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Original Article

Physiotherapy Section

Correlation between Cognition, Functional Ability and Quality of Life in Older Adults having Subjective Cognitive Decline: A Cross-sectional Study

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ABSTRACT

Introduction: Subjective Cognitive Decline (SCD) represents self-perceived cognitive impairment that may precede objective signs of cognitive decline. Exploring the association between cognition, functional ability, and Quality of Life (QoL) among older adults having SCD, will help in identification of at-risk population and tailor interventions.

Aim: To investigate the association between cognition, functional ability and QoL among older adults having SCD across different Socioeconomic Status (SES) and gender.

Materials and Methods: The present a cross-sectional study included data collected from the Outpatient Department (OPD) of a Rehabilitation Institution in Delhi,India between July 2023 to October 2023. Data from 130 older adults with SCD was taken by random sampling for cognition, functional ability, QoL and SES. Cognition was assessed using Montreal Cognitive Assessment (MOCA) and Addenbrooke's Cognitive Examination III (ACE-III). Functional ability was measured by Lawton Instrumental Activities of Daily Living (L-IADL) Scale, QoL {Health Related Quality of Life (HRQoL)} by SF-36 Health Survey and Kuppuswamy socioeconomic scale was used to measure SES. Descriptive statistics, Pearson product-moment correlations, and chi-square tests were used to explore the association between the variables.

Results: SES was not significantly correlated with IADL (r=-0.098, p=0.267), SF-36 scores (r=0.131, p=0.138), or ACE-III scores (r=0.145, p=0.099). In males, a statistically significant moderate positive correlation was found between MOCA and ACE-III scores (r=0.521, p<0.001), indicating consistency in cognitive assessment tools and no significant correlations were found between SES and MOCA (r=0.137, p=0.221), IADL (r=-0.076, p=0.502), or SF-36 scores (r=0.072, p=0.520). Among females, a statistically significant moderate-to-strong correlation was also observed between MOCA and ACE-III scores (r=0.546, p<0.001). Additionally, a weak but positive, nearly significant correlation was observed between SES and MOCA scores (r=0.255, p=0.078), indicating a possible trend. The correlation between SES and SF-36 was also weak and non-significant (r=0.212, p=0.143).

Conclusion: A statistically significant moderate positive correlation was observed between MOCA scores and ACE-III scores. This indicates that participants who scored higher on the MOCA also tended to have higher ACE-III scores. The correlation between SES and MOCA score was weak and not statistically significant. Other variables did not show strong or statistically significant relationships.

Keywords: Activities of daily living, Age-related differences, Socioeconomic status

INTRODUCTION

The SCD is characterised by individuals' self-reported experiences of cognitive difficulties, particularly in memory and executive function, despite the absence of objective evidence of impairment. SCD is increasingly recognised as a public health concern as it often precedes Mild Cognitive Impairment (MCI) and Alzheimer's disease (AD) [1]. Examining the link between cognition, functional ability, and QoL in older adults with SCD is crucial for identifying early decline, guiding tailored interventions, and improving well-being. The study is warranted by the rising prevalence of SCD in aging populations and its role as a risk factor for future cognitive decline [2-5].

Research indicates that cognitive impairment was more common in older persons with lower SES [6]. Considering that people with lower socioeconomic level tend to have poorer diets and more risky health behaviours, it is generally accepted that part of the impacts of socioeconomic conditions on cognition are attributable to lifestyle variations [7]. Furthermore, low SES might have a direct impact on cognition through a decrease in cognitive reserve, as seen by lower educational attainment or occupational complexity [8]. Although the precise mechanism is uncertain, it might be a major player in the process by which other social factors mediate cognitive function.

Higher SES, which is characterised by higher income, education, and a more complex vocational background, is linked to improved cognitive performance [9-12]. People with higher SES typically have larger social networks and are more involved in community life, both of which guard against cognitive decline, the positive effect of SES on cognition is partially mediated by increased social support and social participation [9,13,14]. Education particularly plays a protective role against cognitive impairment and dementia, with more years of formal schooling linked to better cognitive performance in old age [12,13].

Elderly individuals with higher SES, especially higher income and education experience less decline and disability in Instrumental Activities of Daily Living (IADL), helping them maintain independence in day-to-day tasks such as managing finances, medication, transportation, and household upkeep [15-17]. Lower SES is linked to increased functional dependence, particularly among elderly women, and is closely associated with increased disability risk via indirect pathways, such as deteriorating health and limited access to resources [15,16].

SES is a critical determinant of QoL among the elderly, impacting all major domains: physical health, psychological well-being, social

relationships, and environment [18-21]. Higher SES ensures greater independence and financial security, enabling older adults to meet basic needs, access healthcare, maintain social participation, and preserve dignity i.e., factors that contribute to higher QoL scores [18-20]. Factors such as adequate and independent income, higher education levels, secure housing, and continuing employment are consistently linked with better QoL in late life [18,21].

Studies reveal that older women generally experience higher rates of cognitive impairment than older men, especially after age 75 [22-24]. A significant contributing component is education level; for example, women's lower level of education increase the gender differences in cognitive scores [23].

Men tend to have a higher prevalence of poor IADL compared to women (e.g., 17.1% in males vs 4.5% in females in one major study) [25,26]. Participation in social groups and paid work positively affects IADL for elderly, but the effect differs by gender. For males, volunteering and hobbies are associated with better IADL outcomes. For females, paid work and frequent social participation across various groups result in better IADL [25]. The beneficial impact of social engagement is generally stronger for women. Thus, interventions promoting social activity may have greater outcome for elderly women [25].

Elderly men report of higher QOL than elderly women, regardless of income or social class [27]. Factors such as mood, self-esteem, autonomy, and co-morbidity have strong impacts on QOL for both genders, but the odds of reporting poor QOL are generally higher for women [28]. Cultural and country-specific differences can affect gender gaps; for example, Indian elderly women may report higher perceived QOL compared to their male counterparts, despite other disadvantages [28]. These findings highlight the need for gender-tailored interventions in geriatric care, focusing on educational support, increased social participation, and psychological well-being to address the unique challenges faced by older men and women [27].

Previous studies have highlighted the need for targeted research focusing on the relationships between cognition, HRQOL, and IADL in individuals with SCD across different gender and SES, as there remains a lack of comprehensive studies examining how these factors interact specifically within the context of SCD [29-31].

The present study aimed to fill this gap by investigating the correlation between cognition, functional ability and QoL among older adults having SCD across different SES and gender. Understanding the association between these variables is essential for identifying at risk population and developing effective interventions. The present study was the first one to assess the association between cognition, functional ability and QoL across different SES and gender among Indian older adults having SCD. The current manuscript is a part of the larger project to assess the effectiveness of multi-component intervention in the older adults with SCD.

MATERIALS AND METHODS

The present cross-sectional study utilised the data collected from the Outpatient Department (OPD) of a Rehabilitation Institution in Delhi, India between July 2023 to October 2023, after obtaining consent from all the participants. The study adhered to ethical standards for research involving human subjects, ensuring the protection of participants' rights and well-being throughout the research process. The study was approved by the Amity University Ethics Committee (Ref: AUUP/IEC/AUG/2021/10, April 19, 2022) and the PDUNIPPD Institutional Ethics Committee (Ref: IEC11/2022/RP1, December 13, 2022).

Inclusion and Exclusion criteria: Inclusion criteria consisted of individuals aged 60 years and older who reported experiencing cognitive difficulties, specifically in memory or thinking, without significant objective cognitive impairment as determined by clinical assessment (MOCA). Participants were excluded if they had a history of neurological disorders, severe psychiatric conditions, or other medical illnesses (i.e., severe cardiovascular conditions, acute musculoskeletal diseases or recent fractures, malignancy, and metabolic disorders, etc.,) that could affect cognitive function. A convenient sample of 130 participants was considered for this study.

Study Procedure

Data were collected using the following validated assessment instruments:

1. **Kuppuswamy socioeconomic scale-** The Kuppuswamy socioeconomic scale is the gold standard for SES assessment in urban India. It is a widely used tool for measuring the SES, based on three key parameters: education, occupation, and monthly family income. Each parameter is given a score, and the total score ranges from 3 to 29. Based on the total score, families are categorised into five SES groups: Upper (I): 26-29, Upper-middle (II): 16-25, Lower-middle (III): 11-15, Upper-lower (IV): 5-10, Lower (V): below 5 [32].
2. **MoCA:** Its a brief, 30-point cognitive screening tool. It assesses multiple cognitive domains such as memory, executive function, attention, language, visuospatial skills, abstraction, calculations, and orientation and typically takes about 10 minutes to administer. Higher score indicates better cognition, with a minimum score of '0' and maximum '30', where a score of 26 or higher is considered normal. Scores below 26 suggest mild cognitive impairment, and below 21 suggest mild dementia [33].
3. **Addenbrooke's Cognitive Examination III (ACE-III):** This cognitive assessment tool evaluates various cognitive domains including attention, memory, language, and visuospatial abilities. Scores range from 0 to 100, with higher scores indicating better cognitive performance. Scores of 88 and above are generally considered within the normal cognitive function range, while a score below 82 indicates cognitive impairment [34-36].
4. **SF-36 Health Survey:** This instrument measures HRQoL by including 36 questions across eight domains: physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health perceptions. Two summary scales are created using these domains i.e., a Physical Component Summary (PCS) and a Mental Component Summary (MCS). Higher scores indicate a higher QoL; values range from 0 to 100 [37,38].
5. **Lawton Instrumental Activities of Daily Living (IADL) Scale:** This scale assesses the ability to perform complex daily living tasks such as managing finances, using transportation, shopping, preparing meals, and handling medications. It has dichotomous scoring (0-1), where 1 point is given for performing the task independently and 0 points for less able or unable to perform. A total score from 0 to 8 for women and 0 to 5 for men is designated to access independence in instrumental activities of daily living. Values range from 0 to 8. Better functional independence is indicated by higher ratings and fully independent scoring is of 8 [39].

Data collection procedures: Older adults were recruited via poster campaign stating "Do you think you have any difficulties with your memory or cognition, like forgetting important dates, or names of people or confusion in planning things as compared to last one year, or 2 year? If yes, please contact OT-Geriatrics Unit, Room No-3", at all key places of the Institute (for persons with physical disability) i.e., entrance, registration counter, OPD clinic, and all departments and word of mouth. Interested individuals contacted the study coordinator by phone or in person, where they were

provided with a brief description of the study. They were invited to attend a formal in-person screening visit after which the evaluation process was completed in 2-3 days (50-min/day). This process involved providing detailed information about the study's purpose, procedures, potential risks, and benefits, allowing participants to make an informed decision about their participation. After obtaining informed consent, participants completed the assessments in a controlled environment where they were guided through each assessment by an Occupational Therapist. Confidentiality was maintained throughout the study by assigning unique identification numbers to each participant's data, ensuring that personal identifiers were removed from any published results or reports.

STATISTICAL ANALYSIS

The data analysis involved descriptive statistics, Pearson product-moment correlations, and chi-square tests to explore associations of SES and gender with cognition (MOCA and ACE-III), functional ability (IADL), and QoL (SF-36) among older adults having SCD. The data was analysed using IBM Statistical Package for Social Sciences (SPSS) Statistics for Windows, Version 26.0 (IBM Corp., Released 2019, Armonk, New York). Results are presented in five sections: descriptive statistics, overall correlation analysis, gender-wise and SES-wise correlations, and categorical association through Chi-square analysis.

RESULTS

The descriptive statistics presented in [Table/Fig-1], includes 130 older adult participants aged between 60 and 85 years. The mean age of the participants was 66.58 years (SD=5.46). Cognitive functioning scores i.e., the mean MOCA score was 26.62 (SD=1.20), while the mean ACE-III score was 81.91 (SD=7.69), reflecting generally preserved cognitive functioning in the sample. The Instrumental Activities of Daily Living (IADL) score, which ranged from 1 to 8, had a mean of 7.64 (SD=1.03), suggesting a high level of functional independence among the participants. HRQoL, measured using the SF-36 questionnaire, had a mean score of 57.21 (SD=13.64), with scores ranging from 24.40 to 89.02. The Kuppuswamy Socioeconomic Scale (KSES) score was widely distributed, indicating representation from different socioeconomic strata. The KSES, ranged from 3 to 28, with a mean SES score of 13.16 (SD=5.15), indicating a diverse representation across socioeconomic classes.

S. No.	Variables	All Participants (N=130) Mean±SD (Min - Max)	Male (N=81) Mean±SD (Min - Max)	Female (N=49) Mean±SD (Min - Max)
1	Age (years)	66.58±5.46 (60-85)	67.33±5.77 (60-85)	65.33±4.70 (60-77)
2	Kuppuswamy SES Score	13.16±5.15 (3-28)	13.06±4.77 (3-28)	13.33±5.79 (4-26)
3	MOCA	26.62±1.20 (23-30)	26.72±1.31 (24-30)	26.45±1.00 (23-29)
4	IADL score	7.64±1.03 (1-8)	7.67±0.95 (3-8)	7.59±1.17 (1-8)
5	SF-36 score	57.21±13.64 (24.4-89.0)	58.44±13.09 (24.9-89.0)	55.18±14.40 (24.4-85.0)
6	ACE III score	81.91±7.69 (54-98)	82.49±7.90 (56-98)	80.94±7.21 (54-92)

[Table/Fig-1]: Descriptive statistics of the study population (N=130).

Pearson correlation coefficients were computed to assess the linear relationships among SES, cognitive functioning, functional ability, and QoL. The correlation coefficient among key variables is presented in [Table/Fig-2]. A statistically significant moderate positive correlation was observed between MOCA scores and ACE-III scores (r=0.532, p<0.001). This indicates that participants who scored higher on the MOCA also tended to have higher ACE-III scores. The correlation between SES and MOCA score was weak and not statistically significant (r=0.171, p=0.051), although it approached the conventional threshold for significance. Similarly, SES was not significantly correlated with IADL (r=-0.098, p=0.267), SF-36 scores (r=0.131, p=0.138), or ACE-III scores (r=0.145, p=0.099).

To explore gender-specific patterns, the data were split by gender, and correlation analyses were performed separately for males (n=81) and females (n=49) to assess possible variations in cognitive-function relationships [Table/Fig-3].

The correlation of variables among female participants shows a statistically significant moderate-to-strong correlation between MOCA and ACE-III scores (r=0.449, p=0 .001) and a weak but positive, nearly significant correlation was observed between SES and MOCA scores (r=0.255, p=0.078), indicating a possible trend. The correlation between SES and SF-36 was also weak and non-significant (r=0.212, p=0.143).

Among male participants, a statistically significant moderate positive correlation was found between MOCA and ACE-III scores (r=0.517, p=0.000), indicating consistency in cognitive assessment tools. No significant correlations were found between SES and MOCA (r=0.137, p=0.221), IADL (r=-0.076, p=0.502), or SF-36 scores (r=0.072, p=0.520).

MOCA and ACE-III scores are significantly correlated for both genders, supporting their concurrent validity. Females showed slightly stronger cognitive associations with SES than males, suggesting differential sociocultural or health-related pathways. These gender-stratified findings reaffirm the strong association between the two cognitive screening tools in both groups and also suggest a possible SES-cognition relationship that may be more evident among females.

DISCUSSION

Numerous studies have emphasised that higher SES, measured through education, income, occupation, healthcare access, and social resources confers significant protective benefits, including superior cognitive performance, greater independence in daily activities, and improved QoL [9-14]. Contrary to these observations, this study revealed only weak, non-significant correlations between

Variables		MOCA score	IADL score	SF36 score	ACE III score	Kuppuswamy SES
MOCA score	Pearson Correlation	X	0.119	0.050	0.532	0.171
	Sig. (2-tailed)	X	0.178	0.574	<0.001	0.051
IADL score	Pearson Correlation	0.119	X	-0.042	-0.098	-0.098
	Sig. (2-tailed)	0.178	X	0.631	0.268	0.267
SF36 score	Pearson Correlation	0.050	-0.042	X	0.149	0.131
	Sig. (2-tailed)	0.574	0.631	X	0.090	0.138
ACE III score	Pearson Correlation	0.532	-0.098	0.149	X	0.145
	Sig. (2-tailed)	<0.001	0.268	0.090	X	0.099
Kuppuswamy SES	Pearson Correlation	0.171	-0.098	0.131	0.145	X
	Sig. (2-tailed)	0.051	0.267	0.138	0.099	X

[Table/Fig-2]: Correlation coefficients among key variable pairs.

Gender	Variables	Correlation	MOCA score	IADL score	SF36 score	ACE III score	Kuppuswamy SES
Female N=49	MOCA score	Pearson Correlation	1	0.056	-0.033	0.449**	0.255
		Sig. (2-tailed)		0.701	0.821	0.001	0.078
	IADL score	Pearson Correlation	0.056	1	0.036	0.003	-121
		Sig. (2-tailed)	0.701		0.804	0.981	0.406
	SF36 score	Pearson Correlation	-0.033	0.036	1	0.116	212
		Sig. (2-tailed)	0.821	0.804		0.421	0.143
	ACE III score	Pearson Correlation	0.449**	0.003	0.116	1	0.152
		Sig. (2-tailed)	0.001	0.981	0.421		0.297
	Kuppuswamy SES	Pearson Correlation	0.255	-121	212	0.152	1
		Sig. (2-tailed)	0.078	0.406	0.143	0.297	
Male N=81	MOCA score	Pearson Correlation	1	-0.035	0.054	0.517**	0.137
		Sig. (2-tailed)		0.760	0.632	0.000	0.221
	IADL score	Pearson Correlation	-0.035	1	0.007	-0.078	-0.076
		Sig. (2-tailed)	0.760		0.950	0.492	0.502
	SF36 score	Pearson Correlation	0.054	0.007	1	0.189	0.072
		Sig. (2-tailed)	0.632	0.950		0.092	0.502
	ACE III score	Pearson Correlation	0.517**	-0.078	0.189	1	0.149
		Sig. (2-tailed)	0	0.492	0.092		0.185
	Kuppuswamy SES	Pearson Correlation	0.137	-0.076	0.072	0.149	1
		Sig. (2-tailed)	0.221	0.502	0.502	0.185	

[Table/Fig-3]: Gender-wise correlation among key variable pairs.

SES and cognitive test scores, both for MoCA (r=0.171, p=0.051) and the Addenbrooke's Cognitive Examination-III (ACE-III) (r=0.145, p=0.099). These findings suggest that, within this cohort of older adults having SCD, SES was not a strong determinant of cognitive functioning. Several explanations may account for this discrepancy, including the small sample size, cultural or regional factors that moderate the SES-cognition relationship, or the possibility that health-related co-morbidities overshadow SES effects in this population. Moreover, it is possible that SES-related benefits on cognition emerge more clearly over longer follow-up periods or in larger, more diverse cohorts.

Similarly, previous literature has consistently reported associations between poor SES and greater functional dependence [40,41]. SES is known to influence nutritional adequacy, healthcare access, morbidity, and mortality, all of which contribute to functional independence [15]. In contrast, the present study did not find statistically significant associations between SES and IADL. The absence of such associations may reflect sample-specific characteristics, relatively preserved functional ability among the participants having SCD, or compensatory social and familial support systems that buffer the influence of SES on functional outcomes.

The comparative evaluation of cognitive screening instruments in the study provides further insights. Both MoCA and ACE-III are widely validated tests, with MoCA offering efficiency in routine screening and ACE-III providing detailed coverage of domains such as language, memory, and visuospatial abilities [42,43]. The present study results demonstrated a significant and strong correlation between MoCA and ACE-III, suggesting that these instruments measure overlapping constructs of cognition. Importantly, this positive relationship was consistent across genders, with correlations persisting in both males (r=0.521, p<0.001) and females (r=0.546, p<0.001), underscoring the robustness and cross-demographic validity of these tools.

Gender-related patterns in cognitive performance and health outcomes also warrant discussion. Several studies report a higher prevalence of cognitive impairment among older women [22-24]. Evidence from Indian cohorts similarly highlights gender disparities in late-life cognition, shaped by education, socioeconomic background, and life course exposures [23,24]. Interestingly, although the current study with older adults having SCD, did not show statistically significant SES-cognition associations overall, females exhibited a near-significant positive correlation between SES and MoCA scores (r=0.255, p=0.078). This emerging trend aligns with prior evidence suggesting that women's cognition may be particularly sensitive to social and economic resources, and it may merit attention in larger, gender-stratified analyses in SCD population.

Functional disability presents another area of divergence. Studies have documented a greater risk of functional disability among older women (52%) compared to men (35%), with influential factors including multimorbidity, depression, and life dissatisfaction [26]. While one Indian study revealed a gender disparity in IADL difficulties, with prevalence of poor IADL being higher in men (17.1%) than women (4.5%) [25], our findings did not confirm similar gender-specific associations. Our findings indicate that gender and SES did not significantly influence IADL among individuals with SCD. These differences highlight the potential influence of cohort-specific demographic, cultural, or healthcare accessibility variables in shaping functional outcomes.

With respect to QoL, prior research shows higher ratings consistently reported by older men compared to women, with notable cross-country variability influenced by health, social support, and demographic factors [27,28]. In large populations such as India and China, women more frequently report poorer QoL relative to men [28]. In the present study, on the SCD population, both male and female subgroups exhibited only weak associations between SES and QoL. This limited association may be due to unmeasured psychosocial variables such as resilience, family support, or community engagement playing a larger role than socioeconomic positioning in determining individual perceptions of QoL.

Taken together, these findings suggest that while the broader literature establishes SES as a major determinant of cognition, functional independence, and QoL, such associations may not manifest uniformly across populations of SCD. Factors specific to cultural context, sample composition, and unmeasured confounders may attenuate or mask the effects of SES in smaller or more homogeneous cohorts.

Limitation(s)

The present study was limited to the small sample size of older adults mostly of Delhi-NCR, who could reach us and gave their

consent for participation and whose physical and mental health allowed them to participate in the tests and interviews. Majority of the participants were from urban, which excludes the rural population. However, this study's results can be considered representative of the elderly SCD population that live independently or with only a little assistance.

Future research with larger, sociodemographically diverse populations of SCD, complemented by longitudinal analyses, is necessary to clarify the nuanced and potentially context-dependent roles of SES in shaping late-life cognitive and functional outcomes in SCD.

CONCLUSION(S)

In summary, the findings of the present study demonstrated a consistent and statistically significant relationship between MoCA and ACE-III scores. Notably, among females, a near-significant positive correlation between SES and MoCA (r=0.255, p=0.078) was observed, indicating a potential trend that merits further investigation. Other variables such as cognition, QoL, & IADL did not show significant relationship with respect to SES and gender in older adults having SCD.

Authors' contributions

Conceptualisation, M.M and M.B.; methodology, M.M, J.S., and P.K.; writing, M.M; original draft preparation, M.M.; writing-review and editing, M.M, and J.S.; All the authors have read and agreed to the published version of the manuscript.

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