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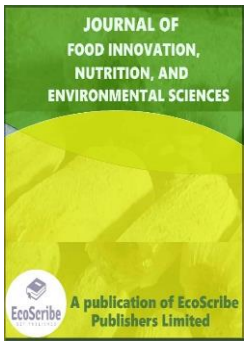

ORIGINAL ARTICLE

Socio-Demographic Correlates of Health and Nutrition Among Rural and Plantation Communities of the western Dooars, Jalpaiguri district, West Bengal, India

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ABSTRACT

Health and nutrition outcomes are profoundly influenced by socio-demographic factors, particularly in economically and geographically marginalized communities. This study investigated the health and nutritional status of tea garden workers and forest fringe village residents in selected areas of the western Dooars region of Jalpaiguri district, West Bengal, India. The primary objectives were to assess the demographic and socio-economic profiles of the population, explore correlations between socio-demographic variables and nutritional status, and suggest recommendations for betterment of community well-being. A community-based cross-sectional study was done from September 2024 to January 2025. Data were collected from 156 adult participants (101 males, 55 females) using a pre-structured questionnaire through a multi-stage random sampling technique. Variables analysed included age, gender, occupation, income, education. Results revealed substantial disparities in age, gender, occupation, income, education, addiction status, food security. Undernutrition, poor dietary diversity, and limited access to healthcare was prevalent, especially among female and elderly respondents. The findings highlighted the urgent need for targeted policy interventions focusing on nutrition education, healthcare accessibility, and livelihood support. Strengthening community-based initiatives and implementing development programs tailored to the unique needs of these vulnerable populations are essential for promoting equitable and sustainable health outcomes in the region.

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1. INTRODUCTION

Health and nutrition are critical indicators of human development and are significantly influenced by socio-demographic factors such as income, education, occupation, gender, caste, and access to healthcare services (Biadgilign et al., 2019; Placzek, 2021). In rural and marginalized populations, these determinants often interact in complex ways, shaping health outcomes, dietary practices, and nutritional status (Khurana et al., 2024). In India, the intersection of poverty, limited access to quality health services, and persistent social inequities continues to adversely affect the health and nutrition of millions, particularly in geographically and economically vulnerable regions (Thresia, 2018).

The Dooars region in the Jalpaiguri district of West Bengal is one such area, characterized by a mosaic of forest fringe villages and tea garden settlements (Chakraborty, 2015; Sarkar, 2017a). While culturally and ecologically diverse, these communities are often socio-economically disadvantaged. Tea garden workers, in particular, represent a historically marginalized workforce with limited access to healthcare, nutrition, education, and stable income (Paul & Rohatgi, 2014). Similarly, forest fringe villagers, who rely heavily on forest resources and subsistence agriculture, often lack consistent access to public health infrastructure. These conditions increase the population's vulnerability to a range of health and nutrition-related challenges, including undernutrition, communicable diseases, and poor maternal and child health outcomes (Sarkar, 2017b). Several studies have previously examined the socio-economic conditions of people in the Dooars region, including work by Paul and Rohatgi (2017) on plantation workers, Dutraj and Chhetri (2023) on food security issues at the Kathalguri tea garden, and Yasmin et al. (2022) on poverty and undernutrition in Alipurduar district. However, despite these known vulnerabilities, there remains a scarcity of recent, region-specific data addressing the socio-demographic dimensions of health and nutrition—particularly in the western Dooars belt. Much of the existing literature either generalizes rural health patterns or fails to consider the unique socio-economic configurations of plantation and forest-dependent communities and their implications for nutritional status. This study sought to bridge this knowledge gap by systematically analysing the socio-demographic correlates of health and nutrition among selected rural populations in the western Dooars region. By examining patterns across variables such as age, gender, occupation, education level the study seeks to identify key determinants and disparities in health and nutrition.

The study was primarily aimed to evaluate the demographic and socio-economic characteristics of rural and tea plantation communities, examine the relationships between these factors and the nutritional status of individuals, and offer practical recommendations to enhance the overall health and nutrition conditions in the study area.

The findings are expected to inform policy interventions, strengthen community-based health initiatives, and contribute to the development of a more equitable public health framework for marginalized populations in this ecologically and culturally sensitive region.

2. METHODOLOGY

This community-based cross-sectional study was conducted between September 2024 and January 2025 among tea garden workers and residents of forest fringe villages in the Dooars region of Jalpaiguri district, West Bengal, India (**Table 1**, **Figure 1**). At the first stage, tea gardens and forest fringe villages were selected with a purpose based on their diverse geographic locations and known socio-economic vulnerabilities within the western Dooars region. In the second stage, households within the selected locations were chosen using simple random sampling, ensuring an unbiased selection process. From each selected household, one adult respondent was randomly chosen ensuring a balanced representation of gender and age groups as much as possible for the study. Stratification was considered indirectly during site selection to include both tea garden communities and forest fringe dwellers—two distinct population groups with differing socio-demographic characteristics. A total of 156 individuals (101 males and 55 females) participated in the study. Individuals aged 15 years and above who voluntarily provided informed consent were included. For minor participants, consent was obtained from their parents or legal guardians.

Data were collected using a pre-structured questionnaire, which covered demographic, occupational, dietary, and health-related variables. The questionnaire was developed based on prior literature (Biswas et al., 2002; Mittal and Srivastava, 2006; Nath et al., 2018; Yasmin et al., 2022) and field experience. Prior to data collection, all participants were briefed about the purpose of the study in local vernacular language and verbal consent was taken. Occupational status was recorded based on each respondent's primary economic activity. Food security status was assessed using a simplified and modified version of the Household Food Insecurity Access Scale (HFIAS), which included three core questions addressing the availability, accessibility, and adequacy of food over the past four weeks. Households were categorized as food secure or food insecure based on their responses. Regarding meal frequency, participants were asked, "How many full meals do you consume on a typical day (excluding tea/coffee or light snacks)?" Responses were recorded and classified as ≤2 meals, 3 meals, or >3 meals per day, where ">3 meals" refers to the consumption of three main meals plus any additional substantial food intakes (excluding minor snacks or beverages).

Basic descriptive statistics were performed using Microsoft Excel (ver. 2023). For inferential statistical analysis, including Chi-square tests (at 5% significance level) and Pearson correlation matrices, PAST (ver. 4.13) and OriginPro (2023b)

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were used. Spatial maps were prepared using QGIS (ver. 3.14, Pi).

Table 1. Study locations of the present study

SN.	Block	Location	District
1.	Malbazar Block	Raja Tea Garden	Jalpaiguri
2.	Malbazar Block	Chengmari Tea Garden	
3.	Banarhat Block	Chamurchi Tea Garden, Banarhat	
4.	Mateli Block	Yonggtong Tea Garden, Samsing	
5.	Mateli Block	Baradighi Tea Garden	
6.	Mateli Block	Zurranti Tea Garden	
7.	Malbazar Block	Panjjhora Forest Busti	
8.	Banarhat Block	Chamurchi Forest Busti	
9.	Malbazar Block	Bamandanga Tea Garden	
10.	Mateli Block	Gorumara Forest Busti	
11.	Banarhat Block	Sulkapara Tea Garden	
12.	Mateli Block	Chalsa Tea Garden	

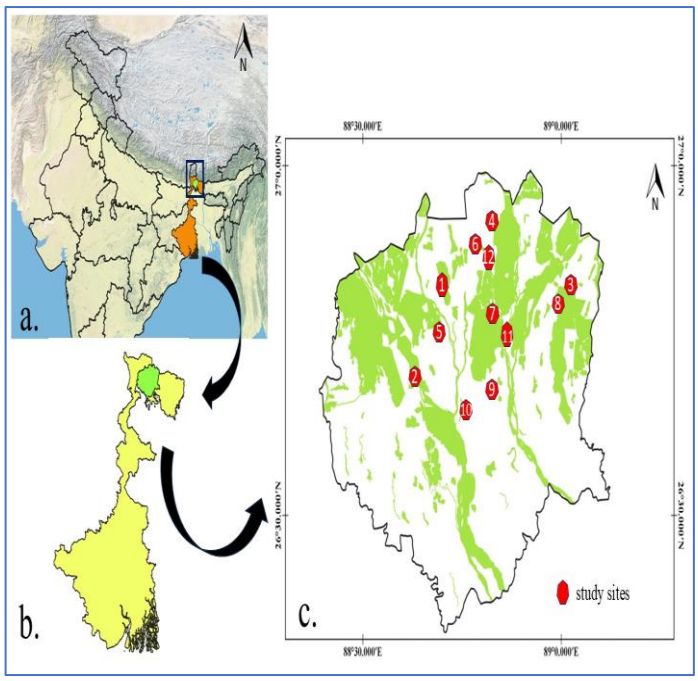


Fig. 1. Study area map, **a**. India, **b**. West Bengal, **c**. Jalpaiguri district (with study sites)

3. RESULTS

3.1 Demographic characteristics

Within the study population (n=156) there was a noticeable gender disparity, with males comprising 64.7% (n=101) and females 35.3% (n=55) (**Table 2**). This higher proportion of males may reflect gender-specific roles or greater male participation in tea garden and informal sectors. Most respondents belonged to the middle-aged groups, with 24.4% (n=38) aged 40–50 and 20.5% (n=32) aged 30–40. Individuals under 18 years constituted 17.3% (n=27), while those over 60 made up only 5.1% (n=8), indicating underrepresentation of dependent age groups.

Regarding education, 39.7% (n=62) of participants had no formal education, and 34.6% (n=54) had studied up to Xth standard (**Table 2**). Only 3.2% (n=5) had education beyond graduation, highlighting low educational attainment in the community. A significant proportion of respondents were employed in the service sector (primarily tea garden workers) (31.4%), followed by a considerable number of unemployed individuals (28.8%). Other categories included student (24.4%, n=38), business (10.9 %, n=17), and others (4.5%, n=7). Notably, 17.3% (n=27) were permanent tea garden workers, reflecting occupational dependence on tea plantations. The combination of high unemployment and low educational levels suggests structural limitations in employment readiness and opportunities.

3.2 Health and lifestyle indicators

3.2.1 BMI distribution

Among respondents, 52.6% (n=82) had normal BMI (18.5–25), indicating generally adequate nutritional status (**Table 3, Figure 2 a, b**). Underweight individuals—combining mild, moderate, and severe thinness—comprised 26.9% (n=42), while overweight and obese individuals (BMI >25) made up 20.5% (n=32). Thinness was more prevalent among females and those aged over 60, whereas overweight and obesity were more common among males and individuals aged 40–50. The 30–40 age group had the highest proportion of normal BMI. Statistical analysis revealed significant age-related differences in BMI distribution (χ^2=51.384, p=0.001), while gender-based variations approached significance (χ^2=10.974, p=0.051), demonstrating important demographic influences on nutritional status patterns. These findings confirm that both age and gender meaningfully impact BMI category distributions within the studied population and reflect a dual burden of malnutrition within the community.

The age-class wise BMI values among the individuals in the study population brings about specific patterns of distribution (**Figure 3**). Such as, individuals aged 30–40 are notably overrepresented in the normal BMI category, indicating a healthier weight profile in this age group. In contrast, severe thinness is significantly overrepresented among those over 60, suggesting potential age-related nutritional deficiencies or health

concerns. The 40–50 age group shows a higher-than-expected prevalence of both overweight and obesity, highlighting a critical window for weight management interventions. Meanwhile, the 18–30 age group exhibits a deficit in both thinness and overweight categories, implying a relatively balanced BMI distribution during early adulthood. These trends underscore the need for age-specific health and nutrition strategies.

3.2.2 Consumption of tobacco and alcohol

Tobacco use was reported by 39.1% (n=61) of respondents, while 25.6% (n=40) consumed alcohol (**Table 2**). The higher prevalence of tobacco use suggests greater accessibility or cultural acceptability. These patterns highlight potential public health concerns and the need for addictive substance abuse intervention.

3.2.3 Household food security

A large majority of households (82.1%; n=128) were food secure (**Table 2**). However, 17.9% (n=28) experienced food insecurity, revealing that nearly one in five families had inconsistent access to sufficient and nutritious food, pointing to ongoing socio-economic vulnerabilities.

3.3 Dietary habits

A large majority of respondents (82.1%, n=128) preferred non-vegetarian diets, with only 17.9% (n=28) identifying as vegetarian. Regarding meal frequency, 51.9% (n=81) reported consuming more than three meals per day, while 48.1% (n=75) had three or fewer meals daily (**Table 2**). This near-even distribution may indicate variability in food access, potentially reflecting economic disparities and uneven nutritional practices.

3.4 Self-reported health problems

Overall, 62.8% (n=98) of respondents reported no current health issues, while 37.2% (n=58) experienced various health problems (**Table 2**). Commonly reported ailments included musculoskeletal conditions (e.g., back and joint pain), respiratory issues (e.g., asthma, bronchitis), gastrointestinal disorders, stunted growth, liver conditions, and cardiovascular problems. These findings suggest that a significant proportion of the population may face undiagnosed or untreated health challenges, likely due to inadequate healthcare access and limited health awareness.

Table 2. Category-wise results of the responses recorded from the respondents

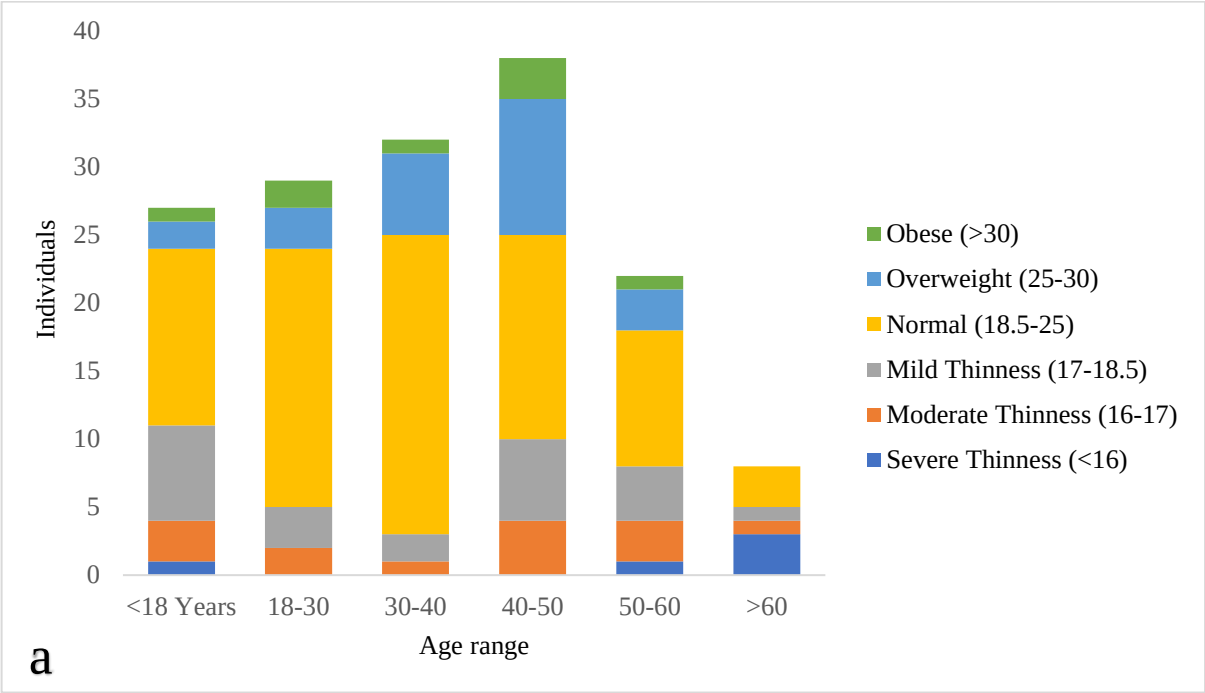
Category	Response Options	Total (n)	%age
Gender	Male	101	64.7
	Female	55	35.3
Age Group	<18 Years	27	17.3
	18-30	29	18.6
	30-40	32	20.5
	40-50	38	24.4
	50-60	22	14.1
	>60	8	5.1
Education Level	No Formal Education	62	39.7
	Upto Xth standard	54	34.6
	XIIth standard	21	13.5
	Graduate	14	9.0
	Above Graduation	5	3.2
Profession	Student	38	24.4
	Business (including farming)	17	10.9
	Service	49	31.4
	Unemployed	45	28.8
	Others*	7	4.5
If Tea Garden Worker	Permanent Garden Employee	27	17.3
	Contractual Garden Employee	21	13.5

BMI	Severe Thinness (<16)	5	3.2
	Moderate Thinness (16-17)	14	9.0
	Mild Thinness (17-18.5)	23	14.7
	Normal (18.5-25)	82	52.6
	Overweight (25-30)	24	15.4
	Obese (>30)	8	5.1
Use of Tobacco	Yes	61	39.1
	No	95	60.9
Use of Alcohol	Yes	40	25.6
	No	116	74.4
Household Food Security	Food Secure	128	82.1
	Food Insecure	28	17.9
Self-Reported Health Problems	No Problem	98	62.8
	Problem Present (Specify)	58	37.2
Food preference	Vegetarian	28	17.9
	Non vegetarian	128	82.1
Meal frequency	3 or more meals	75	48.1
	>3 meals	81	51.9

**Daily-wage workers (unorganised), forest-based livelihood, traditional healers, social workers.*

Table 3. Demographic Category-wise BMI values recorded from the respondents

		BMI categories						χ^2- value (at 5% significance level)
Demographic Categories		**Severe Thinness (<16)**	**Moderate Thinness (16-17)**	**Mild Thinness (17-18.5)**	**Normal (18.5-25)**	**Overweight (25-30)**	**Obese (>30)**	
GENDER	MALE	2	9	9	57	17	7	χ^2=10.974, p=0.051
	FEMALE	3	5	14	25	7	1	
AGE	<18 Years	1	3	7	13	2	1	
	18-30	0	2	3	19	3	2	
	30-40	0	1	2	22	6	1	χ^2=51.384, p=0.001
	40-50	0	4	6	15	10	3	
	50-60	1	3	4	10	3	1	
	>60	3	1	1	3	0	0	



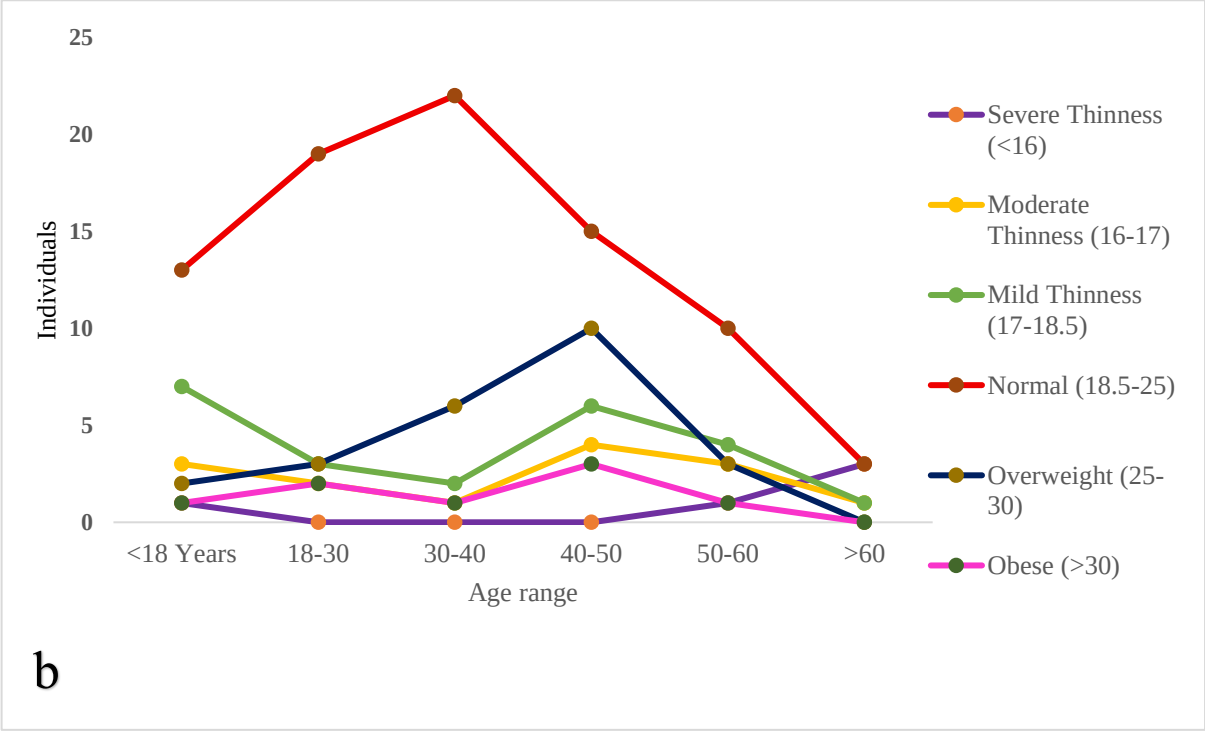


Fig. 2 (a, b). Proportional distribution of BMI across age ranges

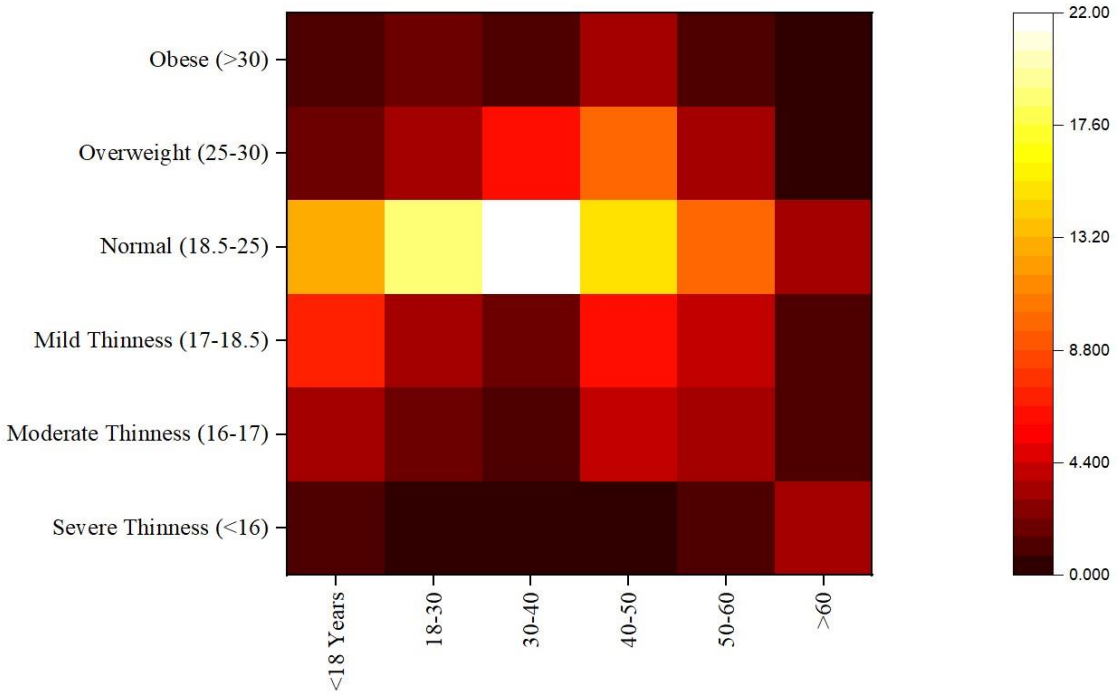


Fig. 3. Heatmap showing the distribution of individuals across age groups and BMI categories in the study population

4. DISCUSSION

This study presents a multidimensional analysis of the socio-demographic attributes, health conditions, and nutritional patterns of a tea plantation-associated population in Eastern India. The findings shed light on the interplay between socio-economic marginalization and health vulnerabilities in a labour-intensive and socio-culturally distinct community.

Demographic and socioeconomic characteristics

A notable gender disparity was observed among respondents, with males accounting for 64.7% of the sample. This skew may reflect gender-based differentials in survey participation, possibly driven by greater male representation in the public and occupational spheres of tea garden society. Similar male-dominated demographic patterns have been documented in tea garden communities across West Bengal, including by Chakraborty (2018), Roy and Chaudhuri (2023), Chakraborty et al. (2023) and Chakraborty et al. (2024).

The preponderance of participants in the 30–50 years age group highlights the prominence of economically active individuals within the community. This age cohort, being engaged in physically intensive labour, is also more susceptible to cumulative occupational health risks, as previously noted by Sternlieb & Hughes (1987) and Suwal & Dahal (2014). Educational attainment within the population was generally poor; 74.3% of respondents reported either no formal education or schooling only up to Xth standard. This low educational profile is closely linked with elevated unemployment (28.8%) and limited access to skilled occupations, echoing earlier findings by DePrince & Morris (2008). Moreover, educational deprivation may further constrain awareness regarding health, sanitation, and nutrition, thereby reinforcing intergenerational cycles of deprivation (Patel et al., 2022).

Nutritional status and lifestyle risk factors

The coexistence of undernutrition and overnutrition within the studied population represents a classic example of the “double burden” of malnutrition (Akhtar, 2016). While a majority of individuals (52.6%) reported normal BMI, a substantial proportion (26.9%) were underweighted, suggesting chronic energy deficiency potentially linked to physically demanding work, caloric insufficiency, or episodic food insecurity (Alaimo et al., 2020). In contrast, overweight and obesity (20.5%) may reflect shifts in dietary habits, reduced physical activity outside work hours, and increasing exposure to poor-quality, energy-dense foods, consistent with nutritional transition models (Saxena, 2018).

The age-wise and gender-wise distribution of abnormal BMI values, especially the higher prevalence of overweight among males aged 40–50 and underweight among elderly and female respondents, mirrors earlier observations among tribal

populations in the Dooars region (Mittal & Srivastava, 2006). However, the undernutrition levels reported here are lower than those recorded among tea garden workers in Assam, Tripura, and Alipurduar by Biswas et al. (2002), Nath et al. (2018), and Yasmin et al. (2022), respectively.

Addictive substance use, particularly tobacco (39.1%) and alcohol (25.6%) consumption, was also found to be widespread. Such high prevalence indicates cultural normalization of these habits, potentially exacerbated by occupational stress, low health awareness, and inadequate regulation (Preeti & Raut, 2012; Anand & Roy, 2016). These behaviours are well-documented risk factors for several chronic conditions, including respiratory, cardiovascular, and gastrointestinal diseases—ailments that were frequently self-reported by participants (Pednekar et al., 2012; Mishra et al., 2022). Comparable findings on addictive behaviours were previously reported among tea-garden workers in Alipurduar by Yasmin et al. (2022).

Food security and dietary practices

Although 82.1% of households reported food security, 17.9% experienced food insecurity, highlighting persistent socio-economic disparities in access to adequate nutrition. Comparable levels of food insecurity were noted by Chakrabarty et al. (2019) among the Rabha tribe in northern West Bengal. Nonetheless, food security alone may not ensure dietary sufficiency or balance, particularly in the absence of nutritional knowledge or diversity in food intake (IFAD, 2017).

The overwhelming preference for non-vegetarian diets (82.1%) and the nearly even distribution in meal frequency suggest that while food quantity may be adequate for many, the quality and nutritional balance of diets require further evaluation. Similar dietary trends have been reported in rural West Bengal by Gupta and Mishra (2014), while Sabud et al. (2020) highlighted the health risks associated with poor hygiene and dietary practices among the Lodha tribal community.

Health burden and healthcare gaps

Approximately 37.2% of participants reported ongoing health issues, including musculoskeletal disorders, respiratory ailments (e.g., asthma, bronchitis), gastrointestinal complaints, liver dysfunctions, cardiac problems, and stunted growth. These conditions are consistent with the occupational profile of the community, which involves prolonged physical labour under suboptimal conditions, compounded by limited access to preventive and curative healthcare (Hossain et al., 2019; Kairi & Dey, 2022).

The pattern of morbidity observed aligns with reports from Medhi et al. (2006) in Assam and Sarkar et al. (2024) in Darjeeling, indicating a growing burden of non-communicable diseases in tea garden populations. Notably, the predominance of chronic, lifestyle-associated ailments over infectious diseases challenges conventional assumptions about the disease burden in low-income, rural settings—echoing findings from Yasmin et al. (2022).

The convergence of occupational, nutritional, and lifestyle risks underscores the urgent need for accessible and culturally attuned healthcare services. Strengthening primary care infrastructure, implementing routine health screenings, and enhancing community-based health literacy initiatives are critical. Similar recommendations have been emphasized by previous studies in tea garden regions, including those by Sarkar et al. (2024), Medhi et al. (2006), and Kairi & Dey (2022).

This present study has a few limitations, including a relatively small sample size and a gender imbalance, with more male than female respondents, which may affect the generalizability of the findings. The cross-sectional design limits causal interpretations, and the geographic focus may not represent wider populations.

5. CONCLUSION

This study underscores the complex interplay between socio-demographic factors and health-nutrition outcomes in a tea plantation population of Eastern India. Low educational attainment, high unemployment, and a dual burden of malnutrition are characteristics of the community that are made worse by widespread use of addictive substances and restricted access to medical care. The prevalence of undernutrition, a lack of dietary diversity, and health risks associated with lifestyle choices raise doubts about nutritional adequacy even in households with a moderate level of food security. The need for age- and gender-specific interventions is highlighted by the noteworthy correlations found between BMI and both gender and age.

A multi-sectoral strategy including education, healthcare, nutrition, and employment is needed to address these interconnected issues. In addition to increasing healthcare access through mobile clinics, community health workers, and culturally sensitive programs, public health strategies should concentrate on enhancing health literacy, raising nutritional awareness, and reducing the use of addictive substances. Additionally, enhancing vocational training and educational facilities could pave the way for people to escape poverty and equip them with the information and abilities they need to lead healthier lives. To better understand causal relationships and evaluate how well targeted programs improve the nutritional status and general health of tea garden communities, future research should use intervention-based and longitudinal designs.

ETHICAL CONSIDERATIONS

Formal ethical approval for this community-based observational study was not required under local guidelines. Participation was voluntary with verbal informed consent from respondents or guardians (for minors). Anonymity and confidentiality were ensured through structured, anonymous questionnaires.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Alaimo, K., Chilton, M., & Jones, S. J. (2020). *Food insecurity, hunger, and malnutrition*. In *Present knowledge in nutrition* (pp. 311–326). Academic Press.

Akhtar, S. (2016). Malnutrition in South Asia—A critical reappraisal. *Critical Reviews in Food Science and Nutrition, 56*(14), 2320–2330. https://doi.org/10.1080/10408398.2013.832143

Anand, A., & Roy, N. (2016). Prevalence and determinants of co-use of alcohol and tobacco among men in working age group (18–59 years) in India. *Epidemiology, Biostatistics and Public Health, 13*(1). https://doi.org/10.2427/11642

Biadgilign, S., Ayenew, H. Y., Shumetie, A., Chitekwe, S., Tolla, A., Haile, D. & Gebre, B. (2019). Good governance, public health expenditures, urbanization and child undernutrition nexus in Ethiopia: An ecological analysis. *BMC Health Services Research, 19*(1), 1–10. https://doi.org/10.1186/s12913-018-3822-2

Biswas, D., Hazarika, N. C., Hazarika, D., Doloi, P., & Mahanta, J. (2002). Study on nutritional status of tea garden workers of Assam with special emphasis to body mass index (BMI) and central obesity. *Journal of Human Ecology, 13*(4), 299–302.

Chakrabarty, S. (2019). Socio-economic inequalities and food security among the Rabha tribe living in fringe forest areas of North Bengal. In *Development and deprivation in the Indian sub-continent* (pp. 369–385). Routledge.

Chakraborty, S. (2015). Human-animal conflicts in northern West Bengal: Losses on both sides. *International Journal of Pure & Applied Bioscience, 3*, 35–44.

Chakraborty, S. (2018). Perception and attitude of local people towards human-elephant conflicts around Mahananda Wildlife Sanctuary, West Bengal, India. *International Journal of Zoology Studies, 3*(2), 93–95.

Chakraborty, S., Banerjee, S., Chatterjee, A., & Mallick, P. H. (2024). People's perceptions and attitudes towards human-elephant conflicts and mitigation practices in the western part of southern West Bengal, India. *GeoJournal, 89*(4), 175. https://doi.org/10.1007/s10708-024-11179-3

Chakraborty, S., Mallick, P. H., & Kundu, S. (2023). Participatory rural appraisal for assessing freshwater wetland status and fishery potential in West Midnapore, West Bengal, India. *Proceedings of the Zoological Society, 76*(2), 134–145. https://doi.org/10.1007/s12595-023-00477-2

DePrince, A. E., & Morris, P. D. (2008). The effects of education on the natural rate of unemployment. *Business Economics, 43*, 45–54. https://doi.org/10.2145/20080205

Dutraj, S., & Chhetri, D. (2023). Food security problems and issues in tea garden of Dooars: A case study of Kathalguri Tea Garden. *Athena*, 97–104.

Hossain, M. K., Ferdushi, K. F., & Khan, H. T. (2019). Self-assessed health status among ethnic elderly of tea garden workers in Bangladesh. *Ageing International, 44*(4), 385–398. https://doi.org/10.1007/s12126-019-09354-w

IFAD. (2017). *The state of food security and nutrition in the world 2017*. FAO.

Kairi, T. K., & Dey, S. (2022). Prevalence of work-related musculoskeletal symptoms among tea garden workers in Bangladesh: A cross-sectional study. *BMJ Open, 12*(5), e061305. https://doi.org/10.1136/bmjopen-2022-061305

Khurana, A., Taksande, A., Meshram, R. J., & Khurana Jr, A. (2024). Beyond boundaries: A comprehensive review of anthropometric indices in urban and rural India. *Cureus, 16*(2). https://doi.org/10.7759/cureus.538994

Medhi, G. K., Hazarika, N. C., Shah, B., & Mahanta, J. (2006). Study of health problems and nutritional status of tea garden population of Assam. *Indian Journal of Medical Sciences, 60*(12), 496–505.

Mishra, V. K., Srivastava, S., Muhammad, T., & Murthy, P. V. (2022). Relationship between tobacco use, alcohol consumption and non-communicable diseases among women in India: Evidence from National Family Health Survey-2015-16. *BMC Public Health, 22*, 713. https://doi.org/10.1186/s12889-022-13191-z

Mittal, P. C., & Srivastava, S. (2006). Diet, nutritional status and food related traditions of Oraon tribes of New Mal (West Bengal), India. *Rural and Remote Health, 6*(2), 1–11.

Nath, S. K., Dutta, A. M., Datta, S., Chattopadhyay, S., & Das, A. S. (2018). Nutritional and health status of the tea garden workers of West Tripura District, Tripura, India. *International Journal of Research and Analytical Reviews, 5*(4), 700–706.

Patel, K., Palo, S. K., Kanungo, S., Mishra, B. K., & Pati, S. (2022). Health literacy on hygiene and sanitation, nutrition, and diseases among rural secondary school children – Findings from a qualitative study in Odisha, India. *Journal of Family Medicine and Primary Care, 11*(9), 5430–5436. https://doi.org/10.4103/jfmpc.jfmpc_2166_21

Paul, S., & Rohatgi, S. (2014). Socio-economic status and health behavior of tea plantation workers of Dooars region, West Bengal. *Geographical Thoughts, 12*.

Pednekar, M. S., Sansone, G., & Gupta, P. C. (2012). Association of alcohol, alcohol and tobacco with mortality: Findings from a prospective cohort study in Mumbai (Bombay), India. *Alcohol, 46*(2), 139–146. https://doi.org/10.1016/j.alcohol.2011.08.006

Placzek, O. (2021). Socio-economic and demographic aspects of food security and nutrition. *OECD Food, Agriculture and Fisheries Papers, 150*. OECD Publishing. https://doi.org/10.1787/49d7059f-en

Preeti, S., & Raut, D. K. (2012). Prevalence and pattern of tobacco consumption in India. *International Research Journal of Social Sciences, 1*(4), 36–43.

Roy, S., & Chaudhuri, S. (2023). Present status of workers in Kalchini Tea Garden: Socio-economic perspective. *BKGC Scholars, 4*(1).

Sabud, P., Ghosh, T., Dhar, A., Dutta, S., Bisai, S., & Choudhury, S. M. (2020). Malnutrition based on mid-upper arm circumference and dietary consumption pattern of Lodha tribal children of West Bengal, India. *International Journal of Research in Medical Sciences, 8*(12), 4329–4333. https://doi.org/10.18203/2320-6012.ijrms20204948

Sarkar, B. C. (2017a). Living conditions of tribal people as tea garden workers in Dooars of Jalpaiguri District. Final Report of UGC Minor Research Project.

Sarkar, B. C. (2017b). Socio-economic status of tribal people in Mal Subdivision of Jalpaiguri District, West Bengal: A geographical analysis (Doctoral dissertation, University of North Bengal).

Sarkar, R., Dasgupta, P., & Bhattacherjee, S. (2024). Morbidity pattern of tea garden residents of Darjeeling, India. *MRIMS Journal of Health Sciences, 12*(3), 215–218.

Saxena, N. C. (2018). Hunger, under-nutrition and food security in India. In *India's development experience* (pp. 55–92). Springer Singapore. https://doi.org/10.1007/978-981-13-0677-8_4

Sternlieb, G., & Hughes, J. W. (1987). The demographic long wave: Population trends and economic growth. *Economic Development Quarterly, 1*(4), 307–322. https://doi.org/10.1177/089124248700100401

Suwal, R., & Dahal, M. P. (2014). Economically active population: Dimensions and dynamics. *Population Monograph of Nepal, 3*, 1–40.

Thresia, C. U. (2018). Health inequalities in South Asia at the launch of sustainable development goals: Exclusions in health in Kerala, India need political interventions. *International Journal of Health Services, 48*(1), 57–80. https://doi.org/10.1177/0020731417738222

Yasmin, S., Sau, M., Patra, M., Sinha, N., & Baur, B. (2022). Poverty, undernutrition and morbidity: The untold story of tea-garden workers of Alipurduar district, West Bengal. *Journal of Family Medicine and Primary Care, 11*(6), 2526–2531. https://doi.org/10.4103/jfmpc.jfmpc_1322_21