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Determinants of major non-communicable diseases in the elderly: the pilot Freemasons health study

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Abstract

Aim To present preliminary results of the pilot phase of the Freemasons Health Study.

Methods A prospective cohort study, in which determinants of occurrence of stroke and dementia in the elderly will be investigated.

Results The pilot study (n = 507) showed substantial heterogeneity in risk factor levels among participants and suggested outcome rates that would allow a study of 6000 individuals aged 65 years and over to produce statistically reliable results within a few years of follow up. Preliminary results of the pilot study suggest that the demographic (age, sex) and risk factor (namely blood pressure levels and ranges of body mass index) profile of the projected sample of the Freemasons population is similar to that of the general elderly New Zealand population.

Conclusions The pilot study confirmed that the collection of baseline data from the New Zealand Freemasons population and their spouses is feasible, and that the prevalence of major vascular risk factors in the elderly Freemasons population is similar to that of the general New Zealand population of comparable age. In addition to contributing to our understanding of the aetiology of major non-communicable diseases in the elderly, the proposed major study provides a unique opportunity to investigate the determinants of health and requirements for care in an elderly New Zealand population.

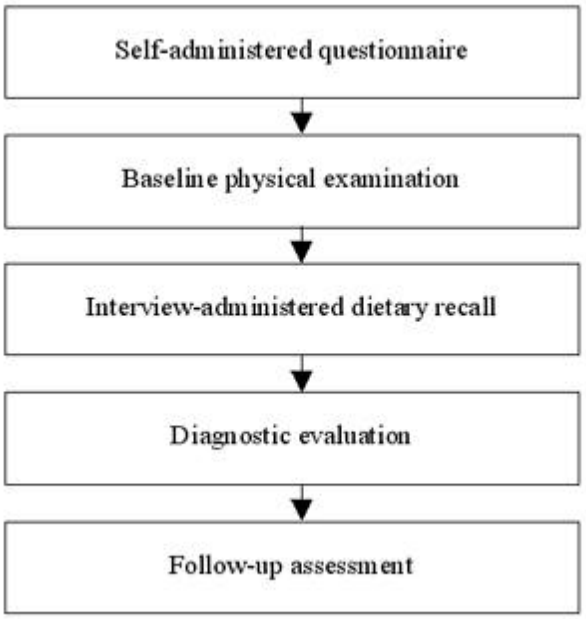
The World Health Report 1997 predicted that non-communicable diseases would come to dominate public health in the world in the 21st Century.[1] As in many other economically developed countries, the proportion of older people in New Zealand is rapidly increasing, and age-related chronic illnesses – including stroke, dementia, Parkinson's disease, depression, coronary artery disease, cancer, and osteoporosis – affect large numbers of older people and are having a dramatic and increasing impact on our society and the health care system. Interventions aimed at preventing or postponing these devastating disorders could have a dramatic positive impact on quality of life[2] and health-related expenditure in society. However, before any potential interventions can be promoted with confidence, more needs to be known about the specific causes of these diseases, especially those with potentially modifiable risk factors.[2] To our knowledge, no prospective cohort studies have been undertaken to investigate relationships between omega-3 fatty acids and inflammatory markers, and the occurrence of cerebrovascular disease and dementia in the elderly. This paper describes the recruitment and other preliminary results of the pilot phase of the Freemasons Health Study.

Methods

The Freemasons Health Study is a prospective cohort study. The study aims to identify determinants of occurrence of stroke, dementia, depression, and hip fracture in the elderly, with a particular emphasis on the role of omega-3 fat consumption, markers of systemic inflammation, endothelial dysfunction, and micronutrients. A study population for the pilot phase of the study comprises a random sample of Freemasons' members and their spouses, aged 65 years and over. The aims of the pilot study were as follows: 1) to develop and test the study questionnaires; 2) to develop and test recruitment methods and assess response rates among Freemasons and their spouses; 3) to formalise and test procedures for data collection, including on-site physical examination; and 4) to assess distributions of the major risk factors of interest. The University of Auckland Human Subjects Ethics Committee approved the study. All participants provided written consent. A computerised system was developed to monitor study performance and follow up of the participants. The study was carried out according to the New Zealand Good Clinical Research Practice Guidelines.[3]

The baseline data collection had five phases/components (Figure 1): 1) self-administered questionnaire about social and demographic parameters, medical and family history, general health and behavioural risk factors; 2) baseline physical examination to be performed at local Lodges or community halls; 3) multiple interview-administered 24-hour recall dietary assessments; 4) diagnostic evaluation of subjects suspected to have an outcome of interest; and 5) follow-up assessment for the confirmed outcomes of interest (for major phase of the study only).

Figure 1. Five phases of data collection



The health questionnaire (phase 1) collected information about a wide range of factors, including medical history, drug history, family history, smoking habits, alcohol consumption, physical activity (exercise habits), social and economic status (ethnic origin, occupation, level of education, gross income), symptoms of anxiety/depression,[4] medical care, and health-related quality of life. In addition, women were asked to provide information about reproductive history, including details of pregnancies, contraception, menstrual history and gynaecological surgery. There is evidence that health interview surveys yield overall reliable data on chronic illness among older respondents.[5] After completion, the questionnaires were checked for completeness by study nurses and data entry staff.

Participants were invited to undergo a physical examination (phase 2) and venesection by study research staff at their local Freemason lodge for completion of the baseline assessment. The physical examination included the following measurements: height/weight, waist and hip circumferences, resting brachial blood pressure (the mean value of two consecutive measurements in the right arm

taken before the participant's blood sample is drawn), radial pulse counting, cognitive assessment questionnaire, mobility tests (timed 'Up-and-Go', a timed mobility task that involves getting up from a chair, walking three metres, turning around and returning to sitting in the chair;[6] and graded fluency of rapid alternating movements of the first two digits in the right hand), and evaluation of muscle tone, postural imbalance and facial expression. Nail/hair samples were taken for further analyses for trace elements, such as zinc and selenium.[7] Trained research nurses performed these measurements in a standardised/uniform manner.

Diet (phase 3) was assessed using the standardised 24-hour diet recall method used and validated in the New Zealand National Nutritional Survey in 1997.[8] The assessments were carried out in the form of telephone-administered computerised 24-hour dietary recalls. A 24-hour diet recall was designed to collect a list of all food and beverages the respondent consumed within the previous 24-hour period, a detailed description of each food, and the amount eaten. As people do not eat the same food every day, a total of three 24-hour diet recalls were collected from all study participants over a period of three weeks. The dietary information collected during the study was sent to the University of Otago for further analysis. Calculation of daily intakes of 43 nutrients was derived from these data for each individual. Nutrients included energy, macronutrients, vitamins, trace elements, fatty acids, antioxidants and fibre. Serial blood sampling was performed to determine: serum level of potassium, sodium, urea, creatinine, total cholesterol, low-density lipoprotein, high-density lipoprotein, triglycerides, fibrinogen, C-reactive protein, full blood count, von Willebrand factor and plasma omega-3 and omega-6 fatty acids. Routine descriptive statistical analysis of basic demographic characteristics and some major risk factors was performed for the pilot phase of the study.

Results

Five hundred and seven male and female participants were recruited to the pilot study. Recruitment and baseline exposure data collection procedures were field tested over a four-month period in 2000. The overall response rate for men (after first invitation) was 53% of all subjects invited to participate in the study. All participants completed the self-administered questionnaire in full. Baseline physical examinations were undertaken in the evenings at 17 local Lodges throughout the South Auckland region extending into the Coromandel Peninsula. Data collection procedures were completed on site without significant revisions to the study protocol. Exposure data were obtained from both the lifestyle (general health) and 24-hour recall diet questionnaires. Baseline physical examination required approximately 40 minutes per subject. Due to time restriction, the 24-hour diet recall data were collected from approximately 90% of the participants. The dietary interviews took an average of 30 minutes each, and each participant had three interviews conducted on different days of the week.

Males constituted 58% of the pilot study sample, with a mean age of 65.7 years (SD: 11.6 years). The mean age for females was 62.0 years (SD: 11.4 years). Thirty six per cent of subjects were aged 65–74 years; 14%, 75–84 years; and 2%, 85 years or more. Of the 502 participants with known (specified) ethnicity, there were 487 (97%) Caucasians, 7 (1.4%) Maori or Pacific people, and 8 (1.6%) Asians or people of other ethnic groups. Of 507 participants, 27 (5%) had a history of stroke and 1 (0.2%) participant died from stroke during the three-month follow up. Distribution of some risk factors among participants is shown in Figure 2 at the end of this article.

Elevated blood pressure (systolic pressure ≥ 140 mm Hg and/or diastolic pressure ≥ 90 mm Hg) and/or history of hypertension, was observed in 369 (69%) subjects. Sixty six per cent of men and 34% of women were former or current smokers. Current smokers (smoking one or more cigarettes per day) made up 9% of male and 7% of female respondents. The mean body mass index in participants was 28.7 kg/m^2 (29.0 in men and 28.2 in women).

Using threshold levels of 25 kg/m^2 and 30 kg/m^2 respectively, 51% of participants could be classified as overweight and 31% as obese. Overall, 67% of respondents were current alcohol consumers (drinking once or more per month) with a mean intake of 2.3 standard drink (75 ml of ethanol) per week. Other data collected but not yet analysed included blood, diet, cognitive function, assessment of anxiety/depression and mobility function. Virtually all participants expressed their satisfaction with the study performance and indicated their willingness to continue to participate in the study.

Discussion

The New Zealand Freemasons Health Study uses a cohort design, one of the most robust epidemiological methods for identifying causes of disease.[9,10] As the risk profile of study participants is established prior to the outcome(s) of interest, there is greater certainty about the strength of causal relationships. In addition, prospective cohort studies are typically less affected by selection and recall biases than other types of observational studies.[9] To reliably investigate causal relationships within specific age groups of the population, it is intended that the cohort be followed for at least five years. This project provides an opportunity for evaluation of diet, dietary or other lifestyle factors in the prevention of stroke, dementia, and other major non-communicable diseases, and may provide a unique source of information on the determinants of healthy life expectancy in an older New Zealand population.

The New Zealand Freemasons are a well defined population of predominantly older (over 60 years) people with a comprehensive membership database. Therefore, this population provides a unique data source with regard to the study of the determinants of major diseases and disability in the elderly, which can be conducted relatively efficiently compared with most large-scale cohort studies. Although it could be argued that Freemasons are not generally representative of the elderly population at large, this should not, however, limit the internal validity and generalisability of anticipated aetiologic relationships in the study. The robust and widely accepted conclusions of studies based on such highly selected cohorts as US nurses,[11] British doctors,[12] Seventh-Day Adventists, and New Zealand blood donors[13] attest to this. As noted by Elwood[14] and quoted by others,[13] "the issue is not whether the subjects are 'typical' or 'representative', but whether the association between outcome and exposure is likely to apply to other groups."

The pilot study confirmed that the collection of baseline data from the New Zealand Freemason population and their spouses was feasible. The preliminary analyses of the data demonstrated substantial heterogeneity in risk factor levels among participants and, together with other population-based studies of stroke in the region,[15] suggest outcome rates that would allow a study of 6000 individuals aged 65 years and over to produce statistically reliable results within a few years of beginning follow up. Distribution of the major risk factors of interest differ little from recent New Zealand national population data,[8] which reveal that in men and women aged 65–74 and 75+ years, mean BMI ranges from 26.0 to 26.4 and prevalence of hypertension (systolic pressure ≥ 140 mm Hg and/or diastolic pressure ≥ 90 mm Hg with or without antihypertensive medication) ranges from 53.0% to 72.5%. The study results also suggest that the composition of the study population is especially pertinent to the study of chronic non-communicable diseases in the elderly. As shown in the pilot

study, the demographic (age, sex) and risk factors profile of the projected sample is estimated to be similar to that of the general elderly New Zealand population.

The major phase of the study aims to identify risk factors for stroke, dementia, and hip fracture in the elderly, with a particular emphasis on lifestyle (especially fat consumption, smoking, physical activity and alcohol intake) and other potentially modifiable risk factors (including systemic inflammation, hypertension). Each of these potential risk factors has a relatively high prevalence in the general community; each therefore might contribute importantly to the total burden of these and other major non-communicable diseases that share similar risk factors. This particular study is not powered to investigate determinants of these diseases in ethnic minority groups (such as Maori and Pacific people). However, inclusion of these ethnic groups in future studies, and accumulation of more outcomes with an increase of length of follow up, will provide an opportunity to compare determinants of occurrence of these outcomes in Maori and non-Maori people.

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Figure 2. Distribution of selected risk factors among participants