradication, elimination and control of major communicable diseases are mainly contributing to this changing disease pattern in India. However, among the poor socio-economic groups, the pace of epidemiological transition is slow, where communicable diseases and undernutrition are still the major causes of disease burden.^[1-3] India is vast country and variation occurs in the disease pattern due to the socio-economic gradient and other factors. There is scarcity of health information in many sub-populations in India, which needs to be explored for public health policy needs.

Tea is an important agro-industry of Assam, which contributes immensely to the state's economy. Tea garden population constitutes approximately 1/5th of state's population. Poor socio-economic conditions, ignorance due to illiteracy, over-crowded and unhygienic living conditions in the residential colonies make tea garden population vulnerable to various communicable diseases and malnutrition. Scattered reports indicate higher prevalence of undernutrition and infectious conditions like filariasis in this population.^[4-8] A recent study showed that NCDs like hypertension is emerging as important public health problem among them, which may be partly due to the excessive use of alcohol and tobacco.^[9] There may be some also specific health problems, which may be related to their occupation. The information, available on health problems and nutritional status among them, is not

adequate for public health planning. Hence, we conducted a survey to with an objective to identify the health problems and nutritional status of tea garden population of Assam. The findings allow us to discuss their health scenario against the backdrop of their socio-economic condition and lifestyles, which will have important public health implication.

MATERIALS AND METHODS

The study was conducted among tea garden population of Dibrugarh district of Assam during the period 2002-2003. Approval of the Institutional Ethical Committee of Regional Medical Research Centre for Northeast India, Indian Council of Medical Research (ICMR) was taken initially to carry out the study.

Dibrugarh is the hub of tea industry and situated in the eastern corner of the state comprising a total land area of 3381 km². The workers of tea plantation industry migrated to Assam from states like Madhya Pradesh, Bihar, Orissa and Andhra Pradesh in the latter part of nineteenth to early twentieth century.^[9] These workers are solely dependent on this industry for their livelihood and generally at least one member of every family is engaged in tea industry mainly as daily waged manual workers. Both adult male and female are equally employed. They work mainly as tea-pluckers, but small proportion of them are also engaged in factory, office etc. Fixed daily wage is paid to them for the working days. However, they are also paid extra amount for generating more than stipulated work-output. They are also paid bonus during festivals. They are mostly illiterate. Most of them reside in the rent-free

houses in the residential colonies situated within the tea estates. The over-crowded and unhygienic conditions of colonies make them vulnerable to various diseases. Within the family campus, many families keep domestic animals and birds. Most of garden labourers purchase various household staffs from weekly market held in garden. Food staffs are kept open in the market in unhygienic conditions. There are hospitals and medical officers in each tea garden for providing free medical services to the workers/dependents and implement various health programmes. Food staffs are also provided to the workers family in a subsidized rate.

A multistage sampling design was adopted in the study for the selection of the individuals to make the samples representatives of the population. Eight out of 138 tea gardens of Dibrugarh districts was selected randomly as first stage unit, followed by random selection of 880 households within the primary sampling unit in the second stage to reach out the study individuals. The tea garden list for sampling frame was prepared in consultation with the district assistant labour commissioner office. All the individuals in the selected households irrespective of age and sex were eligible to participate in the study. There are about 3 lakhs tea garden population in the district and total population of the eight sampled gardens were about twenty seven thousands. A total of 4016 individuals (male-1863 and female-2153) from 880 selected households participated in the study, achieving a response rate of about 90%. (Numbers of participants: Garden 1-387, Garden 2-440,

Garden 3-905, Garden 4-513, Garden 5-498, Garden 6-407, Garden 7-358 and Garden 8-508) Data was collected by house to house visit. Socio-demographic informations like age, sex, educational status, occupation status, availability of household toilet and behavioural characteristics like uses of tobacco and alcohol were collected using a pre-designed and pre-tested questionnaire. Informed consent was taken from all the participants and from the parents of minor participants before collection of data.

The clinicians of the study team carried out general physical examinations of the participants specifically looking into respiratory infection, diarrhoea, skin infection, leprosy, filariasis, gastro-intestinal problem and musculoskeletal (back pain) problems. Information on disease symptoms was obtained from individuals using probing techniques. Stroke and epilepsy cases as per definition used in the study were also recorded.^[10,11] All the available personal medical records including investigation report and medication held by the persons were evaluated and were recorded. Based on all the information collected, a diagnosis of health conditions were made by the same clinicians who collected the data for maintaining the consistency. Health conditions were coded according to alphanumeric coding of 10th revision of international classification of diseases (ICD-10). Some of the conditions were collapsed into one category to make the list less exhaustive. Treatment for leprosy or tuberculosis in the last six months was also recorded. Sitting blood pressure of the adults

(≥20 years) was measured according to the standard procedures. Hypertension was defined as SBP≥140 mmHg and/or DBP≥90 mm Hg and/or treatment with antihypertensive drugs.^[12]

Two anthropometric measurements i.e., height and weight were measured using standard procedures. Weight for age below -2SD of reference median was classified as underweight.^[13] For adults (≥20 years) body mass index (BMI): weight in kg/height in metres² value less than 18.5 was considered as thinness or chronic energy deficiency and BMI more than 25 was considered as overweight.

Stool examinations for helminthic infection (formal-ether concentration technique), blood haemoglobin estimation (cyanmethaemoglobin method) were carried out in sub-samples. World health organization recommended cut-off points of haemoglobin level were used to define anaemia.^[14] To detect microfilariae (mf) of *Wuchereria bancrofti* night blood smear was done as per protocol of the centre in sub-samples. Diseases identified through laboratory investigations were also coded with ICD-10 coding.

Statistical Analysis

Data analysis was done using EPI 6 software. Prevalence of diseases was estimated in percentage and computed separately for both male and female. Prevalence of certain health conditions like tuberculosis, leprosy was expressed in per thousand of populations. The prevalence of

health problems and nutritional status among different groups were compared and tested for statistical significance by applying Chi-square test wherever applicable. A *P*-value 0.05 or less was considered as statistically significant.

RESULTS

Of the total 4016 participants, 1863 (46.4%) were male and 2153 (53.6%) were female [Table 1]. Above the age of six years of age, 65.1% (2001 of 3075) were illiterate. Out of the total adult population (≥15 years), 52.9% (1197 of 2264) were manual workers. Of the total individuals (≥15 years), 59.9% (1356 of 2264) were alcohol and 72.5% (1641 of 2264) were non-smoked tobacco users. Smoking rate was 7.7% (174 of 2264). Out of the total, 2530 (63%) individuals had access to a household toilet.

The prevalence of underweight was 59.9%

Table 1: Distribution of subjects by age, sex, education and occupation

Variables	Male n (%)	Female n (%)	Total n (%)
Age groups (Years)			
0-14	830 (44.6)	922 (42.8)	1752 (43.7)
15-44	746 (40.1)	957 (44.4)	1703 (42.4)
45-59	187 (10.0)	167 (7.8)	354 (8.8)
60+	99 (5.3)	107 (5.0)	206 (5.1)
All age	1863 (100)	2153 (100)	4016 (100)
Educational level [†]			
Illiterate	803 (56.9)	1197 (72.0)	2001 (65.1)
Primary	365 (25.8)	303 (18.2)	668 (21.7)
Middle	211 (14.9)	143 (8.6)	354 (11.5)
Secondary and higher	33 (2.3)	19 (1.1)	52 (1.7)
Occupation ^{††}			
No occupation	401 (38.8)	624 (50.7)	1025 (45.3)
Daily wage labourer	597 (57.8)	600 (48.7)	1197 (52.9)
Higher grades	35 (3.4)	7 (0.6)	42 (1.9)

[†]Only includes individuals aged ≥6 years (Male-1412, Female-1662, Total-3075), ^{††}Only includes individuals aged ≥15 years of age (Male-1033, Female-1231, Total-2264)

(357 of 596) among preschool children [Table 2]. Prevalence of thinness was significantly higher (*P*<0.01) among female (73.1%, 499 of 760) than male (65.7%, 713 of 975). Prevalence of anaemia was 71.8% (112 of 156) and 72.2% (153 of 212) among male and female respectively (*P*>0.05). Clinical signs of Vit A, Vit B-complex and Vit C deficiency were observed in 2.2% (17 of 779), 3.2% (25 of 779) and 1.3% (10 of 779) respectively among the children (0-15 years).

The distribution of various morbid conditions [Table 3] indicates that 65.4% (217 of 332) of individuals harbor at least one intestinal helminthes. Prevalence of *A. Lumbricoides*, *T. trichiura* and *A. duodenale/N. americanus* (hookworms) infection was 49.4% (164 of 332), 29.8% (99 of 332) and 5.4% (18 of 332) respectively. *Mf* of *Wuchereria bancrofti* was detected in 8.7% (20 of 231) of blood slides. In all, 0.6% (23 of 4016) persons had clinical manifestations of filariasis.

Other common health problems observed in the study were respiratory problems (6.7%), various skin lesions (scabies-2.9%, abscess

Table 2: Prevalence of underweight among children, chronic energy deficiency among adults and anaemia (≥20 years)

BMI (Weight in Kg/Height in metre ²)	Male	Female	Total
	Total male (N=760)	Total female (N=975)	Male+female (N=1735)
<18.5	499 (65.7%)	713 (73.1%)	1213 (69.9%)
Prevalence of underweight among under 5 children			
Underweight	Male (N=285)	Female (N=311)	Total (N=596)
<-2 SD	169 (59.3%)	188 (60.5%)	357 (59.9%)
Prevalence of anaemia among tea garden children and adults			
	Male (n=156)	Female (n=212)	Total (N=368)
Anaemic	112 (71.8%)	153 (72.2%)	265 (72.0%)

or furuncle or carbuncle-2.5% and other skin lesions-2%). Prevalence of diarrhoea was 1.7% (n=70). Prevalence of pulmonary tuberculosis was 11.7/000 (n=47) and prevalence of leprosy was 0.8/000 (n=3). Proportion of children (0-5 years) who was suffering from respiratory problems and diarrhoea at the time of survey was 12.8% (97 of 761) and 3% (23 of 761) respectively. Prevalence of epilepsy was 7.3/000 (n=29). Hypertension was diagnosed among 45.9% (817 of 1782) of adults (≥20 years). An increasing trend of hypertension in both sexes with increasing age was also detected [Table 4]. Prevalence of hemiplegia was 43.7/000 (9 of 206) in the elderly age group (≥60 years). Back pain was registered in 8.7% (130 of 1487) of individuals in the age group above 25 years.

We also compared the prevalence of some important health problems according to some important background characteristics of sampled individuals like individual education (or maternal education in case of children below 6 years), availability of a household toilet and use of alcohol and tobacco (results not shown in table). Prevalence of diarrhoea was 1.4% (n=29) among those who had access to a household toilet for defecation, which was significantly lower (*P*<0.001) as compared to 2.8% (n=42) prevalence among those who didn't have access to a household toilet. Similarly, among those who had access to a household toilet, prevalence of one or more intestinal helminths was 58.8% (141 of 240), which was significantly higher (*P*<0.001) as compared to 82.6% (76 of 92) prevalence among those who didn't have a toilet facility in the household.

Table 3: Morbidity conditions observed in the study subject according to international classification of diseases (ICD-10) coding

ICD-10 code	Name of disease	Male (%)	Female (%)	Total (%)
A09	Diarrhoea	31 (1.7)	39 (1.8)	70 (1.7)
A15 [†]	Pulmonary tuberculosis	18 (9.7)	29 (13.5)	47 (11.7)
A30	Leprosy	2 (1.1)	1 (0.5)	3 (0.8)
B74	Filariasis	18 (1.0)	5 (0.23)	23 (0.6)
B83*	Intestinal worm infestation	103 (65.6)	114 (65.1)	217 (65.4)
B86	Scabies	55 (3.0)	60 (2.8)	115 (2.9)
D 50**	Anaemia	112 (71.8)	153 (72.2)	265 (72.0)
E 50***	Vit A deficiency	7 (2.1)	9 (2.2)	17 (2.2)
E 53***	B-complex	11 (2.9)	14 (3.5)	25 (3.2)
E 54***	Vit C deficiency	5 (1.3)	5 (1.2)	10 (1.3)
G40	Epilepsy	12 (6.5)	17 (7.9)	29 (7.3)
G81	Hemiplegia and paralysis	10 (0.5)	6 (0.3)	16 (0.4)
H25 [§]	Senile cataract	24 (25.3)	28 (26.2)	52 (25.3)
I10 [‡]	Hypertension	389 (49.1)	428 (43.3)	817 (45.9)
J00-02, J06, J20, J40, J44, J45	Respiratory problems	129 (6.9)	141 (6.5)	270 (6.7)
K29	Gastritis	32 (1.7)	72 (3.3)	104 (2.6)
L02	Cutaneous abscess, furuncle and carbuncle	51 (2.7)	48 (2.2)	99 (2.5)
L30	Other dermatitis	43 (2.3)	37 (1.7)	80 (2.0)
M13	Joint pain/arthritis	7 (0.4)	14 (0.7)	21 (0.5)
M54 [†]	Musculo-skeletal pain (Dorsalgia)	55 (7.5)	75 (9.9)	130 (8.7)
R10	Pain abdomen	43 (2.3)	58 (2.7)	101 (2.5)

^{||}Figure in parenthesis is in per thousand populations, ^{*}The total numbers of subjects screened for those conditions are 332 (Male-157, Female-175), ^{**}The total numbers of subjects screened for that condition is 368 (Male-156, Female-212), ^{***}The total numbers of subjects screened for those conditions are 779 (Male-374, Female-405), [§]only geriatric age group is included (Male-99, Female-107, Total-206), [‡]The total numbers of subjects screened for those conditions are 1782 (Male-793, Female-989), [†]Only individuals more than 25 years were included (Male-733, Female-754, Total-1487)

Table 4: Prevalence of hypertension among adults (≥20 years) according to the defined criteria - SBP ≥140 or DBP ≥89 (JNC VI classification)

Age group (years)	Hypertensive N (%)
20-29 (n=582)	132 (22.7)
30-39 (n=477)	201 (42.1)
40-49 (n=350)	201 (57.4)
50-59 (n=170)	115 (67.7)
59+ (n=203)	168 (82.8)
Total (N=1782)	817 (45.9)

An educational gradient in the prevalence of most of the health problems and undernutrition was also observed. Out of 44 pulmonary tuberculosis cases (age >6 years), only 2 (4.9/000, 2 of 406) were among those who were educated beyond primary school as compared to 42 cases (15.7/000, 42 of 2669) among those who were illiterate or educated up to the primary level ($P>0.05$).

The prevalence of thinness was 73.3% (969 of 1322) among illiterate which came down to 65% (139/214) among those with primary level education and 52.8% (105 of 199) among those with educational level beyond primary school in a statistically significant way ($P<0.001$). Similarly, in case of children, more children (61.4%, 302 of 492) were found to be underweight among those whose mother were illiterates than those children (51.4%, 55 of 107) whose mother had formal schooling ($P<0.05$).

Prevalence of hypertension among alcohol users was 49.1% (525 of 1070), which was significantly higher ($P<0.001$) as compared to 41% (292 of 712) among non-users. Similarly, prevalence of hypertension among tobacco users was 49.1% (692 of 1408) as compared

to 33.4% (125 of 374) among non-users, which was statistically significant ($P<0.001$).

DISCUSSION

The survey revealed high magnitude of undernutrition and infectious diseases among tea garden population of Assam. Nutritional problems like underweight among children (59.9%), thinness among adults (69.8%) and micronutrient deficiency disorders like anaemia (72%) were widespread. Common infectious diseases were worm infestation (65.4%), respiratory problems (6.7%), diarrhoea (1.7%), skin infections, filariasis (0.6%) and pulmonary tuberculosis (11.7/000). The study also registered a significant burden of NCDs like hypertension (45.9%), senile cataract (25.3%), epilepsy (7.3/000), back-pain (8.7%).

Higher prevalence of underweight was observed among children in comparison to the prevalence in general, but comparable to children belonging to poor socio-economic groups.^[15,16] Similarly, as reported earlier, this study also found higher prevalence of thinness among adults compared to other reports in India.^[7,17] Prevalence of Vit A, B-complex deficiency disorders among children was comparable to lower socio-economic groups.^[16,18] Extent of anaemia was found to be higher in comparison to other states of India, but comparable to Assam.^[15]

Of the infectious diseases, prevalence of tuberculosis was higher in comparison to overall prevalence of Assam and India.^[19,20] Prevalence of respiratory infection was lower

than workers engaged in dust producing textile industry.^[18] However, prevalence among children was comparable to tribal children.^[16] Prevalence of worm infestation was higher as compared to relatively better off population of adjacent rural area.^[21] A higher microfilariasis rate in tea labourers was observed compared to indigenous population.^[6]

Most of these diseases among them appeared to be emanated from poor personal and household hygiene, unsatisfactory sanitation and housing coupled with ignorance due to lack of education. Poor nutrition among them also probably makes them vulnerable to infectious diseases and vice versa. Presence of household toilet was found to reduce orofecally-transmitted diseases, as also reported earlier.^[8] However, high prevalence even among toilet holders may be because of contaminations of surroundings due to open field defecation by large numbers of other community members and poor maintenance of toilets facilities. Unfavorable housing may be attributable to higher rate of tuberculosis and respiratory conditions. Similarly, use of biomass cooking fuel may also contribute to respiratory diseases.^[22] Vector borne disease like filariasis is endemic among tea labourers due to abundance of disease vectors, availability of *mf* carriers acting as reservoir and abundant mosquito breeding places in peri-domestic surroundings due to presence of stagnant water bodies.^[4,5]

We observed positive impact of individuals' education on health and nutrition. Similarly, impact of maternal education on child health

and nutrition was also observed. Lack of education probably adversely influences in health awareness and health-seeking behaviours contributing to higher disease rate.^[5] Parental occupation seems also impinges on child health and nutrition as they remain busy in tea gardens neglecting timely feeding of children or taking sick children to hospital. Exclusive breast-feeding is a positive health practice among them, but adverse cultural practices like delay in weaning is an important factor of undernutrition among infants.^[23]

Adequate dietary supply is required to the workers engaged in occupation, which demands continuous physical labour. However, it is surprising to see a higher rate of undernutrition among them despite supply of subsidized food. In a community where woman is the most important bread earner for the family, high prevalence of thinness and anaemia may have adverse impact on family income as in tea garden wage is directly related to work output. Adverse impact of anaemia and thinness like poor reproductive outcome was also reported from tea garden.^[24]

Among the NCDs, prevalence of hypertension was found to be higher among them in comparison to other contemporary studies, as also reported earlier.^[9] In absence of important risk factors like obesity, high prevalence may be ascribed to the excessive presence of modifiable risk factors of NCDs like use of alcohol and tobacco, salt intake with tea and work-stress.^[9] This study also observed higher prevalence of hypertension among users of alcohol and tobacco. Prevalence of

epilepsy was comparable to earlier report in India.^[25] Geriatrics population faced an increased burden of chronic and non-communicable diseases like hypertension, paralysis and senile cataract. Back pain was complained by a significant numbers of adults, which was lower compared to workers who require lifting or heavy work, but comparable to others.^[18,26] Most of the tea garden workers were mainly involved with non-mechanized manual works in this study. Hence, work places related injuries were not observed.

The present study, being a cross-sectional one, has inherent limitations of cross-sectional study and can't depict the true picture of diseases in the community. Variation in the diseases may occur due to the locations of the garden and other factors. Seasonal variation was also not taken into account. There is also possibility of underestimation of diseases because of inability of illiterate labourers to express their problems. We also didn't gather data on gynecological diseases, vaccine preventable diseases and many neuro-psychiatric conditions and only limited laboratory investigations were conducted. One of the important strength of the study was that the data was gathered through a population-based survey by clinicians did the assessment of health problems, which gives more reliability of information than self-reported information or lay reporting.

CONCLUSION

Despite some limitation, the study identified broad dimension of health and nutritional

problems of tea garden population of Assam, based on which public health action can be strengthened. A comprehensive public health policy should be developed including preventive, promotive and curative measures to address the health and nutritional needs of tea garden population. Specific strategy should be developed for improving nutrition. Welfare measures by garden authorities should be strengthened for better sanitary measures and safe drinking water, better housing, adequate food supply, medical care and for overall improvement of socio-economic condition. Equally important is to educate the community about personal hygienic practices and environmental sanitation, taking preventing measures against commonly prevalent diseases, health risk associated with alcohol and tobacco, appropriate child-rearing practices etc. Although, in every gardens hospital and medical officers are available, many of the curable health problems were found to be laying in untreated conditions, because of individuals not availing the services in appropriate time. Response to the various health programmes like de-worming and HCH care is not satisfactory. Health programmes can be made accessible to community in efficient way through community participation. Already, in some tea gardens, "mothers' club" is formed for community health awareness and doing well and should be extended to all the gardens. Periodic health check up is also advisable to monitor health and nutrition. Further research should be carried out to understand more precisely the factors contributing the various diseases in this community, which will help in undertaking interventional measures to ameliorate their

health status. The study also emphasizes the need for more research on health problems more specifically linked their occupation.

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