A Scoping Review of Community Based Geriatric Health Assessment and Screening Tools used in South Asia Region

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Abstract

There have been many geriatric tools developed to assess health status targeting especially for older adults from developed nations but not context specific. Whereas finger count tools are available for LMICs, especially the South Asia population. CGA, as opposed to medical examination, uses multiple tools to capture a holistic health status of the older adults in line with the more comprehensive WHO definition of health. It includes a harmonized evaluation of the clinical, functional, psychological, environmental and social health status of older population. Although there is no standardized format for carrying out CGA, there is broad consensus on the domains that need to be measured. For the better caring of culturally diverse South Asian older population, we need to develop more culturally competent CGHA tools. So, this review summarised studies that describe validated tools for assessing geriatric health in community settings in South Asia. We followed Arksey and O’Malley’s five-stage scoping review framework, refined with the Joanna Briggs Institute methodology, to identify the research questions, identify relevant studies, select studies, chart the data, and collate and summarize the data. Using the PRISMA-ScR guidelines, a search of 3 databases (PubMed, Embase and PsychInfo was undertaken. After applying eligibility criteria to 607 articles, only 46 studies met the inclusion criteria. 7 studies reported on medical assessment, 4 studies assessed psychological condition, 6 studies assessed functional issue, 2 studies assessed social wellbeing and 9 studies reported on different domains. None study measured all domains. 24 tools calibrated with Gold standard measure, were validated and reliable by assessed with psychometric properties such as sensitivity, specificity, PPV, NPV and ROC-AUC. Meanwhile, 21 tools were validated exclusively for older adults, whereas there are no validated tools available for CGHA in South Asia. This review will guide us for development of CGHA tools or adaptation of existing tools in our context. As well, it will help practitioners to develop tools to measure comprehensive health of the elderly in their context.
With an increasingly older population across the world, the older adults contribute to a majority of disease burden and subsequently the healthcare expenditures in these countries. (1). (2). (3). This burden is more acute in low-income settings where the need for healthcare in older age groups is greater and coverage of health and social security schemes is inadequate. (4) Projections have shown that an overwhelming proportion of global disease burden will be from age-related disorders in the foreseeable future. (5)

Comprehensive geriatric assessment (CGA) is recognized as a key tool to address the health needs of older adults. It includes a harmonized evaluation of the clinical, functional, psychological, environmental and social health status of older population. (6) Although there is no standardized format for carrying out CGA, there is broad consensus on the domains that need to be measured. (7) CGA, as opposed to medical examination, uses multiple tools to capture a holistic health status of the older adults in line with the more comprehensive WHO definition of health. (8)

Many tools have been developed and validated for various domains of geriatric health and are used in CGA. Most of the tools are focussed on a particular domain of CGA and a majority of these have been validated for use in high-income countries, where they have been developed. (9) (10) (11). Concerns have been raised on the utility and accuracy of these tools in Low and Middle-income countries (LMIC). (12) Unlike clinical evaluation, CGA involves complex constructs that are influenced strongly by the socio-cultural milieu of the end-users and target population, which are widely diversified across regions, let alone the world. Therefore, tools need contextual adaptation and validation for optimum utility in the targeted settings.

While there still are linguistic and regional differences among regions in South Asia, historically, the sub-continent has had a common socio-cultural thread running through it making generalizability of health interventions easier. This scoping review aims to summarize studies that describe validated tools for assessing geriatric health in community settings in South Asia. We believe there is no single tool validated for CGA in this population and there is no structured evidence synthesis conducted to map empirical evidence for tools specifically for this population. So this review will provide evidence to researchers and practitioners on available validated tools, their psychometric properties and validity in order to enable them to make an informed choice on which tool to include in community-based CGA. Findings of this review could also aid in identifying scope for further updating of existing tools for the South Asian population as well as identify crucial gaps in the domains of CGA where validated tools are missing.

**Methods**

This scoping review was conducted in order to map and describe available validated community-based geriatric health assessment tools in South Asia. This study was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement for reporting systematic reviews-extension (13) presented in Appendix-1 and registered with Open Science Framework [10.17605/OSF.IO/TFR3H](https://doi.org/10.17605/OSF.IO/TFR3H).

We followed the Arksey and O’Malley framework for conducting scoping reviews which used the following steps - Identification of relevant studies, Study selection, Data charting, Data reporting. (14).

**Identification of relevant studies**
We conducted a systematic search of the following relevant electronic databases: MEDLINE (Via PubMed), Embase (via Ovid) and PsychInfo (via Ovid). As English is the preferred scientific communication language in the region, we searched for articles published in English without any date restrictions. The pilot searches were carried out on variations of the word "Community-based", "elderly", "Health assessment*" "screening", "Tool*", South Asia that appeared in Title/Abstracts. The detailed of search string was presented in Appendix 2. In addition, relevant papers were identified through reference mining and Google scholar database using the keywords.

**Study selection**

After an extensive search in databases, all the eligible studies meeting our inclusion were downloaded and then imported to citation manager (Mendeley). Following de-duplication of electronic articles, two independent review authors (SP & TB) screened relevant articles based on Title/Abstract. Discrepancies were discussed and resolved. In case no consensus was reached, a third author (JSK) made the decision. Full texts were retrieved and reviewed for eligibility. We included studies conducted in any of the 7 South Asian countries that evaluated geriatric health assessment tools, or any of the sub-domains or reported its development process or validation. We excluded manuscripts that were in form of Comments, editorial, letters, Conference or congress papers, abstracts and reviews. We have included those institutional geriatric health assessment tools which can be implemented in community setting as well. Full-text review followed the same method as Title/abstract screening with disagreements resolved by consensus or by a 3rd author. In this study, we have not considered methodological rigor of the included studies.

**Charting the data**

A standard data extraction sheet was prepared by review team to capture all relevant aspects. This extraction sheet was developed iteratively and updated as required. The study characteristics like country of origin, objective, sample characteristics, setting, sample size and sampling method were extracted. Detailed description of the health assessment tool and the procedure of its development, composition, validity, reliability, feasibility, mode and duration of administration of the instrument were extracted from the relevant paper. After completion, the charted tables were examined further within reviewer to ensure accuracy and consistency.

**Collating, Summarising and reporting the result**

Narrative summary of result is presented. Tables were used to present specific details of the tools and development process. The result sections first described the characteristic of the studies, characteristics of the tool described and its clinometric or psychometric properties.

We carried out qualitative thematic analysis of the items or tools included and categorized them into 5 broad domains and further subdomains of CGA as follows(15).

a. Medical Assessment  
b. Functional Assessment  
c. Social Assessment  
d. Environment Assessment  
e. Multiple
Similarly, we also summarized the most reported outcome measures of validity and reliability such as sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and receiver operating characteristics area under curve (ROC-AUC).

**Results**

A total of 46 studies were included in the final analysis. The PRISMA flow diagram for the study selection is provided in figure 1.

All studies were cross-sectional in nature and aimed to either develop, validate or test tools for assessment of different health parameters. A considerable number were part of larger studies or trials with different study designs and a few were multi-national in scope, but we are presenting only the
components that concerned the tool development/validation in South Asia only. All studies included participants from all genders and social classes Rathnayake-2020 which was done in post-menopausal women(16). Majority of studies did not specify the theory/model/framework used to build the tools while 5 studies(17)(18)(19)(20)(21) used regression models to develop the tools. The studies characteristics are summarized in table-1 below.

**Table-1: Characteristic of Included studies**

| Author / YYYY | Tool developed/validated/tested | Country of origin | Study setting | Age group | Sample Size & Sampling Method |
|---------------|---------------------------------|-------------------|--------------|-----------|-------------------------------|
| Adhikari 2009 | Madras Diabetes Research Foundation (MDRF)-Indian Diabetes Risk Score (IDRS) | India | Semi-urban | >20 years | 551, random |
| Bhowmik 2015 | Simple- diabetes risk score (DRS) | Ban’esh | Rural | >25 years | 3129, random |
| Chatterjee 2019 | Integrated care tool (ICT-BRIEF) | India | Hospital, community (Both rural and urban and old age home) | >=60 years | 635, random |
| Chokkanathan 2013 | Centre for Epidemiological Studies – Depression scale (CES-D) | India | Urban | >=65 years | 400, random |
| Corsi 2012 | Environmental Profile of a Community’s Health (EPOCH-2) | Multiple (India in south Asia) | Rural and urban | 35-70 years | 2381, convenient |
| Dandona 2000 | WHO Quality of Life- for vision (WHOQOL-vision) | India | Both rural and urban | 16-75 years | 172, NA |
| Dasgupta 2020 | Alzheimer Questionnaire | India | Urban | >=60 years | 140, random |
| De Silva 2016 | Quality of life instrument for the young elderly in Sri Lanka (QLI YES) | Sri Lanka | Urban and rural | 60-74 years | 200, random |
| Deepthi 2012 | Single question and Shortened Hearing Handicap Inventory for Elderly (HHIE-S) | India | Rural | >60 years | 175, purposive |
| Ganguli 1995 | Hindi Mini-mental state examination (HMSE) | India | Rural | >55 years | 100, random |
| Husain 2006 | Personal Health Questionnaire (PHQ) and Self Reporting Questionnaire (SRQ) | Pakistan | Rural | >18 years | 258, random |
| Jotheeswaran 2016 | EASY-care Independence Scale (EASY Care) | India | Both rural and urban | >60 years | 152, purposive |
| Khan 2015 | Questionnaire to Verify Stroke Free Status (QVSFS) | Pakistan | Urban | >40 years | 322, purposive |
| Marella 2014 | Rapid assessment of Disability (RAD) | Bangladesh | Both rural and urban | >18 years | 1855, random |
| Misra 2014 | Global physical activity questionnaire (GPAQ) | India | Both rural and urban | 15-65 years | 234, random |
| Moiz 2017 | Activities-specific balance confidence in Hindi (ABC-H scale) | India | Urban | 60-86 years | 125, convenient |
| Nepal, G. M., 2019 | Timed up and Go (TUG) test | Nepal | Rural | 60-91 years | 100, convenient |
| Perera, B. P. R., 2020 | WHO-5 well-being index | Sri Lanka | Semi-Urban | 16-75 years | 300, convenient |
| Poongothai, S., 2009 | Personal health questionnaire (PHQ-9,PHQ-12) | India | Urban | ≥ 20 years | 100, random |

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| Author | Year | Title | Country | Region | Age | Sample Size | Methodology Notes |
|--------|------|-------|---------|--------|------|-------------|-------------------|
| Prince, M. | 2003 | Community Screening Instrument for Dementia (CSI ‘D’), Informant interview about daily functioning (IDF), Consortium to Establish a Registry of Alzheimer’s Disease (CERAD) | Multiple (India in south Asia) | Universities | 60 years and older | 2885 (Indian sample 760) |
| Qin 2018 | | General Health Questionnaire (GHQ-12) | India | Both rural and urban | >=60 years | 9478, random |
| Ramachandran 2005 | | DRS- Urban Indians | India | Urban | >=20 years | 4993 (score development), 5010 (validation), random |
| Rathnayake 2020 | | Health Promoting Lifestyle Profile-II (HPLP-II) | Sri Lanka | Both rural and urban | >40 years, post-menopausal | 245, random |
| Sarkar 2015 | | Geriatric depression scale (GDS-15) | India | Rural | >60 years | 242, purposive |
| Sherpa 2015 | | St. George respiratory questionnaire (SGRQ) | Nepal | Both rural and urban | 40-80 years | 150, consecutive |
| Siriwardhana 2018 | | Sinhala Instrumental Activities of Daily Living (IADL) | Sri Lanka | Rural | >60 years | 702, random |
| Stanley 2009 | | Vellore Screening Instrument for Dementia – Patient and Informant (VSID-P and VSID-I) | India | Both rural and urban | >65 years | 191, purposive |
| Stewart 2016 | | Short schedule of 10/66 tool | India (and others) | Both rural and urban | >65 years | 2631, random (from all sites) |
| Tausig 2003 | | Modified DSM-III-R Criteria Checklist | Nepal | Rural | >18 years | 653, random |
| Vaz, M. | | Semi-pictorial Rural Physical Activity Questionnaire (RPAQ) | India | Rural | 35-70 years | 77, purposive |
| Pati 2016 | | Multimorbidity assessment in primary care (MAQ-PC) | India | Both urban and rural | >18 years | 120, random |
| Mohan 2005 | | Indian Diabetes Risk Score (IDRS) | India | Urban | >18 years | 2350, random |
| Fillenbaum 1999 | | Everyday abilities scale for India (EASI) | India | Rural | >55 years | 387, random |
| Rao 2012 | | National Institute of Mental Health and Neurosciences (NIMHANS) Headache questionnaire | India | Both urban and rural | 10-65 years | 381, random |
| Gaiki 2014 | | Mini nutritional assessment (MNA) scale | India | Rural | >60 years | 80, purposive |
| Pandav 2002 | | Functional Ability Scale — EASI and HMSE | India | Rural | >=55 years | 632, random |
| Ghoshal 2015 | | Enhanced Asian Rome III questionnaire (EAR3Q) | India (among other Asian countries) | Both urban and rural | 18-66 years | 75, purposive |
| Swati 2015 | | Dementia assessment by Rapid test (DART) | India | Both urban and rural | 55-84 years | 150, purposive |
| Umayal 2010 | | Modified Bristol and Blessed scale | Sri Lanka | Both urban and rural | >=55 years | 73, purposive |
| Diwan 2018 | | Stroke impact scale | India | Both urban and rural | 35-74 years | 26, purposive |
| McIntyre 2020 | | Personal wellbeing index (PWI) | India | Both urban and rural | >18 years | 2004, quota |
| Anjana 2015 | | MDRF- Physical Activity Questionnaire (MPAQ) | India | Both urban and rural | >=20 | 543, random |
All the tools were either self-administered or administered through an investigator or health worker except 2 tools, modified DSM-III checklist (22) and EASY-care (23) which were designed to be used by clinicians. The characteristics of the tools are provided in table-2 below.

| Domain                  | Sub-domain | Instrument name                  | No. of Items | Language | Duration (mins) | Origin  |
|-------------------------|------------|----------------------------------|--------------|----------|----------------|---------|
| Medical                 | Diabetes   | MDRF-IDRS                         | 4            | Not specified | NA            | Adapted |
|                         |            | Simple DRS                        | 5            | NA       | NA             | Original |
|                         |            | DRS-urban Indians                | 7            | NA       | NA             | Original |
|                         |            | IDRS                             | 4            | NA       | NA             | Original |
|                         | Pulmonary disease | SGRQ                   | 76           | Nepali   | NA             | Adapted |
|                         | Stroke     | QVSFS                            | 8            | Urdu     | 7              | Adapted |
|                         | Headache   | NIMHANS Headache questionnaire   | NA           | NA       | NA             | Original |
|                         | Nutritional status | MNA                   | 18           | Marathi  | NA             | Adapted |
|                         | Bowel disease | EAR3Q               | NA           | Chinese Hindi-Telugu | 35       | Adapted |

All the tools were either self-administered or administered through an investigator or health worker except 2 tools, modified DSM-III checklist (22) and EASY-care (23) which were designed to be used by clinicians. The characteristics of the tools are provided in table-2 below.
| Psychological Assessment | Depression | Indonesian | Korean | Thai | PHQ and SRQ | PHQ=16; Urdu | NA | Adapted |
|--------------------------|------------|------------|--------|------|-------------|-------------|-----|---------|
|                          | CES-D      |            |        |      | 20          | Tamil       | NA  | Adapted |
|                          | GDS-15     |            |        |      | 15          | Tamil       | NA  | Adapted |
|                          | PHQ-9,PHQ-12 |        |        |      | 9, 12       | NA          | NA  | Adapted |
| Psychological disorders  | CSI 'D', IDF, CERAD | CSI "D"= 32, IDF=26, CERAD=10 | Multiple Local languages | NA | Original |
|                          | DART       |            |        |      | 4           | NA          | 5   | Original |
|                          | VSID-P and VSID-I |            |        |      | 10          | Tamil       | 05-Jun | Original |
|                          | Short schedule of 10/66 tool |            |        |      | 12          | Multiple Local languages | 10~15 (participant) | Adapted |
| Cognitive impairment     | HMSE       |            |        |      | 13          | Hindi       | NA  | Adapted |
|                          | Alzheimer Questionnaire |            |        |      | 21          | Bengali     | NA  | Adapted |
| Functional Assessment    | MDRF-MPAQ  |            |        |      | NA          | Tamil       | 10  | Original |
|                          | Semi-pictorial RPAQ |            |        |      | 20          | NA          | NA  | Original |
|                          | GPAQ       |            |        |      | 16          | Hindi       | NA  | Adapted |
| Category                              | Measurement                        | Language | Version | Adapted Status |
|---------------------------------------|------------------------------------|----------|---------|----------------|
| Mobility                              | TUG test                           | NA       | Nepali  | NA             | Adapted       |
| Falls                                 | ABC-H scale                        | 16       | Hindi   | NA             | Adapted       |
| Hearing loss                          | Single question and HHIE-S         | 1 and 10 for HHIE-S | Kannada | NA             | Adapted       |
| Disability                            | RAD                                | 92       | Bangla  | 45             | Adapted       |
| Activities of daily living            | Sinhala IADL                       | 8        | Sinhala | Oct-15         | Adapted       |
|                                      | EASI                                | 12       | NA      | NA             | Original      |
|                                      | Modified Barthel index             | 10       | NA      | NA             | Adapted       |
|                                      | ADL, IADL, POMA                    | 6 for ADL, 8 for IADL, 24 for POMA | NA      | NA             | Adapted       |
|                                      | Modified Bristol and Blessed scale | Bristorl=14; Blessed=13 | Sinhala | NA             | Adapted       |
|                                      | EASY-care Independence scale       | 18       | NA      | NA             | Adapted       |
| Social Assessment                     | Subjective wellbeing               | PWI      | 2 versions-7 and 8 items | English | NA | Adapted       |
|                                      | Health-promoting behavior          | HPLP-II  | 52      | Sinhala        | NA            | Adapted       |
| Multiple                              | Vision specific quality of life (6 domain of QoL: physical, social, psychological, environmental, level of independence, religion domain) | WHOQOL-vision | NA | Telugu | 10-20 | Original |
|                                      | QoL for young elderly (6 domains: physical, mental, social, functional, environmental, and spiritual) | QLI YES | 30 | Sinhala | NA | Original |
| Measure of Wellbeing | Tool Name                  | Language(s) | Cronbach’s α | Specificity (%) | Sensitivity (%) | Cut-off Optimization |
|----------------------|---------------------------|-------------|--------------|-----------------|-----------------|----------------------|
| Level of wellbeing, Depression, Anxiety & depressive symptoms | WHO-5 Well-being index | Sinhala     | NA           | 5               | 20-25           | Original             |
| Multimorbidity, Functional limitation, QoL, Health care utilisation | MAQ-PC                  | Odia        | 20-25        | 32              | 52               | Original             |
| Physical, social, Mental, well-being, Elder abuse | ICT-BRIEF                | Hindi       | 15-20        | 30              | 30               | Original             |
| Physical, mental, functional health, chronic diseases, health behaviours. | SRH                      | NA          | NA           | 1               | NA               | Adapted              |
| Cognitive impairment, Functional ability, Dementia | Functional Ability Scale — EASI and HMSE | Hindi       | NA           | 11              | NA               | Original             |
| Stroke specific QoL (Memory, ADL, Mobility, Social-cognitive) | Stroke impact scale      | Gujarati    | NA           | 59              | NA               | Original             |
| Quality of life (physical, social, emotional well-being, level of independence, self-actualization, and planning and organization) | VisQoL                   | Telugu, Hindi | NA          | 6               | NA               | Adapted              |

### Measures of tool

The most common measures of validity of the tools were compared with a defined "Gold standard" to evaluate the sensitivity, specificity, predictive values and cut-off optimization which was reported in some form for 24 tools and summarized in table-3 below. The other measures of tool design and validation reported were factorial analysis by Bartlett's test of sphericity, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, exploratory and confirmatory factor analysis (EFA/CFA), content, convergent, divergent, criterion and construct validity by inter-item and spearman's correlation, reliability by tests of internal consistency such as Cronbach's α and test-retest reliability by Intraclass correlation coefficients (ICCs), Inter-rater reliability Cohen's Kappa.

#### A. Medical Assessment tools -

The included studies reported on 11 tools related to medical assessment in older adults. Four tools - MDRF-IDRS(24), Simple DRS(17), DRS- urban Indians(20), IDRIS(25) were for risk scoring of diabetes by regression models using baseline population data. All tools reported moderate sensitivity (range: 62.2%-76.6%) and specificity (range: 59.9-73.7), excellent PPV of over 95% each but poor NPV of below 20%.
The QVSFS(26) was intended to verify the stroke-free status and Stroke impact scale to assess the post-stroke quality of life. NIMHANS Headache questionnaire(27) was used for headaches and EAR3Q(28) for bowel diseases.

The EPOCH-2(18) and MNA(29) assessed cardio-vascular and nutritional status respectively and reported reliability of the tools which was good in both cases. EPOCH-2 had Kappa values of over 0.8 for all items (range:0.81-0.96) and MNA had overall kappa of 0.78. Reliability was almost perfect for items on BMI, calf circumference, independence, polypharmacy, morbidities and skin ulcers. SGRQ(30) used linear regression models to predict COPD and found a strong negative correlation between SGRQ scores and lung capacities with a ROC-AUC of 0.78 for a cut-off of 33 points.

B. Psychological assessment tools

There were 4 studies each that assessed tools related to depression (PHQ/SRQ(31),CES-D(32), GDS-15(33), PHQ-9-12(34)) and dementia (CSI ‘D’/IDF/CERAD(35), DART(36), VSID-P/VSID-I(37), Short schedule of 10/66 tool(38)). All the tools for depression and dementia reported moderate to good sensitivity and specificity as shown in table 3. The CES-D scale showed good internal consistency (Cronbach’s alpha=0.89) and factorial analysis showed significant factor item loadings and correlations between dimensions (r >0.8).

Two studies reported on tools for assessment of psychological disorders (Modified DSM-III-R Criteria Checklist(22), GHQ 12(39)). The DSM-III checklist had good construct validity which was assessed by an output of similar prevalence of common psychiatric conditions as compared to those measured by other standard tools. It had variable reliability with low alpha values for schizophrenia (0.45) and mania (0.59) and high alpha values for depression (0.92) and anxiety (0.98). All constructs had mild correlation (r<0.15) except depression and depressive mood (r=0.48). The GHQ-12 tool showed good internal consistency with a Cronbach’s alpha of 0.90. Factor analysis of the GHQ-12 showed that 2 significant components contributed to 59% of the variance. The correlation with subjective wellbeing index scores was moderate (r=0.58) and the study met the KMO criteria for sampling adequacy and significant Bartlett’s test.

Two studies reported on tools assessing cognitive impairment (HMSE(40), Alzheimer Questionnaire(41)). The HMSE had moderate sensitivity and specificity, good NPV but poor PPV as shown in table 3. The Alzheimer’s questionnaire showed good agreement (Cohen’s kappa=0.83) and a strong negative correlation (Spearman’s Rho=-0.709) with the gold standard. It showed moderate to good sensitivity and specificity with a good PPV as shown in table 3.

C. Functional assessment tools

ADL: A total of 6 studies reported on tools assessing ADL. The Sinhala version of ADL(42) had good internal consistency with a Cronbach’s alpha of 0.92 and the ICC for all the raters were above 0.5 indicating moderate to excellent reliability. Bartlet’s test was significant and sampling was adequate with KMO=0.898. Item scale correlation for all the items was greater than 0.7 except for item 1. Values of goodness of fit indices were in acceptable range indicating an excellent model fit. Item 1 (ability to use telephone) consistently demonstrated poor validity. The Spearman’s correlation coefficients with Lawton IADL score and the scores of Barthel index were 0.61 and 0.41 respectively.

The EASI(43) tool had moderate sensitivity and high specificity as shown in table 3. In the Modified Barthel index, substantial agreement was observed between telephonic and face-to-face assessment at 3 and 6 months with weighted Kappa of 0.63 (95% CI 0.61–0.68) and 0.72 (95% CI 0.70–0.77) respectively. Cronbach’s alpha was 0.89 at 3 months and 0.94 at 6 months. The sensitivity and specificity values are provided in table 3.
Singh et al. (44) compared the relationship between 3 tools for activities of daily living with age and frequency of falls. All 3 tools - ADL, IADL and POMA showed a low correlation with age \(r = -0.25, -0.48\) and \(-0.43\) respectively) and moderate to high correlation with frequency of falls \(r = -0.49, -0.63\) and \(-0.49\) respectively). EASY Care (23) independence scale had a good reliability with Cronbach’s alpha across the 18 items over 0.89. The modified Bristol and Blessed scales (45) had very high sensitivity and moderate specificity as shown in table 3.

**Physical activity**

Three studies reported tools assessed for physical activity. MDRF-MPAQ (46) showed an ICC between baseline and 1st month between 0.73 - 0.82 and an ICC between GPAQ and MPAQ of 0.40. Construct validity was assessed by linear association between sitting and Moderate/vigorous physical activity (MVPA) and BMI and waist circumference. Spearman’s correlation coefficients against accelerometer for sedentary activity was 0.48 (95%CI-0.32-0.62), MVPA was 0.44 (0.27-0.59) and overall Physical activity for MPAQ was 0.46 (0.29-0.60).

Semi-pictorial RPAQ (47) had moderate reliability with correlations between two questionnaires administered one year apart were moderately high \(r = 0.37\) to 0.52). Correlations between the first questionnaire and the mean of at least 4 questionnaires administered during the course of one year were generally high (males; \(r = 0.69\), females; \(r = 0.7\)).

GPAQ (48) had very good reliability with a Cohen's kappa of 100%, Spearman’s Rho between 0.40-0.59 and ICC between 0.37 to 0.81. Concurrent validity was assessed by correlation between different variables and the Spearman’s Rho was between 0.89-1.00 while the ICC ranged from 0.76 to 0.91. Criterion validity was assessed by Intra-cluster correlation and kappa values which ranged from 0.68 to 0.72 and 0.51 to 0.58 respectively.

**Mobility**

A single study assessed mobility by an adapted version of the TUG test (49). This had a good inter-rater reliability between the student physiotherapist and caregivers with an ICC of 0.87 (95% CI: 0.82–0.91).

A single study each reported tools used to assess disability, hearing loss and falls. Their validity parameters are provided in table 3.

**D. Social assessment tools**

2 studies reported on tools related to social constructs. Subjective wellbeing as assessed by PWI (50) which had good consistency with a Cronbach’s alpha of 0.89 for the 7-item scale and 0.88 for the 8-item scale. All factor loadings were greater than 0.50 indicating practical significance.

Health-promoting behavior was assessed by HPLP-II (16). This tool had a Cronbach’s alpha of 0.98 and ICC of 0.98 (95% CI = 0.97–0.99). Bartlett’s test was significant and the KMO was 0.89. Principal component analysis revealed the presence of seven factors with Eigen value >1, explaining cumulative variance of over 80%. Correlation coefficient with physical health domain was 0.75 and psychological health domain was 0.63.
E. Multiple domain assessment tools-
A total of 9 tools assessed more than one domain and all had some form of a quality of life assessment included in them.

The WHOQOL vision\(^{(51)}\) and VisQoL\(^{(52)}\) tools were primarily focused on the vision-related quality of life. The WHOQOL vision included 6 domains of quality of life: physical, social, psychological, environmental, level of independence, religion domain. It reported a Cronbach's alpha for physical domain= 0.71, psychological=0.76, independence=0.70, social relationships=0.47, environment=0.66. For inter-interviewer as well as intra-interviewer reproducibility, the mean percentage agreement was over 90% instrument.

VisQoL assessed the physical, social and emotional well-being, level of independence, self-actualization, and planning and organization of individuals. The tool had good reliability and all item fit the model well. Those with low vision had statistically significant better VisQoL score as compared to those blind.

The QLI-YES\(^{(53)}\) assessed the quality of Life for young elderly in 6 domains: physical, mental, social, functional, environmental, and spiritual. A model of 24 items with these 6 domains was found to have good fit indices. Both criterion and predictive validity were proved. The tool had good internal consistency with a Cronbach's α of 0.93. Correlation of the domains of the tool with WHOQOL was moderate with an r-value between 0.41 to 0.71.

The WHO-5 well-being index\(^{(19)}\) assessed the levels of well-being and compared with depression, anxiety & depressive symptoms. The translated version demonstrated good content and face validity. Internal consistency was also good with a Cronbach's alpha of 0.85 and test-retest reliability over 2 weeks was satisfactory with r = 0.72 and ICC = 0.82. CFA supported factorial validity and factor loadings were between 0.55 and 0.89. WHO-5 scores were significantly negatively correlated with PHQ-9 \(r = -0.45\) scores and the Kessler Psychological Distress Scale scores \(r = -0.56\).

The MAQ-PC\(^{(54)}\) assessed multimorbidity, functional limitation, depression, health-related quality of life and health care utilization. It had an overall consistency of 0.69 with Cronbach's alpha ranging from 0.66 for health-related quality of life to 0.89 for depression. The interobserver reliability was good with a Cohen's kappa of 1 for health problems, 0.78 for depression, >0.85 for health care utilization, >0.78 for HRQOL, and 1 for multimorbidity. The test-retest reliability assessed by ICC for multimorbidity assessment domain was 0.97, quality of life physical component score was 0.91, disease severity was 0.90 and self-rated overall health was 0.74. Concurrent validity was assessed by agreement between self-reported and physician's diagnosis of chronic conditions. This was variable with a Kappa between a low of 0.58 for hearing loss and 0.59 for Diabetes to a high of 0.95 for visual impairment and 1.0 for Tuberculosis.

The ICT-BRIEF tool\(^{(55)}\) measured physical, social and mental well-being along with elder abuse. Measure of sampling adequacy and Bartlett's test of sphericity were found to be satisfactory \((KMO >0.7)\) and the overall internal consistency as measured by Cronbach's alpha was 0.79.
The SRH(21) measured self-rated physical, mental, functional health, chronic diseases and health behaviors. In bivariate analyses among men, all health status variables were associated with the SRH, except for drinking alcohol and eating vegetables. Among women, all health status variables were associated with the SRH item, with the exception of overweight and obesity status, drinking alcohol, physical activity and eating vegetables. In multivariable analyses among men and women, 18 and 19 health status variables respectively remained associated with the SRH item. Explained variance across health dimensions ranged from 0.176 (health behaviors) to 0.444 (functional health). Convergent validity was established by a moderate correlation between SRH and satisfaction with r=0.51.

Stroke impact scale(56) assessed the stroke-specific QoL and reported moderate positive correlations between constructs of memory, communication, ADL, mobility and hand function. It showed weak positive correlation with participation and physical domains.

The most common measures of validity of the tools were compared with a defined "Gold standard" to evaluate the sensitivity, specificity, predictive values and cut-off optimization which was reported in some form for 24 tools and summarized in table-3 below.

| Domain    | Tool name                                | Cut off | Sensitivity (%) (95% CI) | Specificity (%) | PPV (%) | NPV (%) | ROC-AUC (95% CI) |
|-----------|------------------------------------------|---------|--------------------------|-----------------|---------|---------|-----------------|
| Medical   | MDRF-IDRS                                | ≥ 60    | 62.2                     | 73.7            | 19.7    | 94.9    | 0.668           |
|           | Simple DRS                               | >9      | 75.7 (62.1–85.5)         | 61.6 (58.1–65.0)| 13.1 (9.7–17.2)| 97.0 (95.0–98.3)| 0.71            |
|           | QVSFS                                    |         | 77.1 (64.1–86.9)         | 85.8 (83.5–87.5)| 48.7 (40.5–54.9)| 95.5 (93.0–97.4)|                 |
|           | DRS-Urban Indians                        |         | 76.6                     | 59.9            | 9.4     | 97.9    | 0.696 (0.668-0.731) |
|           | IDRS                                     | ≥ 60    | 72.5                     | 60.1            | 17.0    | 95.1    | 0.698 (0.663-0.733) |
|           | NIMHANS Headache                         |         | 88 (83–91)               | 81 (74–87)      | 89 (84–92)| 80 (73–86)|                  |
|           | EAR3Q                                    | >60     |                          |                 |         |         |                  |
| Psychological | PHQ                                   | 5/6     | 69.6                     | 85.2            | 78.9    | 77.8    |                  |
|           | SRQ                                      | 5/6     | 93.1                     | 80.8            | 77.9    | 94.1    |                  |
|           | PHQ-12                                   | ≥4      | 92.0                     | 90.7            | 76.7    | 97.1    | 0.979 (0.929 - 0.997) |
|           | Short schedule of 10/66 tool             |         | 94.2                     | 80.2%           |         |         | 0.971 (0.961 to 0.981) |
|           | VSID-P                                   |         | 66.7                     | 77.6            | 8.3     | 98.7    | 0.81             |
|           | VSID-I                                   |         | 100                      | 79.2            | 13.0    | 100     | 0.90             |
|           | DART                                     |         | 95.5                     | 60.0            | 70.2    | 93.0    |                  |
|           | GDS-15                                   |         | 80.0                     | 47.6            |         |         | 0.659 (0.516-0.803) |
|           | HMSE                                     |         | 81.3                     | 60.2            | 9.8     | 98.4    | 0.804 (0.712–0.896) |
|           | Alzheimer’s questionnaire                |         | 85.7% (95% CI=74.2-92.6) | 96.4%           | 94.1%   |         |                  |
| Functional | RAD | (95% CI=89.9-98.7) | (95% CI=84.0-97.9%). |
|------------|-----|--------------------|----------------------|
| ABC-H scale | >58.13 | 86.3 (65.1–97.1) | 87.3 (79.4–93.1) |
| Modified Bristol Scale | 100.0 | 74.2 | 0.933 (0.871-0.995) |
| Modified Blessed scale | 100.0 | 71.0 | 0.892 (0.816-0.967) |
| Single question hearing handicap > 25dB | 30.9 | 93.9 | 92.9 | 34.6 | 0.70 (0.62–0.77) for Mild, 0.75 (0.65–0.85) for Moderate and 0.86 (0.75–0.98) for Marked hearing loss |
| HHIE-S > 25dB | 34.8 | 95.0 | 95.9 | 24.6 | 0.70 (0.62–0.77) for Mild, 0.75 (0.65–0.85) for Moderate and 0.86 (0.75–0.98) for Marked hearing loss |
| EASI | 62.5 | 89.7 | 24.4 | 97.8 | 0.884 (0.824–0.943) |
| EASI + HMSE | 90.6 | 54.3 | 9.6 | 99.1 |
| Modified Barthel Index ≤ 60 at 3 months and ≥ 20 at 6 months | 89.2 | 95.0 |

**Discussion**

This review aimed to identify validated tools in south Asia for geriatric health assessment in community settings and describe their psychometric properties. We undertook a scoping review as a suitable approach, as it facilitates a broad review of a topic in order to summarize the literature, identify research gaps, and inform the policymakers to establish treatment plan and program for health and functional status of elderly to increase their quality of life.

Our systematic search and screening returned 46 studies that were finally included in this review. Where 21 of the tools have been validated exclusively in the older adults (>55 years of age). A large majority of studies were from India (34) followed by Sri Lanka (5), Nepal (3), Bangladesh (2) and Pakistan (2). All these studies were conducted in rural, urban or semi-urban settings except 3 studies(55)(52)(57). 32 tools were reported in regional language. While 2 studies(43)(40) were from before 2000, many studies (32) were published in the past decade. This indicates that tool development and validation research in South Asia is a relatively recent phenomenon.

The present review reports the broad domains of CGA in order to understand how this multifaceted and complex construct is being measured by validated, scientific tools. Majority of the studies reported tools/ instruments that were either health worker administered or self-reported in nature, where various items were grouped into different subdomains. Medical and functional health assessment seems to be the major domain of CGA represented by maximum number of tools. Only 2 studies(16)(50) address domains related to social health. While assessing geriatric QoL, environment plays a very important role, but the domain is the least frequent one found. Similarly, tools assessing financial burden of illness or access to health care were not found. Interestingly only 1 tool, the MAQ-PC(54), was available which combined medical, functional, psychological, and quality of life assessment. This tool also was not developed or validated for use in older adults exclusively. This shows there is a significant gap in tools available for CGA in South Asian population and no tools combining all aspects of CGA has been validated in the region.
We found 4 tools(17)(24)(25)(20) to assess risk of diabetes which had similar questions/items including body mass index and hypertension. We found many tools to assess depression in both rural and urban populations, among older and younger adults age groups. Similarly, for cognitive impairment, HMSE and Alzheimer's questionnaire were used for older population. Functional assessment tools specific to different disorders like dementia (EASI(43) and Modified Bristol & Blessed scale(45)), falls (POMA(44)) and frailty (EASY-care(58)) are available out of which EASI and Modified Bristol & Blessed scales are for population aged >55 years living in rural and care homes respectively while EASY-care was validated for both the rural and urban older adults (>60 years). Quality of life questionnaires included all six domains of health. However, out of these two were specific to vision(59) and one for young elderly(53).

Most of the tools reported the following measures of validity and reliability-internal consistency, inter-rater reliability, specificity, sensitivity and ROC-AUC. Among the reported tools, EPOCH-2(18), MNA(29), PHQ/SRQ(31), CES-D(32), GDS-15(33), PHQ-9-12(34), WHOQOL vision(59) and VisQoL(52) had been shown satisfactory values for validity and reliability in their respective domains. But the variation in intent, constructs and measurements of these tools were high and no meaningful cross-domain comparisons were possible. The sample demography for the tool's development was heterogeneous and the determination of true validity and reproducibility of the existing tools is difficult.

Majority of tools reflect specific results for health outcomes, rather than broader conceptualization of complete wellbeing. A large majority, 29 instruments, were adopted from pre-existing instruments, mostly developed for western population. This indicates insufficient research and uptake of health measurements and scales in the region. This review consolidates the conceptual basis of scales necessary for CGA and points towards areas requiring further work.

Although the identified tools were served the purpose in their respective domain, but we were unable to find a single comprehensive health assessment tool for geriatric population. Therefore, findings of this review highlight the importance of using a multidimensional validated tool in the context of geriatric population.

**Limitation of the review**

Only peer-reviewed articles published in English language were selected which may introduce selection bias. However, as English is the primary language for scientific communication across the region, we expect this to be minimal if any. We have not evaluated the quality of the studies included. We have limited our studies to South Asia region, this could increase the chance of missing out the studies conducted in other LMICs. However, the compliance of the review with PRISMA guidelines with robust search strategy, strengthen the confidence on findings

**Conclusion:**

There are 21 tools validated exclusively for older adults. Considerable variation among tools in the context of item type, content, sample, outcome measures were observed. Only 9 tools captured multiple domains of geriatric health but there are no validated tools available for CGA in South Asia. There is a need to develop and validate a contextual tool for use in CGA in South Asian populations.
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APPENDIX-1

Scoping Reviews (PRISMA-ScR) Checklist

| SECTION       | ITEM | PRISMA-ScR CHECKLIST ITEM                                      | REPORTED |
|---------------|------|----------------------------------------------------------------|----------|
| TITLE         | Title| Identify the report as a scoping review.                       | ✓        |
## Structured summary

| 2 | Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives. |

## INTRODUCTION

| Rationale | 3 | Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach. |
|---|---|---|
| √ |

| Objectives | 4 | Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives. |
|---|---|---|
| √ |

## METHODS

| Protocol and registration | 5 | Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number. |
|---|---|---|
| √ |

| Eligibility criteria | 6 | Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale. |
|---|---|---|
| √ |

| Information sources | 7 | Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed. |
|---|---|---|
| √ |

| Search | 8 | Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated. |
|---|---|---|
| √ |

| Selection of sources of evidence | 9 | State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review. |
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| Data charting process | 10 | Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators. |
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| Data items | 11 | List and define all variables for which data were sought and any assumptions and simplifications made. |
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| Critical appraisal of individual sources of evidence | 12 | If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate). |
|---|---|---|
| NA |

| Synthesis of results | 13 | Describe the methods of handling and summarizing the data that were charted. |
|---|---|---|
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## RESULTS

| Selection of sources of evidence | 14 | Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram. |
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| Characteristics of sources of evidence | 15 | For each source of evidence, present characteristics for which data were charted and provide the citations. |
|---|---|---|
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Appendix-2 Search Strategy

Search terms used in databases MEDLINE (Via PubMed), Embase (via Ovid) and PsychInfo (via Ovid)

1. Community-Based Participatory Research/ or Community participation/ or (Community-Based Participatory Research* or Community-based research* or Community-based or communit* or Community-dwelling* or population-based or Community participation* or Community-directed).ti,ab,kw.

   and

2. Aged/ or (Aged or older people or elderly people or Older adult* or Elderly or Aging or Ageing or Geriatric* or Senior* or older person*).ti,ab,kw.

   and
3. Health impact assessment/ or (Health impact assessment* or Health assessment* or Assessment*).ti,ab,kw. Or diagnosis/ or "diagnostic techniques and procedures"/ or (Diagnos* or Examination*).ti,ab,kw. Or Geriatric assessment/ or Geriatric assessment*.ti,ab,kw. Or Mass Screening/ or (Mass Screening* or Screening*).ti,ab,kw. Or (Instrument* or Tool* or Scale* or Index* or Questionnair* or Evaluation*).ti,ab,kw.

and

4. Validation study/ or (Validation* or Validity or Reliability or Development*).ti,ab,kw.

and

5. Afghanistan/ or Bangladesh/ or Bhutan/ or India/ or Nepal/ or Pakistan/ or Sri Lanka/ or (Afghanistan or Bangladesh or Bhutan or India or Nepal or Pakistan or Sri Lanka or South Asia or Maldives).ti,ab,kw.