Contents lists available at ScienceDirect

International Journal of Gerontology

Original Article

A Preliminary Randomized Controlled Trial of Multifaceted Educational Intervention for Mild Cognitive Impairment Among Elderly Malays in Kuala Lumpur[☆]

Sa'ida Munira Johari [1], Suzana Shahar [1*], Tze Pin Ng [2], Roslee Rajikan [1]

[1] Dietetic Program, School of Healthcare Sciences, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia, [2] Department of Psychological Medicine, National University Hospital, Singapore

SUMMARY

Background: The aim of this study was to determine the effect of health education in changing nutritional, lifestyle, and cognitive function of elderly individuals with mild cognitive impairment (MCI).
Methods: Thirty-five elderly individuals with MCI (mean age 65.7 ± 3.8 years, 45.7% men) were randomly assigned to intervention ($n = 17$) and control ($n = 18$) groups. The intervention group participated in monthly sessions on nutrition and lifestyle education for 12 months, based on a booklet ('7 Guides to Enhance Elderly Memory'). Outcomes (cognitive performance, biomarkers, dietary intake, and knowledge, attitude and practice, knowledge, attitude, and practice score) were measured at 6 and 12 months.
Results: Repeated-measure analysis of covariance showed significant improvements in serum B_{12} ($\eta p^2 = 0.094$, $p = 0.049$), homocysteine ($\eta p^2 = 0.113$, $p = 0.022$), vitamin C ($\eta p^2 = 0.140$, $p = 0.019$), sodium ($\eta p^2 = 0.321$, $p = 0.000$), potassium (ηp^2 0.321, $p = 0.006$), knowledge ($\eta p^2 = 0.220$, $p = 0.001$), and attitude ($\eta p^2 = 0.105$, $p = 0.040$) in the intervention group over the control group. Individuals in the intervention group showed a significantly higher percentage of improvement in block design (+53.7%) compared to the control group (+8.0%), ($p < 0.05$).
Conclusion: A 12-month educational intervention on nutritional, lifestyle, and cognitive exercise significantly improved nutritional status, knowledge, and attitude score. The study lacked power to demonstrate a statistically significant positive effect on cognitive functioning; thus, the preliminary findings should be confirmed in a larger trial.

1. Introduction

Mild cognitive impairment (MCI) is defined as a transitional phase between normal aging and dementia, characterized by cognitive decline in performing normal activities of daily living[1]. Older persons with MCI represent a target population that is at risk of developing Alzheimer disease (AD)[2]. Elderly persons with MCI have a 10–15% risk of developing AD compared to 1–2% among cognitively normal elderly persons[2]. Previous studies have strongly suggested that MCI is reversible and the modification of risk factors may potentially slow cognitive decline, thus preventing onset of dementia[2]. These modifiable factors generally include nutritional, lifestyle, and behavioral training as well as cognitive training[3–5].

Health education aimed at changing nutrition and lifestyle behavior is widely recommended for most chronic diseases and degenerative conditions, particularly as a secondary prevention strategy to prevent the progression of disease in elderly persons. The benefits of nutrition and lifestyle education in the elderly include the ability to contribute to better health, productivity, self-sufficiency, quality of life, and life expectancy[6,7] and is well documented in several studies[7,9]. Single targeted nutrient and lifestyle intervention showed improvement in cognitive scores, as documented in several intervention studies; for example, positive

effects were observed with administration of omega-3 fatty acid[10], folic acid supplementation[11], physical activity[12], and cognitive training[13], and also antioxidants[14] in individuals with mild AD, adults at risk for AD, or those with MCI. However, studies that address the benefits of nutrition and lifestyle education among the elderly with MCI are lacking. Published studies that have described efforts to improve cognitive function and delay cognitive decline have focused on specific food and nutrient supplementation and lifestyle interventions including antioxidants[14], fish oil[10,15], physical activity intervention[12], and cognitive training[16].

Nutritional biomarkers are biological specimens that indicate nutritional status with respect to intake or metabolism of dietary constituents[17]. A single biomarker may be reflective of several nutrients' interaction and metabolism. In this study, serum B_{12}, red cell folate, and serum homocysteine levels are selected as the indicators. Several studies have shown that impaired B_{12} and folate levels in blood are common in neurodegenerative diseases such as dementia[18−20]. These vitamins act as the coenzyme and play roles in homocysteine metabolism;, therefore, homocysteine level is a sensitive marker for low status of both vitamins[21]. There is also evidence that the presence of circulating homocysteine concentrations is a modifiable risk factor for cognitive decline[18].

The current preliminary study was conducted to evaluate the feasibility and efficacy of nutrition and lifestyle education in improving cognitive ability among urban elderly individuals with MCI in Kuala Lumpur (Cheras), Malaysia.

2. Methodology

2.1. Study design, sampling, and data collection

This is a preliminary study to determine the feasibility and effectiveness of nutrition and lifestyle education of 12 months duration among 35 elderly individuals with MCI. Study participants were recruited from a low-cost housing area in an urban area of Malaysia (Cheras, Kuala Lumpur). Participants with MCI were screened using Petersen (2004) criteria[22]. Inclusion criteria were age 60−74 years old with no known terminal illness or mental disturbance and the ability to read and write. Patients who received vitamin, mineral, or fish oil supplementation for the previous 3 months, consumed alcohol, or had concomitant serious disease such as uncontrolled diabetes or kidney failure were excluded. Patients were not allowed to consume any other vitamin, mineral, or fish oil supplementation throughout the intervention period. All patients were assessed regarding food intake, knowledge, attitude, and practice (KAP) scores, biomarkers, and cognitive status at baseline, 6 months, and 12 months. Ethical approval was obtained from Universiti Kebangsaan Malaysia Medical Center (UKMMC) Ethics Committee. Informed consent was obtained from all patients.

2.2. Intervention implementation

Participants were randomized to interventional and control groups. Patients in the active interventional group received monthly nutrition and lifestyle education sessions based on a booklet entitled '7 Guides to Enhance Elderly Memory'. The booklet was developed by a panel of experts based on the recent recommendations and evidences for optimal cognitive function in elderly individuals as reported earlier[23]. The seven guidelines are: eat more fish, eat more foods rich in folic acid, eat more fruits and vegetables, exercise regularly, engage in activities to stimulate memory, stop smoking and consumption of alcohol, and maintain a cheerful and positive attitude. Each subject received the booklet during the first session, including the allocation of scheduled time for education sessions during 12 months of intervention. During the first session, the researcher explained the booklet to participants[24]. The intervention activities based on the booklet content consisted of group activities on healthy dietary instruction that emphasized consumption of fish, vegetables, and fruit, diet counseling, a food quiz, demonstration of healthy food preparation, aerobic exercise, a crossword puzzle, and board games. Advice regarding the intervention activities was provided during monthly group meetings as suggested by Rana et al[25].

Because this study is part of a larger study investigating the efficacy of fish oil supplementation on elderly individuals with MCI, the control group received 12 months of supplementation with isocaloric placebo capsule containing 1000 mg corn oil to be taken three times daily. In this education intervention study, the same control group (placebo) was used because of the small sample size.

2.3. Measures

The outcome measures included in this study were cognitive status, food intake, KAP scores, and biomarkers. Specific assessment on the improvement according to each guideline tabulated in the booklet was not assessed. Compliance toward advice given was monitored monthly through individual and group counseling sessions.

2.3.1. Cognitive status

Cognitive status was assessed by trained interviewers under the supervision of a clinical psychologist using neuropsychological tests comprising the Mini-Mental State Examination (MMSE)[26], Digit Span[27], Digit Symbol[27], Block Design[27], Matrix Reasoning[27], Visual Reproduction I and II[28], Rey Auditory Verbal Learning Test (RAVLT)[29], and Clock Drawing Test (CDT)[30]. The Malay version MMSE was used in this study, and has been validated among the local elderly population[31].

2.3.2. Biomarkers

Nutritional biomarkers including serum B_{12} level, red cell folate, and serum homocysteine were measured. Blood samples were centrifuged at 3000 rpm for 10 minutes immediately after collection. Serum B_{12} level, red cell folate, and serum homocysteine levels were determined using competitive immunoassay using direct chemiluminescent technology method (Advia Centaur, Siemens Healthcare Diagnostics, Germany).

2.3.3. Food intake

Dietary intake was assessed by face-to-face interview using a diet history questionnaire (DHQ)[32], with conversion tables between the weight for each food item consumed and household serving size. FoodWorks (www.xyris.com.au) software was used to obtain basic energy and nutrient intake.

2.3.4. Knowledge, attitude, and practice

The score for nutritional knowledge, attitude and practice was obtained using a questionnaire developed by the research group comprising dietician, nutritionist, physician, and geriatrician. The questionnaire was based on information in the literature on healthy eating, lifestyle, and cognition in elderly individuals. It was pretested on a convenient sample of 20 elderly patients drawn from the local community from whom the participants in this study were recruited and showed good internal consistency (Cronbach $\alpha = 0.918$). There were 37 questions for knowledge, with a dichotous response scale ("yes", "no" or "don't know") and also multiple choice questions; 12 attitude and 15 practice questions with a 5-point Likert scale (strongly disagree to strongly agree)[33].