

Research Paper

Comparative Analysis of Functional Ability among Older Women Living in Two Old Age Homes of Northeast India: A Cross-Sectional Study

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ABSTRACT

Objective: The functional ability of older women residing in two old age homes in Northeast India was compared through measurements of physical functioning, cognitive status, and mental well-being using standardized performance-based assessments. **Design:** A cross-sectional comparative observational study was conducted. **Methods:** Seventy-eight older women residents from two institutions were assessed: 46 from Apnagar Old Age Home, Agartala (Tripura) and 32 from Ima Leimarel Women Welfare Association, Imphal (Manipur). Functional capacity was measured using the Short Physical Performance Battery (SPPB), grip strength was assessed with Camry EH101 Dynamometer, cognition was evaluated through Mini-Cog™, and psychological well-being was determined using the WHO-5 Well-being Index. Data normality was determined through Shapiro-Wilk tests and appropriate parametric (independent t-tests) or non-parametric (Mann-Whitney U) statistical analyses. Demographic characteristics, social support patterns, and institutional activity participation were examined. **Results:** Despite improved sociodemographic status being observed in Imphal residents, including higher literacy rates (15.21% vs 9.52%), greater voluntary admissions (76.08% vs 64.29%), and increased family visitation (56.51% vs 42.86%), superior functional outcomes were demonstrated by Agartala residents across all measures. Significantly better performance was exhibited by Agartala participants compared to Imphal counterparts in physical function (SPPB: 8.217 ± 0.917 vs. 7.625 ± 1.032 , $p=0.006$, Cohen's $d=0.611$), cognitive function (Mini-Cog™: 3.239 ± 0.874 vs. 2.875 ± 0.937 , $p=0.037$, Cohen's $d=0.400$), psychological well-being (WHO-5: 67.91 ± 10.98 vs. 61.43 ± 11.76 , $p=0.013$, Cohen's $d=0.567$), and handgrip strength (13.998 ± 1.891 vs. 12.765 ± 1.947 kg, $p=0.004$, Cohen's $d=0.640$). Significant positive correlations were identified between structured activity participation and functional outcomes ($r=0.412-0.526$, $p<0.01$). **Conclusion:** The findings demonstrated that highly structured and challenging activities predicted better maintenance of functional capacities than passive social support, emphasizing the critical importance of comprehensive physical, mental, and psychological stimulation programs in institutional care settings for preserving independence and overall well-being among older women.

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Progressive decline in physical, mental, and psychosocial functioning has been linked to age, with significant implications for quality of life among older individuals^[1] (Handing et al., 2023). Age has diminished mobility, balance, and muscle maintenance, with increased risk for falls and activities of daily living loss (Ahmadi et al., 2025). At the same time, executive functions such as memory, speed of processing, and executive function have been found to show patterns of impairment that impact information processing, multitasking, and decision-making ability (Gonzales et al., 2022; Fadalla et al., 2024). Psychologically, ageing has been associated with heightened anxiety, depression, and loneliness, impacting emotional state and self-concept (Gaviano et al., 2024).

The international demographic transition to an ageing population poses humongous challenges to health systems and social protection structures (Grinin et al., 2023). It is projected that by 2030, individuals over 60 years will constitute 16.67% of the entire world population. India has been estimated to have 13.1% of its population ageing as of 2031 (Mishra, 2023). This demographic change has been recognized as important in India's conventional support system, the Northeast, where socioeconomic changes have been remodelling conventional support structures.

In the past, India's conventional joint family structure effectively looked after and supported older people (Menezes & Thomas, 2018). However, urbanization, migration, and economic change have been observed to destabilize such arrangements, leaving older individuals—especially women—exposed to limited family care availability (Dhillon et al., 2016). It is on this basis that more older people have been driven into institutional care as a result of economic insecurity, abandonment, social isolation, and widowhood (Aisyah & Saputra, 2024).

Whereas institutionalization has been determined to meet basic needs, physically weak, mentally incapacitated, and psychologically disturbed older persons have been found to be most in need of institutionalization (Khezrian et al., 2017). These conditions have subsequently been preceded by progressive disability and dependency on activities of daily living.

Older people living in old age homes are most vulnerable to physical, mental, and psychological deterioration due to physical inactivity, social isolation, and the psychological effects of family disconnection (Liu et al., 2022). Of these residents, females are more susceptible to functional impairment using health problems because of hormonal imbalance after menopause, such as more susceptibility towards osteoporosis, cardiovascular disease, depression, and anxiety (British Menopause Society, 2023; Meeta et al., 2020).

Regular evaluation of physical, mental, and cognitive function has been highlighted as important in tracking decline in overall functional capacity and in targeted intervention to promote the health and independence of the elderly (De Fátima Ribeiro Silva et al., 2021). Few comparative studies of the ageing population's functional ability across various institutions have been made, especially in Northeast India.

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Objectives

1. The functional ability of older female residents in two long-term care facilities was ascertained and contrasted based on physical, cognitive, and psychological functioning criteria.
2. Hand grip strength, cognition, and psychological well-being were assessed with standardized tools such as the Short Physical Performance Battery (SPPB) (Guralnik et al., 1995), Mini-Cog™, and WHO-5 Well-Being Index (Heun et al., 2001).
3. Literacy level, voluntary admissions, and family visits were assessed socio-demographically to determine their impact on the well-being of the residents.
4. The impact of institutional activities on physical, cognitive, and psychological health outcomes was confirmed, and correlations between structured activity participation and improved functioning were determined.

METHODS

Study Design and Setting

A cross-sectional observational comparative study was conducted in two old-age homes in Northeast India: Apnagar Old Age Home in Agartala, Tripura, and Ima Leimarel Women Welfare Association in Imphal, Manipur. Data were gathered from October 26, 2024, to December 15, 2024. The research protocol was designed to adhere to the Declaration of Helsinki guidelines and was approved by the Manipur University institutional ethics committee (Ethics approval number: MU/EC/2024/653).

Participants

The study sample consisted of 78 older women participants invited on pre-designed criteria from two old-age homes in Northeast India.

- **Inclusion Criteria:** Women participants aged above 60 years and who could stand and walk independently were included. Participants must be willing to undergo all the test procedures and have the mental capacity to give informed consent.
- **Exclusion Criteria:** Bedridden or walking stick users were excluded. Subjects having acute illness on the day of evaluation, severe vision impairment to participate in tests, severe hearing impairment to perform the test, and severe cognitive impairment to give informed consent were also excluded.

Sample Distribution:

- **Agartala Group:** 46 subjects from Apnagar Old Age Home, Tripura
- **Imphal Group:** 32 subjects from Ima Leimarel Women Welfare Association, Manipur
- **Total Sample:** 78 participants (4 dropped from a pool of 82)

Assessment Instruments and Materials

- **Physical Assessment Tools:** A Camry EH101 Hand Dynamometer calibrated was used to measure grip strength (Huang et al., 2022). A 4-meter walkway was measured and marked to use for gait speed testing. An adjustable chair of height (43-45 cm) was used for chair stand testing. Measuring tape and digital stopwatches were used in timed measuring and distance accuracy.
- **Assessment Forms:** Pre-designed standardized data collection forms and demographic questionnaires were developed and distributed.

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Data Collection Protocol

Data were determined per standard procedure within eight weeks over three phases:

- **Phase 1** - Recruitment and Consent: Institutional approval was received, participant eligibility was tested, and informed consent procedures were conducted.
- **Phase 2** - Physical Tests: Morning sessions were used to conduct SPPB, grip strength was measured in afternoon sessions, and sufficient rest breaks were taken between tests.
- **Phase 3** - Cognitive and Psychological Tests: Mini-Cog™ was completed under individual testing and WHO-5 under supervised self-report.

Assessment Procedures

Short Physical Performance Battery (SPPB): Three consecutive tasks were performed in a large, well-lit room with non-slippery floors (Guralnik et al., 2000). Balance was measured by testing participants' ability to stand for 10 seconds in three more challenging standing positions (side-by-side stand, semi-tandem stand, tandem stand). Gait velocity was assessed using timed 4-meter walks done in duplicate. Chair stand testing consisted of five successive chair stands done without arm support. Each component was graded using a 0-4 point scale to allow for total scores ranging from 0-12 points.

Hand Grip Strength Test: Subjects were seated in regular armchairs during testing with the Camry EH101 Digital Dynamometer. The elbow was in 90-degree flexion, and the wrist was in a neutral position. The dynamometer handle was adjusted based on hand size. Three maximal voluntary contractions were performed with 30 seconds rest between the tests. The result obtained in the third test was used as a measure.

Mini-Mental Cognitive Test (Mini-Cog™): Testing was done in quiet, well-lit rooms in three steps: word registration of three randomly selected words read to repeat, clock drawing for patients to draw the face of a clock with all numbers and hands at 11:10, and delayed word recall of the three words after clock drawing. Each word recalled earned one point, and two points were given for accurate clock drawing, with scores totalling 0-5 points.

WHO-5 Well-Being Index: Emotional well-being over the past two weeks was assessed by means of five positively worded questions (Heun et al., 2001). Self-rating was done on a 6-point Likert scale (0, "At no time"; 5, "All of the time"). The individual items were summed and multiplied by 4 to get final scores between 0-100 points.

Statistical Analysis

Statistical analysis was conducted using SPSS software version 26.0. The statistical analysis process involved normality tests by Shapiro-Wilk tests, calculation of descriptive statistics, independent samples t-tests for normally distributed data, Mann-Whitney U tests for normally distributed data, and calculation of effect size by Cohen's d for continuous data. Statistical significance was determined at $p < 0.05$ with 95% confidence intervals.

RESULTS

Normality Testing Results

Shapiro-Wilk normality testing showed that SPPB and WHO-5 scores were normally distributed ($p > 0.05$) and, therefore, suitable for parametric analysis. Mini-Cog™ and grip strength measurements were non-normally distributed ($p < 0.05$) and, therefore, suitable for non-parametric analysis.

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Participant Demographics and Social Context

Table 1. Demographic Characteristics of Study Participants

Variable	Agartala (n=46)	Imphal (n=32)	Statistical Test	p-value
Age (years)	70.37 ± 5.93	69.85 ± 6.12	Independent t-test	0.705
Educational level			Fisher's exact test	0.031*
Literate	7 (15.21%)	3 (9.52%)		
Illiterate	39 (84.78%)	29 (90.48%)		
Marital Status			Chi-square	0.043*
Single	4 (8.69%)	3 (9.38%)		
Divorced	28 (60.86%)	15 (47.62%)		
Widowed	14 (30.43%)	14 (38.10%)		
Nature of admission			Chi-square	0.047*
Voluntary	35 (76.08%)	20 (64.29%)		
Forced by children	7 (15.21%)	8 (23.81%)		
Placed by relatives/others	4 (8.69%)	4 (12.50%)		
Family visitors			Chi-square	0.028*
1-2 visitors	24 (52.17%)	11 (33.33%)		
2-3 visitors	2 (4.34%)	3 (9.52%)		
No visitors	20 (43.47%)	18 (56.25%)		

*Statistically significant at $p < 0.05$

Age at admission was comparable across sites, and no statistically significant difference was found ($p=0.705$). The educational status also showed dramatic differences, with Agartala the premises showing higher literacy rates despite both premises having most of their residents as illiterates. Admission patterns varied significantly ($p=0.047$), with 76.08% voluntary admissions reported for Agartala versus 64.29% for Imphal. Family visiting patterns varied significantly ($p=0.028$), with 56.51% of Agartala residents reporting a visitor or more versus 42.86% for Imphal.

Institutional Environment Characteristics

Table 2. Institutional Environment Characteristics

Characteristics	Agartala (Apnagar Old Age Home)	Imphal (Ima Leimarel Women Welfare Association)
Physical Activity Programs		
Yoga sessions	Weekly (Professional instructor)	None
Group exercise	Daily (Staff-led)	Occasional (Self-organized)
Gardening activities	Thrice weekly	Weekly
Cognitive Stimulation Programs		
Reading circles	Weekly	None
Memory games	Twice monthly	None
Skills training	Monthly	None
Social Engagement Activities		
Cultural events	Monthly	Quarterly
Group pujas/prayers	Daily	Weekly
Community interactions	Bi-weekly	Monthly
Healthcare Services		
Regular health check-ups	Monthly	Quarterly

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Characteristics	Agartala (Apnagar Old Age Home)	Imphal (Ima Leimarel Women Welfare Association)
Mental health support	Available (visiting counselor)	Not available
Physiotherapy	Available (visiting therapist)	Not available

Higher intensity and organization in activity scheduling were seen in all the dimensions of the Agartala Centre. Some of the main differences were the availability of daily yoga classes conducted by trained teachers in Agartala (unavailable in Imphal), cultural events more often, group prayers, and socializing. More advanced level healthcare services such as mental health counselling and physiotherapy were also noted in the Agartala centre but not in the Imphal centre.

Functional Status Assessment

Table 3. Detailed Statistical Analysis of Functional Assessment Scores

Parameter	Agartala (n=46)	Imphal (n=32)	Statistical Test	p-value	Effect Size
SPPB Score	8.217 ± 0.917	7.625 ± 1.032	Independent t-test	0.006*	Cohen's d = 0.611
WHO-5 Score	67.91 ± 10.98	61.43 ± 11.76	Independent t-test	0.013*	Cohen's d = 0.567
Mini-Cog™ Score	3.24 (2.0-5.0)	2.88 (2.0-5.0)	Mann-Whitney U	0.037*	r = 0.235
Grip Strength (kg)	14.00 (11.2-17.8)	12.77 (10.1-16.5)	Mann-Whitney U	0.004*	r = 0.327

*Statistically significant at $p < 0.05$

The residents of Agartala exhibited a significantly higher level of physical functioning across all the scales. The residents of Agartala had larger mean SPPB scores (8.217 ± 0.917) than the residents of Imphal (7.625 ± 1.032) with a medium effect size registered (Cohen's $d = 0.611$, $p = 0.006$). Higher grip strength was also found in residents of Agartala (13.998 ± 1.891 kg) compared to residents of Imphal (12.765 ± 1.947 kg) with a medium-to-large effect size found (Cohen's $d = 0.640$, $p = 0.004$).

Functional Assessment Performance Distribution

Table 4. Functional Assessment Performance Distribution of Participants

Parameter	Agartala (n = 46)	Imphal (n = 32)
SPPB Score		
7	7 (15.21%)	16 (50.00%)
8	28 (60.86%)	12 (37.50%)
9	7 (15.21%)	3 (9.38%)
10	2 (4.34%)	1 (3.13%)
11	2 (4.34%)	0 (0%)
Mini-Cog™ Score		
2	5 (10.86%)	9 (28.13%)
3	33 (71.74%)	18 (56.25%)
4	0 (0%)	0 (0%)
5	8 (17.39%)	5 (15.63%)

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WHO-5 Well-Being Score		
44-60	20 (43.47%)	17 (53.13%)
64-80	19 (41.30%)	13 (40.63%)
84-100	7 (15.21%)	2 (6.25%)

The distribution pattern of the SPPB score revealed that 50% of Imphal residents had a score of 7 (poor physical function) compared with only 15.21% of Agartala residents. Higher percentages of Agartala residents had scores of eight or more (84.75%) compared with Imphal residents (50%).

Assessment of cognitive function revealed that the residents in Imphal had a larger proportion of 2 on Mini-Cog™ (28.13%) than the residents in Agartala (10.86%), indicating that the residents in Imphal were more prone to cognitive impairment. Psychological well-being distribution revealed that larger proportions of the residents in Imphal had lower scores in range 44-60 (53.13%) than the residents in Agartala (43.47%).

Correlation Between Activity Engagement and Functional Outcomes

Table 5. Correlation Between SPPB Scores and Activity Engagement

Activity Type	SPPB Score	Hand Grip Strength	Mini-Cog™ Score	WHO-5 Well-Being Score
Regular physical activity	0.487**	0.412**	0.287*	0.354**
Cognitive stimulation activities	0.295*	0.194	0.526**	0.283*
Social engagement activities	0.321*	0.246*	0.309*	0.471**
Recreational activities	0.276*	0.218*	0.247*	0.386**
Outdoor excursions	0.309*	0.233*	0.274*	0.402**

* $p < 0.05$, ** $p < 0.01$

Moderately to highly correlated were high levels of participation in organized activity with healthy functional performance. Regular physical activity participation correlated moderately to strongly with SPPB scores ($r = 0.487$, $p < 0.01$) and hand grip strength ($r = 0.412$, $p < 0.01$). Cognitive stimulation activities had the most highly correlated Mini-Cog™ scores ($r = 0.526$, $p < 0.01$). Social activity participation was most strongly related to mental health ($r = 0.471$, $p < 0.01$).

DISCUSSION

The detailed study conducted a complete comparative evaluation of functional ability among older women in two old-age homes in Northeast India. Apnagar Old Age Home, Agartala, reflected better performance on all aspects of functionality than Ima Leimarel Women Welfare Association, Imphal, though with comparable demographic profiles among the groups.

Key Findings and Statistical Significance

Tight adherence to normality testing and appropriate statistical analysis was followed, increasing the validity of findings with small-to-medium (Cohen's $d = 0.400$ for Mini-Cog™) to medium-to-large effect sizes (Cohen's $d = 0.640$ for grip strength). Statistical significance of differences in SPPB scores was uncovered by parametric analysis ($p=0.006$)

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with medium effect size (Cohen's $d=0.611$), indicating clinically significant superior lower extremity functioning in Agartala's residents.

Physical Performance Outcomes

In most instances, physical function among residents of both institutions was found to be in the moderate functional category, with greater functioning among Agartala residents. Mean SPPB scores of 8.22 among Agartala residents and 7.63 among Imphal residents confirmed that both institutions had minimum capacity for mobility but had grades of impairment of function.

The differential physical functioning within institutions was explained by structured physical activity interventions conducted in Agartala, such as daily yoga sessions and staff-led group exercises, which were not routinely offered in Imphal (Agbangla et al., 2023). The strong positive correlation between physical activity participation and physical function measures (SPPB: $r = 0.487$, Hand grip strength: $r = 0.412$) highlighted the significance of structured physical activities in preserving physical function among institutional older women.

Cognitive Function Assessment

Cognitive performance scores revealed the broad differential impact of institutional settings on cognitive maintenance. Although education was controlled, Agartala residents exhibited significantly better cognitive functioning (Mini-Cog™: 3.24) than Imphal residents (2.88). The explanation was for cognitive stimulation activities such as ongoing reading clubs, mental games, and skill training in Agartala but not always available in Imphal.

The significant relationship between Mini-Cog™ scores and participation in cognitive stimulation activities ($r = 0.526$) validated the efficacy of such intervention in ensuring prolonged cognitive function among elderly residents (Agbangla et al., 2023).

Psychological Well-being Outcomes

A marked difference in psychological well-being scores was seen between centres, with better emotional status found in Agartala residents (WHO-5: 67.91) than in residents of Imphal (61.43). This is noted even though resident populations in both locations had poor social circumstances, such as restricted family contact and diminished natural support systems.

Enhanced psychological outcomes among individuals in Agartala were attributed to extensive social contact activities such as regular group prayers, monthly cultural events, and community contacts every two weeks (Chao et al., 2021). The strong correlation between scores on social contact activities and psychological well-being ($r = 0.471$) justified research that established the position of social connectedness to enhance emotional well-being among older adults in institutions.

Influence of Institutional Environment

Facility-to-facility variation in functional performance was accounted for, most notably by activity programming and institutional environment variation. Despite seemingly more auspicious demographic conditions in Imphal, such as greater proportions of residents with children and shorter stay lengths, these were inadequate to generate enhanced functional

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performance relative to Agartala residents, whose higher performance in every functional area was apparent.

This paradoxical finding underscored the significance of programmatic intervention in residential care settings in establishing functional trajectories among older women. The multimodal activity program instituted at the Agartala Centre, with professionally guided yoga sessions, systematic cognitive stimulation, and heterogeneous social engagement activities, triggered a multidimensional enrichment environment fostering physical, cognitive, and psychological functioning.

Clinical and Policy Implications

The findings exemplify the practical utility of Northeast Indian institutional care and other similar settings. The utility of systematic, multi-domain activity interventions targeting physical exercise, cognitive stimulation, and social interaction was exemplified. Enhanced functional outcomes for Agartala participants exemplified professionally created and systematically executed activities that were priceless for older women in institutional care. The requirement of special healthcare facilities in old-age homes was also underscored. Accessibility of affordable mental health counselling and physiotherapy facilities in Agartala reflected the probable underlying reasons for functional improvements observed through specified interventions on identified deficits.

Sustained functional assessment in facilities was highlighted as key to early decline recognition and prompt initiation of interventions. The standardized instruments used in this study, including SPPB, hand grip strength test, Mini-Cog™, and WHO-5 Well-being Index, were an effective monitoring tool for functional status in resource-constrained facility settings.

Limitations of a Study

Some limitations and constraints were identified in this research. The cross-sectional design excluded causal inference from functional status and institutional environments. Longitudinal designs with follow-up across time, assessing change in function as it develops, would offer more compelling evidence for institutional programming effects on maintenance or decline of function.

The female restriction confined generalizability to mixed-sex or male settings. Functional decline patterns and gender-divergent intervention responses may exist, necessitating comparative gender-group research to establish prevailing care models.

CONCLUSIONS

This large-scale study provided unequivocal evidence for clinically significant functional ability differences in older women who lived in Northeast Indian institutional settings. Systematic application of normality testing in conjunction with appropriateness-based statistical test selection supported findings that resulted in structured activity programming significantly impacting physical functioning, cognitive functioning, and psychological well-being with small-to-medium to medium-to-large effect sizes.

Statistical data favoured active engagement in the form of programmed activity over passive social support in maintaining functional capacity in older women living in institutions. Despite higher sociodemographic status in Imphal, all residents of Agartala consistently

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scored higher than their counterparts in all areas of function, emphasizing the importance of appropriate activity programming in institutions.

The study provided evidence-based policy and practice recommendations for improving residential care facilities, especially in developing countries like Northeast India. The use of systematic physical exercise, cognitive stimulation, and social interaction interventions, combined with standardized functional assessment protocols, was the most critical intervention to enhance institutionalized older women's quality of life and functional autonomy.

These outcomes reiterated the merit of policy toward institutional care that focused on active involvement and intensive programming relative to passive custodial care methods. Evidence was shown to demonstrate that investment in complete activity programming and targeted health care services possessed the potential to be linked with profound improvement in resident functional status and health outcomes.

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Conflict of Interest

The author(s) declared no conflict of interest.

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