A COMPARISON OF THE PROTEIN STATUS OF VETERAN HOSPITAL-BASED-HOME-CARE PATIENTS AND NURSING HOME CARE PATIENTS

A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF MASTER OF SCIENCE

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

COLLEGE OF NUTRITION, TEXTILES, AND

HUMAN DEVELOPMENT

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MAY, 1981

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December 3 19 80

We hereby recommend that the thesis prepared under our supervision by Karen Ann Vaclavik Stone entitled A COMPARISON OF THE PROTEIN STATUS OF VETERAN HOSPITAL-BASED-HOME-CARE PATIENTS AND NURSING HOME CARE PATIENTS

be accepted as fulfilling this part of the requirements for the Degree of Master of Science.

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ACKNOWLEDGEMENTS

Sincerest gratitude to my committee chairperson, Kathleen Lawson, M.S., R.D. Thanks also to my committee members, Yee Lew, M.S., R.D., Dr. Duer, and Dr. Baird, for their help and consideration. Special consideration is extended to Dr. Eisenstadt and the HBHC staff, especially Miss Evelyn Kile, RN and Mrs. Ruth Castillo, RN, for their time and help in reaching the HBHC patients and to Dr. Tausend and the NHCU staff. I am also grateful to all the patients who participated in this study. And finally a special thanks to my husband, Scott, and my family for their support and understanding during the completion of this demanding program.

INTRODUCTION

The lifestyles of the elderly vary greatly, with many persons being institutionalized while others live at home. Nutritional status of the institutionalized elderly and the noninstitutionalized elderly have been investigated; however, studies on patients in special programs such as the V.A. Hospital-Based-Home-Care program and the Nursing Home Care Unit in the Veteran's Administration Medical Center (VAMC) have been limited to demographic data (Birge et al. 1979, Oller 1976).

The V.A. Medical Center offers a unique situation for elderly veterans. Some elderly patients unable to care for themselves enter the V.A. Nursing Home Care Unit (NHCU), a long-term care unit which is attached to the hospital itself. The V.A. sponsored Hospital-Based-Home-Care (HBHC) program is an alternative to institutional care in a nursing home. Its purpose is to decrease the cost of in-house care of veterans. A caretaker provides care for the veteran at home with the help of a visiting team, which consists of a physician, a social worker, nurses, a corrective therapist, and a dietitian. Criteria for admission to this program include that the patient lives within a thirty mile radius of the VAMC, has had previous admission to the VAMC, and has a person to act as caretaker.

Provision of adequate nutritional care for the elderly is of major concern today (Carlson 1972). However, it appears certain that altered eating habits and the nutritional status of the aged are influenced not only by medical conditions, but also by social, psychological, and economic factors (Brown et al. 1977). Factors that may adversely affect the ability of an older person to obtain an adequate diet include decreased income, disabilities, inadequate housing and transportation, lack of information and education, food faddism, and loneliness (Fisher et al. 1978, Mayer 1974).

The relationship between nutrition and the aging processes is not well understood. Many physiologic alterations take place in late life, including a decline in the efficiency of renal function, a decrease in calcium absorption, a reduction in the secretory ability of the digestive glands, and changes in the nervous system. It is estimated that the basal metabolic rate declines 16% between thirty and seventy years of age. Also, a redistribution of the major body components occurs, with a decrease in lean body mass and an increase in adipose tissue (Munro and Young 1978). It is generally believed that despite continuing physical exercise, muscle strength and mass diminish as a person gets older. As muscle cells decrease, they are replaced by fat and fibrous connective tissue.

These changes suggest the need for careful evaluation of nutritional requirements for the elderly since unrecognized changes in nutrient requirements may greatly influence nutritional status. For example, the total caloric requirement decreases approximately one-third in the elderly because of the decline in the metabolic rate and a usual reduction in exercise. Similarly, the decrease in muscle mass suggests that protein and amino acid requirements may change with age (Busse 1978, Mayer 1974).

Nutritional care of the elderly presents a challenge for health professionals and public officials in terms of finding ways to maintain the health of an increasing number of elderly persons (O'Hanlon & Kohrs 1978). Along with the rise in the elderly population has been a concomitant increase in the number of nursing homes (Stiedmann et al. 1978). Since evidence as to the nutritional status of the institutionalized aged versus the noninstitutionalized aged is very conflicting and because there is no research on the protein status of elderly persons in special programs such as the HBHC program further examination of this area is warranted.

The purpose of this study was to investigate the protein status of a group of geriatric patients in the the V.A. Hospital-Based-Home-Care program, and to compare their protein status to that of a group of elderly persons in the

Nursing Home Care Unit at the Veteran's Administration Medical Center in Houston, Texas.

PROBLEM STATEMENT

The following question was addressed in this study: Is there a significant difference between the protein status of veteran patients in the V.A. Hospital-Based-Home-Care program and those in the VAMC Nursing Home Care Unit?

DEFINITION OF TERMS

In studies of nutrition, the terms "aged" or "elderly" may refer to a lower age limit of 51 years, 60 years, or 65 years of age (Vir & Love 1978). A lower age limit of 51 years was used in this study to allow for the varied ages of individuals in both study groups. An upper age limit of 74 years was used. MacLeod et al. (1974) documented some differences in nutrient intake between persons 51 to 74 years of age and those 75 years or older.

Protein status is that condition of health of people as relating to indices of protein nutrition. Indices of protein status utilized in this study include serum albumin, total serum protein, hemoglobin, total lymphocyte count, and mid-arm muscle circumference.

HISTORICAL PERSPECTIVE

The elderly comprise a growing population segment who are particularly vulnerable to nutritional problems such as protein malnutrition. It has been suggested that this can result from decreased intake, altered requirements, or impaired absorption of nutrients, presence of pathological intestinal flora, and food-drug interactions (Vir & Love 1978).

Some studies have focused on the nutritional status of institutionalized elderly people and have documented a high frequency of nutritional defiencies. Others have directed their attention to the housebound elderly and have found little evidence of specific deficiencies. Leichter et al. (1978) conducted a study to determine the nutritional status of a group of 150 free-living elderly persons. Examination of the dietary and biochemical data indicated that the nutritional status of this group was good. The authors found few biochemical values outside the standards and dietary intake was adequate except for total calories. In a study conducted by Banerjee et al. (1978), nutrient intakes of a group of geriatric long-stay patients was sub-optimal when compared to recommended amounts. The authors also noted that whole-food supplementation increased total protein intake; however, supplementation did not affect either serum albumin or transferrin. On the other hand, Purohit and Sharma (1975) report that old people, whether living with their family, alone, or in nursing homes, show signs of inadequate intake. They concluded that the danger of malnutrition is greatest in those elderly persons living at home.

Brown et al. (1977) compared the dietary status of a group of elderly residents in a rural community with that of residents in a nursing home in the same geographic area. Their results showed that mean protein intakes of the independent-living elderly were significantly higher than those of the institutionalized subjects. Although the protein intake of the institutionalized subjects was significantly less than that of those living independently, it was still more than adequate.

Vir and Love (1979) conducted a multifaceted analysis of the nutritional status of 196 subjects institutionalized in hospitals and sheltered dwellings and in noninstitutionalized subjects. Thirty-two subjects (16%) had inadequate energy intakes, while protein intakes were poor in seven subjects (3.5%). The authors noted that the correlation of energy with protein intake was important since the subjects with poor energy intakes had a higher incidence of low serum albumin.

Nutritional assessment of persons over fifty-nine years of age who participated in the Missouri Nutrition Survey was based on biochemical measurements, dietary intakes, anthropometric measurements, and a dental examination. It was found that 53% of these noninstitutionalized elderly had low hemoglobin levels, while only 3% had low serum albumin levels. Fewer than 10% of the group consumed less than 67% of the Recommended Daily Allowance for protein. The Ten-State Nutrition Survey found an even greater number of elderly persons with low serum albumin values. Six to ten percent of the low income, white elderly people who participated had low levels of serum albumin (Kohrs et al. 1978).

In a study comparing the nutritional status of institutionalized elderly men and women, Stiedmann, Jansen, and Harrill (1978) showed that mean serum protein and albumin levels were acceptable for both groups. However, thirty percent had total serum protein levels which were less than normal and 15% had low albumin levels. In similar studies, Purohit et al. (1975), Morgan (1962), Lloyd (1971), and Ferber et al. (1973) reported that hemoglobin values decreased significantly with age. Also, in a study of rural senior Utahns, Fisher et al. (1978) found that 40% of the women and 21% of the men studied had low serum total proteins. Likewise, Kohrs et al. (1978) indicated that the percentage of persons with low serum proteins increases with age.

O'Hanlon and Kohrs (1978) summarized information on the nutritional assessment of older Americans. Protein was one of the nutrients most often found to be deficient in the reviewed studies.

Assessment of the protein status of elderly people presents problems that differ in magnitude, if not in kind, from those encountered in other age groups (Vir et al. 1978). Greaves and Berry (1974) discussed the relationship of non-nutritional medical conditions to the interpretation of nutritional status. The authors noted three problems in connection with this. The first is the effect of non-nutritional disease in masking malnutrition, such as the effect of edema on the concentration of albumin in the bloodstream. Another problem is that a non-nutritional disease may lead to malnutrition. A familiar example is the additional nutritional demand imposed upon the individual who has inoperable cancer, which may lead to malnutrition. The third problem posed by the elderly is the extent to which diseases, such as osteoporosis, are of nutritional origin and therfore, to what extent measurements such as bone density should be included in nutritional assessments.

According to Watkin (1973), protein metabolism in the aging adult is very difficult to assess because each individual ages differently, aging being a function of the accumulation of insults over the years. Thus, there is little agreement about this subject in the literature.

Hoffenberg et al. (1966) and DeMaeyer (1976) report that serum albumin concentration will be lowered after some degree of depletion of the albumin stores. The former authors hypothesize that the effect of reduced protein intake, in the beginning, is a reduction in albumin synthesis. If this persists, the intravascular albumin pool will diminish and albumin from the extravascular pool will be transferred to the intravascular. As deprivation continues, both pools become reduced and serum albumin levels will decrease.

There is much controversy surrounding the use of serum albumin levels as an indicator of visceral protein stores. Some authors state that hypoalbuminemia is a late manifestation of malnutrition (Wardle et al 1975, Truswell 1976). Baertl et al. (1974) and Vir et al. (1979) report that this index cannot be used alone as an indicator of body protein or concentration since serum albumin is affected by both protein and calorie intakes and the relation between these. DaCosta and Moorhouse (1969) and Banerjee et al. (1978) also note that no significant correlations were found between protein intake and serum albumin.

Bistrian et al. (1975b) support the use of serum albumin levels in assessing protein status:

> Although it is not considered an early indicator, serum albumin is a useful measure of significant protein deficit,

> since various biochemical alterations characteristic of kwashiokor occur when albumin falls below 3.0 grams/ 100 milliliters. This depression of serum albumin levels reflects a reduction in albumin synthesis rates, and has been ascribed to reduced amino acid availability in protein-free or low-protein diets (p. 1153).

Sauberlich (1974) also points out that serum albumin may be a reliable index of protein status. Bistrian (1974 and 1976) notes that serum albumin levels have a highly significant correlation with arm muscle circumference. A significant decrease can occur in ten days or less in patients in catabolic stress receiving only 5% dextrose. A possible mechanism is that insulin, produced in response to stress and the dextrose load, depresses the release of amino acids from muscle tissue to maintain visceral synthesis of serum proteins.

In a study of 93 acute geriatric admissions to a hospital, Morgan et al. (1975) found that 70% of the subjects had depressed albumin levels with only ten of these patients having a potential liver involvement. MacLeod et al. (1974) also suggested a relationship between serum albumin levels and poor nutritional status among old people in the community.

Total serum protein values have been utilized in numerous studies as indices of malnutrition (Truswell 1976, Mullen et al. 1979, Fisher et al. 1978, Stiedmann et al. 1978, and

Leichter et al. 1978). Amino acids are necessary for the synthesis of proteins, thus total serum proteins may be used as a nonspecific indicator of protein status. However, Jelliffe (1966) and Truswell (1976) point out that this index is not as useful as serum albumin in the assessment of protein stores. They reasoned that raised levels of certain constituents, such as globulins, will influence the results of measures of total protein and body proteins do not all decline at the same rate when there is a shortage of amino acids for their synthesis. Also, in a study reported by Mullen et al. (1979), it was found that while low serum albumin and low serum transferrin levels were found in 16% and 50% of patients, respectively, serum total protein levels were normal in 95% of the patients.

Malnutrition contributes to the susceptibility to infection and heightens the intensity of infections by weakening the various host defense mechanisms (Butterworth 1974, Dreizen 1979, Law et al. 1974). However, the exact relationship between protein depletion and host defense mechanisms is unclear (Law et al. 1974).

Several mechanisms by which malnutrition suppresses the immune response have been noted. In malnourished conditions, the thymus is involuted and the thymic-dependent areas of the lymph nodes and spleen are depleted of lymphocytes (Faulk et al. 1977). Cell-mediated immunity is depressed as measured by lymphopenia, low T-cell (for thymus dependent) numbers in the circulating blood, diminished tonsillar size, and decreased reactivity to delayed skin test antigens. Thus, protein-calorie deficient patients cannot be easily sensitized to antigens and cannot readily recall prior sensitization (Dreizen 1979 and Law et al. 1974).

It has been suggested by Law et al. (1973) that the B-cell (for bone marrow dependent) population is also depressed in the malnourished patient. The B-cells are responsible for the synthesis and secretion of antibodies. Such reductions in secretory antibody response permit replication of microorganisms on the mucosal surfaces and a heightened susceptibility to mucocutaneous infection (Dreizen 1979, Law et al. 1974). On the basis of these findings, the cellular immune system may be estimated by a total lymphocyte count (Blackburn et al. 1976).

Several other mechanisms for suppression of the immune response during malnutrition were noted by Dreizen (1979). These include diminishing nonspecific resistance factors such as complement. The complement system is the principal mediator of the inflammatory response, thereby serving an essential function in host defense against infection. Secondly, protein deficiency heightens vulnerability to infection through changes in the character of the epithelium. The protective epithelium depends on an adequate supply of essential amino acids for the protein synthesis needed to maintain optimal cellular structure and function to withstand trauma. Phagocytosis and intracellular digestion of pathogenic organisms is also suppressed. Nutrition plays an important role in maintaining the number and phagocytic capacity of these cells. Lastly, protein deficiency retards wound healing. A lack of the essential amino acids for tissue regeneration impedes containment and repair of infected lesions (Dreizen 1979, Law et al. 1974).

It is estimated that there are about 750 grams of hemoglobin in the total circulating blood of a 70 kilogram man and that about 6.25 grams are produced and destroyed each day. Hemoglobin is made up of a prosthetic group, heme (an iron-containing porphyrin), and globin, a protein moeity (Harper et al. 1979). It has been recognized that a low protein intake retards hemoglobin regeneration, principally because of the normal requirement of 8 grams of protein per day for the globin component (Wardle, Kerr, & Ellis 1975). On this basis, Thiele (1976), Frieman (1975), and Morgan (1962) note that decreased levels of hemoglobin may indicate protein deficiency. However, hemoglobin levels can be affected by factors other than protein intake, such as iron deficiency which decreases the rate of hemoglobin synthesis (Pike & Brown 1975). For this reason, many authors note that hemoglobin may be a more sensitive indicator of iron nutriture (Stiedmann et al. 1978, Fisher et al. 1978, Purohit et al. 1975, Leichter et al. 1978).

Serum transferrin levels and the creatinine-height index have been described as sensitive indicators of protein deficiency, although these measures were unavailable for this study. Transferrin is a glycoprotein which is responsible for the transportation of iron. It is considered a more sensitive indicator of protein malnutrition than is serum albumin. The greater sensitivity of the transferrin level may be due to its shorter metabolic half-life or to a less efficient conservation mechanism (Wardle et al. 1975).

The creatinine-height index (CHI) represents the actual 24-hour urinary creatinine excretion divided by the expected excretion of a "normal" person. Since the height of an individual remains unchanged during malnutrition and the creatinine excretion correlates with the body cell mass, calculation of CHI affords an effective measure of metabolically active tissue by comparison of expected cell mass for height and actual body cell mass (Blackburn et al. 1977, Blackburn & Bistrian 1977, Bistrian et al. 1975a). However, the difficulty of obtaining accurate 24-hour urine collections makes this method impractical for widespread use (Heymsfield et al. 1979, Mullen et al. 1979).

Certain body measurements are sensitive to changes in food intake and can provide one index of nutritional nutriture. The most common measurements are height, weight, various skin-fold measurements, and arm circumference (Grant 1979).

Jelliffe (1966) supports the use of anthropometric measurements in the assessment of nutritional status:

> In adulthood, growth has ceased, and only physiological changes in body dimensions are those that result from aging or that are associated with constant physical exercise. Consequently, selected anthropometric measurements in adults have a useful place in assessing past or present protein-calorie malnutrition (p. 214).

He indicates that routine measurements should include height, weight, triceps skin-fold, and arm circumference. Collins et al. (1979), Buzina (1974), Young et al. (1978), Gurney and Jelliffe (1973), and other authors all support the use of anthropometric measurements for the assessment of protein nutrition.

Measuring the weight of the body is the most commonly used measure of nutritional status. Interpretation of data on body weight, however, may create certain problems, as the direct interpretation of measured values is justified only as long as there are no marked differences in body height. Therefore, many authors prefer to use indices of relative body weight based on the weight/height ratio which gives an idea of weight per unit of height (Buzina 1974). However, the relative usefulness of body weight ratio may be confounded by body build and edema (Seltzer et al. 1970).

As measurement of body weight represents the sum total of a number of body tissues which are differently affected by changes in dietary intake, anthropometric techniques have been developed by which differentiation can be made between nutritionally more variable tissues, such as fat and muscle (Buzina 1974).

The use of skin-fold thickness as an indicator of leanness or fatness has been recognized by many authors. The technique using the skin-fold calipers is well standardized, but the sites of measurement and the number of skin-folds which should be measured are still debatable. Buzina (1974) states that for prediction of body density a number of skin-fold measurements, including biceps, triceps, and subscapular, is suggested. He adds that when a single skin-fold is measured, the triceps skin-fold is a more satisfactory indicator than the subscapular one. Likewise, Blackburn et al. (1976) states that measurement of triceps skin-fold gives a reasonable estimate of subcutaneous fat stores. The triceps skin-fold is assumed to be twice the width of the outer ring of midarm fat (Heymsfield et al. 1979). Gurney and Jelliffe (1973), however, note that the physical compression of the fat is difficult to take into account satisfactorily. A thin ring on a muscular arm may contain as much fat as a thicker ring around a smaller muscle.

Whereas the measurement of skin-fold thickness may be useful for better interpretation of the overweight cases, the measurement of muscle circumference would appear to be a more sensitive criterion of undernutrition. During stress, starvation, and injury, visceral and skeletal muscle protein reserves are mobilized to meet acute demands for protein leading to a progressive depletion of these compartments. A low arm circumference is mainly a reflection of muscle depletion, a decreased layer of fat, or small bone structure. The arm muscle circumference, however, gives an indication of the body's muscle which is its main protein reserve. It is derived from the arm circumference and triceps skin-fold (Buzina 1974, Blackburn et al. 1976, Blackburn et al. 1977, Gurney & Jelliffe 1973). However, Mullen et al. (1979) point out that anthropometric measurements require that individuals use standard protocols to reduce observer variability.

Evaluation of protein status of the elderly utilizing various anthropometric measurements and biochemical data is dependent upon the accuracy of the measurements themselves. However, many of these measurements, including MAMC, serum albumin, serum total protein, hemoglobin, and total lymphocyte count, are now gaining increasing importance in establishing the protein status of patients. Furthermore, studies of the nutritional status of the institutionalized and noninstitutionalized elderly have shown that a significant proportion fall below the given standards.

HYPOTHESIS

The statistical hypothesis evaluated in this study was: There is no significant difference in three of five of the indices of protein status of Nursing Home Care patients and Hospital-Based-Home-Care patients at the Veteran's Administration Medical Center in Houston, Texas.

LIMITATIONS

The major limitation of this study was that measurements could not be obtained on all patients at the same time. Persons in the HBHC program live within a thirty mile radius of the VAMC. It was not feasible to have all sample members brought to the hospital by ambulance to have blood samples drawn for this study. Also, many patients live in unsanitary conditions where it would have been unadvisable to draw blood samples at home. Therefore, lab results from blood drawn no more than three months prior to data collection were used. In this way, advantage was taken of regular clinic visits to the hospital made by HBHC patients (Eisenstadt, Oct. 24, 1979).

METHODS AND PROCEDURES

The setting for this study was the Veteran's Administration Medical Center in Houston, Texas. A twenty member sample was randomly selected from the HBHC program and a similar sample was drawn from the NHCU. Patients under 51 years of age and over 74 years of age were excluded, so the study would not have been complicated by the more frequent medical problems encountered by older persons. Also, patients must have been admitted to each program at least three months prior to the beginning of data collection because data taken on recently admitted patients would not truly reflect the protein status of persons in each program.

An oral informed consent was obtained from each subject before charts were reviewed for blood test results and anthropometric measurements were taken.

The following anthropometric and biochemical measurements were obtained as indicators of protein status: serum albumin, total serum protein, total lymphocyte count, hemoglobin, and mid-arm muscle circumference (MAMC). Measurements of weight, height, triceps skin-fold (TSF), and mid-arm circumference (MAC) were also taken. Additional demographic data, including age, diagnosis, and diet prescription, were obtained.

Each patient was weighed in street clothes, without shoes, on a portable scale. TSF thickness was measured on the non-dominant arm using Lange skinfold calipers. The MAC was measured on the same arm. MAMC was derived from the MAC and TSF as follows: MAMC (cm)=MAC (cm) - [0.314 X TSF (mm)]. Exact methodology is cited by Blackburn et al. (1977).

Blood samples were collected by venipuncture for hemoglobin, serum albumin, total serum protein, and total lymphocyte count. Samples were collected and analyzed utilizing standard laboratory procedures by V.A. Medical Center lab personnel. Anthropometric measurements and blood analyses were recorded once for each subject.

All data were treated with the nondirectional, two-sample t-test between population means to determine significant differences between the HBHC group and NHCU group. This t-test was applied to the mean values of each group for MAMC, total serum protein, serum albumin, hemoglobin, and total lymphocyte count to determine any significant differences in three of five of these indices of protein status. The level of probability was set at $p \leq 0.05$.

A nondirectional, one-sample t-test between the population mean and a given parameter standard was also computed to test for any significant differences between the mean values of either group for TSF, MAC, MAMC, total serum protein, serum albumin, hemoglobin, and total lymphocyte count, and standards set by the VAMC for laboratory values and standards set by Jelliffe (1966) for anthropometric measurements. The level of probability was again set at $p \leq 0.05$.

RESULTS AND DISCUSSIONS

Upon completion of the data collection, the nondirectional, two-sample t-test between population means was computed, using computer facilities at Texas Woman's University, Houston Center. The statistical analyses indicated that of the five indicators of protein status used in this study, only one (serum albumin) was significantly different between the HBHC group and NHCU group, at the $p \leq 0.05$ level. On this basis, the null hypothesis in this study failed to be rejected.

A one-sample t-test between each population mean and the parameter standard was also computed. This analysis indicated that only one index of protein status was significantly different from the standard, at the $p \leq 0.05$ level. The HBHC group was significantly different from the standard value for MAMC.

Serum albumin levels were significantly different between the two population groups. The mean value for the HBHC group was 3.53 grams/100 milliliter, while that of the NHCU was 3.84 grams/100 milliliter (see Table 1). However, both groups were within the normal values of 3.5 to 5.0 grams per 100 milliliters (see Table 2). These results could be an anomaly or they could be a signal that a potential problem

TABLE 1

SUMMARY TABLE OF SERUM ALBUMIN, SERUM TOTAL PROTEIN, TOTAL LYMPHOCYTE COUNT, AND HEMOGLOBIN MEASUREMENTS COMPARISON BETWEEN GROUPS

	Serum Albumin (gms/100 ml)	Serum Total Protein (gms/100 ml)	Total Lymphocyte Count (no./mm^3)	Hemoglobin (gms/100ml)
Mean HBHC	3.5300	6.8500	1895.4500	14.2250
Mean NHCU	3.8350	6.8300	1947.6500	13.7800
Mean Difference	-0.3050	0.0200	-52.2000	0.4450
Standard Deviation (pooled)	0.3889	0.5209	610.5909	1.7678
Degrees of Freedom	38	38	38	38
T-test	-2.48(s)	0.12(ns)	-0.27(ns)	0.80(ns)
Probability	0.018	0.904	0.788	0.431
* Standard	3.5-5.0	6.0-8.0	1500-3000	12-18

s = significant

ns = not significant

* standards set by the Veteran's Administration Medical Center laboratory.

TABLE 2

SUMMARY TABLE OF T-TEST ANALYSIS BETWEEN THE POPULATION MEAN AND THE STANDARD PARAMETER FOR EACH MEASUREMENT

	Standard Value	Degrees of Freedom	Probability HBHC group	Probability NHCU group
Serum Albumin (grams/100 ml)	3.5-5.0*	19	0.780 (ns)	0.116 (ns)
Serum Total Protein (grams/100 ml)	6.0-8.0*	19	0.129 (ns)	0.151 (ns)
Total Lymphocyte Count (no./mm^3)	1500-3000*	19	0.190 (ns)	0.100 (ns)
Hemoglobin (grams/100 ml.)	12.0-18.0*	19	0.526 (ns)	0.243 (ns)
MAMC (cm)	25.3**	19	0.023 (s)	0.5711 (ns)
MAC (cm)	29.3**	19	0.150 (ns)	0.306 (ns)
TSF (mm)	12.5**	19	0.708 (ns)	0.304 (ns)

s = significant

ns = not significant

* standards set by the Veteran's Administration Medical Center laboratory.

** Jelliffe, D.B.: The Assessment of the Nutritional Status of the Community. WHO Monograph No. 53. Geneva: World Health Organization, 1966.

might exist. The mean value for the HBHC group was only slightly above the lower value in the range of normal values, so it bears watching. Also, albumin is not only a reflection of protein status, but also of the relation between protein and calorie intake. Thus, total calorie intake by the HBHC group may be lower than the NHCU group.

There were no significant differences between the HBHC and NHCU measurements for the remaining four indices of protein status: serum total protein, total lymphocyte count, hemoglobin, and MAMC. Table 1 summarizes measurements and standards for serum total protein, total lymphocyte count, and hemoglobin. Table 2 indicates that there was also no significant difference between the group mean for each measurement and standard value.

Table 3 presents the measurements of MAMC and the standard parameter. Although there was no statistically significant difference between the two groups, there was a significant difference between the mean of the HBHC group and the standard (see Table 2). The mean value for the NHCU group was 25.0 centimeters and the mean value for the HBHC group was 23.7 centimeters. The standard value is 25.3 centimeters. It has been suggested that there is a progressive decrease in lean body mass with age due to muscle atrophy and loss of muscle cells. However, present standards (Jelliffe, 1966) were set for the adult male with an upper age limit of 44.

TABLE 3

SUMMARY TABLE FOR TRICEPS SKIN-FOLD, MID-ARM CIRCUMFERENCE, AND MID-ARM MUSCLE CIRCUMFERENCE MEASUREMENTS COMPARISON BETWEEN GROUPS

	Mid-arm Muscle Circumference (centimeters)	Triceps Skin-fold (millimeters)	Mid-arm Circumference (centimeters)
Mean HBHC	23.7150	13.2750	27.7350
Mean NHCU	25.0150	10.9700	28.4550
Mean Difference	-1.3000	2.3050	-0.7200
Standard Deviation (pooled)	2.7092	7.9123	4.1627
Degrees of Freedom	38	38	38
T-test	-1.52(ns)	0.92(ns)	-0.55(ns)
Probability	0.137	0.363	0.588
* Standard	25.3	12.5	29.3

ns = not significant

* Jelliffe, D.B.: The Assessment of the Nutritional Status of the Community. WHO Monograph No. 53. Geneva: World Health Organization, 1966.

Additional anthropometric measurements obtained include TSF and MAC. Tables 2 and 3 summarize measurements and standards for TSF and MAC. There was no significant difference in TSF or MAC between the HBHC group and NHCU group. Also, no statistically significant difference was found between each group and the standard values. However, these standards, too, are set for persons up to age 44. There is still a question as to the reliability of TSF as an accurate measurement of subcutaneous fat in the elderly. Findings indicate that subcutaneous fat loss with age tends to be centripetal. Fat is lost earlier and to a greater degree from the extremities and is maintained more consistently and longer on the trunk. These measurements are also subject to the measuring technique, although it was the researcher only who did the measuring for this study.

Weights and heights were taken to derive the percentage weight per unit height. However, these measurements could not be obtained on six of the HBHC patients and one NHCU patient. The six HBHC patients were bedridden or unable to stand and only a portable scale was available. The NHCU subject was a bilateral, below-knee amputee so normal weight/height standards could not be applied.

Table 4 illustrates the mean values of each group for the percentage weight/height based on the table of ideal weight for height of adult males as put forth by Jelliffe

TABLE 4

SUMMARY TABLE OF PERCENTAGE IDEAL
WEIGHT FOR HEIGHT OF ADULT MALES

Group	Mean (% of standard) *	Range Low	Range High
NHCU	97.6%	62.2%	141.1%
HBHC	97.5%	64.1%	175.4%

*REFERENCE: Jelliffe, D.B.: The Assessment of the Nutritional Status of the Community. WHO Monograph No. 53. Geneva: World Health Organization, 1966.

(1966). The mean for the NHCU group was 97.6% of standard with a range of 62.2 to 141.1%. The mean value for the HBHC group was 97.5% with a range of 64.1 to 175.4%. This indicates that the means of both groups were 95% of ideal weight/height. However, there were patients from both groups who were up to 140% of ideal weight/height. This wide standard deviation could raise the mean values of the two groups. Studies have also indicated that weight progressively decreases after the ages of 50 to 55. Jelliffe's table of ideal weights for heights is for adult males up to age 44, and does not allow for fundamental weight changes in the elderly. In this way, the data could inaccurately reflect the percentages of ideal weight for height of the elderly in this study.

Certain demographic data, including age, diet prescription, and diagnosis, were obtained. Appendix 1 shows the ages of subjects involved in the study. The HBHC group had a mean age of 62.1 years, with a range of 52 to 73. The NHCU group had a mean age of 60.6 years, with a range of 52 to 70. Appendix 2 summarizes the dietary prescriptions of the subjects involved in this study. Sixty-five percent of the 20 subjects from the HBHC program were on modified diets. The same results were found with the NHCU subjects. The modified diets of the HBHC patients included sodium-restricted diets (35%), diabetic and/or weight reduction diets with sodium restriction (10%), and various others. Sodium-restricted diets (25%) and diabetic diets with sodium restriction (25%) also accounted for the majority of the diet modifications of the subjects in the NHCU. Thus, the two groups appear to be comparable in age and diet modifications.

The primary medical diagnoses of patients involved in the study are summarized in Appendix 3. The majority of the patients in both groups have similar diagnoses. Thirty-five percent of the subjects in each group had a primary diagnosis of quadriplegia or hemiplegia. Similarly, in each group, 10% had a diagnosis of diabetes; 5% had a diagnosis of cancer; and 5% had a diagnosis of hypertension.

The results of this study indicate that there was no significant difference in protein status between the HBHC patients and NHCU patients. However, these groups may have more in common with each other than with free-living geriatrics or geriatrics in private nursing homes. Free-living geriatrics may receive minimal medical care and may or may not receive nutritional care by a dietitian. They may live alone and be solely responsible for the purchase and preparation of their meals. Patients in the HBHC program are provided with regular care from the visiting health care team and they have caretakers who assist in the purchase and preparation of food, similar to the care provided to NHCU patients. The V.A. NHCU is atypical of many community nursing homes. The V.A. NHCU has full-time registered nurses and a physician and dietitian who are more accessible than in a private nursing home because the NHCU is attached to the hospital. Coverage by registered nurses in private nursing homes may be the minimum required. Physicians and dietitians usually only serve the nursing home on a part-time consultative basis.

The protein status of the HBHC patients, according to indices used in this study, appears to be as good as that of the NHCU patients. However, serum albumin values were significantly different between the two groups; although, both were within the normal range. It does not appear that diagnosis could be a factor in the difference. Serum albumin was probably the best of the five indicators of protein status used in this study, thus it bears watching. The means of both groups were also within the standard values, with the exception of MAMC for the HBHC group.

The results do not support a need for additional staffing of dietitians in the HBHC program at the VAMC in Houston. However, the results of this study could reflect a need for an increased number of home care programs such as the HBHC program of the VAMC, since no difference in protein status was found between the HBHC group and NHCU group. The purpose of the HBHC program is to decrease the cost of in-house care of veterans. Also, the HBHC program provides a socialization factor; the patients are able to live at home and have a caretaker to care for them. Apparently, it is not a detriment to be free-living and belong to the HBHC program.

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

Twenty veteran patients from the Nursing Home Care Unit and 20 patients from the Hospital-Based-Home-Care program were chosen for participation in a study comparing the protein status of patients in the two groups. Those chosen included patients who were between the ages of 51 and 74 and were admitted to either program at least three months prior to data collection. Indices of protein status utilized in this study include mid-arm muscle circumference, serum albumin, serum total protein, hemoglobin, and total lymphocyte count. Other measurements taken include triceps skinfold, mid-arm circumference, and certain demographic data. A two-sample t-test between the sample means showed no significant difference in protein status of the HBHC group and NHCU group. On this basis, the null hypothesis in this study failed to be rejected. However, there was a significant difference between the serum albumin values of the two groups. This could suggest the existence of a potential problem. A one-sample t-test between each population mean and the standard value showed no significant differences in these measurements, with the exception of MAMC for the HBHC group.

These results may indicate that the living situations of the HBHC patients and NHCU patients are not so different, and the statistical analyses demonstrated that these two groups belong, in fact, to the same population. Perhaps, these groups are more similar to each other than free-living geriatrics and private nursing home residents. Therefore, a study similar to this one should be done comparing the NHCU group and HBHC group with private nursing home residents and free-living geriatrics.

The indices of protein status utilized in this study were limited by those blood values routinely performed by the VAMC laboratory. A similar study utilizing a greater number of indicators of protein status, including serum transferrin and creatinine/height index, would be beneficial.

Furthermore, present standards for anthropometric measurements are set for adults to the age of 44 years. Studies have shown that there are fundamental changes in fat and muscle composition in the aged. More research is necessary in order to develop standards for the elderly.

APPENDICES

APPENDIX 1

AGES AND WEIGHTS OF SUBJECTS INVOLVED IN STUDY

HBHC Group Subject	Wt/Ht % Std.	Age (years)	NHCU Group Subject	Wt/Ht % Std.	Age (years)
1	111	63	1	62	68
2	99	70	2	93	63
3	152	58	3	81	52
4		57	4	105	54
5	101	70	5		56
6	105	54	6	105	58
7		62	7	89	60
8	86	65	8	84	54
9	75	67	9	91	65
10	74	58	10	120	65
11		53	11	105	58
12		65	12	106	70
13	64	62	13	108	52
14	71	63	14	106	63
15	93	67	15	74	63
16		63	16	141	68
17		60	17	105	58
18	175	73	18	109	58
19	86	60	19	76	69
20	72	52	20	93	64
Mean	97.5	62.1	Mean	97.6	60.5

APPENDIX 2

DIETARY PRESCRIPTIONS OF SUBJECTS IN STUDY

Dietary Prescription	No. of Patients HBHC	NHCU
Regular (includes modification in consistency)	7	7
Sodium-restricted	7	5
Diabetic/weight reduction with sodium restriction	2	5
Diabetic/weight reduction	1	2
Diabetic, sodium restriction, and protein restriction	1	
Bland	1	
Sodium restriction, high fiber	1	
Diabetic, renal		1

APPENDIX 3

PRIMARY MEDICAL DIAGNOSES OF PATIENTS IN THE STUDY

Primary Diagnosis	No. of HBHC Patients	No. of NHCU Patients
Quadri- or hemiplegia	7	7
Diabetes mellitus	2	2
Cancer	1	1
Hypertension	1	1
Parkinson's disease	1	2
Multiple sclerosis		2
Chronic renal failure		1
Congestive heart failure		1
Rheumatic heart disease		1
Arteriosclerotic heart disease	1	1
Schizophrenia or senile dementia	1	1
Cirrhosis	1	
Chronic obstructive pulmonary disease	2	
Emphysema	1	
Render Weber Osler disease	1	
Transverse myelopathy 2^{o} to cervical spondylosis	1	

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