A systematic review of the status of neuropsychological research and dementia in South Asia

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Review

A systematic review of the status of neuropsychological research and dementia in South Asia

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Abstract
It is recognised that there is a notable presence of psychology and dementia-related issues in South Asian (SA) countries, and this problem is on the rise. Nevertheless, the problems found in the field of neuropsychology are yet to be fully resolved in the region. Unlike the case in developed countries, neuropsychology, despite the scopes and genuine potential, is not broadly practised in South Asia (which constitutes 25% of the world population), and the opportunity for extensive research is limited. Although India has made substantial progress in neuropsychology through the establishment of neuropsychological units and by developing assessment modules based on cultural requirements and the living standards of the population, the rest of the South Asia region is lagging far behind in the sphere of health science. Neuropsychology covers a vast area of brain-behaviour relationships, of which cognitive impairment is an important part. Except for India, other South Asian countries like Pakistan, Bangladesh, Sri Lanka, and Nepal have not had specific noteworthy studies on neuropsychology, but there have been a few research works done on neuropsychology, cognitive impairment, and other neurological assessments. This article focuses on reviewing the status of the development of neuropsychological research in South Asia, and it also assesses quantitative studies on dementia in the region where cognitive and neuropsychological assessments have been used.

Keywords Neuropsychology · Cognitive impairment · Dementia · Neuropsychology assessment · Cognitive assessment · South Asia

1 Introduction

Neuropsychology is a relatively new scientific discipline that has become common across the world over the last few decades and it bridges the fields of psychology, neurology, and psychiatry [1]. Neuropsychology refers to the study of the brain- behaviour relationship where all the psychological functions, such as cognitive, conative, and affective, mediate through the central nervous system and brain [2]. This subject has always been an area of interest in modern psychology [1, 3].

The last three decades have seen tremendous growth in the field of neuropsychology, particularly in North America, Australia, and Europe, where the profession is now well-established. Many developed countries in these continents have made big advances in neuropsychological research [1]. Yet, studies have revealed that the neuropsychological practice is available only to a limited number of countries—generally those who sit on an economic vantage point [1]. So, what

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is happening to the countries with low-middle income populations that are less developed? Nowadays, people from all over the world suffer from mental health and psychological issues, and neuropsychology is an important part of addressing the situation. A major talking point here is the cognitive health of the middle-aged and the elderly.

Cognitive health is determined through cognitive neuropsychology, which uses investigative studies on people with cognitive impairments (acquired or developmental) to learn more about normal cognitive processes. This is a branch of cognitive psychology, as Rapp and Goldrick [4] have argued. This view of cognitive neuropsychology as a branch of cognitive psychology and distinct from cognitive neuroscience is widely accepted: "The term cognitive neuropsychology often connotes a purely functional approach to patients with cognitive deficits that do not make use of, or encourage interest in, evidence and ideas about brain systems and processes" [5].

Neuropsychological assessment is a performance-based method to evaluate cognitive functioning where neuropsychologists assess a series of disorders which include neurodegenerative illnesses, acquired and developmental neurological conditions, and also metabolic and psychiatric disorders [6]. The expression of neurodegenerative diseases can be divided into three main categories of symptomatic domains: neurological, cognitive and, neuropsychiatric [7].

1.1 Neuropsychological test batteries

Neuropsychological test batteries are based on the assumption that there are differential functions in the brain, and separate structures of the brain are responsible for different functions. These test batteries ignore brain mechanisms such as adaptability, equipotentiality, and compensatory. These batteries are time-consuming and better suited for research thatis theoretical in nature rather than those that serve practical purposes [2].

1.2 Cognitive assessment

Cognitive assessments are based on practical aspects of behaviour, including the validated concept of intelligence, memory attention, and concentration. PGI Battery of Brain Dysfunction uses this concept. In cognitive assessments, intelligence tests, memory tests, and perceptuomotor function tests are mainly used [8].

1.3 Cognitive neuropsychiatry

Cognitive neuropsychiatry is a new hybrid discipline that attempts to apply some of the successful methodology of its sister discipline, cognitive neuropsychology, to (neuro-) psychiatric disorders [9]. It is a phenomenological manifestation of Alzheimer's and schizophrenia and composed of classic features of cognitive neuropsychiatry such as delusions, hallucinations, misidentifications, and apparently, extraordinary behaviours as well.

Neurodegenerative diseases are different types of dementia which pose as a major challenge to many societies in the Asia Pacific region [10] in comparison to Europe, North America or Australia. This is because in the less developed and densely populated regions like South Asia, most people do not have the knowledge or awareness to realise neurohealth concerns.

The term South Asians denotes residents of India, Bangladesh, Afghanistan, Sri Lanka, Pakistan, Nepal, Myanmar, Bhutan, and Maldives, who constitute 24.8% of the total world's population [11, 12]. Despite having one-fourth of the world's population in this region, very limited research on neuropsychological assessment and dementia have taken place here irrespective of the population's country of settlement or their country of origin [13].

The objective of this review is to appraise and synthesize the best available evidence to provide a better understanding of the neuropsychology practice in the South Asian region and to discuss the use of neuropsychological and cognitive assessment tests for people at risk of dementia.

2 Method

This paper provides a comprehensive review of the status of neuropsychology studies and the practice of neuropsychological assessments in dementia research in South Asian countries. A literature search was performed on electronic databases, including on Scopus, Web of Science, and PubMed/PMC for related publications from 2011 to December 2022. References were collected through the search by keywords input such as 'Neuropsychology', 'Cognitive impairment', 'Dementia', 'cognitive assessment', 'South Asia*', 'India*', 'Bangladesh*', 'Pakistan*', 'Sri Lanka*', 'Nepal*', 'Myanmar*',

'Bhutan*', 'Maldives*' and 'Afghanistan*'. The keywords for each component of the research were linked using 'or', and the results of the two sections were combined by using 'and' for further searching.

Titles and abstracts of retrieved studies were screened to select potentially relevant articles. Full texts were independently analysed to see whether they conformed to the established inclusion criteria. Moreover, references of eligible articles went through a manual search from Google Scholar for additional papers that might have been missed in the electronic search. Figure 1 summarizes the results of the different steps to identify appropriate articles for the review. The PRISMA 2020 checklist was adhered to in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement [14].

In this study, 3890 papers were screened from Scopus, 2059 papers from Web of Science, and 4217 numbered papers were screened from PubMed.

Inclusion criteria concerning article types were prospective cohort studies, retrospective and cross-sectional studies, and also randomized controlled trials have been included in the present work. Which were mainly focused on the elderly population, Quantitative studies used cognitive and neuropsychological assessment-related variables. On the contrary, Medicine/ Clinical/ Imaging techniques/genetic studies/ non-human models/ Biomarker studies, non-original articles (Systematic/meta-analysis review papers and conference proceeding papers), Qualitative studies, and studies in non-English languages were excluded.

After complying with the inclusion and exclusion criteria, 1488 peer-reviewed articles were screened using the 'Covidence systematic review' software. This screens the titles and abstracts to find out which articles are eligible for review in parallel before retrieving full texts. All three reviewers independently screened all titles and abstracts for eligibility and examined 164 full-text records for relevance. After the screening, 47 articles were identified as related to the review topic. 117 articles were excluded for not meeting the setting characteristics: 52 for not meeting the age of study participants,

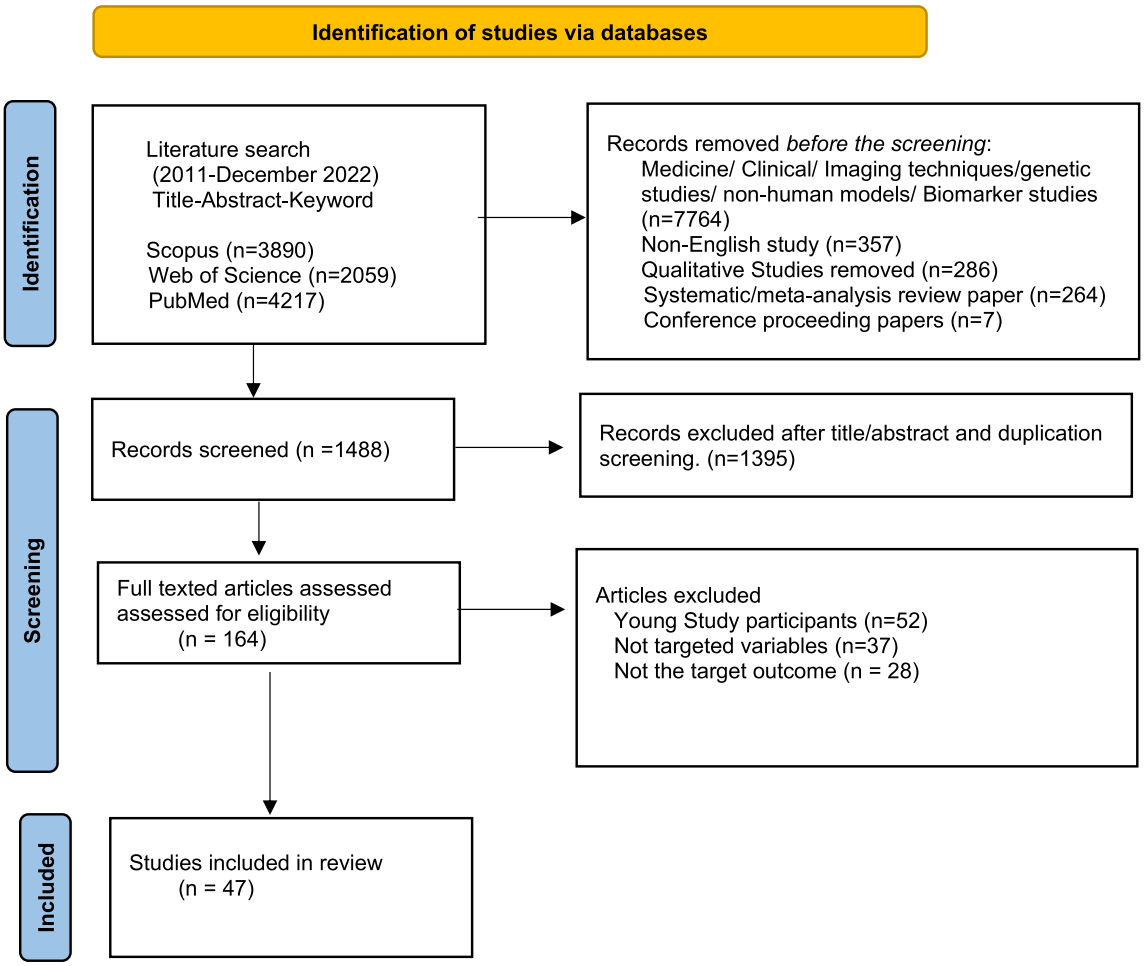

Fig. 1 A PRISMA flowchart of search results

37 for not meeting the targeted variables, and 28 for not meeting the target outcomes. Finally, 47 studies met the inclusion criteria and were included in this review.

We have marked the most important results for each study, concentrating on the supposed underlying mechanisms through which the reported effect was determined. To maintain the quality of our review. We used AMSTAR 2(A Measurement Tool to Assess Systematic Reviews) for systematic review. It was developed to address limitations and improve the assessment process of systematic reviews in healthcare research [15].

AMSTAR2 consists of 16 items that cover key domains in the systematic review process. These domains include study design, search strategy, data extraction, assessment of publication bias, synthesis of results, and the overall risk of bias. Each item is evaluated on a binary scale (Yes/No/Unclear) to determine if it has been adequately addressed in the systematic review [15].

Most of the articles in our review (n = 41) have been assessed to be of high quality, including 7 articles from Table 1 and 34 from Table 2. This categorization indicates that systematic reviews featuring these articles are more likely to draw reliable and valid conclusions, thereby informing decision-making processes. Although the remaining reviewed articles fell into the category of moderate quality due to identified limitations or areas for improvement, they still demonstrate a commendable level of methodological rigor and transparency.

Reference manager Mendeley has been used to cite the published articles.

3 Results and discussion

In Sect. 3.1, we have explained the practice of neuropsychology in India where the status of neuropsychology research, and the development and implementation of neuropsychological batteries in the context of India, have been reviewed. In Sect. 3.1.1, a short overview is given of the established neuropsychological measures in India for cognitive screening in patients with dementia. These measures have been developed in the context of the population, their language, and the different regional neurocognitive assessments. Neuropsychology practice in regions of South Asia other than India has been discussed in Sect. 3.2. Section 3.3 is an overview of the practices concerning dementia in South Asia; there is also discussion of the leading organisations which work for dementia awareness and care in the countries of the region.

Table 1 Established neuropsychological measures for cognitive screening in patients with dementia developed in the context of Indian population are described below

Cognitive assessments	Descriptions
Hindi mental state examination(HMSE) [22]	Hindi translation and adaptation of the MMSE for screening the illiterate rural elderly population. The maximum score if all items are answered correctly is 30 like the MMSE. It is freely available
Montreal cognitive assessment (MoCA) [13]	A freely available, global cognitive screening tool, which is becoming increasingly popular through its availability across multiple global languages, including the Indian languages of Bengali, Kannada, Malayalam, Marathi, Tamil, Telugu, Hindi, and Urdu [14]
Addenbrooke's cognitive examination-III (ACE-III) [17]	A 100-point simple, brief paper- and pencil-based measure of global cognitive function that can be used at the bedside. It is available in many global languages including Tamil, Hindi, Indian English, Kannada, Telugu, Urdu, and Marathi. This test is freely available for clinical and research use [18]
Kolkata cognitive screening Battery (KCSB) [22]	A global cognitive screening battery which has established normative data for the population of the city of Kolkata. The test language used is Bengali. The translated test battery is freely available in the public domain
Cognistat-Indian adaptation [24]	A brief cognitive screening tool that has been adapted for use in the Indian population, it has shown good validity for use in patients with traumatic brain injury [24] This type of measurement is reliable and valid in a small-sized sample
Hindi adaptation of Mattis dementia rating scale [28]	This consists of 36 tasks divided into five components, with a maximum score of 144. It has shown good reliability and validity for evaluation of dementia in Hindi-speaking Indian population
Rowland universal dementia assessment scale [29]	This assessment tool was validated for use in the Malayalam-speaking population [29]. It has a maximum score of 30. Rowland universal dementia assessment scale (RUDAS) was found to have similar sensitivity but better specificity when compared to the Malayalam MMSE

Table 2 The uses of neuropsychological assessments in dementia studies in South Asian countries (2011–2022)

Country	First author (Publication year)	Study loction	Screening instrument/tools	Sample size	Journal name
India	Bhattacharyya et al. (2022) [36]	West Bengal	ACE-III, Mini Mental State Examination (MMSE), Clinical Depression Rating (CDR)	Sample size, n = 182 Normal Control (NC) = 120, Mild Cognitive Impairment (MCI) = 22 Dementia = 40	Archives of Clinical Neuropsychology
India	Karim and Venkatachalam (2022) [37]	Tamil Nadu	MOCA-tamil version	Sample size, n = 233 NC = 104 MCI = 129	International Journal of Gerontology
India	Sundrakumar et al. (2022) [38]	Koral district, Banglalore	GDS, Hospital Anxiety and Depression Scale (HADS), CDR	Sample size, n = 3955 Rural = 3262 Urban = 693	The Journal of Alzheimer's Disease
India	Chaudhari et al. (2022) [39]	Jabalpur, Central India	GDS, MMSE	Sample size, n = 73	National Journal of Community Medicine
India	Dhikav et al. (2022) [40]	Jodhpur, western Rajasthan	MMSE, General Practitioner Assessment of Cognition (GPCoG)	Sample size, n = 370 (diabetes and/or hypertension)	Journal of Neurosciences in Rural Practice
India	Lee et al. (2020) [41]	Assam, Delhi, Haryana, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, and West Bengal	HMSE, CDR, Raven's standard progressive matrices, Blessed Dementia Rating Scale (BLS-D), Digit span forward and Backward, 10/66 Dementia Research Group informant questionnaire (10/66 DRG), HRS–HCAP cognitive test batteries	Sample size, n = 3224	Journal of American Geriatrics Society
India	Mekala et al. (2020) [42]	Hyderabad, Delhi, Trivandrum, Bangalore, Puducheri	ACE-III	Sample size, n = 1203 NC = 757 MCI = 204 Dementia = 242	Archives of Clinical Neuropsychology
India	Bajpai et al. (2020) [43]	All India Institute of Medical Sciences, New Delhi	HMSE, ACE-III	Sample size, n = 412 NC = 222 MCI = 70 Major neurocognitive disorder (MNCD) = 120	Clinical Interventions in Aging
India	Mohan et al. (2019) [44]	Kerala	Malayalam version of Addenbrooke's Cognitive Examination (m-ACE)	Sample size, n = 426 (MCI)	BMJ open
India	Sharma et al. (2019) [45]	All India Institute of Medical Sciences (AIIMS), Patna	HMSE, Electroencephalogram (EEG)	Sample size, n = 44	IRBM

Table 2 (continued)

Country	First author (Publication year)	Study loction	Screening instrument/tools	Sample size	Journal name
India	Banerjee et al. (2017) [46]	Kolkata	CDR, KCSB, Everyday Ability Scale for India (EASI), GDS	Sample size, n = 1330 Not demented = 1227 Alzheimer's Disease(AD) = 47 Vascular Dementia (VD) = 46 Frontotemporal Dementia (FTD) = 2 Dementia due to Lewy body disease (DLBD) = 1	International Journal Geriatric Psychiatry
India	Sinha et al. (2016) [47]	The Institute of Human Behavior and Allied Sciences (IHBAS), Delhi	HMSE, CDR, The Neuropsychiatry interview (NPI)	Sample size, n = 64 AD = 32 Psychosis patients = 32	Asian Journal of Psychiatry
India	Anand et al. (2016) [48]	Out Patient Department (OPD) of the Neurology Department in a tertiary hospital, Northern India	MMSE, CDR	Sample size, n = 31 AD = 27 MCI = 7	Annals of Indian Academy of Neurology
India	Nair et al. (2015) [49]	Karnataka	MMSE, CDR	Sample size, n = 366	Central Asian Journal of Global Health
India	Sanyal et al. (2015) [50]	Kolkata	Montgomery Aberg Depression Rating Score (MADRS), MMSE, HADS	Sample size, n = 150 (Parkinson)	Journal of Neurological Sciences
India	Gambhir et al. (2014) [51]	Vanarasi	HMSE	Sample size, n = 728 NC = 708 Dementia = 20	Indian Journal of Psychiatry
India	Raina et al. (2014) [52]	Himachal	HMSE	Sample size = 500	North American Journal of Medical Sciences
India	Raina et al. (2013) [53]	Bharmour, Himachal	Bharmour version of MMSE (BMSE)	Sample size = 50 (Clinically non-demented)	Journal of Neurosciences in Rural Practice |
India	Mathuranath et al. (2012) [54]	Trivandrum, Kerala	m-ACE, Malayalam mini mental status examination (mMMSE), The instrumental activities of daily living for elderly (IADL-E)	Sample size, n = 2466 Demented paitient = 93 (47 classified as AD)	Neurology India
India	Poddar et al. (2011) [55]	Mirjapur, Vanarasi	HMSE	Sample size, n = 202	Annals of Indian Academy of Neurology
India	Seby, et al. (2011) [56]	Pune	MMSE, GDS	Sample size, n = 2890 Neuropsychological disorders = 146	Indian Journal of Psychiatry
Pakistan	Zaheer and Ghazal (2020) [57]	Islamabad/Rawalpindi	Montreal Cognitive Assessment (MoCA), Neuropsychological Assessment Battery- Screening Module (NAB-SM)	Sample size, n = 160 Chronic Substance-dependent patients = 100 NC = 60	Journal of Addiction Science

Table 2 (continued)

Country	First author (Publication year)	Study loction	Screening instrument/tools	Sample size	Journal name
Pakistan	Khan et al. (2020) [58]	Karachi	Urdu version of 10/66 DRG including Cognitive screening instrument for dementia (CSI-D) and Consortium to Establish a Registry of Alzheimer Disease (CERAD), Aga Khan University Anxiety and Depression scale (AKUADS) and MMSE	Sample size, n = 200 Dementia = 100 NC = 100	Alzheimer Disease & Associated Disorders
Pakistan	Atif et al. (2017) [59]	Lahore	MoCA, GDS	Sample size, n = 400 (Type-2 diabetes mellitus patients)	International Journal of Diabetes in Developing Countries
Pakistan	Khan et al. (2012) [60]	Aga Khan University Hospital (AKUH) Karachi, Pakistan	Beck's Depression Inventory (BDI), Blessed Dementia Scale (BDS)	Sample size, n = 309 (Stroke Patients)	BMC Open
Bangladesh	Khalil et al. (2021) [61]	Shaheed Suhrawardy Medical College and Hospital (hSMCH), Dhaka	MMSE, Parkinson's Disease with dementia short screen (PDD-SS) score	Sample size, n = 130 (Parkinson)	Bangladesh Medical Research Council Bulletin
Bangladesh	Roy et al. (2019) [62]	Bangabandu Sheikh Mujib Medical University, Dhaka	MMSE	Sample size, n = 90 AD patients = 45 NC = 45	Bangladesh Journal of Neuroscience
Bangladesh	Haq et al. (2017) [63]	National Institute of Mental Health (NIMH),Dhaka,	BAMSE	Sample size, n = 78(Dementia Patients)	Bangladesh Journal of Psychiatry
Bangladesh	Khan et al. (2016) [64]	Bangabandu Sheikh Mujib Medical University, Dhaka,	MMSE	Sample size, n = 88(Dementia Patients)	Bangladesh Journal of Neuroscience
Bangladesh	Palmer, et al. (2014) [65]	Matlab, Chadpur	BAMSE	Sample size, n = 471	International Psychogeriatrics
Sri Lanka	Ariyasinghe et al. (2021) [66]	Homagama, Colombo	MMSE, MOCA	Sample size, n = 166 Case (Obese group) = 83 Control (Not obese) = 83	International Journal of Research in Medical Sciences
Sri Lanka	Gamage et al. (2018) [67]	Galle and Matara	MMSE, While verbal WM (VWM), visuo-spatial WM (VSWM) and IC (interference control, inhibition of pre potent and ongoing responses) were assessed using VWM, VSWM tasks, colour word Stroop (CWS), go/no-go (GNG) and stop signal (SS) tasks	Sample size, n = 237	BMC Geriatrics
Sri Lanka	Suraweera et al. (2016) [68]	Psychiatry Unit of the National Hospital of Sri Lanka, Colombo	The Repeatable Battery for Assessment of Neuro-psychological Status (RBANS)	Sample size,n = 114 AD = 54 NC = 60	Ceylon Medical Journal
Nepal	Adhikari et al. (2021) [69]	Community Hospital, Nepal	Mini-Cog (MMC) tool, Dementia Severity Rating Scale (DSRS)	Sample size, n = 63 No neurological diseases = 45 Neurological disease = 18	International Journal of Alzheimer's disease

Additionally, in this section, we have listed the quantitative studies conducted on dementia by using different neuropsychological, cognitive and neuropsychiatry assessments in South Asia between 2011 to December 2022.

3.1 Neuropsychology practice in India

In India, which has a population of over 1.3 billion, neuropsychology research has developed over the last 40 years following the establishment of the Neuropsychology Unit by C.R. Mukundan at the National Institute of Mental Health and Neurosciences (NIMHANS) in Bangalore. This remains the national centre of excellence in neuropsychology to this day [1]. An overview report on the introduction and progress of neuropsychology research in India was published in 2016 [16]. This report titled 'Neuropsychology in India' was written by J. Keshav Kumara and Akila Sadasivan. According to this article, neuropsychology-related study started in India in the mid-1970s and neuropsychology as a specialty was introduced in 1975 by Professor Mukundan. A formal neuropsychology unit was established at the NIMHANS in the following year and to this day, the institute has been working on neuropsychology research. It puts emphasis on developing culturally appropriate tests for the Indian population, which are used for various neurological conditions including TBI (Traumatic Brain Injury), stroke, Parkinson, Mild Cognitive Impairment (MCI), Mild Alzheimer's, Healthy normal elders with age-related cognitive decline, Alcohol Dependence Syndrome, and Schizophrenia. In this Section we mainly describe the practices surrounding neuropsychology and dementia in South Asia.

Neuropsychological test batteries developed by NIMHANS are listed below:

- NIMHANS Neuropsychological Battery for children [16]
- NIMHAS Neuropsychology Battery for adults [16]
- NIMHANS Neuropsychology Battery for elderly [17].

Apart from NIMHANS batteries, some other neuropsychological test batteries also widely used in India including:

- All India Institute of Medical Sciences (AIIMS) comprehensive neuropsychological battery in Hindi-adult Form[18]
- PGI Battery of Brain Dysfunction [19].

These batteries have been developed to work with psychiatric and neurological patients in India. A short description is given below.

3.2 NIMHANS Neuropsychology battery for children

This battery is for children aged 5–15 years. There are 28 areas which are covered, including intelligence, motor speed, verbal fluency, design fluency, motor coordination, attention, expressive speech, working memory, visuospatial working memory, planning, set shifting, motivation, behaviour change, visuo-conceptual ability, visual recognition, apraxia, somatosensory perception, reading, writing, calculation, verbal comprehension, verbal learning, visual learning, and memory [16].

3.3 NIMHAS neuropsychology battery for adult

There are 19 tests in all, which measure 15 functions, in seven neuropsychological domains. These domains are Speed, Attention, Executive Functions, Comprehension, Verbal Learning and Memory, Visuospatial Construction, and Visual Learning and Memory Test. Normative data have been established for adults aged 16–65 years after a factorial sampling design [16].

3.4 NIMHANS neuropsychology battery for the elderly

The 'NIMHANS Neuropsychological Battery for the Elderly (NNB-E)'[17] is a comprehensive test developed to identify early dementia that touches the following domains of cognition: Attention, memory, language, executive functions, visuospatial construction, and parietal focal signs [17].

3.5 All India Institute of Medical Sciences (AIIMS) comprehensive neuropsychological battery in Hindi-adult Form

The AIIMS comprehensive neuropsychological battery in Hindi (adult form) is a comprehensive battery of tests which is normed for those aged 15–80 years. It is based on the Luria-Nebraska Neuropsychological Battery [8]. It consists of 160 items divided into ten basic scales and four secondary scales. It is the only indigenously developed Indian test in Hindi [18].

3.6 PGI battery of brain dysfunction

The PGI Battery of brain dysfunction consists of five sub tests – PGI memory scale, Bhatia's Short Scale, Verbal adult intelligence scale, Nahor-Benson test of Perceptual Acuity, and Bender Visual Motor Gestalt Test. This test battery gives a global measure of cognitive dysfunction based on 19 test variables. It has established norms for the age group of 20–59 years. It was developed in 1990 and estimates well-accepted or validated psychological concepts of (a) intelligence, (b) memory, and (c) gestalt formation or perceptual acuity. It gives a profile of current cognitive functioning of the subject [19].

3.6.1 Neurocognitive assessment in India

There is a decreased priority attached to research in the field of cognitive assessment in the country because of the scarcity of trained scientist-practitioners who are hard pressed for time, financial resources, infrastructure and the workforce required for carrying out and reporting good quality work [20]. Resources and lack of uniform training prevent the professionals from documenting, publishing, and sharing their work, which at times includes cognitive tests that they have developed in their clinics for their targeted patient communities, mainly patients suffering from dementia [21].

3.7 Neuropsychology practice in other Regions of South Asia

Among the eight countries of South Asia, India has the largest geographical area, and the research scopes are greater in India. Naturally, these factors have contributed to the development of neuropsychological units in India but still this progress pales in comparison to neuropsychology research in developed countries which have a clear advance in this field. In South Asian countries like Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, Myanmar, Maldives and Afghanistan, studies have been conducted on psychology, but no units have been established with the focus on the discipline of neuropsychology. It appears that there has been very limited neuropsychology practised in this region.

A review article titled "Clinical And Neuropsychology In Pakistan: Challenges And Way forward", which was published in 2022 [23], states that in Pakistan, people are developing an interest in psychology studies but research on neuropsychology is still far behind, even though it is acknowledged that the state of mental health of the population is a concern and that sector is dependent on limited neuropsychology research and study of clinical psychology in the country.

The article further informs that one neurological assessment tool had been developed and it is known as the Neuropsychological Impairment Scale (NPIS) [24]. In 2000, the NPIS was developed in the Urdu language for stroke patients. The NPIS comprised 46 items, the sub-scales and the number of the items included. Emotional problem dimensions consist of 10 items. The learning problem had six items. The sensory and motor problems had six items. The concentration problems had eight items and the mental and the physical incoordination consisted of four items. The rest of the 12 items have been derived from the Siddiqui-shah Depression (SSD) scale, which was developed in 1977.

3.8 Practice against Dementia in South Asia

Dementia or neurodegenerative diseases are a branch of neuropsychology. Even though it is not practised extensively, neuropsychology study has been present on a limited scale in India, Pakistan, Bangladesh and Sri Lanka.

According to the Alzheimer's Association, more than four million people in India have some form of dementia**.** The Alzheimer's and Related Disorders Society of India (ARDSI) [25] has been a pioneer in the field of dementia since

the early 90 s. ARDSI has been at the forefront of gathering evidence and data and has taken the mantle of searching for preventive measures. ARDSI also provides care, support advice and guidance for health professionals, carers, and communities in 24 cities in India.

In Bangladesh three organisations, Dementia Care Foundation Bangladesh [26], Dementia Bangladesh [27] and Alzheimer Society of Bangladesh (ASB) [28] work with dementia. The organisations have all been established in recent times. Dementia Care Foundation Bangladesh was founded in 2016 while Dementia Bangladesh and Alzheimer's Society of Bangladesh were established in 2008 and 2006 respectively. Dementia Bangladesh is affiliated with Dementia Australia. These organisations mainly work on raising awareness against dementia and caring for the elderly. Even though there is huge potential for Dementia research in Bangladesh, there has not been a nationwide mega survey conducted yet. In 2020, Dementia Care Foundation Bangladesh joined the Alzheimer's Disease International (ADI) Membership Development Programme.

In Pakistan there is only one day-care centre in Lahore for patients with dementia; it is run by Alzheimer's Pakistan, founded in 2001 [29]. This is a non-governmental organization formed in collaboration with Alzheimer's Australia [30]. The Lanka Alzheimer's Foundation (LAF) [31] was incorporated in 2001, an approved charity, it is registered with the Ministry of Social Services. LAF is the first and, to date, the only organization dedicated to advocating and addressing the needs of those diagnosed with cognitive impairment and dementia in Sri Lanka. Their mission is to improve the quality of life of those with Alzheimer's and related dementias and improve the well-being of their families and carers. LAF is a member of the world body, Alzheimer's Disease International (ADI). In Nepal, there is The Alzheimer and Related Dementia Society Nepal (ARDS-Nepal); it was established in 2012 and has been a member of ADI since 2014.The association is based in Kathmandu, Nepal [32].

As a part of neuropsychology, cognitive assessment tests play a major role in dementia studies. Cognitive assessments are some of the most important terms in behavioural science, as already mentioned in the introduction. Yet, in these countries the understanding of the importance of dementia risk and application are quite distinct. In this article, we also review the studies conducted on dementia by using different neuropsychological, cognitive and neuropsychiatry assessments in South Asia. We mainly focus on reviewing those articles with the sample population being elderly or associated with different types of dementia and cognitive impairments. Furthermore, it is evident from several that various neurological or neuropsychological disorders, diabetes, stroke, hypertension, depression, and obesity have a substantial effect on the development of dementia [33–35]. Consequently, for this review, we considered those articles in which the sample population or case groups of the sample population were suffering from aforementioned risk factors.

From Table 2 we can see that for dementia research in South Asia from 2011 till 2022, certain cognitive assessments have been applied. Among these, MMSE or MMSE assessments in suitable languages (Hindi, Bhar Mouri, Bangla) in terms of the regions, have been mostly used. Besides, the globally recognised assessment scale CDR, MOCA has been employed also. The use of ACE-III, KCSB Cognitive Assessments are also seen. As a part of other neuropsychological assessments, GDS has been in use in a good number of studies and as evident in the literature, depression has a significant effect on dementia [70]. It should be noted that we listed only the quantitative studies in Table 2.

4 Conclusion

Neuropsychology seeks to determine the relevance of brain damage or diseases to changes in behaviour and cognition [9]. It is also a broad area where neurodegenerative disease is one of the branches. It would have been extremely challenging to review the practice of neuropsychology and cognitive neuropsychology in low-middle-income countries all over the world because of the differences in geographical, environmental, sociological, cultural, political, and religious practices. Hence, this systematic review paper has focused specifically on the South Asian (SA) region. Also, SA is one of the most densely populated regions which houses one-fourth of the total world population. Despite the assembly of such a large number of people, the exercises on neuro or cognitive psychology in this region is not of a very advanced level.

Among the South-Asian countries, there has been more research on different assessments and dementia in India compared to the rest. Pakistan, Bangladesh, and Sri Lanka have seen very little work while in Nepal, Bhutan, Myanmar and in Afghanistan the practice is rare.

Only India, to our knowledge, has managed to differentiate neuropsychology from psychology and has established institutions and developed batteries. Despite more than 100 years of psychology research and practice, over 75 years of neurology, and 40-odd years of neuropsychology in India, cognitive testing is still in its infancy in India. Clinical psychology and neuropsychology are areas which have a lot of scope not only in India but also in other South Asian countries

where extensive research has not yet taken place. The past decade has witnessed active dementia research in India where both rural and urban populations were studied.

While clinical psychology has evolved all over the world, neuropsychology is still at its crossroads in the South Asian countries. Because of gaps in the education system and clinical setups, there is an urgent need to finalise guidelines for the future students and specialists in this field, so that a fixed format for imparting education, theoretical and practical training can be adopted.

In spite of being a global health priority, with substantial social and economic consequences, little progress has been made in regard to diagnosis and management of patients with dementia, especially in low and middle income countries [71] Even though studies point to certain barriers in approaching mental health services in the region, the make-up of the South Asian population requires careful definition. South Asians are a heterogeneous group, with members having diverse regional, linguistic, social status and financial backgrounds [72]. Poverty, religious prejudice and political restlessness have all contributed to the general lack of understanding and awareness of neuropsychology. Also, conducting research and surveys with South Asian regional neuropsychological and cognitive assessment requires considerable manpower and financial support which is a luxury for the region where there is a struggle to fulfil basic needs. To date, a self-assessing neuropsychological tool, especially a dementia self-assessment tool, that would focus on this region only and relate to self-reported memory problems or changes prior to the dementia diagnosis, has not been developed. If personal assessment tools for lifestyle, culture and other factors can be designed for the South Asian population, then that would be an unprecedented discovery for the low- and middle-income countries.

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