

Malnutrition and Cognitive Impairment Assessment of Elderly Tribal People of Bankura District, West Bengal by using MNA and MMSE Questionnaire

Joydeb Saha¹, Sk. Nazibar Rahaman², Saheli Ghosal³, Subhash Kanti Roy⁴ and Jagannath Ghosh^{5*}

¹Researcher, Swami Vivekananda University, Telenipara, Barasat - Barrackpore Road, Barakanthalia, Kolkata (West Bengal) - 700121

²Department of Nutrition, M.U.C. Women's College, Burdwan-713104, India

³Guest faculty, College of Paramedical and Allied Health Sciences, WBUHS

⁴Oriental Institute of Science & Technology (Affiliated to Vidyasagar University), Dewandighi, Katwa Road, Burdwan-02

^{5*}Assistant Professor, Department of Food and Nutrition, Swami Vivekananda University, Barrackpore, W.B., India.

DOI: <https://doi.org/10.63001/tbs.2024.v19.i03.pp114-119>

KEYWORDS

Malnutrition,
Cognitive
impairment,
Tribal elderly,
MNA
Questionnaire,
MMSE
Questionnaire.

Received on:

20-08-2024

Accepted on:

16-12-2024

ABSTRACT

Background: Mental problems and malnutrition are more common as people age. Both cognitive status and malnutrition are significantly influenced by sociodemographic factors. Because they lack many opportunities, tribal elders are the most vulnerable group in any type of healthcare facility.

Method: A cross-sectional community study has been carried out in Bankura District, West Bengal. A total of 400 elderly tribal individuals were identified from four blocks using the stratified random sample procedure. The nutritional state and cognitive function of the elderly were measured using the Mini Nutritional Assessment (MNA) tool and the Mini Mental State Examination method (MMSE). Data has been uploaded into Microsoft Excel 2010 and analysed with SPSS version 20.

Results: The results of MNA revealed that 26% and 49% of the elderly subjects were malnourished and at risk malnourished respectively. Sociodemographic factors like age related degeneration, low income, low education, nuclear family and socio-economic class are significantly responsible for malnutrition. It is also found that large malnourished are severe cognitive impairment.

Conclusions: Malnutrition and cognitive impairment occurred frequently among the elderly tribal people in the study area. Malnutrition must be identified without delay and cognitive function tests need to be performed to maintain nutritional status to avert dementia.

INTRODUCTION

The population is aging as a result of decreased fertility and rising life expectancy, which is one of the most notable turns in the demographic structure of the twenty-first century. Every society experiences the unavoidable demographic transition of population aging and India is not any different. The elderly population, or those 60 years of age and over, is growing quickly in India as a result of gradually declining fertility and death rates, followed by rising life expectancy and improved health (Jahangir and Mahata 2019). Population aging was once believed to be a phenomenon exclusive to economically developed societies, but it is now also seen in middle-class and low-income nations. Remarkably, compared to high-income nations, the rate of population aging is higher in middle-class and lower-class societies. While the World Health Organization (WHO) considers population aging as a sign of privilege and a more developed society, there is also a clear correlation between aging and an elevated risk of disability (Jahangir and Mahata 2019).

Tribes are endogamous groups that have distinct physical, socioeconomic and social characteristics from the general population. They live in regions of dense woodland that are steep. When compared to the rural population, these tribes have greater rates of undernutrition, newborn and maternal mortality and socioeconomic backwardness, making them more susceptible to

health and nutritional issues (Arlappa *et al.*, 2005). Identification of those who are nutritionally vulnerable is greatly aided by nutritional assessment (Beverley 1999)(Anthony 2000). The National Institute of Nutrition reports on the nutritional status of elders living in rural areas across the nation, but there is very little systematic data available about the dietary habits and nutritional state of the elderly living in the country's tribal communities (Arlappa *et al.*, 2003).

The most popular tool for quickly evaluating the cognitive status of senior citizens in clinical and research contexts is the Mini-Mental State Examination (MMSE), which was created by Folstein *et al.* in 1975. The exam typically takes less than ten to fifteen minutes to complete and is thought to cover a wide range of cognitive function topics. The criteria of dementia in the current DSMIII-R,3 states that there must be observable evidence of deterioration in both short- and long-term memory, which highlights the necessity of brief mental assessments of cognitive function. There are 20 distinct elements on the MMSE and the total possible score is 30. The test consists of 16 binary (0/1) scored queries regarding reading, writing, copying, naming, repeating and time and place orientation. An ordinal scale ranging from 0 to 5 or 0 to 3 is used to score four more elements. Instantaneous recall, short-term memory, reverse spelling (or backward subtraction) and executing a three-stage instruction are among them. We speculate that some questions in a test with up to 20

items may not be as effective as others at detecting people with cognitive impairment. Furthermore, it would be easier to administer and less taxing for the respondent if the test's strong qualities in terms of sensitivity and specificity were preserved but the amount of items and scoring were simplified (Braekhus *et al.*, 1992; Bravo and Hébert 1997).

Recently, the Mini Nutritional Assessment (MNA) was developed and approved to provide a quick and easy way to evaluate an elderly person's nutritional status. The MNA's objective is to assess malnutrition risk in order to provide early nutritional intervention when necessary. Primary care doctors can quickly screen for patients who might later require a more thorough nutritional evaluation with the help of the MNA. The MNA is utilized in numerous medical facilities worldwide and has been translated into other languages (Vellas *et al.*, 1999).

Therefore, in order to help governmental and non-governmental organizations create policies, strategies and programs for the well-being of the elderly population, a database on the diet and nutritional status of the tribal elderly from various parts of the nation needs to be developed. This study uses the most recent data that was gathered by the National Nutrition Monitoring Bureau (NNMB) in nine States/Provinces of the nation during 1998 and 1999 in an effort to evaluate the food and nutritional health of the senior tribal population (Arlappa *et al.*, 2005). An important factor in the aging process is nutrition. A healthier life is largely dependent on good nutrition and the nutrition that is consumed during one's early years has an impact on one's later years (Lekha *et al.*, 2023). A theoretical model that includes four domains food and nutrition, physical performance and capability, health and somatic disorders and malnutrition among older adults that affects cognitive, emotional and sensation functions was recently proposed as a means of evaluating the bidirectional relationship between nutritional status and functional status. Studies has also indicated that there is a possible link between morbidity and mortality risk and undernutrition and obesity or overweight. In addition to changing their dietary habits and preferences, older persons also frequently experience changes in their physical, emotional and psychological well-being (Lekha *et al.*, 2023).

In accordance with a study, people's average Body Mass Index (BMI) decreases with age (Singh and Chattopadhyay 2023). It's remarkable how nutritional elements, along with lifestyle choices like eating a good diet, exercising and abstaining from harmful behaviours like smoking, may slow down the aging process (Lekha *et al.*, 2023). Prior study has shown an association between food insecurity and malnutrition; therefore, a clear knowledge of nutritional status depends on food security (Abdu *et al.*, 2020). For elderly people, food insecurity poses a significant risk factor and increases their susceptibility to persistent ailments (Bhattacharya *et al.*, 2019). A study found a link between food insecurity and inadequate nutrition, including overweight and malnutrition, indicating that food security has an impact on nutritional status. Another study discovered no association between food insecurity and BMI categories, but a significant correlation between food insecurity and weight and nutritional risk (Ganhão-Arranhado *et al.*, 2018).

Furthermore, it was shown that nutrition, which is typically disregarded was a direct indicator of financial status and its impact on wellbeing (Rahman *et al.*, 2021). The literature makes clear that a range of socioeconomic and demographic characteristics, such as age, gender, marital status, the number of those living in the family, financial resources and socioeconomic position, influence nutritional status (Fernandes *et al.*, 2018). Additionally, nutritional status is strongly impacted by mental health and educational attainment (Shuremu *et al.*, 2023). Studies found a strong correlation between the likelihood of dietary issues and health-risk behaviours including drinking alcohol and smoking. Among Indian adults, there is a notable gender disparity in weight, with females being more likely than males to be overweight or underweight as a result of behaviours associated to health risks (Lekha *et al.*, 2023). It is vital to comprehend the role that nutrition plays in aging. This is especially important given the anticipated rapid aging of the global population as well as in

Result

Table 1: Physical measures and nutritional anthropometric indicators of the elderly tribal male and female

Parameters	Elderly tribal (n=400)
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developing nations like India in the near future (Kushwaha *et al.*, 2020). Understanding the factors that influence the nutritional status of elderly people in India is crucial since sociocultural, economic and health-related issues can all have a substantial impact on nutritional status. In this regard, the current study attempts to comprehend the factors that influence elderly individuals' nutritional status in India. We have taken into account a variety of elements in this study, such as socioeconomic and demographic demographics, health-related variables, food security and health behaviour determinants (Lekha *et al.*, 2023). These outcomes exhibit the necessity for exploring the nutritional status and cognitive impairment of elderly people in rural parts of a state like West Bengal, where the tribal elderly age group is significantly prominent. The focus of this study is to assess the cognitive impairment and nutritional state of the tribal elderly people in a rural area of Bankura district, West Bengal.

Methodology:

Study Site:

The study has conducted in four blocks named Hirbandh, Khatra, Ranibandh and Raipur of Bankura district in West Bengal. The Bankura district is located between latitudes 22° 38' and 23° 38' north and longitudes 86° 36' and 87° 46' east. 6,882 square kilometres make up its whole area (2,657 sq mi). Bardhaman, Hooghly, Paschim Medinipur and Purulia districts around Bankura district. This cross-sectional study consisted of 236 female and 164 male elderly tribal over 60 years old from the Bankura district of West Bengal.

Data collection parameters:

1. Socio demographic profile: Field surveys, in-person interactions with people through structured interviews and observational data were the primary sources of information regarding the socioeconomic background and demographic characteristics of elderly tribal people. The socioeconomic and demographic factors that were incorporated into the interview schedule were developed using Kuppaswami scales.
2. The ABCD approach, involving height, weight, BMI (body mass index), MUAC, waist circumference, hip circumference, waist hip ratio, blood pressure and pulse pressure, was used to evaluate nutritional status (Ghosh and Agrawal 2021).
3. Mini Nutritional Assessment (MNA) tool: The risk of malnutrition in the elderly population was evaluated using the MNA method. The four components of MNA include anthropometric parameters, nutritional assessment, subjective evaluation of one's own impression of nutrition and health and general examination of mobility, medication and lifestyle. There was a value-matched response to each inquiry. The boxes with the pertinent answers were marked for each question. Each question's points were added together to determine the final screening score. The subjects' nutritional status was categorized by the MNA tool as followed: malnutrition (MNA score: <17), "at risk" of malnutrition (MNA score: 17-23.5) and appropriate nutritional status (MNA score: >23.5).
4. Mini Mental State Examination: Cognitive impairment or dementia was evaluated by MMSE method and four stage of cognitive impairment are recorded like normal (score 30-26), early (score 25-20), middle ((score 19-10) and late (score 9-0)(Tombaugh and McIntyre 1992).

Statistical analysis

Frequencies and percentages were used to explain categorical variables, whereas mean and standard deviation were used to examine continuous variables. The student's t-test and the chi-square test were used to calculate differences for continuous and categorical data, respectively. With the aid of the IBM SPSS version 20, all analyses were completed. Furthermore, crude odd ratios (COR) and adjusted odd ratios (AOR) with 95% confidence intervals (95% CI) were applied for conveying what was found of logistic regression examinations.

	Male (n=164)	Female (n=236)	t value	p value
Age (years)	66.82±4.45	66.58±4.92	0.51	0.305
Height (cm)	152.90±7.22	145.36±5.77	11.58	<.0001**
Weight (kg)	43.69±7.60	40.31±7.68	2.68	0.003***
BMI (kg/m ²)	18.68±2.95	19.03±3.30	-1.1	0.135
MUAC (cm)	20.77±3.02	20.99±2.69	-0.76	0.223
Waist (cm)	76.07±7.56	75.61±8.04	0.57	0.284
Hip (cm)	80.04±6.54	80.52±8.38	-0.61	0.271
WHR	0.94±0.04	0.94±0.06	+1.44	0.075
Systolic pressure (mmHg)	129.40±22.91	134.93±23.80	-2.32	0.010*
Diastolic pressure (mmHg)	78.03±10.45	79.21±13.72	-0.93	0.176
Pulse Rate	80.95±8.71	85.73±10.05	-4.94	<.0001***

*p<0.05, **p<0.01, ***p<0.001

Table 1 depicts important nutritional anthropometric factors and physical measures for elderly tribal participants, both male and female. The average age of elderly tribe men and women are 66.82±4.45 and 66.58±4.92 years, accordingly. Male elderly tribal participants were substantially taller and heavyweight (152.90±7.22 cm and 43.69±7.60 kg) than female elderly tribal

participants (145.36±5.77 cm and 40.31±7.68 kg). Elderly tribal female individuals had a substantially higher systolic pressure (134.93±23.80 mmHg) than elderly tribal male participants (129.40±22.91 mmHg). In the current study, the pulse rates of female subjects (85.73±10.05) are significantly higher than those of male respondents (80.95±8.71).

Table 2: Nutritional status evaluation by Mini Nutritional Assessment (MNA) Questionnaire of elderly tribal male and female

Grades of MNA	Male (%) N=164	Female (%) N=236	χ ²	p
Malnourished	56 (34)	48 (20.33)	4.1	0.04
At risk of malnutrition	72 (43.9)	124 (52.54)	1.18	0.27
Well-nourished	36 (21.96)	64 (27.11)	0.47	0.49

*p<0.05, **p<0.01, ***p<0.001

Table 2 exhibits the findings of the Mini Nutritional Assessment (MNA) of the nutritional status in elderly tribal participants. Male subjects (34%) are exceptionally malnourished than female the respondents (20.33%), with 26% of elderly tribal people reported to be malnourished. The current study also reveals that 49% of elderly tribal participants are at risk of malnutrition. Male

individuals (43.9%) are less likely to be impacted from malnutrition than female subjects (52.54%). Just 25% of the elderly tribal participants in this study are well-nourished. The present investigation additionally indicates that there are notable differences between the groups of people who are malnourished, at risk of malnutrition and well-nourished.

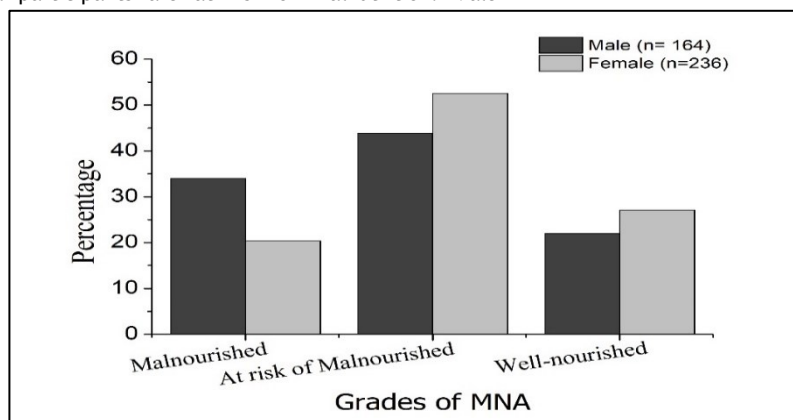


Figure 1: Different grade of Mini nutritional categories of elderly tribal people in percentage

Figure 1 exhibit the percentage of different grade nutritional status like malnourished, at risk of malnourished and well-nourished in elderly tribal people. Our figure shows that most of

the elderly tribals are at risk of malnourished. Male is more malnourished while female is more at risk of malnourished

Table 3: Cognitive status assessment by Mini Mental State of Examination (MMSE) of elderly tribal people

Stage of Mini-Mental State Examination	Male (%) N=164	Female (%) N=236	Total (%) N=400
Normal	0 (0)	4(1.69)	4(1)
Early	44(26.82)	72(30.50)	116(29)
Middle	100(60.98)	132(55.93)	232(58)
Late	20(12.19)	28(11.84)	48(12)

Table 3 presents different stage of cognitive impairment among elderly tribal people. It is noted that total 1% female are normal stage of cognitive but no male is normal cognitive level in the present study. Total 29% of tribal elderly people are early stage of cognitive impairment whereas 30.50% are female and 26.82% are

male respondents. Middle stage of cognitive impairment of elderly tribal subjects are 58% and among them 60.98% are male and 55.93% are female. Male (12.19%) are more late cognitive impairment compared to female (11.84%).

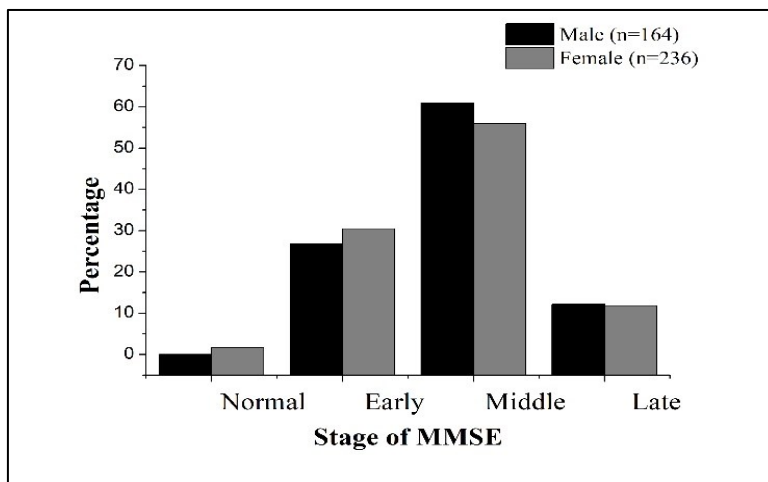


Figure: 2 Different stages of Mini-mental State Examination of elderly tribal people in percentage.

Figure 2 presents different stages of Mini mental State Examination like normal, early, middle and late of elderly tribal people in percentage. It shows that middle cognitive impairment

is more compered to early and late or severe cognitive impairment. Male are more affected by cognitive impairment than female elderly tribal people.

Table 4: Sociodemographic factors associated with malnutrition among elderly tribal subjects (n=400)

Parameters		N (%)	Malnutrition f (%)	COR (95 th CI)	p value	AOR (95 th CI)	p value
Age (years)	60-70	325 (81.25)	55 (16.92)	1			
	>70	75 (18.75)	49 (65.33)	9.252(5.301-16.148)	0.000**	4.892(2.171-11.020)	0.000**
Gender	Male	164(41)	56 (34.14)	1			
	Female	236(59)	48 (20.33)	0.492(0.313-0.774)	0.000**	0.182(0.085-0.389)	0.000**
Family	Nuclear	68 (17)	11 (16.17)	1			
	Joint	262 (65.5)	62 (23.66)	1.614(0.797-3.269)	0.183	1.874(0.746-4.709)	0.181
	Extended	70 (17.5)	31(44.28)	4.016(1.808-8.918)	0.001**	2.703(0.928-7.878)	0.068
Education	Illiterate	330 (82.5)	96 (29.09)	1			
	1-5 years	70 (17.5)	8 (11.42)	0.315(0.145-0.682)	0.003	0.165(0.035-0.785)	0.023
Monthly income	>5000	328 (82)	81 (24.69)	1			
	5000-10000	67(16)	22(32.84)	1.491(0.845-2.632)	0.168	81.160 (3.541-1860.227)	0.006**
	<10000	5 (1.25)	1 (20)	0.762(0.084-6.919)	0.809	-	-
Socioeconomic class	Upper Lower Class	166 (41.5)	11 (6.62)	0.108(0.055-0.209)	0.000**	0.061(0.015-0.252)	0.000**
	Lower Class	234(58.5)	93 (39.74)	1			
Stage of MMSE	Normal	4 (1)	0	-	-	-	-
	Early	116 (29)	0	-	-	-	-
	Middle	232 (58)	64 (27.58)	1			

	Late	48 (12)	40 (83.33)	13.125(5.828-29.559)	0.000**	23.600(8.104-68.721)	0.000**
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COR=Crude Odds Ratios, AOR= Adjusted Odd Ratios, CI=Confidence interval, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 depicts bivariate and multivariate logistic regression analyses to study the association between different sociodemographic factors associated with malnutrition among elderly study population. Participants who are over 70 years of chronological age are more likely to be malnourished (AOR=4.892; 95th CI: 2.171-11.020) than those between 60 and 70 years of age. In respect to gender status, the possibility of malnutrition is less prevalent for female individuals (AOR=0.182, 95th CI: 0.085-0.389). In the present study, elderly tribal of Joint and extended families are more (AOR= 1.874 95th CI: 0.746-4.709 and AOR= 2.703 95th CI: 0.928-7.878) prone to be malnourished compared to nuclear families. When education level is compared to malnourished. It is noted that educated elderly participants are less (AOR= 0.165 95th CI: 0.035-0.785) likely to be malnourished. Malnutrition of elderly tribal people are more in low-income families of elderly tribal people. When we are analysed of malnourished based on socio-economic class, we find out that upper lower class are less (AOR= 0.061 95th CI: 0.015-0.252) prone to be malnourished. We are also studied the association between mental impairment and malnourished of elderly tribal people, it is found out that late categories or severe mental impairment of elderly tribal are more (AOR= 23.600 95th CI: 8.104-68.721) affected by malnutrition.

DISCUSSION

Tribal people in India remains vulnerable despite significant developments in the field of healthcare. Because of their sociocultural concepts, tribal groups are not only different from other members of the community, but they are also subjected to improper lifestyles (Sinha *et al.*, 2023). Additionally, illiteracy, age-related sickness, physical and economic dependency and financial insecurity make Indian elderly people especially older women extremely susceptible (Bir 2008). A large percentage of tribal elders had various medical conditions, including leg discomfort (84.5%), vision problems (78.5%), headaches (72%), anorexia (62%) and insomnia (60.5%), according to Zanvar and Revanwar (2020), who also found that rural and urban elderly individuals had similar issues (Zanvar and Revanwar 2020).

In the present study BMI is low (Male $> \text{BMI} = 18.68 \pm 2.95$ and Female $> \text{BMI} = 19.03 \pm 3.30$) of the study participants. Arlappa *et al.*, 2005 also reported that prevalence of Chronic Energy Deficiency (CED = $\text{BMI} < 18.5$) of elderly tribal people was 65.4% in female and 61.8% in male. It is described that elderly tribal people are having low BMI (Arlappa *et al.*, 2005). Nutritional assessment in elderly population is essential to prevent nutrition-related chronic morbidity and mortality. Previous studies conducted in plain regions of India have documented varied prevalence of malnutrition from 8% to 53.7% (Gupta *et al.*, 2022). Prevalence of malnutrition and risk of malnutrition in elderly tribal people in the present study are 26% and 49%. Almost same result accounting 37% of malnutrition and 49% of risk of malnutrition was recorded by Chataut *et al.*, 2021 (Chataut *et al.*, 2021).

Mental impairment is common phenomenon of elderly people. MMSE is among the most widely used of general mental status tests (Ragubathy and Adikane 2019). In the present study elderly tribal also affected by this disorder. Previous elderly tribal reveals a substantial incidence of undetected diabetes, hypertension, depression as well and CAD (coronary artery disease) in the community, all of which are associated with increased risk for dementia. Unfortunately, these conditions are often inadequately undergoing treatment (Ragubathy and Adikane 2019). Our study points to elderly male tribal individuals have a greater incidence of cognitive impairment. In India, the average incidence of dementia in the people who are 60 and over is 7.4% (Lee *et al.*, 2023).

We found that the prevalence of malnutrition was significantly higher with advancing age, possibly due to degenerative physiological changes related to aging. Previous study has also found that the elderly are at a higher risk of malnutrition (Amarya *et al.*, 2015). In study of Donini *et al.* (2013), Malnutrition was

indeed more prevalent in women (26%) in comparison to men (16.3%) and the risk of malnutrition was 40.9% in women and 35% in men (Donini *et al.*, 2013). Khoddam *et al.*, 2019 was also observed that females was more malnourished compared to males (Khoddam *et al.*, 2019). However, our study shows that male is more malnourished. One of its most significant indicators of the risk of malnutrition in elderly people is loneliness, social isolation and neglected by their son and daughter (Ramic *et al.*, 2011). Present study also reports that malnourished elderly people are more in nuclear family. Education helps everyone in their holistic development (Rahaman *et al.*, 2021). Previous studies reported higher educated elderly people had a lower incidence of malnutrition and a decreased risk of developing it (Hoogendijk *et al.*, 2018). Education, several times believed to be a proxy for socioeconomic status, strongly correlates with several health outcomes. The study found that those who were illiterate had a substantially higher prevalence of malnutrition than those who had received formal education (Baker *et al.*, 2011). We also found that illiterate elderly participants are more prone to malnutrition. It has been shown that low socioeconomic status and financial dependence influence dietary preferences and total food spending. Other studies have found that elderly people who are reliant and economically insecure are most likely to suffer from malnutrition, which is consistent with our findings (Agarwalla *et al.*, 2015; Saikia and Mahanta 2013). Malnutrition has been defined as "a acute or chronic state of nutrition, in which a combination of inflammatory activity and varying degrees of under- or overnutrition lead to in altered body composition and impaired activity." Dementia alters eating behaviours, hunger and thirst cues, swallow function, ability to self-feed and recognition and interest in food. There is a high prevalence and risk of malnutrition in those with dementia living in long-term care facilities (Perry *et al.*, 2023). A large percentage of malnourished elderly individuals suffer from cognitive impairment in our study. Health care and social support for the elderly have become scarce in India due to their lack of knowledge concerning their lives under transforming economic and social standards (Dey 2006).

CONCLUSION

The present study concludes that a number of sociodemographic factors, including low income, age-related alteration of the body and its activities, low living standards and poor access to food, are responsible for the high rate of malnutrition among elderly tribal people. Block-level healthcare facilities and specific nutrition intervention programs may be established to evaluate elderly people's cognitive capacity and detect malnutrition early.

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