SCREENING AND DIAGNOSIS OF DEMENTIA IN THE HOSPITAL AND THE COMMUNITY

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DECLARATION

I hereby declare that this dissertation titled **"Screening and diagnosis of dementia in the hospital and the community"** is a bonafide work done by me under the guidance of **Dr. K.S.Jacob**, Professor of Psychiatry, Christian Medical College, Vellore. This work has not been submitted to any university in part or full.

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DECLARATION

I hereby declare that the investigations, which form the subject matter of this thesis, **"Screening and diagnosis of dementia in the hospital and the community",** were carried out by **Dr. Rena Rosalind S.B.**, a bonafide trainee in Psychiatry, under my guidance. This has not been submitted to any university in part or in full.

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Dr. Rena Rosalind S.B.

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INTRODUCTION

Dementia (from the Latin *de mens*—from the mind) is not a specific disease itself, but rather a group of psychological and behavioral symptoms associated with a variety of diseases and conditions that affect the brain (Rabins, Lyketsos, and Steele 1999). Generally, dementia is characterized as the loss or impairment of mental abilities. With dementia, these cognitive losses (e.g., in reasoning, memory, and thinking) are severe enough to interfere with a person's daily life. Additionally, such losses are noticeable in a person who is awake and alert—the term *dementia* does not apply to cognitive problems caused by drowsiness, intoxication or simple inattention (American Psychiatric Association 1994).

Although often associated with later life, the symptoms of dementia can affect people of any age. Before age sixty-five, however, the incidence of dementia is low—affecting one-half to 1 percent of the population (Rabins et al. 1999). As people get older, the risk of dementia rises. It is estimated that dementia affects less than 10 percent of the sixty-five-and-over population globally (Ikels 1998). The prevalence doubles every 5 years among people in this age group.

Despite its prevalence, up to three fourths of dementia goes unrecognized or misdiagnosed in its early stages (Sternberg, et al., 2000). Many health care professionals mistakenly view the early symptoms of dementia as inevitable consequences of ageing or Minimal Cognitive Impairment (MCI). Dementia continues to be one of the most common causes of institutionalization, morbidity, and mortality among the elderly.

1.1 DEMENTIA

1.1.1 DEFINITION

Dementia is defined as global impairment of cognitive function that interferes with normal activities (APA, 1994). Although impaired memory -both short term and long term- are typical of dementia, deficits in other cognitive functions such as abstract thinking, judgment, speech, coordination, planning and organization are required to make a diagnosis.

There are many definitions of dementia. The Royal College of Physicians (1982), define dementia as the acquired global impairment of higher cortical functions including memory, the capacity to solve problems of day-to-day living, the performance of learned perceptual and motor skills, the correct use of social skills, all aspects of language and communication and the control of emotional reaction, in the absence of clouding of consciousness. The condition is often progressive though not necessarily irreversible.

1.1.2 DIAGNOSTIC CRITERIA

DSM IV DIAGNOSTIC CRITERIA

The diagnosis of dementia can be made according to the DSM-IV classification as stated below:

A. The development of multiple cognitive deficits manifested by:-

- Memory impairment (impaired ability to learn new information or to recall previously learned information)
- One (or more) of the following cognitive disturbances
    - ✓ aphasia

- ✓ apraxia
- ✓ agnosia
- ✓ disturbance in executive functioning

B. The cognitive deficits in criteria A1 and A2 each cause significant impairment in social and occupational functioning and represent a significant decline from a previous level of functional (APA, 2000).

INTERNATIONAL CLASSIFICATION OF DISEASES (ICD – 10) DIAGNOSTIC CRITERIA:

Dementia is a syndrome due to disease of the brain, usually of a chronic or progressive nature, in which there is disturbance of multiple higher functions, including memory, thinking, orientation and comprehension, calculation, learning capacity, language and judgment. Consciousness is not clouded. Impairments of cognitive function are accompanied and occasionally preceded by deterioration in emotional control, social behavior or motivation (WHO, 1992).

1.1.3 TYPES

Dementing disorders can be classified in many different ways. These classification schemes attempt to group disorders that have particular features in common, such as whether they are progressive or what parts of the brain are affected. Examples of types of dementia include the following:

I. Cortical Dementia:

- Dementia caused due to damage to the cortex or outer layer is cortical dementia. Cortical dementias tend to cause problems with memory, language, thinking and social behavior. Some example of cortical dementias are Alzheimer's disease, Vascular dementia (also known as *multi-infarct dementia*), Binswanger's disease, Dementia with Lewy bodies (DLB), Alcohol-Induced Persisting Dementia, Frontotemporal lobar degenerations (FTLD), including Pick's disease, Creutzfeldt-Jakob disease and Dementia pugilistica.

II. Subcortical Dementia:

Dementia affecting parts of the brain below cortex is subcortical dementia. This type causes changes in emotions and movement in addition to problems with memory. Some examples of sub-cortical dementias are Dementia due to Huntington's disease, Dementia due to Hypothyroidism, Dementia due to Parkinson's disease, Dementia due to Vitamin B1 deficiency, Dementia due to Vitamin B12 deficiency, Dementia due to Folate deficiency, Dementia due to Syphilis, Dementia due to Subdural hematoma, AIDS dementia complex

III. Progressive Dementia:

As the name indicates, the dementia that worsens over a period interfering with cognitive abilities is called progressive dementia.

IV. Primary Dementia:

Primary dementia does not result from any other disease for example: Alzheimer’s disease.

V. Secondary Dementia:

Dementia caused due to a physical disease or injury is called secondary dementia. (Karen Ritchie, 2002; Peter, 2003)

REVERSIBLE DEMENTIAS

Studies indicate that 10% to 33% of all dementias are potentially reversible (Rabins, et al., 1983). The percentage is higher in inpatient and tertiary referral centers. Clearly, age of onset is a very important consideration. Treatable causes of dementia occur in 21% of those under 65 and 5% of those over 65. Unfortunately, even in the potentially treatable group of illnesses, response rate is not 100%. Common examples of reversible causes of dementia are depression ("pseudo dementia"), dementia due to drug intoxication, metabolic-endocrine derangements, Hypothyroidism and normal pressure hydrocephalus (Rabin's, 1983).

In a prospective study done in India, 18% had reversible cause. However this was a study done in a tertiary referral centre (Srikanth, et al., 2005).

1.1.4 RISK FACTORS FOR DEMENTIA

The known risk factors for dementia are

- Age
- Genetic factors
- Head injuries (Mehta, 1999).
- History of stroke (Breteler, 1998)
- Vascular disease (Breteler, 1998)
- Alcohol Abuse

- Low education (Ott et al., 1995)
- Untreated infectious and metabolic disease
- Brain tumor
- Cardiovascular disease (e.g., hypertension, atherosclerosis)
- Kidney failure
- Liver disease and
- Thyroid disease,
- Vitamin deficiencies (B12, folic acid and thiamine).

1.1.5 MANAGEMENT OF DEMENTIA

CLINICAL PRACTICE GUIDELINES - SUMMARY OF RECOMMENDATIONS (Doody, 2001)

Dementia is often progressive and symptoms will change over time. Similarly, treatment must evolve with time as new issues will emerged as symptoms change. At each stage the physician should be alert and help the patient and family anticipate future symptoms and care that may be required.

Psychiatric Aspects of Management

The core treatment of a patient with dementia is psychiatric care which must be based on a close alliance with the family/caregiver. A thorough psychiatric, neurological and general medical evaluation to determine the nature of deficits is required for every patient. It is critical to identify and treat the general medical conditions that may contribute to the dementia and associated behavioural symptoms.

Ongoing assessment includes periodic monitoring of cognitive and non-cognitive psychiatric symptoms and their responses to intervention. It is generally necessary to routinely review patients every 3-6 months. More frequent visits may be required for

patients with complex or potentially dangerous symptoms or during administration of specific therapies. Safety measures need to be constantly evaluated. Educating the patient and family about the illness, treatment, sources of care and support, and financial and legal issues is important.

NON-PHARMACOLOGICAL INTERVENTIONS

Non-pharmacological interventions should always be considered along with drug options before treatment is started. These include behaviour oriented treatment approaches, stimulation oriented treatment approaches and emotion oriented treatment approaches. A care plan should be made for each individual and treatment reviewed every 3-6 months.

PHARMACOLOGICAL INTERVENTIONS

Acetylcholinesterase inhibitors show modest efficacy in improving cognition in patients with mild to moderate Alzheimer's disease. Drugs like Donepezil, Rivastigmine, Memantine, etc., must only be used after a thorough discussion of their potential risks and benefits. There is insufficient evidence at present to recommend the routine use of other cognitive enhancers such as vitamin E, selegiline, gingko biloba etc.

Neuroleptic drugs are often required for the management of psychosis, serious emotional distress or danger from behavioural disturbances. The choice of drug depends on their side-effect profile. Low doses should be prescribed initially with a slow and cautious increase, if necessary. Treatment should normally be short term and should be reviewed regularly. Awareness of potential side-effects including akathisia

and tardive dyskinesia is important; the risk of severe side-effects is greater in Lewy body dementia. The routine use of anticholinergics should be avoided.

Marked and persistent depression should be treated with antidepressant medication. Severe and persistent anxiety and insomnia may require short-term symptomatic treatment.

1.1.6 PROGNOSIS OF DEMENTIA

The mode of onset and subsequent course of dementia depend on the underlying etiology. Dementia may be progressive, static or remitting. The reversibility of dementia depends on the underlying pathology, the availability and timely application of effective treatment. The prognosis for reversible dementia related to nutritional or thyroid problems is usually good once the cause has been identified and treated. The prognoses for dementias related to alcoholism or HIV infection depend on the patient's age and the severity of the underlying disorder (Wolfson, 2001). Irreversible causes of dementia often result in gradual deterioration of the patient's functioning ending in death. The natural history of the disease is that of a decline due to progressive damage to widespread areas of the brain. The length of time varies. Patients with Alzheimer's disease may live from two–20 years with the disease, with an average of seven years. Patients with frontal lobe dementia or Pick's disease live on average between five and 10 years after diagnosis. The course of Creutzfeldt-Jakob disease is much more rapid, with patients living between five and 12 months after diagnosis (Wolfson, 2001)

1.1.7 BURDEN OF DISEASE

Dementia was estimated to be the 10th leading cause of non-fatal burden in the world in 1990, accounting for 2.6% of total YLD (Years Lived with a Disability); this is around

the same percentage as congenital malformations. In the Version 2 estimates for the Global Burden of Disease 2000 study, published in the World Health Report 2002, dementia is the 11th leading cause of YLDs at global level, accounting for 2.0% of total global YLDs. Despite the difficulties of determining its prevalence and incidence, it is clear that dementia causes a substantial burden globally (Mathers, 2000). Dementia poses considerable medical, social, and economic concerns as it impacts individuals, families and health-care systems throughout the world (National Institute on Aging and National Institutes of Health 1999; O'Shea and O'Reilly 2000). The annual costs of treating Alzheimer's disease alone, including medical and nursing costs and lost productivity have been estimated to be $67 billion (Langa, et al., 2001) to $100 billion (Ernst, et al., 1994).

With the majority of persons with dementia being cared for in the community, it has been suggested that the coping mechanisms and resources of families may be severely tested (O'Shea and O'Reilly 2000). During the prolonged care period characteristic of Alzheimer's disease and other demential conditions, caregivers face the potential for social isolation; financial drain; and physical duress (Clyburn et al. 2000). Women are particularly vulnerable, as they make up the majority of care providers (Gwyther 2000).

1.2 PREVALENCE OF DEMENTIA

1.2.1 INTERNATIONAL DATA

Prevalence refers to the number of people with dementia in the population at a given point in time. There are a large number of prevalence surveys, which have been carried out throughout the world. These tend to give slightly different results depending on the methods used in the study. However, all studies show a sharp rise in the prevalence of dementia with age.

In the United States, approximately 5 to 8 percent of people over the age of sixty-five suffer from dementia (Tinker 2000). For the oldest old (age seventy-five and over), the risk of dementia is much greater. Approximately 18 to 20 percent of those over the age of seventy-five have dementia and between 35 to 40 percent of people eighty-five years of age or older are affected (Ikels 1998; Rabins et al. 1999; Tinker 2000).

Thus the prevalence of dementia increases steadily with age, roughly doubling every 5 years. Studies of community-dwelling elderly have reported dementia in 0.8-1.6% of persons 65-74 years old, 7-8% of persons 75-84 years old, and 18-32% of persons over 85.5. Estimates of the annual incidence of dementia in community-based studies in the West are 0.6-1% for ages 65-74, 2-3% for ages 75-84, and 4-8% for ages 85 or older (Ritchie, et al**.,** 1992).

In the famous Rotterdam study 474 cases of dementia were detected, giving an overall prevalence of 6.3%. Prevalence ranged from 0.4% (5/1181 subjects) at age 55-59 years to 43.2% (19/44) at 95 years and over. Alzheimer's disease was the main sub diagnosis (339 cases; 72%); it was also the main cause of the pronounced increase in dementia with age. The relative proportion of vascular dementia (76 cases; 16%), Parkinson's disease dementia (30; 6%), and other dementias (24; 5%) decreased with age. A substantially higher prevalence of dementia was found in subjects with a low level of education (Ott, et al., 1995).

In the Canadian study, 1994, the prevalence of dementia was 8.0% among all Canadians aged 65 and over and the female: male ratio was 2:1. The age-standardized rate ranged from 2.4%, among those aged 65 to 74 years, to 34.5%, among those aged 85 and over. The corresponding figures for Alzheimer's disease were 5.1% overall, ranging from 1.0% to 26.0%; for vascular dementia it was 1.5% overall, ranging from 0.6% to 4.8%.

1.2.2 INCREASE IN PREVALENCE

Because of the ageing of the world's population, in the future there will be relatively more people in the age groups at most risk for dementia. In the absence of effective prevention or treatment, the increase in the numbers of people with dementia will come about as a simple consequence of an increase in the size of the population most at risk, i.e. of those aged 65 years and over. Between 1990 and 2010, the number of dementia cases in the more developed countries is projected to increase from 7.4 million to 10.2 million (a 37% increase), the elderly population (aged 65+) from 143 million to 185 million (a 30% increase) and the total population in these countries is projected to increase from 1,143 million to 1,213 million (6% increase). Because of the lack of prevalence data from the less developed countries, it is difficult to make projections of the future number of dementia cases. However, these countries are also ageing rapidly and are therefore expected to show an increase in dementia cases. The prevalence rate might also conceivably increase if, for example, better care of people with dementia meant that they survived longer (Ferri, 2005).

1.2.3 INDIAN STUDIES

Investigators have documented prevalence rates for dementia in various community surveys in India. In a study conducted in an urban setting in South India to investigate the prevalence, psychosocial correlates and risk factors of various dementias, the prevalence of dementia was 33.6 per 1000 (95% CI 27.3-40.7). Alzheimer's disease was the most common type (54%) followed by vascular dementia (39%), and 7% of cases were due to causes such as infection, tumor and trauma. Family history of dementia was found to be a risk factor for Alzheimer's disease while a history of hypertension was a risk factor for vascular dementia. (Shaji, et al., 2005)

In a 3-year epidemiological survey for dementia in an urban community-resident population in Mumbai, India, the prevalence rates were as follows: the prevalence rate for dementia in those aged 40 years and more was 0.43% and for persons aged 65 and above was 2.44%. The overall prevalence rate of dementia was 0.32% and a prevalence rate of 1.81% for those aged 65 years and older. The overall prevalence rate for Alzheimer's disease (AD) in the population was 0.25%, and 1.5% for those aged 65 years and above. AD (*n* = 62; 65%) was the most common cause of dementia followed by vascular dementia (*n* = 23; 22%). There were more women (*n* = 38) than men (*n* = 24) in the AD group (Sachdeva, 2001).

1.2.4 VARIATION IN RATES

In various studies the reported prevalence has been lower in India (1.36% to 3.50%) compared to the West (5.9% to 9.4%) (Chandra, et al., 1998; Ferri, et al., 2005). True differences may be attributed to

- Differing genetic factors
- Environmental factors
- Life expectancy
- Duration with disease and age specific incidence (Prince, et al., 2000).

Variation in rates may also be as a result of

- Different survey procedures (one stage/two stage)
- Diagnostic criteria used (Henderson,1994)
- Assessment schedules
- Diagnostic instruments used (most instruments not validated in developing world) (Jacob, 2007).

In a study done to examine the effect of different diagnostic criteria on the prevalence of dementia, 10000 subjects aged above 65 years were recruited in a community survey using a one-stage procedure. The results showed that the prevalence of dementia was different on using different diagnostic criteria. Minor differences in criteria had a significant impact on the diagnosis. The assessment was influenced by

- Education (Ott, et al., 1995)
- Level of baseline function
- Lifestyle and demand on the person
- Tolerance of impairment
- Expectation by relatives
- Differences between hospital and community based populations.

The prevalence according to this study showed wide variation in rates of prevalence when different criteria were used.

Criteria for dementia	**Prevalence**
GMS (using AGECAT)	63.4 %(60.3-69.6)
10/66 algorithm (Prince et al., 2003)	21.2% (18.7-23.9)
Education adjusted 10/66 algorithm (Prince et al., 2004)	10.6% (8.8-12.7)
DSM IV full criteria	0.8% (0.4-1.6%)

(Jacob, et al., 2007)

1.3 ISSUES RELATED TO DIAGNOSIS OF DEMENTIA

1.3.1 ADVANTAGES OF EARLY DETECTION:

There are several potential benefits of detecting dementia before patients are severely impaired:

- Reversible causes of dementia may be identified and treated.
- Treatments to slow the progression of disease can be instituted.
- Measures can be taken to reduce the morbidity associated with dementia.
- Patients and their family members can anticipate, prepare for problems and plan for the future.
- Better control of risk factors for cerebrovascular disease.
- Treatment of associated disorders may improve function in patients with dementia.
- Effective interventions can be planned to prevent falls or accidents.
- Decisions about durable power of attorney can be made while the patient is still competent to participate.

1.3.2 PROBLEM OF UNDERRECOGNITION

Dementia continues to be under-recognized within community practice settings (Bair, 1998). Dementia is easily recognized in its advanced stages, but numerous studies indicate that clinicians often overlook the early signs of dementia. Clinicians fail to detect an estimated 21% to 72% of patients with dementia, especially when the disease is early in its course. Thus around two thirds of the cases of dementia may remain undetected. A population-based study found that the prevalence of undiagnosed dementia among individuals aged 65 years and older was 1.8 percent (Sternberg, et al., 2000). Another population-based study found that about half of the relatives of men

with mild dementia failed to recognize a problem with thinking or memory. Among the undiagnosed patients the majority had dementia of were mild to moderate severity. These low detection rates, the availability of therapy, and the opportunity to elucidate patients' preferences for future health planning drives the interest in dementia screening programs in primary care.

1.3.3 BARRIERS TO DISEASE DIAGNOSIS

The barriers to the diagnosis of dementia include:

- Difficulty in distinguishing early disease from normal aging
- Definitions usually depend upon the impact of the condition on social, functional or occupational activities, which can be biased.
- Patients, fearing a label, deliberately minimize their symptoms
- Patients with more advanced dementia may not be aware of their deficits.
- The “homelessness” of clinical management of dementia between various medical specialties
- Most psychiatrists do not incorporate a cognitive screen in daily practice.
- Clinicians in the primary care setting are even less inclined to incorporate cognitive screening in routine clinical assessments (Knopman, et al., 1998).

In addition to the above-mentioned reasons, the other factors which lead to under recognition of dementia include.

- Patients and their caregivers do not often report cognitive difficulties.
- Cognitive difficulties may be masked by a continued ability to act in a socially acceptable manner.
- Physicians fail to recognize early signs.

- The screening tests currently available are time-consuming
- Some of the most commonly used mental status tests lack the sensitivity and/or specificity required for an accurate diagnosis.
- In a small number of cases, co-morbid conditions (especially depression and delirium) can make differential diagnosis problematic.
- Lack of training

Routine screening in primary care practice could, therefore, potentially increase the number of patients diagnosed with dementia, and most newly discovered cases would have mild to moderate forms of the disease.

1.3.4 BARRIERS TO SCREENING IN PRACTICE

Implementation of screening programs would require screening of asymptomatic elders, the capacity to conduct an accurate diagnostic assessment, and the resources to provide education and management for patients with a confirmed diagnosis. Such resources are not available in the typical primary care practice.

The low predictive value of most screening tests for dementia raises the possibility that unselective screening may have adverse effects. Many asymptomatic patients with abnormal results on Mini Mental State Examination (MMSE) or other screening tests will not have dementia; these patients may be subjected to further tests (e.g., neuropsychological testing, blood tests, lumbar puncture, computed tomography [CT]) to confirm the diagnosis, rule out other reasons for altered mental status, and assign a cause of dementia. Comprehensive follow-up, although posing little risk to patients, will be time-consuming and expensive. If clinicians make a diagnosis based on screening alone, patients may be incorrectly diagnosed as having a progressive,

incurable illness. Nonetheless, in the absence of screening, misdiagnosis of dementia is common in outpatient practice.

1.4 SCREENING FOR DEMENTIA

1.4.1 ISSUES RELATED TO USE OF SCREENING AND CONFIRMATORY TESTS

It has been highlighted that a screening test would require a high sensitivity, while a diagnostic test would require a high specificity (Jacob, 2003). The sensitivity and specificity of a diagnostic procedure is constant only when the test and the population characteristics remain constant. Moreover the predictive values of tests are dependent on the prevalence of the disorder in the population. These predictive values are based on the probability of the presence or absence of the phenomenon in question. Thus the prevalence of the condition in the population is a major determinant of the predictive potential of the tests. Tests used in groups of people with low prevalence of the condition to be detected would produce high false positive rates and low positive predictive values.

Confirmatory tests should be used on individuals who have tested positive on the screening instrument. This method would artificially increase the prevalence of the disorder in the group being tested and would result in more accurate prediction.

Similarly a screening test employed in high prevalence area may generate high false negative rates and low negative predictive values. Optimum test results would be obtained when prevalence of the tested condition is around 50%. The use of confirmatory tests in patients where the probability for the disease is either too low or

too high would demand caution in interpretation as it would increase the likelihood of misclassification of subjects as diseased or non-diseased.

1.4.2 REVIEW OF CURRENTLY AVAILABLE NEUROPSYCHOLOGICAL ASSESSMENT TOOLS

Neuropsychological assessment has retained its key role in the diagnosis of dementia despite improvements in neuroimaging techniques, such as magnetic resonance imaging (MRI) and single photon emission computerized tomography (SPECT).

The following are the commonly used screening instruments for cognitive impairment:

The Mini-Mental State Examination (MMSE) or the Folstein Test

This is a brief 30 point questionnaire that is used to assess cognition. It is commonly used in medicine to screen for dementia. In the time span of about 10 minutes, it samples various functions, including arithmentic, memory and orientation. It was introduced by Folstein et al in 1975 and is widely used with small modifications.

Any score over 24 (out of 30) is effectively normal. The normal value is also corrected for degree of schooling and age. Low to very low scores correlate closely with the presence of dementia.

A review assessing the validity of the MMSE showed that the reliability and construct validity were judged to be satisfactory. Measures of criterion validity showed high levels of sensitivity for moderate-to-severe cognitive impairment and lower levels for mild degrees of impairment. Content analyses revealed the MMSE was highly verbal, and not all items were equally sensitive to cognitive impairment. Items measuring language were judged to be relatively easy and lacked utility for identifying mild language deficits (Tombaugh, 1992).

In an up to date review the construct validity of the test is considered good. An MMSE score of less than or equal to 23 is generally accepted as indicating cognitive impairment and was associated with the diagnosis of dementia in at least 79% of cases. The major variable that affects the MMSE's sensitivity is the level of cognitive impairment. The attainment of high levels of sensitivity increases with increased impairment. Specificity was found to be between 80-100%.

The PHC COG:

PHC-COG was developed by supplementing informant questionnaires with patient questionnaires, the combination of which can increase predictive power. Items were derived from four sources: the Mini Mental State Examination, the Barthel Index, the Instrumental Activities of Daily Living (IADL), and the Korean Dementia Screening Questionnaire (KDSQ). The PHC-cog Patient's Section consists of ten cognitive test items. Scoring is based on the total number of incorrect responses, the maximum score is 20, and lower scores indicate better functions. (Park et al., 2005)

The PHC-cog Patient's Section had a sensitivity and specificity of 0.75 and 0.92, respectively. The PHC-cog Informants' Section had a sensitivity and specificity of 0.79 and 0.83, respectively. The total method of administering the PHC-cog had a sensitivity and specificity of 0.96 and 0.82, and the two-stage method had a sensitivity and specificity of 0.92 and 0.76, respectively. (Park et al., 2005)

HMSE – Hindi Mental status Examination

This instrument designed in 1995, was a modified version of the standard MMSE, suited for the rural and illiterate population of North India. In this instrument, the question about orientation to time was modified as time of the day, day of the week,

date, month and season. The orientation to place was modified to assess district, post office, village, block and "whose house is this?" The three-word recall of HMSE used Hindi version of mango, coin and chair, which was more suitable in this population. The WORLD backwards test was modified to saying the days of the week backwards and serially reducing bus fare amount in a story recited. The naming test was given allowance for local colloquial terms, which were scored right. For repetition, the phrase used was "neither this, nor that". The visual command test was modified as "Look at me and do exactly what I do". The sentence test was modified to "tell me something about your house". The copying of intersecting pentagons was replaced by a simpler diamond with a square (Ganguli, et al., 1995).

EASI – The Everyday Disability Scale for India

This instrument was developed to assess the elderly population in rural North India, which could be used for screening for dementia in the illiterate population. The test items were selected carefully so that it was relevant regardless of sex, socio-economic class, caste and culture. The items focus on ADL – 4 related to eating behavior, 4 related to personal hygiene, 7 related to grooming and 2 related to attention to health needs. The reliability and validity of this instrument was tested to be reasonably adequate (Ganguli, et al., 1998).

Abbreviated Mental Test (AMT)

The Abbreviated Mental Test (AMT) is a brief, 10-item scale used to screen for impairments. It was derived by selecting 10 questions with the most discriminatory value from the longer Mental Test Score (rated out of 34). It includes components requiring intact short and long term memory, attention and orientation. A score of <8 is

the usual cut-off suggesting a significant cognitive deficit. It takes approximately 3 min to administer in elderly patients.

There is also a four-question version of the AMT (the AMT4), using the questions age, date of birth, place and year only. Scores achieved have been found to correlate reasonably well with those from the longer form of the AMT. The AMT has a lower sensitivity and specificity to detect cognitive impairment than the MMSE. The AMT4 appears to perform even less favorably, although it is particularly quick and easy to administer.

The Clock Drawing Test - CDT

In this test subjects are asked to draw a clock showing a time of 3 o'clock. Clocks were scored using three scoring scales - Shulman, Sunderland, and Wolf-Klein. When compared with the MMSE, clock drawing provided additional diagnostic discrimination, identifying 7/8 AD patients with MMSE scores = 24 (Brodarty, 1997). For the poorly educated subgroup, sensitivity and specificity for detecting dementia by clock drawing were 90% and 42% by the Shulman scale, 74% and 44% by the Sunderland scale, and 48% and 90% by the Wolf-Klein scale (Seigerschmidt, 2002).

The 7 Minute Screen – SMS

The 7MS consists of four brief cognitive tests: Benton temporal orientation, Enhanced cued recall, Clock drawing and Verbal fluency (Meulen, et al., 2004). The overall sensitivity of the 7MS for all dementia cases versus controls and cognitively intact patients was 91.2%. The sensitivity for Alzheimer's disease was 92.9%. Sensitivity for detecting other dementias was 89.4%. Specificity was 93.5% (Solomon, 1998).

The Mini Cog

The Mini-Cog comprises of 2 subtests - three word recall and clock drawing test. The Mini-Cog had higher sensitivity but lower specificity than the MMSE using the generally applied MMSE cut off of 24. Specificity and sensitivity were similar when the MMSE cut off was raised to 25 (Borson, 2003).

The RUDAS – The Rowland Universal Dementia Assessment Scale

The Rowland Universal Dementia Assessment Scale (RUDAS) is a screening test developed in a multicultural setting in Australia. It assesses body orientation, praxis, drawing, judgment, memory, and language. It has the additional advantage of being capable of assessing impairment in executive function. It has a reported sensitivity of 89% and a specificity of 98% when tested in a multicultural setting in Australia. (Rowland et al., 2004)

Short and Sweet Screening Instrument

The Short and Sweet Screening Instrument (SAS-SI) derives from analysis of tests used in the population-based MoVIES study of dementia prevalence and incidence. Used by itself, it can be given in 10 minutes. However, the SAS-SI does not contain a memory test and therefore does not test a core symptom of dementias in general and of AD in particular. The sensitivity and specificity of SASI is 94% and 91%, respectively.

Short Portable Mental Status Questionnaire

The Short Portable Mental Status Questionnaire contains a 10-item test aims to detect "organic brain syndrome" and is easy to score. It covers short-term recall, long-term recall, orientation, current event information and mathematical tasks. The number of

errors determines whether the subject is classified as having intact intellectual functioning or mild, moderate, or severe intellectual impairment. In a comparison with a clinical sample the SPMSQ had a sensitivity of 67% and a specificity of 96%. The same evaluation of an institutional sample with a 34% prevalence of dementia showed a sensitivity of 26% and a specificity of 98%.

Cognitive Abilities Screening Instrument

The CASI samples a broad range of cognitive abilities, and domains of attention and concentration, verbal and non-verbal memory, language, visual-spatial functions, executive functions and drawing. The CASI incorporates elements of the Mini Mental State Exam (MMSE), the Modified Mini-Mental State (3MS), and the Hasegawa Dementia Scale for the Aged. Scores of each of these shorter tests can be derived from CASI results. The MMSE score derived from the CASI was found to have a correlation coefficient of 0.92 compared with the standard MMSE (Graves et al., 1993; McCurry, 1999).

The GPCOG

The General Practitioner Assessment of Cognition (GPCOG) (Brodaty et al., 2002) is intended for use in primary practice as a brief screening test for cognitive impairment. It has two sections—a patient examination (GPCOG-patient) with a maximum score of nine and an informant interview with a maximum score of 6. A GPCOG-patient score of 9 indicates no cognitive impairment. If the GPCOG-patient score lies between 5 and 8 the GPCOG-informant should be administered. A GPCOG-patient score of 4 or lower or a GPCOG-informant section score of 3 or lower suggests cognitive impairment.

It has been shown to be a valid instrument for detecting dementia with sensitivity and specificity of 0.85 and 0.86 respectively in a representative general practice population. (Brodaty, et al., 2002)

Relevance of Informant questionnaire in Dementia Screening:

A relative, friend or carer who knows the patient well completes an informant questionnaire. The advantage of such questionnaires is that they are able to look at more than just a snapshot in time, as they ask for an impression of change. For example, the history of onset and progression is extremely important when distinguishing between delirium and dementia. However, this information would usually be gathered by informal interview with a suitable source during standard assessment. Informant questionnaires usually give an impression of general decline rather than specific domains of cognitive impairment. They are not biased by the patient's baseline educational level, but may be influenced by factors regarding the informant's state of mind and relationship with the patient. Informant depression or poor relationship with the patient tends to cause an over-estimation of cognitive changes, whereas informants who do not live with the patient tend to underestimate changes. A number of tools that incorporate both patient and informant questioning exist. In addition, some authors have proposed methods of adding informant rating scales to standard tools such as the MMSE to improve screening accuracy. (Mackinon et al., 1998)

Informant Questionnaire for Cognitive Decline in the Elderly - IQCODE

An example is the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE), which asks a person who knows the patient well to answer 26 questions based on change in cognitive function over a 10-year period. The IQCODE, developed

by Jorm, assesses prior cognitive decline over time, based on ratings of everyday cognitive abilities. Informants are asked about the subject's change in capabilities in relation to performance 10 years ago, rating change on a 5-point scale (1 = much better, 3 = little change, 5 = much worse). The original test had 26 questions, but a shortened 16-question version has proven just as effective. The short IQCODE takes an average of 10 to 12 minutes (range 8 to 15 minutes) to administer. (Jorm, 1996, 2003)

When compared to DSM-IIIR criteria in elderly people admitted as emergencies to a geriatric unit, sensitivities and specificities of 100% and 86% were obtained for the IQCODE, compared to 96% and 73% for the AMT (<8).

1.4.3 PROBLEMS WITH CURRENTLY AVAILABLE SCREENING INSTRUMENTS FOR DEMENTIA

The usual diagnostic standard for dementia consists of detailed assessment of mental status and careful investigation to rule out other causes of cognitive impairment. A variety of abbreviated instruments have been examined for their ability to screen for dementia in the outpatient setting. The most widely studied of these instruments have been reviewed above.

Recent data suggest that level of education and cultural differences have important effects on the range of MMSE scores in a given population. Among individuals with only 5-8 years of education versus those with college education, the cut-off points that identified the lowest 25% on MMSE cut-off may miss significant changes among well-educated patients (false negative result) and generate more frequent false-positive results among persons who are less educated or from different cultures. Thus age, education, cultural and socioeconomic background can cause considerable bias in the

MMSE scores (Lancou, 2006). The other disadvantage of the MMSE is the difficulty to identify MCI and difficulty in recording changes in cases of severe dementia. Moreover other mental disorders can also lead to abnormal findings on MMSE testing. The presence of purely physical problems can also interfere with the interpretation if not properly noted. For example a patient maybe physically unable to hear or read instructions properly, or may have motor deficits that affect writing and drawing skills (Wind, 2001).

Shorter screening instruments such as the Short Portable Mental Status Questionnaire and the Clock Drawing Test seem to be reasonably sensitive and specific for moderate to severe dementia, but they have not been adequately studied as screening tests in asymptomatic outpatients. Because they each examine a lesser range of cognitive function, they are not likely to be as sensitive as the MMSE or more comprehensive tests for detecting early dementia.

The disadvantages of PHC cog have been education and culture bias. The questions based on vaccination, birthday, calculation ability, clothing, construction of the intersecting pentagons have an educational bias and a culture-ethnicity bias and cannot be used in the developing world for screening.

RUDAS has been validated in Indian settings against the MMSE (Shaji et al., 2005). RUDAS had a similar sensitivity but better specificity than MMSE. Though it was culturally fair, it did have an educational bias. The test items in RUDAS, such as ‘‘crossing the road’’ and ‘‘cube copying’’, especially have an education and culture bias.

In the GPCOG, the clock drawing component in the patient version is again a pen and paper test. This has a culture and educational bias. In the informant version, the component about the medication and transport management make the questionnaire culture and education biased (Brodaty et al., 2004).

The Short Portable Mental Status Questionnaire has large effects of literacy on error scores and cut-off scores had to be adjusted for education and literacy. The test has been criticized for its lack of a learning and memory task.

In the IQCODE, three items which carry most of the instrument's power to classify cognitive status: learning to use new gadgets, knowing the day and month, and handling everyday arithmetic problems have an educational bias.

In the Clock Drawing Test the clock-drawing ability is affected by education in non-demented elderly persons. The scoring method of Wolf-Klein is least educationally affected and maximizes specificity for detecting dementia but has low sensitivity. Educational effects make clock drawing a poor single screening test for dementia in a poorly educated population.

The 7MS, by virtue of its design has been useful only in Alzheimer's Dementia and not in other types of dementia. Its reliability and validity in primary care setting and community setting has not been assessed. The Seven Minute Screen also is biased by educational background and culture and hence cannot be used for routine community screening in developing countries. Moreover if the clinician is not acquainted with the 7MS, the scoring system can appear difficult (Meulen, et al., 2004).

The Mini Cog has been not been validated against a gold standard for diagnosis. Moreover the Clock drawing component has educational and cultural bias.

Increased age and lower education were associated with a lower CASI score, as well as an increased spread in score distribution. Gender was also significantly related to total CASI, with women having a slightly higher distribution of scores. Like most cognitive screening instruments, performance on the CASI in non-demented persons is influenced by age and education (Susan, 2001).

1.5 RATIONALE FOR THE STUDY

The recognition of dementia by primary care physicians is shown to be poor. Reported rates of overlooked dementia are between 35% and more than 90%. Evidence suggests that physicians should initiate an early search for reversible causes of dementia, and some research suggests that there is a benefit to early intervention with cholinesterase inhibitors. For both the patient and the caregiver , the early and timely recognition of dementia marks an important transition from the uncertainty and ambiguity of the early cognitive and behavioural change to a phase in which the patient adjusts and learns to live with impairment and loss of function. There is indeed a need for timely detection and diagnosis that will prevent crises, facilitate adjustment and provide access to treatments and support.

The high prevalence and social costs of dementias in late life and the emergence of useful therapies, a growing consensus favors cognitive screening as part of routine primary care of the elderly. Routine dementia screening in primary care could achieve several useful objectives in addition to dementia detection: it could sensitize primary care physicians to the possibility of declining cognition in their older patients, accelerate translation of research advances into actual practice, promote development of quality standards for dementia care across practice sites and styles, and encourage

design of proactive strategies for population-based health care of dementia patients and their families.

The conventional screening instruments have the following drawbacks

- Some are time consuming and need training to use
- Many have language and cultural bias
- Some are dependent on the educational background of the individual.
- Some of these tests require a computer programme to interpret results.

A brief screening tool with no education, culture or language bias, which has also been validated against a standard assessment tool, is still not available for routine use in the Tamil population. In this study a new screening instrument was designed so as to avoid cultural and educational bias. It was designed to test the main cognitive domains using a simple method of scoring and validated against the gold standard for use in different settings.

AIMS

The aim of this study was to design a brief screening instrument for dementia.

SPECIFIC OBJECTIVES

1. To design a test that is valid and reliable with high sensitivity and specificity.

2. To design a test that is without significant education, language and culture bias.

3. To design a test that tests the key cognitive domains affected in dementia.

4. To design a test that is easy to administer, with a short test time and simple scoring.

3.1 DEVELOPMENT OF INSTRUMENTS

The first phase of the study involved the development of the screening instrument for dementia and its translation into Tamil.

3.1.1 THE DEVELOPMENT OF THE NEW SCREENING INSTRUMENT-PHASES OF INSTRUMENT DEVELOPMENT

The goal of developing the new screening instrument was to identify those subjects in the hospital and the community most likely to be currently demented. The instrument has been constructed to be reliable, valid, sensitive and specific using simple questions that test the key cognitive domains in day-to-day activities.

Initial selection of potential test items by consensus.

A panel of psychiatrists developed a series of measures to screen for dementia. Data from reviewed literature on screening and diagnostic tests for dementia as well as collective clinical and research experience was taken into account.

Each item and subtest was examined for relevance, adaptability, the conceptual basis for the test and the cognitive domain being tapped by the test. Each individual screening item was specifically reviewed for their ability to be culture and education fair.

The study and procedures for obtaining informed consent were approved by the Research Committee of the Christian Medical College, Vellore.

Pretesting

Pretesting of the test items were carried out on 3 volunteer subjects aged above 65 after obtaining informed consent. The objective was to examine the level of difficulty, acceptability, comprehensibility and relevance of the potential items and the distribution of scores on each subtest and item.

FIELD STAFF TRAINING AND OPERATIONS MANUAL

A detailed operations manual with explicit instruction for field staff was prepared and modified as the test was modified. Particular attention was paid to listing allowable prompts and probes to be used if the subject did not respond or gave a nonspecific or irrelevant reply.

The primary researcher was a qualified psychiatrist. The co-investigators were field workers who have extensive experience in the administration of dementia screening tests (Jacob et al, 2007).

3.1.2 TEST DESCRIPTION

The new screening instrument for dementia comprises of 2 questionnaires-the Patient Questionnaire and the Informant Interview. Each questionnaire comprises of 10 questions each, 2 for each key cognitive domain affected in dementia, based on DSM-IV (Diagnostic and Statistical Manual 4th Edition) (American Psychiatric Association, 1994) criteria. The questions are worded in simple terms with a focus on activities of daily living. The required time for administration is about 7-10 minutes. The scoring was done as 0 or 1 based on the response.

The new screening instrument for dementia-PATIENT QUESTIONNAIRE

Item description

Registration: Three objects are given to test memory registration. The Tamil words for 'mango, chair, coin,' were given. A cueing devise was used, as in the Hindi Mental State Examination (HMSE) (Ganguli et al, 1995), with the instruction beginning 'I went to Chennai and brought back three things…'The place Chennai was substituted for Delhi (used in the HMSE), considering the Tamil population being tested.

Aphasia: This is measured by the ability to comprehend spoken language and to formulate oral language. The examiner says 'Look at my face and do exactly what I do' and then closes his/her eyes for 2 seconds and then opens them. The subject's response is observed.

Subjects are asked to tell the examiner something about their home using the question,' Say a sentence about your home'. This taps the ability to understand the task of generating a complete thought. A point is awarded to any complete sentence offered in response. These items have been incorporated from the HMSE (Ganguli et al, 1995).

Apraxia: The ability to execute a voluntary motor movement in response to verbal command, to imitate and to handle an object correctly is checked by asking the subject to demonstrate simple day-to-day activities. Questions include,' Show me how you light a candle' and 'Show me how you comb your hair'. These questions were developed for the new scale.

Agnosia: The ability to recognize objects and attach appropriate meaning is checked by showing the subject a key and asking him/her to name it. A comb is put into the

patient's hand while his/her eyes are closed and he/she is asked to name it. While this item is in other scales, the objects described here were chosen, as they are commonly used and considered culturally more appropriate than the wristwatch and pen employed in the MMSE (Folstein et al, 1975) and HMSE (Ganguli et al, 1995).

Disturbances in executive functioning: The subject is asked to fold a paper according to instructions given. This item is taken from the MMSE (Folstein et al, 1975). A lock and key are handed to the patient with instructions to open it. This item from day-to-day life was introduced into the new screening instrument.

Recall: The subject is asked to recall the three objects (mango, chair and coin) named earlier with a cue,' Do you remember the three things that I brought from Chennai?'This item is from the HMSE (Ganguli et al, 1995).

The new screening instrument for dementia-INFORMANT QUESTIONNAIRE

Item description

Memory impairment The relative is asked about any difficulty the patient may have in recent memory .The cue of citing an example is used to make the question clearer. The examiner asks the question,' Does he/she regularly forget things that have happened recently? For example, does he/she forget that he/she has just eaten and asks again for food?' . This question has been taken form the General Practitioner Assessment of Cognition (GPCOG) (Brodaty et al, 2002). A second question regarding trouble remembering where the patient has kept his/her belongings was introduced from the Short form of the Informant Questionnaire on Cognitive Decline in the Elderly (Short IQCODE) (Jorm and Jacomb, 1989).

Aphasia: The patient's ability to comprehend spoken language and to formulate oral language is checked by asking the relative questions regarding the patient's ability to find the right words and understand what is said to him/her. This question has been taken form the General Practitioner Assessment of Cognition (GPCOG) (Brodaty et al, 2002). A second question regarding trouble with comprehension was introduced.

Apraxia: The relative is asked about the patient's ability to dress and use the toilet appropriately to assess execution of voluntary motor movements and the ability to handle objects correctly. These questions were incorporated into the scale from the Everyday Abilities Scale for India (EASI) (Fillenbaum et al 1999).

Agnosia: The relative is asked if the patient is able to recognize familiar people and objects. These questions are routinely used in. These questions are routinely employed in neurological interviews (Strub and Black, 1993).

Disturbance in executive functioning: The relative is asked,' Is he/she able to go to the market and purchase things like before';' Has he/she ever got lost in the village or town'. These questions are used to assess executive functioning using examples form day-to day life. Several scales such as the Public Health Centre Cognitive Dysfunction Test (PHCcog)(ho et al, 2004) and the GPCOG give a certain activity- such as using tools, paying bills- and ask if the patient is able to do it as he used to in the past. In the new scale the same theme has been maintained but a more common activity of going to the market was substituted in the first question. The second question was taken from the Everyday Abilities Scale for India (EASI)(Fillenbaum et al 1999).

Decline in functioning: To assess the deterioration in functioning, the relative is asked regarding the presence or absence of a worsening of the patient's problems during the previous year. This question was introduced to incorporate information about deterioration in functioning, necessary to make a diagnosis of dementia by DSM IV.

3.1.3 PILOT PHASE

After the pretest data was examined and appropriates modifications were made to the test items, a random sample of subjects above the age of 65 were recruited for a pilot study. The researchers administered the new instrument as well as the diagnostic tests for dementia to the subjects after obtaining informed consent and basic demographic information

3.1.4 INSTRUMENTS FOR THE DIAGNOSIS OF DEMENTIA

Dementia was defined as those scoring above a cut point of predicted probability of DSM IV Dementia syndrome from the algorithm developed in the 10/66 international pilot study, using coefficients from the Geriatric Mental State, Community Screening Instrument for Dementia, the modified CERAD10 word learning task and History and Aetiology Schedule Dementia Diagnosis and Subtype (Prince et al, 2003).

The Geriatric Mental State (GMS) (Copeland et al, 1986): This is a standardized psychiatric interview and its computerized diagnostic system, AGECAT, has been used and updated for over three decades. It has been employed in many countries and in diverse settings to diagnose dementia and other psychiatric disorders in the elderly. The GMS is considered a flexible and effective case-finding instrument.

Community Screening Instrument for Dementia (CSID) (Hall et al, 1993): This test was developed as a screening instrument for dementia for use in cross-cultural studies. It consists of two components, a cognitive test for non-literate and literate populations and an informant interview regarding performance in everyday living. The cognitive test covers multiple domains, including orientation to time and space, language, memory, praxis, and abstract thinking. It deliberately excludes literacy-dependent items. The informant interview assesses a close relative's perception of a decline in memory or intelligence, activities of daily living, and functioning at work and in social relations. Three summary scores can be generated from the CSI-D: (a) the cognitive score (COGSCORE), an item-weighted total score from the participant's cognitive test, (b) the informant score (RELSCORE), an unweighted total score from the informant interview, (c) the discriminant function score (DFSCORE), a weighted score combining the COGSCORE and RELSCORE.

Modified CERAD 10-word-list-learning-task (Ganguli et al, 1996) This is the cognitive test proposed by the Consortium to Establish a Registry for Alzheimer's Disease (CERAD). The Tamil word list consists of the Tamil words for butter, arm, letter, queen, ticket, grass, corner, stone, book, and stick, because these were deemed more appropriate in the local culture and language. The test yields a total immediate recall and a delayed recall score.

History and Etiology Schedule Dementia Diagnosis and Subtype (HAS-DDS) (Copeland et al, 2002): It is part of the GMS-AGECAT package and is designed to clarify diagnosis into the sub-categories of AGECAT, ICD-10, DSM-IV and to cover the MRC's Clinical Information for Studies in Alzheimer's Disease. The HAS interview

is designed to be given to the most relevant significant other, if a complete GMS interview with the subject is not possible, to supplement the missing report, or to validate a report of a questionable subject.

3.1.5 TRANSLATION OF INSTRUMENT

The new instrument was translated into Tamil independently by 2 health professionals (outside the research team), proficient in both Tamil and English. The Tamil version thus obtained was then back translated into English by another 2 bilingual individuals, working independently, who were unaware of the original English version. The translators then together arrived at a consensus decision on the final Tamil version. Care was taken that the translators used language that closely matched the language usage of the target group.

3.2 THE STUDY

3.2.1 STUDY SETTING AND SITE

The Christian Medical College is 2234 bedded multi-speciality, tertiary care teaching hospital. It has a total of 3700 outpatients a day and runs 76 clinics.

The Community Health Department of the hospital has been working in Kaniyambadi block for the past 50 years. The surveillance system is rigorous and data for the whole block is computerized and reviewed monthly by the entire health team.

This study was conducted at four different sites-

Hospital sample:

i) The out patient clinics of the department of Geriatric Medicine, Christian Medical College, Vellore.
ii) The out patient clinics of the department of Neurology, Christian Medical College, Vellore
iii) The outpatient clinic of the department of Psychiatry, Christian Medical College, Vellore

Community sample:

The community in the village of Pennathur, Kaniyambadi block.

3.2.2 DURATION OF THE STUDY

Participants were recruited between the months of December 2006 and August 2007.

3.2.3 SUBJECTS

Neurology and Geriatric Medicine clinics

Consecutive patients attending these clinics were contacted for possible recruitment into the study. Patients who were diagnosed to have dementia clinically using DSM IV criteria were chosen and an equal number of patients who did not were included as controls.

SUBJECTS

Inclusion criteria

1. Patients satisfying DSM IV criteria for dementia
2. Age 65 years and above
3. Conversant in Tamil
4. Accompanied by a reliable informant

Exclusion criteria

1. Presence of delirium
2. Patients with hearing impairment
3. Patients with visual impairment
4. Patients with wasting and weakness of hands

CONTROLS

Inclusion criteria

1. Patients without dementia
2. Age 65 years and above
3. Conversant in Tamil
4. Accompanied by a reliable informant

Exclusion criteria

1. Presence of delirium
2. Presence of neurological disorders like Parkinson's Disease or Cerebrovascular accidents
3. Patients with hearing impairment
4. Patients with visual impairment
5. Patients with wasting and weakness of hands

Psychiatry out patient clinic

Inclusion criteria

1. Patients satisfying the ICD 10 criteria for depression
2. Patients without dementia
3. Age 65 years and above
4. Conversant in Tamil
5. Accompanied by a reliable informant

Exclusion criteria

1. Presence of delirium
2. Presence of neurological disorders like Parkinson's Disease or Cerebrovascular accidents

3. Patients with hearing impairment

4. Patients with visual impairment

5. Patients with wasting and weakness of hands.

Community sample

Inclusion criteria

1. Age 65 years and above

2. Conversant in Tamil

3. Availability of a reliable informant

Exclusion criteria

1. Presence of delirium.

2. Presence of neurological disorders like Parkinson's Disease or Cerebrovascular accidents.

3. Patients with hearing impairment.

4. Patients with visual impairment.

5. Patients with wasting and weakness of hands.

3.2.4 PROCEDURE

Sampling

In the hospital, patients and controls were referred to the investigator by their primary physicians based on the inclusion and exclusion criteria. Age and suitability for inclusion into the study were then confirmed.

In the community, a list of residents of Pennathur village was obtained from the computerized database obtained from the Department of Community Health. With this as a guide, a door-to-door survey of the village was done. Eligible participants were identified.

Consent

The details of the study and the purpose were explained in Tamil to the patient and accompanying relative. Written consent was obtained from all participants, prior to inclusion in the study.

Socioeconomic data

The socio-demographic details for all those recruited were recorded.

Physical Examination

A physical examination which included measurement of vital signs and a detailed neurological examination was done to assess physical disabilities that could interfere with the performance on the tests in the questionnaires.

Hearing, Vision and Motor assessment

This was specifically looked into to ensure that the inability to perform the test items was not due to physical problems but due to the cognitive impairment.

Hearing was assessed by asking the patients name in a simple Tamil sentence – "What is your name? ". This was asked in a clear tone, normal loudness with no gestures of hand. If the subject answered correctly, hearing was assumed to be normal.

Vision was assessed by asking the patient to identify the direction of the examiner's fingers ('pointed upwards' or 'pointed sideways'). This was done by the examiner holding his/her right hand fingers either upwards or sideways at a distance of 18 inches from the patients face. If he/she was unable to identify, the test was repeated at 9 inches distance. If the subject failed at this distance also he/she was excluded from the study.

The *motor power* of the hands was also specifically assessed by the arm drift test. The subject was asked to sit with both his hands outstretched in front and with eyes closed. Inability to do so or the drift down of one arm was suggestive of weakness and these patients were excluded.

Ruling out Delirium

The reliable informant was asked whether the cognitive impairment was of very recent acute onset. An affirmative answer was suggestive of probable delirium and hence such patients were excluded from the study.

Preparation of subjects

The testing session began with a polite conversation that included collection of the socio-demographic data followed by a "DUMMY TEST" which was not scored. The dummy test serves to get the subject into the test "set" or "mode", helping him to

comprehend that this is a new type of social situation where specific choices must be made, he needs to be alert and precise answers be given. The dummy test was designed to appear like a real test but had a high probability of correct responses to provide the subject with early success and allay initial anxiety.

Administration of the Questionnaire

The administration of the new screening instrument - informant and patient questionnaire- was done in privacy. It was ensured that all the patients and the controls were administered the questionnaire in the same setting with regard to degree of external distracting stimuli. The patient questionnaire was administered first, following which the informants were questioned in privacy. The questions were repeated if the attention span was inadequate. The scoring was done as 0 or 1 based on the response.

Final Diagnosis using Gold Standard

The subjects were subsequently administered the battery of confirmative tests by a co-investigator. These included the Community Screening Instrument for Dementia (CSID), Geriatric Mental State (GMS), Modified CERAD 10-word learning test, History and Etiology Schedule Dementia Diagnosis and Subtype – HAS – DDS.). Each of the diagnostic standards employed was based on the computerized algorithms developed by the 10/66 Dementia Research Group (Prince et al., 2003; 2004).

Blinding

The primary researcher who carried out the screening test for dementia was blind to the case/control status of the participants. Data entry was also carried out independent of this researcher. The standard diagnostic tests were administered by the co-investigators.

Referral

The relatives and caregivers of patients with dementia were briefed about the disease and its prognosis, available treatment options and a handout containing information in Tamil was also given. In the hospital, the patients were then referred back to the treating physicians for further management. Those in the community were referred to the hospital.

3.3 STATISTICAL METHODS

DETERMINATION OF SAMPLE SIZE

EpiInfo (ver 5.0) (1990) was employed to calculate the sample size for the study.

The following assumptions were used for the hospital sample: estimated prevalence of dementia among the elderly in a hospital setting 25%, estimate of error ± 10%, with a 95% confidence interval and 80% power. The sample size obtained was 72.

The following assumptions were used for the community sample: estimated prevalence of dementia among the elderly in a community setting 10%, estimate of error ± 6%, with a 95% confidence interval and 80% power. The sample size obtained was 96.

DATA ANALYSIS

The new screening instrument was validated against the standard of the confirmatory test. Sensitivity, specificity, positive and negative predictive values were calculated for the screening questions. Receiver operator characteristic (ROC) analysis was used to assess the patient section, the informant section and total scores as screening tools for DSM IV-defined dementia. The ROC curve was constructed by plotting the true positive ratio against the false positive ratio for each possible cutoff point of the test.

The statistical software SPSS for Windows Release 6.1.3 (SPSS Inc, 1995) was employed for the analysis of data.

4 .1 HOSPITAL SAMPLE

4.1.1 SUBJECTS

A total of 90 subjects were contacted from the hospital clinics -30 from the Geriatric clinic, 30 from the neurology clinic and 30 from the psychiatry clinic. All consented to participate in the study. An informant was interviewed for each subject included in the study.

4.1.2 SOCIODEMOGRAPHIC PROFILE OF SAMPLE

Tables 4.1.1 and to 4.1.2 document the sociodemographic profile of the hospital sample.

The mean age of the participants was 71.53 years with a range between 65 and 96 years. Of the sample, a majority (57.8%) were men. A majority (61.1%) were married at the time of the study. Most subjects lived in their own home (84.4%) with their family (93.3%). While 24 (26.7%) had never worked, 85 subjects (94.4%) were not employed at the time of conducting the study. A majority had an income of their own (80%). Many were from a low socio-economic background.17.8% had been unable to buy food in the past month due to financial problems and had only two meals a day. 35 participants (38.9%) had completed primary education, 4 (4.4%) had completed secondary education and 6 (6.7%) tertiary education. A majority could read (68.8%) and write (62.2%). 43 (47.8%) had diabetes, 40 (44.4%) had hypertension and 9 (10%) had a history of cerebrovascular accidents.

The mean age of the informants accompanying these subjects was 44.03 years with a range between 18-82. The majority (55.6%) were female. 33 (36.7%) were the subject's child and 23 were the subject's spouse (25.6%). A majority (66.7%) were residing with the subject.

Sociodemographic profile of sample

Table 4.1.1 Hospital sample-Subjects

Sociodemographic characteristic	Number	%
Age: Mean (yrs)	71.53	
Standard deviation	6.691	
Range	65-96	
Gender: Male	52	57.8
Female	38	42.2
Marital status: Never married	1	1.1
Married	55	61.1
Widowed	32	35.6
Divorced/separated	2	2.2
Level of education: None	25	27.8
Did not complete primary education	19	21.1
Completed primary education	35	38.9
Completed secondary education	4	4.4
Completed tertiary education	6	6.7
Others	1	1.1
Can read: No	29	32.2
Yes	61	67.8
Can write: No	34	37.8
Yes	56	62.2
Housing ownership: Rented	14	15.6
Own	76	84.4
Type of house: Thatch	2	2.2
Tiled	15	16.7
Concrete	73	81.1
Living arrangements: Alone	6	6.7
With family	84	93.3
Past occupation: None	24	26.7
Unskilled	14	15.6
Semiskilled	22	24.4
Skilled	30	33.3
Current occupation: None	85	94.4
Semiskilled	4	4.4
Skilled	1	1.1

Table 4.1.1 Hospital sample-Subjects (Continued)

Has own income: No Yes	18 72	20.0 80.0
Family per capita income: Mean (Rs) Standard deviation Range	1521.08 2053.858 0-13000	
Presence of debt: No Yes	73 17	81.1 18.9
Number of square meals per day: Two Three	16 74	17.8 82.2
Had difficulty buying food in the past one month: No Yes	74 16	82.2 17.8
Physical status: Diabetes Hypertension Cerebrovascular accidents	43 40 9	47.8 44.4 10

Table 4.1.2 Hospital sample- Informants

Sociodemographic characteristic	Number	%
Age: Mean (yrs)	44.03	
Standard deviation	15.292	
Range	18-82	
Gender: Female	50	55.6
Male	40	44.4
Relationship to subject: Spouse	23	25.6
Child	33	36.7
Son/Daughter-in-law	11	12.2
Sibling	2	2.2
Other relative	17	18.9
Friend	1	1.1
Others	3	3.3
Informant is co-resident: No	30	33.3
Yes	60	66.7
Marital status: Never married	18	20.0
Married	68	75.6
Divorced/separated	2	2.2
Widowed	2	2.2
Level of education: None	12	13.3
Did not complete primary education	5	5.6
Completed primary education	33	36.7
Completed secondary education	16	17.8
Completed tertiary education	23	25.6
Not known	1	1.1
Employment: Paid full-time employment	22	24.4
Paid part-time employment	19	21.1
Unemployed (looking for work)	7	7.8
Housewife/ husband (full-time)	34	37.8
Retired	7	7.8
Others	1	1.1
Income source/s: Government pension	4	
Occupational pension	7	
Money from family	59	
Income from paid work	36	
Income from rent	2	
Nil	1	

4.1.3 PREVALENCE OF DEMENTIA IN THE HOSPITAL SAMPLE

In the hospital sample eighteen (20%) of the ninety subjects interviewed satisfied DSM-IV criteria for dementia.

4.1.4 NEW SCREENING INSTRUMENT FOR DEMENTIA

4.1.4.1 GENERAL DATA

Patient scores ranged from one to ten with a mean of 6.86 and standard deviation of 2.68.Informant scores ranged from zero to eleven with a mean of 7.22 and a standard deviation of 3.783.

4.1.4.2 VALIDATION

1) SENSITIVITY AND SPECIFICITY OF THE NEW SCREENING INSTRUMENT FOR DEMENTIA

18 (20 %) individuals met psychiatric case criteria for dementia using the DSM-IV diagnostic guidelines. The sensitivity and specificity values of various thresholds of the new screening instrument when compared with the standard of DSM IV 'case-noncaseness' is shown in Table 4.1.3

TABLE 4.1.3 Sensitivity and specificity for different thresholds of the new screening instrument for dementia against DSM IV.

-HOSPITAL SAMPLE

PATIENT QUESTIONNAIRE

THRESHOLD	SENSITIVITY (%)	SPECIFICITY (%)	1-SPECIFICITY
0/1	0	100	0
1/2	11.11	94.44	.0556
2/3	33.33	93.06	.0694
3/4	50	91.67	.0833
4/5	72.22	90.28	.0972
5/6	**83.33**	**88.89**	**.1111**
6/7	94.44	83.33	.1667
7/8	100	75	.25
8/9	100	50	.50
9/10	100	2.78	.9722

INFORMANT QUESTIONNAIRE

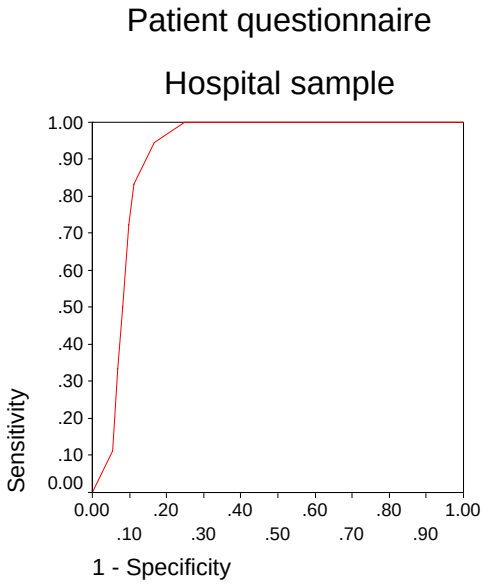
THRESHOLD	SENSITIVITY (%)	SPECIFICITY (%)	1-SPECIFICITY
0/1	28.571	95.83	.0416
½	38.89	94.44	.0556
2/3	55.56	91.67	.0833
¾	55.56	90.28	.0972
4/5	77.78	84.72	.1528
5/6	77.78	80.55	.1945
6/7	**88.89**	**75**	**.25**
7/8	94.44	68.055	.3195
8/9	100	59.72	.4028
9/10	100	51.39	.4861
10/11	100	38.89	.6111

2) RECEIVER OPERATOR CHARACTERISTIC CURVE

Receiver operator characteristic (ROC) curves were constructed (FIGURES 1 and 2). The optimal threshold for screening for dementia using the new instrument was found to be 6/7 for both the patient and informant questionnaires i.e. all those who scored 6 and below can be considered a 'case'. This threshold had a positive predictive value of 58.62%, a negative predictive value of 98.36%, a false positive rate of 12 % and a false negative rate of 1% for the patient questionnaire. The informant questionnaire yielded a positive predictive value of 47.06%, a negative predictive value of 96.43%, a false positive rate of 18 % and a false negative rate of 2% at this threshold.

RECEIVER OPERATOR CHARATERISTIC CURVES FOR THE NEW SCREENING INSTRUMENT FOR DEMENTIA AND DSM IV DIAGNOSIS OF DEMENTIA

Figure 1



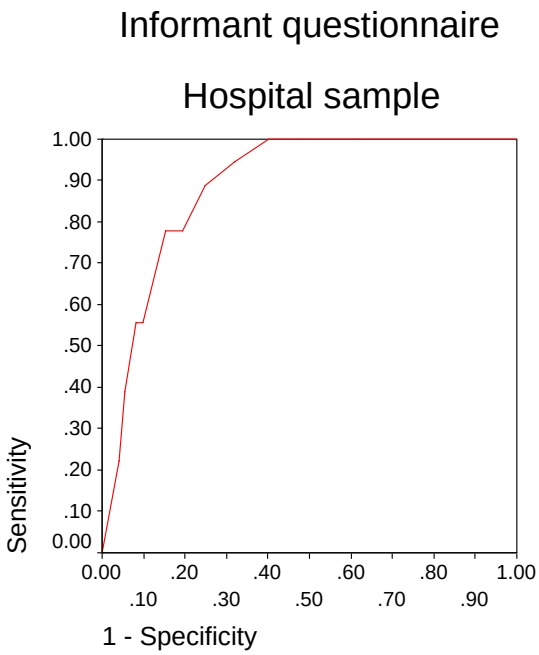


Figure 2

4.2 COMMUNITY SAMPLE

4.2.1 SUBJECTS

4.2.1.1 THE STUDY SAMPLE

201 individuals were contacted in the community. Of these 35 did not satisfy inclusion criteria, 5 refused consent, 4 had died, 30 had moved out of the village, 10 were unavailable despite repeated attempts to contact them and 25 could not be assessed due to time constraints. Finally a total of 101 subjects were recruited for the study from the community. An informant was interviewed for each subject included in the study.

4.2.1.2 REFUSERS VERSUS CONSENTERS

The age and sex of those who consented and those who refused to participate in the study were compared. Both age and gender were not significantly different between the 2 groups.

4.2.2`SOCIODEMOGRAPHIC PROFILE OF SAMPLE

Tables 4.1.3 and 4.1.4 document the sociodemographic profile of the sample.

The mean age of the participants was 72.49 years with a range between 65 and 85 years. Of the sample, a majority (59.4%) were women. A majority (56.4%) were widowed at the time of the study. Most participants lived in their own home (82.2%) with their family (89.1%). While 34 (33.7%) had never worked, 84 subjects (83.2%) were not employed at the time of conducting the study. A majority had an income of their own (83.2%). Many were from a low socio-economic background.24.8% had been unable to buy food in the past month due to financial problems and 31.7% had only two meals a day.21.8% had financial debts. A majority (53.5%) had had no formal education and could not read (54.5%) or write (57.4%). 19 (18 %) had diabetes, 26 (25 %) had hypertension and 2 (2%) had a history of cerebrovascular accidents.

The mean age of the informants accompanying these subjects was 42.98 years with a range between 19-83. The majority (82.2%) were female .25 (24.8%) were the subject's spouse, 23 were the subject's child (22.8 %) and 25 (24.8%0 were a son or daughter-in-law .A majority 77 (76.2%) were residing with the subject.

Table 4.2.1 Community sample-Subject

Sociodemographic characteristic	Number	%
Age: Mean (yrs) Standard deviation Range	72.49 5.545 65-85	
Gender: Male Female	41 60	40.6 59.4
Marital status: Never married Married Widowed Divorced/separated	2 41 57 1	2.0 40.6 56.4 1
Level of education: None Did not complete primary education Completed primary education Completed secondary education	54 23 23 1	53.5 22.8 22.8 1
Can read: No Yes	55 46	54.5 45.5
Can write: No Yes	58 43	57.4 42.6
Housing ownership: Squatting Rented Own	3 15 83	3.0 14.9 82.2
Type of house: Thatch Tiled Concrete	5 30 66	5.0 29.7 65.3
Living arrangements: Alone With family	11 90	10.9 89.1
Past occupation: None Unskilled Semiskilled Skilled	34 32 33 2	33.7 31.7 32.7 2.0
Current occupation: None Unskilled Semiskilled	84 12 5	83.2 11.9 5.0

Table 4.2.1 Community sample-Subjects (continued)

Has own income: No Yes	17 84	16.8 83.2
Family per capita income: Mean (Rs) Standard deviation Range	672.71 788.264 0-3800	
Presence of debt: No Yes	79 22	78.2 21.8
Number of square meals per day: Two Three	32 69	31.7 68.3
Had difficulty buying food in the past one month: No Yes	 76 25	 75.2 24.8
Physical status: Diabetes Hypertension Cerebrovascular accidents	19 26 2	18 25 2

Table 4.2.2 Community sample-Informants

Sociodemographic characteristic	Number	%
Age: Mean (yrs)	42.98	
Standard deviation	15.290	
Range	19-83	
Gender: Female	83	82.2
Male	18	17.8
Relationship to subject: Spouse	25	24.8
Child	23	22.8
Son/Daughter-in-law	25	24.8
Sibling	3	3.0
Other relative	21	20.8
Friend	1	1.0
Others	3	3.0
Informant is co resident: No	24	23.8
Yes	77	76.2
Marital status: Never married	9	8.9
Married	87	86.1
Divorced/separated	5	5.0
Level of education: None	23	22.8
Did not complete primary education	18	17.8
Completed primary education	45	44.6
Completed secondary education	10	9.9
Completed tertiary education	5	5.0
Employment: Paid full-time employment	12	11.9
Paid part-time employment	19	18.8
Unemployed (looking for work)	2	2.0
Student	1	1.0
Housewife/ husband (full-time)	62	61.4
Retired	5	5.0
Income source/s: Government pension	1	
Occupational pension	4	
Money from family	84	
Income from paid work	31	
Other	3	
Nil	4	

4.2.3 PREVALENCE OF DEMENTIA IN THE COMMUNITY SAMPLE

In the community, three (2.97%) of one hundred and one subjects interviewed satisfied DSM-IV criteria for dementia.

4.2.4 NEW SCREENING INSTRUMENT FOR DEMENTIA

4.2.4.1 GENERAL DATA

Patient scores ranged from three to ten with a mean of 8.09 and standard deviation of 1.13.Informant scores ranged from five to eleven with a mean of 9.71 and standard deviation of 1.63.

4.2.4.2 VALIDATION

1) SENSITIVITY AND SPECIFICITY OF THE NEW SCREENING INSTRUMENT

3 (2.97%) individuals met psychiatric case criteria for dementia using the DSM-IV diagnostic guidelines. The sensitivity and specificity values of various thresholds of the new screening instrument when compared with the standard of DSM IV 'case-noncaseness' is shown in Table 4.2.3.

TABLE 4.2.3 Sensitivity and specificity for different thresholds of the new screening instrument for dementia against DSM IV

COMMUNITY SAMPLE

PATIENT QUESTIONNAIRE

THRESHOLD	SENSITIVITY (%)	SPECIFICITY (%)	1-SPECIFICITY
0/1	0	1	0
½	0	1	0
2/3	0	1	0
¾	0	98.98	.0102
4/5	33.33	98.98	.0102
5/6	33.33	97.96	.0204
6/7	**66.67**	**94.90**	**.0510**
7/8	66.67	78.57	.2142
8/9	100	44.90	.5510
9/10	100	1.02	.9897

INFORMANT QUESTIONNAIRE

THRESHOLD	SENSITIVITY (%)	SPECIFICITY (%)	1-SPECIFICITY
0/1	0	100	0
½	0	100	0
2/3	0	100	0
¾	0	100	0
4/5	0	100	0
5/6	0	97.96	.0204
6/7	33.33	94.897	.0510
7/8	66.67	86.73	.1327
8/9	**100**	**80.61**	**.1939**
9/10	100	74.49	.2551
10/11	100	44.897	.5510

2) RECEIVER OPERATOR CHARACTERISTIC CURVE

Receiver operator characteristic (ROC) curves were constructed (FIGURES 3 and 4).

The optimal threshold for screening for dementia using the patient questionnaire of the new instrument was 6/7 i.e. all those who scored 6 and below can be considered a 'case'. This threshold had a positive predictive value of 28.57%, a negative predictive value of 98.94 %, a false positive rate of 5 % and a false negative rate of 1% .The optimal threshold for screening for dementia using the new instrument's informant questionnaire was 8/9 i.e. all those who scored 8 and below can be considered a 'case'.

This threshold had a positive predictive value of 13.64 %, a negative predictive value of 100 %, a false positive rate of 19 % and a false negative rate of 0%.

RECEIVER OPERATOR CHARATERISTIC CURVES FOR THE NEW SCREENING INSTRUMENT FOR DEMENTIA AND DSM IV DIAGNOSIS OF DEMENTIA

Figure 3

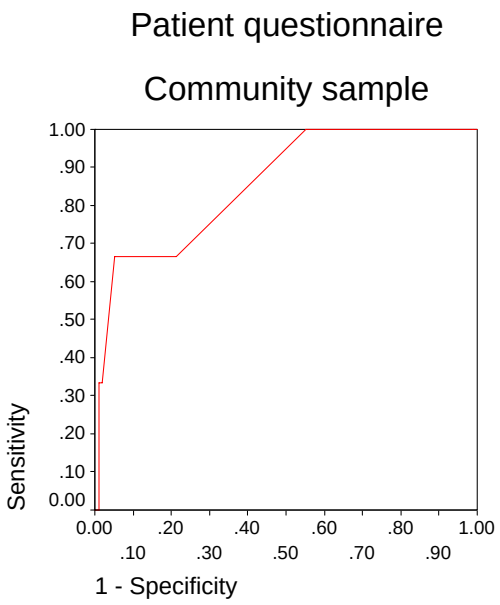
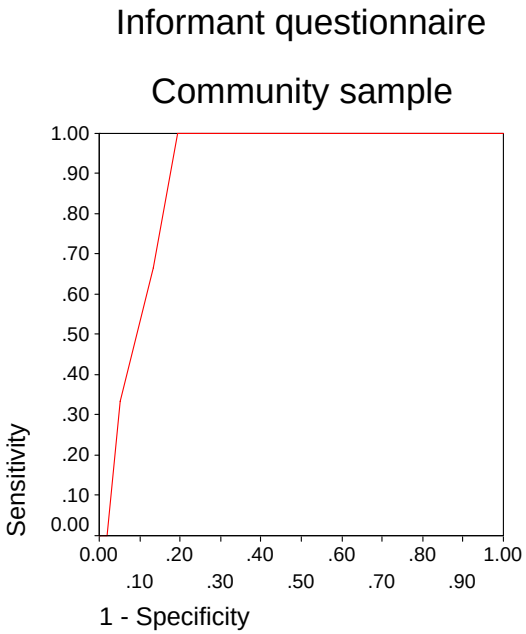


Figure 4



4 .3 TOTAL SAMPLE (COMBINED HOSPITAL and COMMUNITY DATA)

4.3.1 THE STUDY SAMPLE

A total of 191 subjects were included in the study .An informant was interviewed for each subject included in the study.

4.3.2 PREVALENCE OF DEMENTIA IN THE ENTIRE SAMPLE

Twenty-one subjects from the entire sample (10.99%) met psychiatric case criteria for dementia using the DSM-IV diagnostic guidelines. Of these eighteen (85.7%) were from the hospital sample and three (14.3%) were from the community.

4.3.3 NEW SCREENING INSTRUMENT FOR DEMENTIA

4.3.3.1 GENERAL DATA

Patient scores ranged from one to ten with a mean of 7.51 and standard deviation of 2.09.Informant scores ranged from zero to eleven with a mean of 8.54 and standard deviation of 3.106.

4.3.3.2 VALIDATION

1) SENSITIVITY AND SPECIFICITY OF THE NEW SCREENING INSTRUMENT

The sensitivity and specificity values of various thresholds of the new screening instrument when compared with the standard of DSM IV 'case-noncaseness' is shown in Tables 4.3.1 and 4.3.2.

TABLE 4.3.1 Sensitivity and specificity for different thresholds of the new screening instrument for dementia against DSM IV

TOTAL SAMPLE

PATIENT QUESTIONNAIRE

THRESHOLD	SENSITIVITY (%)	SPECIFICITY (%)	1-SPECIFICITY
0/1	0	1	0
½	9.52	97.65	.0235
2/3	28.6	97.1	.029
¾	42.9	95.9	.041
4/5	66.67	95.3	.047
5/6	76.2	94.1	.059
6/7	90.5	90.0	.10
7/8	**95.2**	**77.1**	**.229**
8/9	100	47.1	.529
9/10	100	1.8	.82

INFORMANT QUESTIONNAIRE

THRESHOLD	SENSITIVITY (%)	SPECIFICITY (%)	1-SPECIFICITY
0/1	19.05	98.24	.0176
½	33.33	97.65	.0235
2/3	47.62	96.47	.0353
¾	47.62	95.88	.0412
4/5	66.67	93.53	.0647
5/6	66.67	90.59	.0941
6/7	**80.95**	**86.47**	**.1353**
7/8	90.48	78.82	.2117
8/9	100	71.76	.2824
9/10	100	64.71	.3529
10/11	100	42.35	.5765

In the entire sample the optimal threshold for screening for dementia using the patient questionnaire of the new instrument was 7/8 i.e. all those who scored 7 and below can be considered a 'case'. This threshold had a positive predictive value of 33.89%, a negative predictive value of 99.24%, a false positive rate of 39 % and a false negative rate of 1% .The optimal threshold for screening for dementia using the new instrument's informant interview was 6/7 i.e. all those who scored 6 and below can be considered a 'case'. This threshold had a positive predictive value of 42.5%, a negative predictive value of 97.35%, a false positive rate of 23 % and a false negative rate of 4%. .

2) RECEIVER OPERATOR CHARACTERISTIC CURVE

Receiver operator characteristic (ROC) curves were constructed (FIGURES 5 and 6).

In the entire sample the optimal threshold for screening for dementia using the patient questionnaire of the new instrument was7/8 i.e. all those who scored 7 and below can be considered a 'case'. This threshold had a positive predictive value of 33.89%, a negative predictive value of 99.24%, a false positive rate of 39 % and a false negative rate of 1% .The optimal threshold for screening for dementia using the informant interview was 6/7 i.e. all those who scored 6 and below can be considered a 'case'. This

threshold had a positive predictive value of 42.5%, a negative predictive value of 97.35%, a false positive rate of 23 % and a false negative rate of 4%. .

RECEIVER OPERATOR CHARATERISTIC CURVES FOR THE NEW SCREENING INSTRUMENT FOR DEMENTIA AND DSM IV DIAGNOSIS OF DEMENTIA

Figure 5

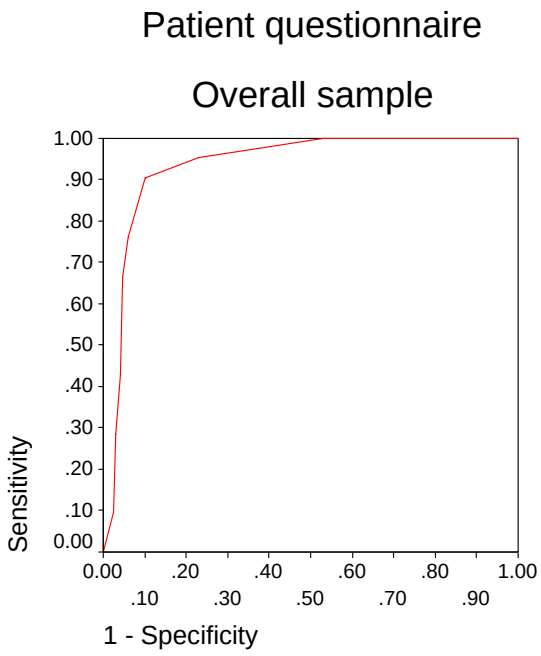
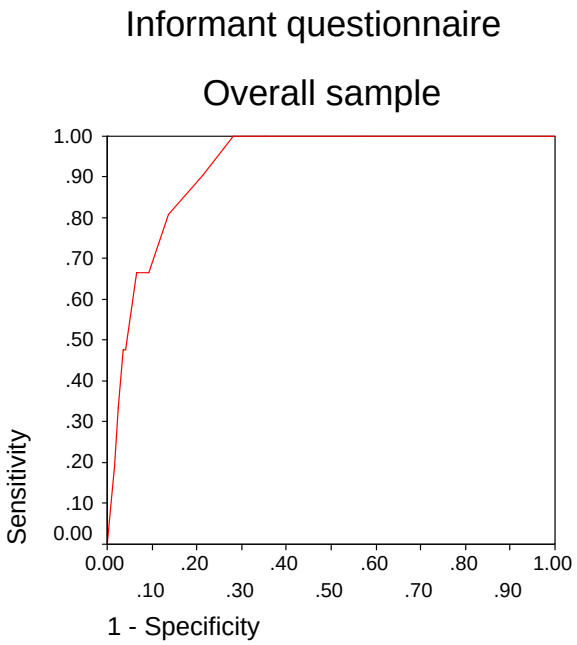


Figure 6



4.4 SUMMARY

In the hospital a total of 90 individuals were contacted and recruited into the study after consent. The majority were male (57.8%), married (61.1%), could read (67.8%) and write (62.2%), lived with their family (93.3%) and were currently unemployed (94.4%). The mean age was 71.53 years (SD 6.691).

18 subjects (21.11 %) satisfied DSM IV criteria for dementia. The optimum threshold for screening, obtained using a receiver operator characteristic curve, was 6/7 .For the patient questionnaire the positive and negative predictive values at this threshold were 58.62% and 98.36% while sensitivity and specificity were 94.44 and 83.33 respectively. For the informant questionnaire the positive and negative predictive values at this threshold were 47.06% and 96.43% while sensitivity and specificity were 88.89% and 75% respectively.

In the community a total of 101 individuals were contacted and recruited into the study after consent. The majority were female (59.4%), widowed (56.4%), could not read (54.5%) and write (57.4%), lived with their family (89.1%) and were currently unemployed (83.2%). The mean age was 72.49 years (SD 5.545).

3 subjects (2.97 %) satisfied DSM IV criteria for dementia. The optimum threshold for screening using with the patient questionnaire obtained using a receiver operator characteristic curve, was 6/7 .The positive and negative predictive values at this threshold were 28.57% and 98.94% while sensitivity and specificity were 66.67% and 94.90% respectively. The optimum threshold for screening using with the informant questionnaire obtained using a receiver operator characteristic curve, was 8/9 .The positive and negative predictive values at this threshold were 13.64% and 100% while sensitivity and specificity were 100% and 80.61% respectively.

In the entire sample the optimal threshold for screening for dementia using the patient questionnaire of the screening instrument was 7/8. This threshold had a positive predictive value of 33.89%, a negative predictive value of 99.24%, a sensitivity of 95.2% and specificity of 77.1%. The optimal threshold for screening for dementia using the informant questionnaire was 6/7. This threshold had a positive predictive value of 42.5%, a negative predictive value of 97.35%, a sensitivity of 80.95% and specificity of 86.47%.

5.1 INTRODUCTION

Screening for dementia is an important component of clinical practice Routine screening for dementia increases the pick up rates and promotes better standards of dementia care in the health care system.

There are several screening instrument that are currently available. However, there are different problems with the different tests-these include the length of the assessment, bias related to the age, language, education and ethnicity of the subject and the requirement of special training to use or a computer programme to interpret. This study attempted to create a brief screening tool for dementia, free of the above problems and validated against standard diagnostic criteria, for routine use in clinical practice.

5.2 METHODOLOGICAL CONSIDERATIONS

Instruments The DSM IV was chosen as the diagnostic standard against which the new screening instrument was validated, as this is the criterion that is used in routine clinical practice. The items of the new instrument were chosen after careful examination for relevance, adaptability, the conceptual basis for the test and the cognitive domain being tapped by the test. Each individual screening item was specifically reviewed for their ability to be culture and education fair.

Translation During the translation of the screening instrument to Tamil, care was taken to use language as spoken by the local people to ensure that it would be appropriate to the study population.

Sample size This was sufficiently large to draw valid conclusions from the study.

Subjects Subjects were chosen from within the hospital, who had passed through a referral system, as well as from individuals residing in the community.

Setting The screening and interview procedures in the hospital were carried out in busy outpatient settings with constraints of time and privacy. While this could influence the results of the study, the instrument was designed for use in such situations. The community interviews took pace at the individual's residence.

Procedure Since a large number of the subjects and their informants were not literate, the instruments were not self-administered, but were instead read out to them using the recommended procedure.

5.3 PREVALENCE OF DEMENTIA IN THE STUDY POPULATION

Dementia in the hospital sample studied was 20 %. Many from this group were brought to the hospital by their relatives with symptoms and were then referred to the researcher by their primary physicians. This would explain the relatively high rate obtained.

In the community the rate of dementia was 2.97%. Reported prevalence from Indian community studies have ranged from 0.8% (Jacob et al, 2007) to 3.50% (Ferri et al, 2005).

5.4 VALIDITY OF THE NEW SCREENING INSTRUMENT

Screening tests require a high sensitivity .The Patient and Informant Questionnaires of the new screening instrument were found to have a high sensitivity and specificity in the hospital population being screened for dementia. The threshold of 6/7 appears to be efficient for screening in this population.

In the community sample, the instrument had a poor sensitivity though the specificity was high. The poor positive predictive value of the test is related to the low prevalence of dementia in the community. Thresholds of 6/7 for the patient questionnaire and 8/9 for the informant questionnaire were the most efficient for this population.

5.5 SIGNIFICANCE

The high sensitivity and specificity of the new screening instrument for dementia suggest that it is a valid instrument for screening for dementia in a clinical population.

5.6 RECOMMENDATIONS FOR FUTURE DIRECTIONS FOR RESEARCH

Differences in information, interview schedules, diagnostic criteria and settings contribute to variation in identification of people with dementia. The new screening instrument can be used for the screening for dementia in clinical settings. Applying the instrument to people in the community who are reported by their relatives to have symptoms of dementia would artificially raise the prevalence of dementia in the group being tested and would result in more accurate prediction. This is a preliminary study that needs to be further validated.

SUMMARY AND CONCLUSIONS

1. A brief screening instrument for dementia was developed.

2. The new instrument was validated for use in clinical and community populations against the standard diagnostic criteria of the DSM IV. The instrument was found to have a high sensitivity and specificity for the patient (94.44% and 83.33%) and informant (88.89% and 75%) questionnaires and is an efficient tool for screening for dementia in a clinical setting with a threshold of 6/7.

In the community, the patient questionnaire had a sensitivity and specificity of 66.67% and 94.90% respectively at the threshold of 6/7 for the patient questionnaire, and a sensitivity and specificity of 100% and 80.61% respectively at a threshold of 8/9 for the informant questionnaire.

3. The high sensitivity and specificity of the new screening instrument for the identification of dementia and its ease of administration make it a valuable tool for screening in clinical settings.

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PATIENT INTERVIEW

1) **I WENT TO CHENNAI AND BROUGHT BACK 3 THINGS: THEY ARE A MANGO, A CHAIR AND A COIN. CAN YOU TELL ME THE THREE THINGS I BROUGHT**?

   Remember these three things that I got from Chennai. I will ask you to repeat it after sometime

2) **LOOK AT MY FACE AND DO EXACTLY WHAT I DO**. (Close your eyes for 2 seconds and then open them)
3) **SAY A SENTENCE ABOUT YOUR HOME.**
4) **SHOW ME HOW YOU LIGHT A CANDLE.**
5) **SHOW ME HOW YOU COMB YOUR HAIR.**
6) **WHAT IS THIS?** (Show a key).
7) **CLOSE YOUR EYES AND TELL ME WHAT IS IN YOUR HAND**. (Put a comb into the patient's hand).
8) **TAKE THIS PAPER WITH YOUR RIGHT HAND, FOLD IT INTO 2 AND PUT IT DOWN ON THE LEFT SIDE OF THE TABLE**.
9) **CAN YOU OPEN THIS LOCK?**
10) **DO YOU REMEMBER WHAT THE 3 THINGS THAT I BROUGHT FROM CHENNAI ARE?**

INFORMANT INTERVIEW

1) DOES HE/SHE REGULARLY FORGET THINGS YHAT HAVE HAPPENED RECENTLY?

For example, does he/she forget that he/she has just eaten and asks for food again?

(i) YES (ii) NO

2**) DOES HE/SHE HAVE TROUBLE REMBERING WHERE HE/SHE HAS KEPT HER BELONGINGS?**

For example does he/she regularly forget where he/she has left the money?

(i) YES (ii) NO

3) **DOES HE OR SHE REGULARLY HAVE DIFFICULTY FINDING THE RIGHT WORDS OR DOES HE OFTEN USE THE WRONG WORDS IN CONVERSATION?**

(i) YES (ii) NO

4) **DOES HE/SHE REGULARLY HAVE DIFFICULTY UNDERSTANDING WHAT IS SAID TO HIM/HER?**

Foe example is he able to follow instructions or?

(i) YES (ii) NO

5) **DOES HE/SHE REGULARLY HAVE DIFFICULTY IN DRESSING APPROPRIATELY?**

For example does he or she have difficulty in buttoning her shirt /blouse or in wearing his dhoti/saree?

(i) YES (ii) NO

6) **DOES HE/SHE URINATE IN AN APPROPRIATE PLACE?**

(i) YES (ii) NO

7) DOES HE/SHE HAVE DIFFICULTY RECOGNISING FAMILIAR FACES?

For example does he/she recognize close relatives?

(i) YES (ii) NO

8) DOES HE OR SHE HAVE DIFFICULTY RECOGNISING FAMILIAR OBJECTS?

FOR EXAMPLE DOES HE/SHE RECOGNISE COMMON OBJECTS LIKE KEYS, COMB, and SPOONS etc.?

(i) YES (ii) NO

9) IS HE/SHE ABLE TO GO THE MARKET AND PURCHASE THINGS LIKE BEFORE?

(i) YES (ii) NO

10) HAS HE/SHE EVER GOT LOST IN THE VILLAGE/TOWN?

(i) YES (ii) NO

11) HAS THERE BEEN A WORSENING OF HIS/HER PROBLEMS IN THE LAST 1-YEAR OR SO?

(i) YES (ii) NO

khjphp Njh;T

Njh;thsh; : ehd; ,g;nghOJ cq;fsplk; rpy Nfs;tpfis Nfl;Ngd; ePq;fs; jahwh?

khjphp Njh;T 1)
khjphp Njh;T 2)
khjphp Njh;T 3)

1. ehd; nrd;idf;F nrd;W %d;W nghUl;fis nfhz;L te;Njd;. mit khk;gok; , ehw;fhyp kw;Wk; xU ehzak; MFk;. ehd; nfhz;L te;j %d;W nghUl;fs; vd;dntd;W cq;fshy; nrhy;y KbTkh.?

   ehd; nrd;idapypUe;J nfhz;L te;j %d;W nghUl;fspd; ngah;fis epidtpy; itj;Jf;nfhs;Sq;fs;, Vnddpy; mtw;iw rpwpJ Neuk; fopj;J cq;fis ehd; epidTgLj;j nrhy;Ntd;.

2. vdJ Kfj;ij ghh;j;J ehd; nra;tij mg;gbNa jpUg;gpr;nra;aTk (cq;fs; fz;;;;;;;fis ,uz;L tpehbfs; %bitj;J , gpwF jpwf;fTk;).

3. cq;fsJ tPl;ilg;gw;wp xU thf;fpak; $wTk;.

4. xU nkOFth;j;jpia vg;gb nfhSj;JtJ vd nra;J fhl;lTk;.

5. cq;fsJ jiy Kbia vg;gb rPTtJ vd nra;Jf; fhl;lTk;.

6. ,J vd;d? (xU rhtpia fhl;lTk;).

7. cq;fsJ fz;fis %bf;nfhz;L cq;fs; ifapy; vd;d ,Uf;fpwJ vd vd;dplk; $wTk;. (xU rPg;ig NehAw;wtupd; ifapy; itf;fTk;).

8. ,e;j fhfpj;ij cq;fs; tyJ ifapy; vLj;J, ,uz;lhf kbj;J, cq;fs; ,lJ Gwk; itf;fTk;.

9. cq;fshy; ,e;j G+l;il jpwf;f KbAkh?.

10. ehd; nrd;idapUe;J nfhz;L te;j nghUl;fs; vd;dntd;W cq;fs; epidtpy; cs;sjh?

jfty;jUgtUld; fye;Jiuahly;:

1. mth; rkPgj;jpy; ele;j tp\aq;fis tof;fkhf kwe;J tpLfpwhuh?

   Cjhuzkhf mth; mg;nghOJ jhd; rhg;gpl;ij kwe;J tpl;L kPz;Lk; czT Nfl;fpwhuh?

2. mth; jdJ clikfis vq;F itj;Njhk; vd Qhgfk; nfhs;s f\;lg;gLfpwhuh?

   Cjhuzkhf mth; vq;F gzk; itj;Njhk; vd;gij tof;fkhf kwe;J tpLfpwhuh?
   m). Mkhk; M). ,y;iy.

3. mth; ciuahLk;NghJ rhpahd thh;j;ijfis fz;Lgpbf;f rpukg;gLfpwhuh my;yJ jtwhd thh;j;ijfis mbf;;;;;;;;;fb gad;gLj;Jfpwhuh?

1). Mkhk; 2). ,y;iy

4. mth; tof;fkhf mthplk; nrhy;yg;gLk; tp\aq;fis Ghpe;Jf; nfhs;s f\;lg;gLfpwhuh?

Cjhuzkhf, mtuhy; topKiwfisAk; ciuahly;fisAk; Ghpe;J nfhs;s Kbfpwjh?

1). Mkhk; 2). ,y;iy

5. mth; tof;fkhf rhpahf cilazpa f\;lg; gLfpwhuh?

Cjhuzkhf mth; jdJ rl;il my;yJ ,utpf;if nghj;jhd; mzpaNth my;yJ Ntl;b kw;Wk; Nriy cLj;jNth f\;lg;gLfpwhuh?

1). Mkhk; 2). ,y;iy

6. mth; rhpahd ,lj;jpy; rpWePh; fopf;fpwhuh?
1). Mkhk; 2). ,y;iy

7. mth; gof;fkhd Kfq;fis milahsq;fhz f\;lg;gLfpwhuh?

cjhuzkhf, mth; neUq;fpa cwtpdh;fis milahsq; fz;L nfhs;fpwhuh?
1). Mkhk; 2). ,y;iy

8. mth; gof;fkhd nghUl;fis milahsq; fz;L nfhs;s f\;;lg;gLfpwhuh?

cjhuzkhf, rhtp, rPg;G, fuz;b, Nghd;w nghJthd nghUl;fis milahsk; fz;L nfhs;fpwhuh?

1) Mkhk; 2). ,y;iy

9. mth; Kd;G Nghy re;ijf;Fr; nrd;W nghUl;fis thq;f Kbfpwhjh?

1). Mkhk; 2). ,y;iy

10. mth; cq;fs; fpuhkj;jpy; my;yJ efuj;jpy; vg;NghNjDk; top jtwpg; NghdJ cz;lh?

1). Mkhk; 2). ,y;iy

11. Rkhuhf fle;j xU tUlj;jpy; mtuJ gpur;rpidfs; NkhrkhdJ cz;lh?

1). Mkhk; 2). ,y;iy.