Relationship Between Nutritional Status and Executive Functions Among Elderly in Geriatric Homes

Thesis

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List of Abbreviations

AD ····· Alzheimer disease

ADL····· Activities of daily living

BMI ····· Body mass index

CLOX1 ····· Clock drawing test of executive function

NP····· Neuropsychological

DA ····· Dopamine

DCH····· Delayed cutaneous hypersensitivity

DHA ····· Docosahexaenoic acid

DSM-IV····· Diagnostic and Statistical Manual of Mental Disorders, 4^{th} edition

ECF····· Executive function

EXIT25····· Executive Interview test

GDS····· Geriatric depression scale

GT····· Glucose tolerance

HIV····· Human immunodeficiency virus

IADL ····· Instrumental activities of daily living

IL-6····· Interleukin 6

IL-1 beta ····· Interleukin-1 beta

MCI ····· Mild cognitive impairment

MMSE ····· Mini mental status examination test

MNA····· Mini Nutritional Assessment

MUFA ····· Mono unsaturated fatty acids

SFA····· Saturated fatty acids

PUFA····· Polyunsaturated fatty acid

TNF-alpha···· Tumor necrosis factor-alpha

Zn ····· Zinc

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Introduction

Malnutrition is a general term that has been used to mean over nutrition, undernutrition, specific nutrient deficiencies, or imbalances ***(Chen et al., 2001).***

Malnutrition is prevalent in elderly populations, even in the developed world ***(Visvanathan, 2003).***

The prevalence of malnutrition increases with age and is most common in the institutionalized individuals ***(Jan Hudgens et al., 2004).***

Protein-energy malnutrition has been reported in up to 15% of community-dwelling and home-bound elderly individuals, up to 62% of hospitalized elderly patients, and up to 85% of residents of nursing homes ***(Thomas et al., 2002).***

Macronutrient malnutrition may take two forms; inadequate protein intake relative to energy (e.g kwashiorkor), or inadequate energy intake relative to protein (e.g marasmus) ***(Thomas, 1999).***

Under-nutrition is associated with exacerbation of health conditions, increased frailty, and decrease in physical and cognitive functions ***(Challa et al., 2007).***

Greenwood and Winocur (1999) stated that Cognitive decline in the elderly can be caused or worsened by nutritional deficiencies.

Vitamin deficiencies could also have an effect upon cognitive impairment, and the prevention of nutritional deficiencies

in patients with dementia could be considered the first line of defense against the development and progression of cognitive decline ***(Solfrizzi et al., 2003).***

Cognitive impairment can be influenced by a number of factors and the effect of nutrition on cognitive function has become a topic of increasing scientific and public interest ***(Salerno-Kennedy et al., 2006).***

Lee et al., (2007) studied relationship between nutritional risk and cognitive impairment in community-dwelling elderly. Multiple logistic regression analysis revealed that moderate or high nutritional risk subjects were associated with an increased risk of cognitive impairment, and these results suggest that nutritional risk may be associated with cognitive impairment in the elderly.

Also, ***Brownbill et al., (2004)*** examined the relationship between diet and cognitive function and they have found that both carbohydrate and total potassium intake (food and supplements) were significantly correlated to MMSE score.

While, ***Irving et al., (1999)*** found correlation between cognitive functions and BMI (body mass index), weight loss and age.

In one study, subjects with an adequate cognitive capacity (MMSE ≥28) showed a greater intake of total foods, and these subjects had a more adequate intake of fatty acids and cholesterol, and a greater intake of vitamins implicated in correct brain function (thiamine and folic acid) ***(Requejo et al., 2003).***

Another study examined the nutritional status in a community-dwelling elderly sample using MNA and found that 25.8% presented at inclusion a risk of undernutrition with a MNA score of 23.5 or less. During follow-up; the rapid loss on MMSE was higher in subjects who presented a risk of undernutrition at inclusion than in the well-nourished subjects ***(Vellas et al., 2005).***

Also, ***Deshamps et al., (2002)*** stated that, in apparently healthy elderly people a BMI ranging between 23 and 27 is associated with lower risks of functional and cognitive decline in the subsequent 5 years.

Aim of the Work

To study the relationship between nutritional status and executive functions among elderly subjects in geriatric homes

Malnutrition and Aging

Definition and Epidemiology:

Nutrition is an important determinant of health in elderly patients. Over the past decade, the importance of nutritional status has been increasingly recognized in a variety of morbid conditions including cancer, heart disease, and dementia in persons over the age of 65 ***(Coombs et al., 2004)***.

Although there is no uniformly accepted definition of malnutrition in the elderly, some common indicators include involuntary weight loss, abnormal body mass index (BMI),specific vitamin deficiencies, and decreased dietary intake ***(Reuben et al., 2004).***

Malnutrition may be defined as a state of nutrition in which a deficiency, excess or imbalance of energy, protein and other nutrients causes adverse effects on body form, function and clinical outcome ***(Stratton et al., 2003)***.

The term undernutrition is often used interchangeably with malnutrition. Undernutrition rather than overnutrition has been agreed to be the main cause for concern in the older population (principally due to increased morbidity and mortality with undernutrition compared to obesity) ***(Elia, 2003).***

Malnutrition (i.e. undernutrition) is a frequent and serious problem in the elderly: it is the result of insufficient macro- and

micronutrients to meet optimal physiological requirements ***(Omran and Morley, 2000)***.

Malnutrition in older patients is regularly underdiagnosed ***(Gariballa, 2000),*** and many physicians have expressed their need for more education regarding nutritional status in older patients ***(Mihalynuk et al., 2004)***.

The elderly are a particularly nutritionally vulnerable group. In the UK 12.4% of those aged 65 or over living in the community at high or medium risk of malnutrition, rising to 20.4% in people in residential accommodation and up to 40% of patients admitted to hospital of this age ***(Kopelman and Lennard-Jones, 2002)***.

Undernutrition is the most frequent type of malnutrition in elderly patients due to protein-energy deficiency. Epidemiological studies show that 5–10% of non-institutionalised older people are malnourished. This prevalence rises to 26% in patients who have been hospitalized for acute diseases, and reaches 30–60% in long-term care units and nursing homes ***(Arnaud-Battandier et al., 2004)***.

Causes of Nutritional Deficiency in Elderly:

Malnutrition is often due to one or more of the following factors: inadequate food intake; food choices that lead to dietary deficiencies; and illness that causes increased nutrient requirements, increased nutrient loss, poor nutrient absorption, or a combination of these factors ***(Demling and De Santi, 2005)***.

Functional, psychological, social, and economic issues associated with concomitant medical problems may all contribute

to poor nutrition and weight loss in the frail elderly patient ***(Bartali et al., 2003)***.

Most factors which may predispose to malnutrition in the elderly person are reversible or responsive to treatment ***(Gariballa, 2004)***.

Nutritional inadequacy in the elderly can be the result of one or more factors physiological, pathological, social, and psychological ***(Morley, 2002)***.

1. Physiological Causes:

(a) Anorexia of aging:

Anorexia of ageing describes the physiological decrease in appetite and food intake that accompanies normal ageing. These processes can be augmented by acute and chronic diseases ***(Gariballa, 2004)***.

Anorexia of aging involves alterations in neuro-transmitters and hormones that affect the central feeding drive and the peripheral satiation system ***(Endoy, 2005)***.

Physiological anorexia of aging is thought to be caused by decrease in taste and smell as well as several neuroendocrine changes in both the central feeding system and the peripheral satiety system ***(Huffman, 2002)***.

Also other causes include modifications in cytokines network (e.g. TNF-alpha, IL-6, IL-1 beta, etc), reduction of anabolic hormones serum levels (e.g. growtli hormone, androgens, and insulin-like growth factors) ***(Morley, 1997)***.

(b) Changes in sensory function:

Normal parts in the ageing process of some people are diminished taste and smell abilities. The taste threshold increases due to reduced number of taste receptors and changes in taste cell membranes ***(Ng et al., 2004)***.

Diminished taste perception might reflect the progressive loss of the number of taste buds/papilla on the tongue ***(Gariballa and Sinclair, 1998).***

Reduced perception in tasting often results in dissatisfaction with food, diminished appetite and lost motivation to eat ***(Donini et al., 2003).***

However, ***Schiffman and Graham (2000)***, argue that the taste cell number remains stable in advanced ageing. They propose that altered taste perception might reflect changes in taste cell membrane activity (i.e. altered functioning of ion channels) rather than an actual loss of taste cells.

Cowart (1989), found that Losses in olfactory sensitivity tend to be relatively uniform, affecting responses to all or most odour stimuli.

But the elderly are often unaware of their sensory loss and note no decrease in their appreciation of food and their ability to smell ***(Rolls and Drewnowski, 1996)***.

(c) Age-related changes to the gastrointestinal tract:

1- Oral changes:

Changes in the oral cavity, such as loss of teeth, ill-fitting dentures, decreased saliva production and gingivitis, can profoundly affect the ability of older people to chew and/or swallow, with subsequent avoidance of many foods ***(Curran, 1990)***.

According to ***Kashiwazaki et al., (2005)***, BMI correlated more strongly with total bite force than it did with the number of natural teeth, the number of functional teeth or stability of denture. This result indicates that we need to reconsider systems of evaluating oral status for the promotion of nutrition.

2- Atrophic gastritis:

The most significant change in gastrointestinal function with ageing is the reduction of gastric acid output in older people who have atrophic gastritis. Atrophy of the stomach mucosa becomes more common in old age and is estimated to affect one-third of those over 60 years of age ***(Horwarth, 2002)***.

It is characterized by a partial loss of fundic glands and a corresponding decrease in the parietal cell mass. The physiological consequences of atrophic gastritis are decreased acid-pepsin digestion in the stomach, decreased secretion of intrinsic factor, bacterial overgrowth of the stomach and proximal small intestine, and elevated pH in the proximal small intestine ***(Russell, 2001)***.

Pancreatic enzyme secretion also appears to decline with increasing age, impairing the digestion of fat and protein when