CHAPTER 2

LITERATURE REVIEW

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1. Cognitive status in the elderly

Concept of cognitive status

Definition of cognitive status

Cognitive status is defined as the intellectual process by which one becomes aware of, perceives, or comprehends ideas. Cognitive status embraces the quality of knowing, which includes all aspects of perception, recognition, conception, sensing, thinking, reasoning, remembering, and imagining. Cognitive impairment is difficulty in dealing with or reacting to novel information or situations (Carayannis, 2000).

Cognitive status also refers to the performance of intellectual tasks, such as thinking, remembering, perceiving, communicating, orienting, calculating, and problem solving (Stone, Wyman & Salisbury, 1999).

Cognitive status is comprised of perception, memory, and thinking, including recognition/registration, storage, and use of information. Cognitive status can be affected by many factors (Stromborg & Olsen, 1997).

As concluded by the researcher, cognitive status is the ability of the brain to function in the process of perception, memory, attention, language, and recall. There are several factors related to an individual's cognitive ability. Cognitive impairment leads to difficulty in living and may threaten independent living.

Mechanism of cognitive status

The brain consists of two major types of cells known as neurons and neuroglia.

1. Neurons are the basic units of the nervous system and are responsible for conducting nerve impulses from one part of the body to another.

2. Neuroglia provides the supporting structure for nervous tissue and consists of blood vessels, connective tissue, and supporting cells (Matteson, McConnell & Linton, 1997).

Nerve impulses are carried from one cell to another at the synaptic junctions. The transmission is usually carried from the axon of one to the dendrite of another. Transmission of electrical impulses at the synapse requires the intervention of chemicals mediators, or neurotransmitters (Matteson, McConnell & Linton, 1997). Acetycholine is an essential neurotransmitter, a decrease in which is associated with cognitive decline (Greenwell, 2000; Nicoli, 1999).

Aging and certain conditions, such as those that cause trauma, change the cerebral metabolic rate, or interfere with the circulation to the cerebrum, are believed to decrease the number of neurons over time. As the neurons die they are replaced by neuroglia, which is the supporting structure of nerve tissue. After age 70 it is estimated that there is a one percent loss of neurons per year in the human cerebral cortex. Cerebral changes become more pronounced during the seventh and eighth decades of life. Brains of persons in their seventh decade show an increase in the amount of senile plaque, also called neurotic plaque, and in neurofibrillary tangles. A considerable number of senile plaques and neurons with neurofibrillary change and granulovascular degeneration have been found in persons with severe cognitive dysfunction, when compared with aged persons with normal cognitive status (Yurick, Spier, Robb & Ebert, 1989). Cognitive decline is associated with widespread structural brain damage (Flier et al., 2002). Kordower et al. (2001) found that loss of neurons is associated with cognitive decline.

Components of cognitive status

Cognitive status consists of 5 components: perception, memory, attention, language, and recall (Jitapunkul, 1998). Perception is the intellectual function that integrates sensory impressions into meaningful data and transfers it to memory. Perception includes activities such as awareness, recognition, discrimination, patterning, and orientation. Orientation is awareness of where one is in relation to time, place, person, and situation (Stone, Wyman & Salisbury, 1999). Perceptual patterns refer to an individual's ability to evaluate himself/herself and the environment (Dellasega, 1998). Memory is the intellectual function that registers stimuli, stores them as perceptions, and retrieves them at will. Attention is the ability to focus in a sustained manner on a single activity. Language is an expressive intellectual function through which information is communicated or acted upon. Recall is immediate memory (Stone, 1999).

Impact of cognitive decline

Impact of cognitive decline on the elderly

As the natural process of aging progresses, humans experience a progressive decline in overall cognitive status. This causes loss of ability to store information and retrieve information from short-term memory, employ abstract reasoning, and easily learn new information. However, research at the University of California at Davis confirmed that cognitive decline is not a normal part of aging for the majority of elderly people (Pararas-Carayannis, 2000). The prospect of decline in cognitive status is a major fear for many elderly persons (Groot et al., 2002). Mild cognitive impairment is associated with an increased risk of death and incidence of Alzheimer's disease (Bennett et al., 2002). Cognitive impairment in elderly populations is a major

health issue, as it is commonly associated with dementia, disability in daily activities, and poor quality of life in old age (Frisoni, Fratiglioni, Fastbom, Vitanen & Winblad, 1999). Cognitive problems may severely interfere with activities of daily living (Pararas-Carayannis, 2000). Loss of independence in activities of daily living is a marker of decline and frailty in older adults, and an indicator of health care use (Greiner, Snowdon & Schmitt, 1996). Cognitive decline was a strong predictor of mortality among elderly, especially these with mild and severe cognitive impairment. Moreover, this longitudinal study indicated that even small declines in cognitive status are significantly associated with subsequent mortality among the community-dwelling elderly (Bassuk, Wypij & Berkman, 2000).

Impact of cognitive decline on the family

The family traditionally has been the primary source of protection, aid, and support for its members in times of crisis and need. However, providing care for a family member with dementia is a progressively overwhelming experience for the caregiver. North American is estimated that one million elderly diagnosed with dementia are cared for at home by family members (Levine & Lawlor, 1991 cited in Chou, LaMontagne & Hepworth, 1999). The number of family members experiencing high burden levels is likely to double by the beginning of the 21st century (Evans, Bishop & Ousley, 1992 cited in Chou, LaMontagne & Hepworth, 1999). The extensive literature on caregivers shows that many family caregivers report loss or curtailment of employment associated with being caregivers, as well as feelings of helplessness, guilt, anger, apprehension, and social alienation (Biegel, Milligan, Putman & Song, 1994 cited in Chou, LaMontagne & Hepworth, 1999; Braithwaite,

1992, cited in Chou, LaMontagne & Hepworth, 1999; Zarit, Zarit & Rosenberg, 1990, cited in Chou, LaMontagne & Hepworth, 1999).

Assessment of cognitive status

There are two approaches for evaluation of cognitive status, as follows:

1. Assessment of specific dimensions of cognitive status.

Albert (1988), cited in Stromborg and Olsen (1997), identified five specific components of cognitive status that should be evaluated: attention, visuopatial abilities, language, memory, and conceptualization. The advantage of this method is that it is easy to administer to the individuals requiring it most. The disadvantage of this method is that it is not a comprehensive examination and important deficits may be overlooked.

2. Global measures of cognitive status. Global measures are used to survey multiple aspects of cognition, and are useful screening tools for cognitive impairment. In addition, global measures tend not to be comprehensive measures of cognition, but consist of those elements that increase the sensitivity for detecting impairment. There have been a number of instruments developed to assess global measures of cognitive status. The most commonly used instruments are the Mini-Mental State Examination (MMSE), Cognitive Capacities Screening Examination (CCSE), and Short Portable Mental Status Questionnaire (SPMSQ).

The Mini-Mental State Examination questionnaire is a global measure of cognition used to survey multiple aspects of cognition (Stromborg & Olsen, 1997). It is a screening test for organic brain syndrome (Taemeeyapradit, Tanchaiswad, Hangsprueg & Phunsiri, 1990), and is used as the standard cognitive screening instrument in virtually all studies involving cognition in the elderly. The MMSE has

been used for screening various areas of cognitive status in people suffering from or at risk of dementia (Houx et al., 2002). In 1994 a study by the Research Committee of the American Neuropsychiatric Association revealed that 58% of respondents employed formal assessment of cognitive status; the Mini-Mental State Examination (MMSE), and neuropsychological testing. The MMSE appeared to meet most of the criteria for clinically useful screening tests, and has been subjected to more intense research scrutiny, with a broader range of diagnosis, than any other instrument. The MMSE successfully differentiates patients with dementia of the Alzheimer's type from normal subjects with 87% sensitivity and 82% specificity. The MMSE requires approximately 12 minutes to administer in most patients. Administration procedures are relatively simple and can be mastered easily (Malloy et al., 1997). It consists of 11 questions, divided into two parts, the first of which requires vocal responses and covers orientation, registration, recall, attention, and calculation; the second part is written and covers language. The total possible scores range from 0 to 30 points. The cut-off point for MMSE for the diagnosis of normal healthy elderly is a score of 21 (Taemeeyapradit, Tanchaiswad, Hangsprueg, & Phunsiri, 1990).

In Thailand, there are two popular mental tests, TMSE and CMT. The Thai Mental State Examination (TMSE) was modified from MMSE as the standard mental status examination for Thai subjects. The total possible score of TMSE ranges from 0 -30 points and contains six basic subtests concerning orientation (6 points), registration (3 points), attention (5 points), calculation (3 points), language (10 points) and recall (3 points). TMSE was completed by 180 normal Thai elderly, aged 60-70, years throughout the country. The mean score of TMSE for normal Thai elderly is 27.38 (standard deviation 2.02) points. The cut-off point for the diagnosis of

normal healthy Thai elderly for TMSE is a score of 23. There were 16.37 percent of Thai elderly who achieved the full score of 30 points in the TMSE test.

The Thai Mental State Examination has been used throughout Thailand as it is quick (less than 10 minutes), sensitive, reliable, and applicable. Neuropsychiatric tests for Thai subjects of differing socioeconomic status as well as differing levels of education and traditional status, are different from those used by Westerners (Paungrin et al., 1993). The limitation of this instrument is that the subjects have to be literate.

The Chula Mental Test was modified from TMSE (Jitapunkul, 1998). It consists of five components: perception, memory, attention, language, and recall. It yields a score between 0-19; a score of less than 15 indicates an abnormal mental state (Jitapunkul, 1998). Currently, this instrument is the most appropriate for Thai elderly people because of its high criterion validity, sensitivity, and specificity (Jitapunkul, 1998). The validity of the Chula Mental Test was tested by comparison with a neurologist's independent diagnosis of dementia. Comparisons were made with the Mini-Mental State Examination and the Abbreviated Mental Test. The Chula Mental Test at its optimal threshold had the best combination of sensitivity (100%) and specificity (90%) for detection of cognitive impairment. The reliability of the Chula Mental Test (CMT) was high, demonstrated by a test-retest kappa coefficient of 0.65 and an internal consistency (Cronbach's alpha) of 0.81. The Chula Mental Test is a very practical test to use with people who have difficulty in reading and writing, and consequently is also helpful for people with visual impairment. The cutoff point of the Chula Mental Test is set at 80 % of the maximum score attainable, which is similar to Western populations, which range from 70 to 80 %. The cutoff point for Chula Mental

Test was 15 (Jitapunkul, Lailert, Worakul, Srikiatkhachorn & Ebrahim, 1996). Those with a score of CMT 15 and over are classified as having normal cognitive status. Those with a CMT score below 15 are classified as having impaired cognitive status.

Cognitive decline in the elderly

In the elderly, cognitive impairment is progressive. It occurs as a result of decreased acetylcholine and is manifested as poor memory, diminished learning ability, and general cognitive decline. Most elderly experience only a minimal decline that they can compensate for (Greenwell, 2000; Lusis, Hydo & Clark, 1993; Botwinick, 1977, cited in Yurick, Spier, Robb & Ebert, 1989). Progressive and severe cognitive decline in the elderly can affect the individual and their family when the cognitive level reaches the stage of dementia.

Loss of short-term memory, delayed response time, and altered ability to learn complex information are examples of physiological, rather than pathological, changes that occur with aging (Eliopoulos, 1993; Esberger & Hughes, 1992, cited in Dellasega, 1998). Memory decline is the most frequent cognitive complaint of older people. Older subjects have more difficulty than younger ones in secondary or short-term memory tasks. When asked to divide their attention or to reorganize the material presented, a remote memory event is also diminished in the elderly, but recall and recognition of past events remains good. Moderate or severe memory difficulties are not normal and suggest dementia (Nicholi, 1999). For the most part, the changes are highly individualized (Yurick, Spier, Robb & Ebert, 1989).

A study was conducted using Thai Mental State Examination (TMSE) among elderly person age 60-70 years old. The main subtest found that the areas in which most elderly had failing scores were recall (76.43%), calculation (41.14%),

language (25.14%), and orientation (24%). The failing scores lost for attention and registration were minimal, only 4.57% and 2.86% respectively (Paungrin et al., 1993).

Persons with mild cognitive impairment declined significantly faster on measures of episodic memory, semantic memory, and perceptual speed, but not on measures of working memory or visuospatial ability, as compared with persons without cognitive impairment. Mild cognitive impairment is associated with increased risk of Alzheimer's disease, and a greater rate of decline in cognitive status (Benett et al., 2002). Alzheimer's disease accounts for almost two-thirds of prevalent cases of dementia (Lindsay et al., 2002). Syndromes of severe cognitive impairments are characterized by multiple impairment in cognitive status without disturbances in consciousness. The cognitive statuses that can be affected include general intelligence, learning and memory, language, problem solving, orientation, perception, attention and concentration, judgment, and social skills. The critical points of dementia are the identification of the syndrome and the clinical workup of its cause. The disorder can be progressive or static, permanent or reversible (Kaplan & Sadock, 1998).

2. Factors related to cognitive status among the elderly

Demographic factors

*Age***:** Increased age has been related to cognitive impairment. Cognitive impairment is more prevalent in the oldest of the old (Greiner, Snowdon & Schmitt, 1996). The incidence of cognitive impairment increased with age (Bassuk, Wypij & Berkman, 2000; Devanand et al., 1996; Forsell, Jorm & Winblad, 1994; Yaffe, Sawaya, lierburg & Grady, 1998). Forsell, Jorm and Winblad (1994) studied the

association of age, gender, cognitive dysfunction, and disability with major depressive symptoms in an elderly sample. The result of their study showed that increased age is related to cognitive dysfunction. Studies of the elderly by Schofield, Marder, Dooneief, Jacobs, Sano and Stern (1997) found that subjects with cognitive impairment were older. This is congruent with Moritz, Kasl and Berkman (1995), Who found cognitive impairment is relatively common among persons aged 65 years and older. Crum, Anthony, Bassett and Folstein (1993) found that bivariate correlations between MMSE score with both age and years of schooling were significant (for age, $r = -.38$ and $p < .001$ for years of schooling, $r = .50$ and $p < .001$). Tubmanee (1998) found that with increased aged there is a trend to increased dementia, which is cognitive impairment. Age was related to decreased cognitive status in both woman and men (Gale, Martyn & Cooper, 1996).

Gender: Gale, Martyn and Cooper (1996), and Lindsay et al. (2002) found no relationship between gender and cognitive status as well as dementia. This is also congruent with the study by Tubmanee (1998), a questionnaire survey of the elderly, which found that gender had no association with dementia. Dufouil, Fuhrer, Dartigues and Alperovitch (1996), however, found the incidence of cognitive deterioration (defined as a rapid decline in cognitive status) was greater among women. Tubmanee (1998) found that there was a greater trend toward cognitive impairment and dementia in women than in men. This is because there are more women than men in the general population, and the fact that women live longer. This is congruent with the results of studies of mental disorders among elderly patients in primary care settings. The Linkoping study by Olafsdttir, Marcusson and Skoog (2001) found that women were more often prescribed benzodiazepines,

antidepressant, and any psychotropic drug, than were men. A diagnosis of a mental disorder in case records was related to a high prescription rate of psychotropic drugs. Patients with mental disorders, according to this research, were more often females, had more visits to the doctor, more diagnoses in medical records, and were prescribed more drugs. Bassuk, Wypij and Berkman (2000) found that patients diagnosed with cognitive impairment were more likely to be female. These findings are congruent with the study by Sutranu et al. (1989), a survey of the elderly by use of questionnaires that found men had better cognitive status than women.

This was in contrast to the study done by scientists at the University of Limburg, who tested 599 elderly men and women aged 85, reporting that elderly women had better cognitive status than men despite differences in education. The proportion of women with limited formal education was significantly higher than that of men (70% versus 53%, $p<0.001$); women received better scores for cognitive speed and memory (33% versus 28% and 41% versus 29%, respectively; $p< 0.05$). This advantage in speed and memory remained after adjusting for differences in education and presence of depressive symptoms. The researchers suggested that limited formal education alone cannot account for differences in mental decline among men and women. The researchers instead support the hypothesis that biological differences (e.g., arteriosclerosis) could be an important underlying factor in differences in cognitive status decline (Axelrod, 2002). Men and women differ in hormone concentrations, which may affect cognitive status. Research has found that estrogen in women might, either independently or synergistically, act with other neurotrophic factors, improving cognitive status by promoting cholonergic activity in the brain.

There are plausible biological mechanisms by which estrogen might lead to improved cognition (Yaffe, Sawaya, lierburg & Grady, 1998).

In summary, there are contrasting views regarding the role of gender associated with cognitive impairment among the elderly. It is unclear how gender affects cognitive status.

Marital status: A longitudinal study reported that being single was associated with functional decline (Bush et al., 1989 cited in Hebert, Brayne & Spiegelhalter, 1999; Colditz et al., 1987; Tilley et al., 1985). The most common way to measure functional disability is through the evaluation of basic activities of daily living, and instrumental activities of daily living (Kempen & Suurmeijer, 1990, cited in Gelinas, Gauthier, McIntyre & Gauthier, 1998). Cognitive decline was also reported to be associated with functional decline (Bush et al., 1989; Hebert, Brayne & Spiegelhalter, 1999; Kroger et al., 1994). For every 10- point decrease in the modified Mini-Mental State Examination score, the risk of functional decline increases by 33% (Hebert, Brayne & Spiegelhalter, 1999). Being single may therefore be associated with low cognitive status.

Living alone and social isolation: Living alone was associated with functional decline (Hebert, Brayne & Spiegelhalter, 1999). Social isolation and lack of participation in selected social events were associated with limitations in daily living activities (Moritz, Kasl, Berkman & 1995). Cognitive decline was also reported to be associated with functional decline (Bush et al., 1989; Harel et al., 1994, cited in Hebert, Brayne & Spiegelhalter, 1999; Kroger et al., 1994). Cognitive impairment is a very strong predictor of functional decline (Hebert, Brayne & Spiegelhalter, 1999). Living alone and social isolation may be associated with cognitive status.

Education influences cognitive status (Greiner, Snowdon & Schmitt, 1996). Lower levels of education were associated with greater cognitive impairment (Bassuk, Wypij & Berkman, 2000; Devanand et al., 1996). Subjects with no education were likely to have low cognitive status. (Dartigues et al., 1992; Jitapunkul, Lailert & Worakul, 1996). Plassman, Welsh, Helms, Brandt, Page and Breitner (1995) stated that the cognitive status score had a positive association with education. Crum, Anthony, Bassett and Folstein (1993) found correlations of MMSE score with both age and years of schooling (for age, $r = -.38$, $p < .001$ for years of schooling, $r = .50$ and $p < .001$). This study found that the level of education was associated with MMSE scores among elderly in a community-based household survey. The MMSE scores were lower for those with fewer years of schooling. This is congruent with the studies conducted by Schofield, Marder, Dooneief, Jacobs, Sano and Stern (1997) and Fraser, Singh and Bennett (1996), whose study among the elderly found that less educated subjects had lower MMSE scores. Education is the strongest predictor of sustained cognitive status. Education early in life may have a direct beneficial effect on brain circuitry. It may also set a pattern of intellectual activities which, when exercised later in life, serves to maintain cognitive status. Education can act as a surrogate for important environmental influences that build brain cells. The direct effects of education on brain structure continue throughout life. Increased levels of education may alter an individual's ability to perform well on tests of cognitive status (http://www.asaging.org/mindalert/fitness.html, 2002).

Income and Occupation: Occupation during active life appears to be one of the most important correlated factors of cognitive impairment in the elderly (Dartigues et al., 1992). The risk of dementia was increased among subjects with low

occupational status (low status occupations such as unskilled/semiskilled, skilled trade or craft, and clerical/office worker; high occupation status such as manager business/government and professional/technical) (Stern, Gurland, Tatemichi, Tang, Wilder & Mayeux, 1994). Tubmanee (1998) found that having no occupation might lead to poor cognitive status due to lack of brain stimulation. Bassuk, Wypij and Berkman (2000) reported that cognitive impairment was more likely to be poorer than richer.

Location of residence: Suntranu et al., (1989) found that the elderly living in urban areas have better cognitive status than those living in a rural setting. They explained that most elderly in rural lived a house separate from their children, while the elderly in urban localities usually stay with their grown children. Jitapunkul, Phoolcharoen, Kunanusont, and Suriyawongpaisal (2001) studied prevalence of dementia among Thai elderly by conducting a national survey which explored the living conditions of the elderly. It was found that the north-eastern region had the highest cognitive scores. The effect of the place of residence might represent some hidden factors, such as psychosocial and cultural variables, which could have protective or predisposing roles in cognitive impairment. To explain these findings, further investigation is required.

Health related factors

Chronic illness: Chronic illnesses are associated with cognitive impairment such as chronic heart failure (Zuccala et al, 1997), cerebrovascular disease (Gale, Martyn & Cooper, 1996), and hypertension (Johasson, 1994; Kilander et al., 1998 cited in Bari et al., 2001; Skoog, 1997). Tubmanee (1998) found the elderly with chronic illnesses had greater cognitive decline than those elderly without

chronic illness. Most elderly (76.2%) have chronic illnesses such as heart disease, hypertension, and diabetes mellitus. A risk for diabetes mellitus was associated with cognitive dysfunction that changes the glucose and insulin metabolism. People with diabetes mellitus are at risk of cognitive impairment caused by hyperinsulinemia and features of insulin resistance (Vanhanen, 1998). Cognitive decline in hypertensive patients may result from central nervous system dysregulation or occult injury to the prefrontal autonomic centers (Jawde & Messsinger-Rapport, 2002). High blood pressure hardens the walls of the arteries, which in turn increases the risk for heart disease (Jacob, 2002). Hypertension may shrink the size of the brain, thus affecting cognitive status (Jacob, 2002).

Depression is associated with decreased cognitive status (Babara cited in Ann, 1989; Devanand et al., 1996; Dufouil, Fuhrer, Dartigues & Alperovitch, 1996). This is congruent with the Yaffe, Blackwell, Gore, Sands, Reus and Browner (1999), who found an association of depression with cognitive decline in 5,781 non-demented elderly women aged 65 years and older. Women with depressive symptoms had worse cognitive status and greater cognitive decline than those without depression. Cognitive impairment is frequently part of the depressive syndrome, especially in the elderly. Tubmanee (1998) found that depression was associated with dementia in a study of 370 Thai elderly living in the community. Depression and cognitive decline are associated due to neuronal degeneration in the brain, high levels of cortisol that lead to neuronal death, and the apolipoprotein E4 allele that is a risk factor for cognitive decline and depression (Yaffe, Blackwell, Gore, Sands, Reus & Browner, 1999). Dufouil, Fuhere, Dartigues and Alperovitch (1996) reported that among the elderly with depression, the incidence rate of cognitive impairment was

higher in individuals taking psychotropic drugs than in those who did not. It may be that the medication affects cognitive performance, or that psychotropic treatments are a marker of the severity of depressive symptoms.

Activities of daily living have been found to affect cognitive status (Moritz, Kasl & Berkman, 1995). Persons with poor cognitive status at baseline were at increased risk for limitation in activities of daily living. Greiner, Snowdon and Schmitt (1996) investigated the role of low normal cognitive status in the subsequent loss of independence in activities of daily living by using questionnaires with 678 elderly nuns, aged 75 to 102 years. They found that cognitive status, as indicated by Mini-Mental State Examination score, had a strong negative association with loss of independence in activities of daily living. It has been noted that there is a progressive decline in basic activities in later stages of cognitive impairment (Gauthier & Gauthier, 1990; Gauthier, Gelinas & Gauthier, 1997; Stern, Hesdorffer, Sano & Mayeux, 1990 cited in Tabert, 2002). Instrumental activities of daily living in the early stages of cognitive impairment which led to Alzheimer's disease, performance of daily household activities essential to maintaining independence (instrumental activities of daily living) is altered (Stern, Hesdorffer, Sano & Mayeux, 1990 cited in Tabert, 2002). In dementia cases, these patients lose the IADL's first (http://www-instruct.nmu.edu/communications/ hkahn/COURSES/ COGNITION%20AND%20AGING/CD%20460%20LECTURES/IADL'S%20LECTURE, 2003). Maintenance of physical activity keeps the brain healthy and slows progression of cognitive impairment.

Drugs can either interfere with or improve the cognitive status of the elderly. The elderly tend to be more susceptible to side effects of drugs that affect cognitive status. It should be determined whether the cognitive problems are related to the side effects of drugs or interactions between drugs (Yurick, Spier, Ronn & Ebert, 1989).

Cognitive status could be negatively affected by many drugs, such as anticonvulsant, antineoplastic medications (Shaner, 2000), and psychoactive drugs (Fraser, Singh, & Bennett, 1996; Gary, Pramil & Hannelre, 1996). Hypnotics, tranquilizers, and antidepressants frequently cause daytime drowsiness, vertigo, and confusion, resulting in poor cognitive status in older persons (Yurick, Spier, Ronn & Ebert, 1989).

The followings are examples of drugs causing cognitive impairment (Larson, Kukull, Buchner & Reifler, 1987): Diazepam, Methydopa, propanolol, Reserpine, Meprobamate, Flurazepam, Clorazepate, Phenobartital, Thioridizine, Oxazepam, Clorazepate, Hydrochlorothiazide, Haloperidol, Thorazine, Aspirin, Cimetidine, Insulin,Amoxapine,Meperidine,Oxycodine, and Amantadine.

Others

Coffee consumption has been found to have a protective effect against Alzheimer's disease in many studies (Jonson-Kozlow, Kritz-Silverstein, Barrett-Connor & Morton, 2002; Lindsay et al., 2002). Caffeine may have a supplementary effect on cholinergic stimulation, resulting in better cognitive status. Thus, coffee consumption is associated with better cognitive status among the elderly.

Regular wine consumption has also been associated with a reduced risk

of Alzheimer's disease. It has been suggested that specific substances in wine, but not in other alcoholic beverages, could be responsible for this positive effect on nerve cells in dementia (Orgogozo et al., 1997; Tredici et al., 1999 cited in Lindsay et al., 2002).

Nutritional deficiencies: It has been reported that Vitamin B-12 deficiency, low blood concentration of vitamin C, and folic acid are associated with cognitive impairment (Gale, Martyn, & Cooper, 1996; Goodwin, Goodwin & Garry, 1983). High caloric consumption in middle age may accelerate the decline in cognitive status seen with aging (Fraser, Singh & Bennett, 1996).

3. Lifestyle of the elderly in Natawee District

Songkhla province has 16 districts. The land is primarily plains, sloping hills, and steep areas. Its population is primarily Buddhist and agricultural. Most of the agricultural areas are rubber plantations; however, Ranode and Stingpra districts have no rubber plantations at all, since most of the population in these districts are fishermen and fish mongers.

Natawee is a district in Songkhla. Seventy percent of the population is Buddhist, 19.8% are Muslims, and 0.2% are Christians. Most are agriculturists who work in rubber plantations. Therefore, their main income is from work in the plantations and from selling rubber. Generally, parents train their children to work in rubber plantations and later this work becomes their occupation. When the children grow up and have their own families, most of them still live near their parents' house. They keep in touch and help each other. Thus, the relationships among the community's members are very close and they share similar lifestyles. They still live

close to the natural environment, with traditional customs. They are usually willing to assist and participate in community activities, and they know each other very well.

The elderly who live in Natawee District have generally have excellent relationships with their children. Most of them used to work their own the rubber estates before getting old and then they passed on their farms and livelihoods to their children. Most of their income is still generated from the rubber plantations now managed by their children. Thus, their children have sufficient money to look after them very well. In addition most of houses of the elderly are in close proximity to their children's houses. Thus, the elderly feel happy and secure yet they still have their freedom and privacy and do not feel depressed or lonely.