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Assessing intrinsic capacity in older adults using the ICOPE tool in a tertiary care setting in Karachi, Pakistan

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ABSTRACT

Background: Ageing in Pakistan highlights the urgent need to preserve intrinsic capacity. The WHO Integrated Care for Older People (ICOPE) tool provides a standardized framework for assessing intrinsic capacity. This study applied a translated version of the ICOPE tool in older adults in Karachi to assess intrinsic capacity and its association with sociodemographic and health-related factors.

Methods: A cross-sectional study was conducted among older adults ≥60 years recruited consecutively from a tertiary care setting in Karachi. Intrinsic capacity was assessed using the WHO ICOPE tool, covering cognition, mobility, nutrition, sensory, and psychological well-being. Each domain scored 1 if any item indicated impairment; aggregated scores generated the overall ICOPE score. Sociodemographic and health-related data were collected using a structured questionnaire. Robust linear regression was performed in STATA 17 software. Ethical approval was obtained from the Aga Khan University Ethical Review Committee.

Results: A total of 81 participants (mean age 69.1 ± 3.6 years; 58 % female) were included in the study analysis. Hearing loss (87.7 %), visual impairment (79.0 %), and limited mobility (63.0 %) were the most commonly reported conditions. The mean ICOPE score was 3.4 ± 1.2. Higher scores, reflecting greater impairment and reduced intrinsic capacity, were observed in individuals with hypertension (+0.70 units, 95 % CI: 0.21–1.19) and ischemic heart disease (+0.73 units, 95 % CI: 0.06–1.39).

Conclusion: High rates of impairment across multiple domains of intrinsic capacity were identified among older adults in this setting. The study supports the feasibility of ICOPE in Pakistan and highlights the importance of its wider implementation to facilitate early decline in intrinsic capacity in ageing populations.

1. Introduction

Intrinsic capacity, defined by the World Health Organization (WHO) as the composite of physical and mental capacities, provides a holistic measure of healthy ageing beyond disease-based approaches [1]. The world is ageing and the global increase in the older adult population is no longer limited to developed countries. This presents significant challenges in developing countries that often have inadequate healthcare infrastructure, weak social security systems, and limited geriatric expertise [2,3]. With fewer working-age individuals available to support a rising number of older adults, many of whom live in poverty, these regions face mounting economic and social strains [4]. According to the WHO, Pakistan's ageing population is projected to triple by 2050, rising from its current estimate of 5–6 % [5]. Pakistan faces a substantial burden of both infectious and non-communicable diseases (NCDs) [6–8]. The chronic nature of NCDs increases the risk of end-organ damage, particularly in older adults, leading to various impairments that contribute to dependency and loss of functionality. Among the many determinants of intrinsic capacity, comorbidities play a central role [9]. For instance, diabetes, a major public health concern, is a leading cause of visual impairment in older adults due to diabetic retinopathy [10]. It is also strongly associated with cognitive decline [11]

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and neuropathy, which increases the risk of falls [12,13]. Similarly, hypertension has been linked to memory impairment and psychological distress [14], while osteoarthritis contributes to reduced physical activity, muscle deconditioning, frailty and increasing risk of falls [15].

Despite the increasing burden of ageing-related impairments globally [16], Pakistan lacks a structured approach to assessing intrinsic capacity in older adults. Current healthcare approaches are predominantly reactive, emphasizing on disease management as opposed to proactive identification of functional impairments. There is a critical need for standardized assessment tools to evaluate functional capacity and guide early interventions in the ageing demographic [17]. Therefore, tools that assess the specific needs of older individuals are needed. To operationalize the concept of intrinsic capacity, the WHO developed the Integrated Care for Older People (ICOPE) tool in 2019. Unlike traditional disease-centred approaches, ICOPE promotes proactive, person-centred care by identifying early declines in intrinsic capacity. This promotes healthy ageing and lowers the risk of disability and dependence amid a rising NCD burden.

The ICOPE tool has been successfully implemented in multiple countries with diverse socioeconomic backgrounds and has shown promise in identifying early declines in intrinsic capacity and supporting care planning for older adults [18]. Studies in India have reported significant cognitive and mobility impairments among older adults in rural areas [19,20], while research from a community dwelling older population in Hong Kong found locomotion and cognition to be the most affected domains [21]. Similarly, studies in China and France have highlighted widespread functional impairments among older individuals [22,23]. These findings highlight ICOPE's ability to identify functional decline across multiple domains of intrinsic capacity and to connect older adults with timely, targeted care interventions. In Pakistan, previous research has identified cognitive and mobility impairments in older adults using various assessment tools [6]. However, a standardized, locally adapted tool that comprehensively evaluates multiple domains of intrinsic capacity has not been used in Pakistan. The ICOPE tool presents a valuable opportunity to fill this gap, given its validity, accessibility, ease of use, and global adoption.

2. Objective and hypothesis

To assess intrinsic capacity in older adults visiting a tertiary care setting in Pakistan using a translated Urdu version of the WHO ICOPE screening tool, and assess its association with sociodemographic and health-related factors.

The study hypothesized that the ICOPE screening tool would identify a high prevalence of impairments across multiple intrinsic capacity domains in older adults in Karachi. The study also hypothesized that higher levels of impairment would be significantly associated with sociodemographic characteristics and comorbid health conditions.

3. Methods

3.1. Study design, setting, and participants

We conducted a cross-sectional analytical study at the Aga Khan University Hospital, Karachi. Individuals aged 60 years and older were considered eligible for inclusion. Participants with acute severe illness requiring immediate referral or hospitalization, or those fully dependent on assistive devices, i.e., they could not perform essential daily activities independently and relied entirely on equipment such as wheelchairs, walkers, or similar aids for basic functioning, were excluded to ensure participant safety and alignment with ICOPE's focus on identifying early functional decline. After obtaining written informed consent, eligible participants were enrolled in the study.

3.2. Sampling technique and sample size

Consecutive sampling was employed to recruit the study participants. The study was primarily designed as a pilot to provide an initial assessment of the Urdu-translated ICOPE tool in a tertiary care setting. The calculated minimum sample size was 71, with a target of 85 participants to account for potential exclusions after data collection. The study was designed with a power of 80 % and a 95 % confidence interval. Reduced intrinsic capacity in the assumed unexposed group, i.e., the younger population in Pakistan was taken to be 10 %, while reduced intrinsic capacity in the assumed exposed group, i.e., the older adult population, was taken to be 50 %. An anticipated prevalence ratio of greater than 5 was used with a 5 % level of significance. A 10:1 exposed-to-unexposed ratio was applied to calculate the study's sample size using the online OpenEpi sample size calculator version 3.0. While the sample size of the study was modest, it was sufficient to achieve the study's objective.

3.3. Outcome variable

The ICOPE score was the primary outcome variable, calculated as the sum of six functional impairments assessed using the ICOPE tool. In this study, functional impairment was defined according to the WHO ICOPE screening tool as the presence of a limitation in one or more domains of intrinsic capacity. The tool assesses six domains: (i) cognition, (ii) mobility, (iii) nutrition, (iv) vision, (v) hearing, and (vi) psychological wellbeing. Impairment in a domain was coded as present if the participant responded positively to at least one screening item indicating difficulty or decline in that domain. The overall intrinsic capacity score was generated by summing impaired domains, with higher scores reflecting greater cumulative functional decline.

3.3.1. ICOPE tool translation

To ensure linguistic and cultural adaptability, a rigorous translation process was followed. The original English version of the ICOPE tool was first translated into Urdu by a bilingual expert. Another independent bilingual expert, blinded to the original tool, then back translated the Urdu version into English to ensure accuracy. This process helped identify discrepancies and maintain the intended meaning of the tool. A panel of geriatric specialists and public health experts reviewed the final Urdu version to validate its clarity, cultural appropriateness, and consistency. The finalized questionnaire consisted of two sections: the first section collected socio-demographic information, while the second included the translated Urdu version of the ICOPE tool.

3.4. Independent variables

Sociodemographic variables included age, recorded in years, gender, marital status, educational level, and household size, i.e., the number of people living in the participant's household. Details relevant to the number of male children, female children, and total children were also recorded. Health-related variables included the presence of self-reported physician-diagnosed comorbidities, namely diabetes, hypertension, ischemic heart disease, and osteoarthritis, as well as an indicator for other comorbidities aside from the afore-mentioned ones. The total number of comorbidities as well as the total number of daily medications taken by the participant was also recorded.

3.5. Data collection

Data was collected using structured interviews by Family Medicine postgraduate trainees during routine clinic visits for potential participants. The trainees received formal data collection protocols prior to data collection. Eligible participants who presented to the outpatient clinics for routine follow-up visits, chronic disease management (such as hypertension, diabetes, etc.), or minor acute conditions not requiring

Table 1
Distribution of sociodemographic and health-related factors of older adults (N = 81).

Factor	N (%)
Age*	69.14 ± 3.58
Gender	
Male	34 (41.98 %)
Female	47 (58.02 %)
Marital Status	
Married	58 (71.60 %)
Widowed/Single/Divorced	23 (28.4 %)
Level of Education	
Illiterate/Primary/Secondary	9 (11.11 %)
Undergraduate	28 (34.57 %)
Postgraduate	44 (54.32 %)
Number of People in Household*	4.23 ± 2.18
Diabetes	
Yes	36 (44.44 %)
No	45 (55.56 %)
Hypertension	
Yes	50 (61.73 %)
No	31 (38.27 %)
Ischemic Heart Disease	
Yes	14 (17.28 %)
No	67 (82.72 %)
Osteoarthritis	
Yes	32 (39.51 %)
No	49 (60.49 %)
Other Comorbidities/Ailments	
Yes	40 (49.38 %)
No	41 (50.62 %)
Total Comorbidities/Ailments*	2.11 ± 1.07
Total Daily Medications*	3 ± 2
Male Children*	1.39 ± 1.13
Female Children*	0.88 ± 1.18
Total Children*	2.28 ± 1.79

* This indicates the mean ± standard deviation of quantitative variables.

urgent referral were approached after they completed their clinical consultation. The postgraduate trainees briefed potential participants about the study aim to assess intrinsic capacity in older age using the WHO ICOPE screening tool as well as the processes the data collection process entailed. The questionnaire was administered by the postgraduate trainees in Urdu after obtaining informed written consent. Data collection took approximately 10–12 minutes to complete per participant.

All six ICOPE domains were assessed at screening stage, patients who reported a decline in any domain were counselled and referred to their primary physician for further evaluation.

3.6. Statistical analysis

For the descriptive analysis, mean and standard deviation and median and interquartile range for quantitative variables and frequencies and percentages were calculated for categorical variables. Simple robust linear regression was performed to calculate crude beta coefficients with 95 % confidence intervals. Variables with a p-value$\leq$0.25 were considered for further analysis. Multiple robust linear regression was employed to adjust for potential confounders. Adjusted beta coefficients with 95 % confidence intervals were reported. Variables with a p-value$<$0.05 were included in the final model. Regression analysis allowed for the adjustment of interaction and confounding, ensuring that observed associations reflected independent effects rather than being influenced by underlying covariates. Robust linear regression was used to account for potential violations of model assumptions, such as heteroscedasticity, ensuring more reliable and unbiased estimates of the associations between intrinsic capacity impairments and predictor variables.

Table 2
Distribution of individual ICOPE domains in older adults (N = 81).

ICOPE Domain	N (%)
Cognitive Decline	22 (27.16 %)
Cannot Recall Three Words	21 (25.93 %)
Disoriented to Time and Space	4 (4.94 %)
Limited Mobility	51 (62.96 %)
Malnutrition	22 (27.16 %)
Weight Loss	9 (11.11 %)
Appetite Loss	21 (25.93 %)
Visual Impairment	64 (79.01 %)
Hearing Loss	71 (87.65 %)
Depressive Symptoms	46 (56.79 %)
Low Mood	46 (56.79 %)
Loss of Interest	40 (49.38 %)

Table 3
Simple robust linear regression analysis of factors significantly associated with ICOPE score among older adults reporting the crude beta coefficient and 95 % confidence interval.

Variable	Crude Beta Coefficient (95 % CI)	P-Value
Age	0.11 (0.04–0.18)	0.0033
Hypertension		
Yes	0.92 (0.41–1.44)	<0.001
No	Reference	–
Ischemic Heart Disease		
Yes	0.80 (0.11–1.49)	0.0233
No	Reference	–
Other Comorbidities/Ailments		
Yes	0.87 (0.37–1.38)	<0.001
No	Reference	–
Total Illnesses	0.55 (0.33–0.78)	<0.001
Total Daily Medications	0.22 (0.10–0.35)	<0.001
Number of Male Children	0.18 (−0.05–0.42)	0.189
Number of Female Children	−0.19 (−0.42–0.03)	0.140

3.7. Ethical considerations

Ethical approval was obtained from the Aga Khan University Ethical Review Committee (2021–6051–19,439). All research activities were performed in accordance with the Declaration of Helsinki and in accordance with relevant institutional guidelines. Written informed consent was obtained from all participants prior to their inclusion in the study. All data collection procedures took place in a secluded setting to ensure participant privacy and no identifiers were recorded to maintain participant anonymity. The data was coded and secured in password-protected files to ensure confidentiality. Participants identified with functional decline through the ICOPE tool were advised to seek further evaluation from their primary care physicians.

4. Results

A sample of 81 older adults with a mean age of 69.1 ± 3.6 years was analysed for this study with nearly two-thirds of the sample consisting of females (n = 47, 58 %). Hypertension was the most commonly reported condition (n = 50, 61.7 %), followed by diabetes (n = 36, 44.4 %) and osteoarthritis (n = 33, 39.0 %). IHD was less commonly reported among the participants (n = 14, 16.5 %). On average, the respondents presented with 2.1 ± 1.1 illness (median: 2; IQR: 1–3), consumed 3 ± 2 medications daily (median: 3; IQR: 2–4), and had 2.3 ± 1.8 children (median: 2; IQR: 1–3) (mean: 1.4 ± 1.1 male children; 0.9 ± 1.2 female children). Refer to Table 1 for details about the study participants' sociodemographic details.

When assessed using the ICOPE tool, 27.2 % (n = 22) presented with cognitive decline, 63 % (n = 51) with limited mobility, 27.2 % (n = 22) with malnutrition, 79 % (n = 64) with visual impairment, 87.7 % (n = 71) with hearing loss, and 56.8 % (n = 46) with depressive symptoms.

Table 4
Robust linear regression analysis of factors associated with ICOPE score among older adults reporting the adjusted beta coefficient and 95 % confidence interval.

Variable	Adjusted Beta Coefficient (95 % CI)	P-Value
Hypertension		
Yes	0.70 (0.21–1.19)	0.006
No	Reference	–
Ischemic Heart Disease		
Yes	0.73 (0.06–1.39)	0.032
No	Reference	–
Other Comorbidities		
Yes	0.59 (0.11–1.06)	0.016
No	Reference	–
Number of Female Children	−0.20 (−0.40–0.00)	0.046
Interaction: Age and Gender		
No increase in Age # Male	Reference	–
No increase in Age # Female	10.75 (0.74–20.76)	0.036
5-year increase in Age # Male	0.95 (0.35–0.62)	0.002
5-year increase in Age # Female	−0.75(−0.05–0.19)	0.039

***Overall model p-value=<0.001; **Overall model F-value=6.47.

The mean ICOPE score was reported to be 3.4 ± 1.2 (median: 4; IQR: 2–4). Table 1 summarizes the descriptive statistics for the study sample. Table 2 summarizes the distribution of individual ICOPE domains for the participants.

Significant associations were reported between the participants' ICOPE score and the variables of age (p-value=0.0033), hypertension (p-value=<0.001), IHD (p-value=0.0233), other ailments (p-value=<0.001), total illnesses (p-value=<0.001), and the number of daily prescribed medication (p-value=<0.001). The summary of the univariate analysis is reported in Table 3. Older adults with hypertension had significantly higher ICOPE scores, increasing by 0.70 units (95% CI:0.21–1.19). Similarly, ischemic heart disease was associated with a 0.73-unit increase (95% CI:0.06–1.39), emphasizing the role of cardiovascular conditions on intrinsic capacity. Interestingly, ICOPE scores decreased by 0.20 units (95% CI:–0.40 to –0.00) with each additional female child. Among women, the estimated ICOPE score declined by 0.75 units (95% CI:–0.05 to 0.19) for every five-year increase in age, after adjusting for other variables. These results are summarized in Table 4, which presents adjusted beta coefficients and 95% confidence intervals from the final multivariable linear regression model.

5. Discussion

5.1. Summary of key findings

In this study, the ICOPE tool was translated and used to assess intrinsic capacity among older adults, evaluating its applicability as a screening tool and the performance of its individual components in a tertiary care setting. High levels of impairment were observed across multiple intrinsic capacity domains among older adults in Karachi, with hearing, vision, and mobility most frequently affected. The prevalence of NCDs observed was comparable to that reported in previous community-based studies [24,25]. The findings indicate that the ICOPE tool can be effectively applied in a tertiary care setting, with regression analysis further highlighting significant associations of intrinsic capacity with hypertension, ischemic heart disease, other comorbidities, as well as age- and gender-related differences.

5.2. Comparison with global and regional studies

A significant association was found between reduced intrinsic capacity and the presence of hypertension and ischemic heart disease highlighting the broader challenge of multimorbidity, where multiple chronic conditions interact to accelerate functional decline. Hypertension, IHD, and osteoarthritis were reported to significantly impact intrinsic capacity, reinforcing the need to shift from disease-specific management to comprehensive geriatric assessment [6]. Integrating physiotherapy, cognitive training, and nutritional support could help improve intrinsic capacity [26]. Given the high burden of multimorbidity among older adults in Pakistan, healthcare systems should prioritize person-centred care that focuses on maintaining functional health and preventing disability.

Cognitive decline was frequently observed, with many participants unable to recall three words, despite being oriented to time, place, and person. This is consistent with prior research and may reflect underdiagnosed cognitive impairment in clinical settings [25,27]. The results of this study also identified high rates of depression, consistent with prior research in Pakistan [28–30]. The strong relationship between cognitive impairment and depression has been well-documented, with depression often exacerbating memory deficits and functional decline [31].

Additionally, hearing loss, one of the most prevalent impairments in this study, has been linked to cognitive decline, likely due to reduced sensory input, communication difficulties, and social isolation, which collectively contribute to poorer cognitive outcomes [32–35]. These findings highlight the need for integrated screening strategies that address both sensory and cognitive health in ageing populations.

High rates of mobility impairment likely reflect sedentary lifestyles, compounded by osteoarthritis and osteoporosis, which increase fall risk and reduce quality of life [36]. Previous research has also reported a high prevalence of osteoarthritis and osteoporosis among older adults, conditions that can result in postural instability, reduced mobility, and an elevated risk of falls [37–40]. Falls, in turn, negatively affect quality of life, often leading to self-imposed activity limitations, depression, and anxiety [39,41].

The ICOPE tool demonstrated strong feasibility, in our context. The malnutrition domain of the ICOPE tool posed a challenge in our study setting. Many participants were unaware of their baseline weight or were unable to quantify weight loss. For those attending follow-up visits, weight was available in medical records; however, this approach would not be feasible in a community-based setting. A more practical alternative would be to incorporate self-reported loosening of clothes as an indicator of unintentional weight loss when specific weight measurements are unavailable.

5.3. Sociocultural and gender dynamics

Most participants had impairments in at least three intrinsic capacity domains, supporting the need for community-based screening in high NCD-burden settings [42]. These impairments negatively impact social engagement, as hearing loss often leads to social isolation, while mobility problems may restrict participation in community activities [43,44]. Prior research has also demonstrated that intrinsic capacity impairments contribute to increased dependence, hospitalization, and mortality among older adults [43,45]. Assessing intrinsic capacity is a critical step in preventing or slowing the progression of functional decline, especially in low- and middle-income countries (LMICs) that lack the resources and infrastructure to support a rapidly ageing population.

This study's sample was predominantly female, reflecting broader demographic patterns, as women tend to live longer and are more frequently represented in ageing cohorts. In South Asian settings, older women, especially widows, may face greater vulnerability due to cultural norms that limit social support, contributing to higher risks of depression and functional decline [46].

An unexpected finding was the negative association between ICOPE scores and the number of female children. This could reflect sociocultural dynamics in Pakistan, where sons are often expected to provide financial support, while daughters, though more involved in emotional and hands-on caregiving, may face constraints due to marriage or domestic obligations [47]. However, daughters are often more involved in

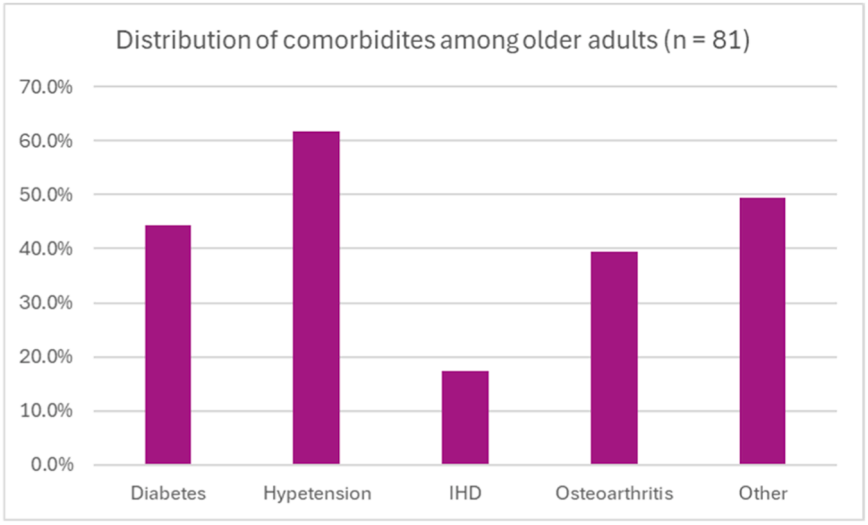

Fig. 1. Distribution of comorbidities in older adults (n = 81).

managing health, providing companionship, and supporting daily functioning, all of which can positively impact intrinsic capacity [48]. This aligns with prior evidence suggesting that daughters play a central role in preserving functional ability and emotional well-being in later life [49,50].

In LMICs like Pakistan, intrinsic capacity is shaped not only by biological ageing, but also by socioeconomic conditions, education, and healthcare access. Pakistan's healthcare system is highly heterogeneous, with significant disparities in healthcare access between urban and rural populations. Older adults from disadvantaged backgrounds often face multiple barriers, such as limited preventive care, poor nutrition, and weak social support systems, all of which can accelerate functional decline. Cultural expectations, such as reliance on sons for financial support or the isolation of widows, may further compound vulnerability, particularly among older women. These factors highlight the need to utilize screening tools like ICOPE in community-based research that incorporates gender, literacy, and healthcare access variables to develop inclusive, culturally relevant strategies for healthy ageing. Future studies should also assess the applicability of the ICOPE tool in rural and underserved areas, where health access barriers may further impact intrinsic capacity.

5.4. *Strengths, limitations, contributions, and recommendations*

This study has several limitations. The relatively small sample size and use of convenience sampling in an outpatient setting may limit generalizability. Participants were drawn from an urban, clinical population, which may overrepresent functional decline compared to community-based or rural older adults. Future research should employ probability-based sampling methods and include participants from diverse healthcare settings, including public, rural, and community-based facilities, to improve representativeness. The cross-sectional

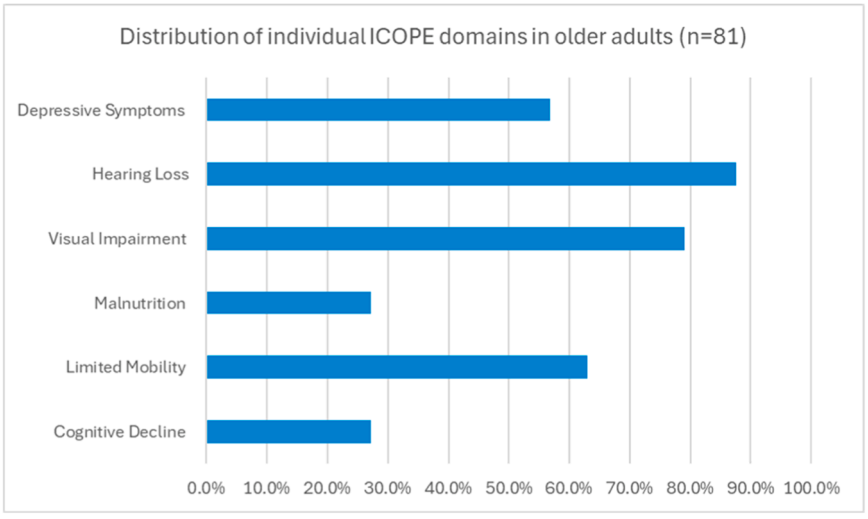

Fig. 2. Distribution of individual ICOPE domains in older adults (n = 81). Significant associations were reported between the participants' ICOPE score and the variables of age (p-value=0.0033), hypertension (p-value=<0.001), IHD (p-value=0.0233), other ailments (p-value=<0.001), total illnesses (p-value=<0.001), and the number of daily prescribed medication (p-value=<0.001). The summary of the univariate analysis is reported in Table 3. Older adults with hypertension had significantly higher ICOPE scores, increasing by 0.70 units (95 % CI:0.21–1.19). Similarly, ischemic heart disease was associated with a 0.73-unit increase (95 % CI:0.06–1.39), emphasizing the role of cardiovascular conditions on intrinsic capacity. Interestingly, ICOPE scores decreased by 0.20 units (95 % CI:0.40 to –0.00) with each additional female child. Among women, the estimated ICOPE score declined by 0.75 units (95 % CI:0.05 to 0.19) for every five-year increase in age, after adjusting for other variables. These results are summarized in Table 4, which presents adjusted beta coefficients and 95 % confidence intervals from the final multivariable linear regression model.

design limits the ability to infer causality between intrinsic capacity impairments and non-communicable diseases. While significant associations were observed, the directionality of these relationships remains unclear. Longitudinal studies are needed to track changes in intrinsic capacity and assess the impact of targeted interventions over time. Although the ICOPE tool was translated into simple Urdu, most participants had higher levels of education, which may have facilitated comprehension. Further testing is warranted among populations with lower literacy to ensure usability across socioeconomic strata.

Despite these limitations, this study is among the first few studies in Pakistan to translate and apply the WHO ICOPE framework to assess intrinsic capacity in a tertiary care setting. It provides valuable information about common functional impairments, including cognitive decline, mobility limitations, and sensory loss, among older adults in Pakistan. These findings contribute to the limited evidence base on geriatric health in South Asia and support the need for community-based screening and early intervention programs. Minor modifications to the malnutrition section of the ICOPE tool are recommended to improve clarity and applicability in the Pakistani context. Additionally, future community-based studies should be conducted to establish baseline intrinsic capacity in older adults and assess the effectiveness of the WHO ICOPE care pathways in promoting healthy ageing.

6. Conclusion

The older adult population in Pakistan faces a high burden of NCDs, which significantly impact intrinsic capacity across multiple domains. Routine screening using the ICOPE tool can enable early identification of functional impairments and guide timely interventions to enhance quality of life. Integrating the ICOPE tool into clinical and community-based care can help tailor interventions using the ICOPE care pathways, to address specific impairments. These actions have the potential to delay disability and promote healthier ageing. Scaling up its use could support patient-centred strategies to reduce functional decline and improve the wellbeing of older adults across diverse care settings. (Figs. 1, 2).

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CRediT authorship contribution statement

Saniya Raghib Sabzwari: Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Conceptualization. **Samreen Fatima:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Data curation. **Sonia Sameen:** Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Investigation, Formal analysis, Data curation. **Noshi Maria:** Formal analysis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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