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Research and Reviews

Weight Loss in Alzheimer's Disease: An International Review of the Literature

Gisele P. Wolf-Klein and Felix A. Silverstone

ABSTRACT. Alzheimer's disease affects an estimated 2 million elderly in the U.S. and challenges primary care physicians to assist caregivers in dealing with the daily management of these patients. To support the clinical observation of weight loss in Alzheimer patients despite adequate food intake, we reviewed the existing literature. To date, eight international studies have focused on nutrition in Alzheimer's disease and all have found weight loss. It is not clear whether this weight loss is a component of or a consequence of the disease.

These findings suggest systemic, metabolic alterations in Alzheimer's disease. They require further investigation as to their nature and as to their appropriate recognition and management to retard the deteriorating effects of chronic weight loss and malnutrition. Finally, some reports lead to speculation that nutritional strategies may improve cognitive function.

During the past decade, interest in Alzheimer's disease has surged as longevity has increased and the cognitive changes of later years have been unmasked. In 1989, Evans and colleagues estimated that the prevalence of dementia, even in community-residing elderly, rises steeply from 3% in those aged 65 to 74 to 47.2% in those over the age of 85 years.

While researchers pursue etiological and pathological factors, family members press their physicians for practical advice. Providing basic essential care in the home setting includes adequate nutrition as well as proper toileting, hygiene, and sleep habits. A common anecdotal observation brought to the physician's attention is that of persistent weight loss in the Alzheimer patient. This weight loss represents a serious concern for the caregivers who interpret it as a sign of physical deterioration and a possible indicator of their own failure to provide enough nutrition, thereby raising feelings of inadequacy and guilt. Weight loss has also become a major issue in nursing homes. State and federal regulations require chart documentation and explanation of weight changes of 5 lb. or more.

From the Albert Einstein College of Medicine, Bronx, New York, U.S.A. (G. P. Wolf-Klein, MD, and F. A. Silverstone, MD).

To assess whether these observations of weight loss are otherwise substantiated, we reviewed the international literature on Alzheimer's disease (AD) and weight change. This review provides the basis for this report.

CLINICAL STUDIES ON WEIGHT PATTERNS IN ALZHEIMER'S DISEASE

To date, eight studies have focused specifically on weight patterns in AD patients. All have found weight loss. The first researchers to address this problem were John Blass and Alexander Zemcov. In their 1984 review of AD, Blass and Zemcov described weight loss to the point of cachexia in AD patients, despite the substantial care provided by family members or nursing staff. They raised the possibility that AD may have systemic, metabolic manifestations, opening an innovative research avenue.

In January 1987, Sandman and his colleagues published a large Swedish study of nutritional status and dietary intake in demented patients. In a sample of 44 severely demented, institutionalized patients, 39 lost weight even though the mean dietary intake appeared sufficient. The average daily caloric intake was 2,059 kcal. None of the demented patients was obese. Indeed 50% of these patients seemed malnourished, using both anthropometric and laboratory parameters. Patients with AD had lost twice as much weight as patients with multi-infarct dementia (MID) during their hospitalization. The authors concluded that more longitudinal studies were needed to explore the influence of nutritional factors on the dementing process.

The third study, conducted in 1987 by Tavares and Rabins, observed weight loss in a longitudinal survey of 21 demented patients with AD who attended a geropsychiatric clinic compared with normal subjects from the Baltimore Study of Aging. Weight loss was significant in demented women.

In England, Singh and colleagues (1988) reported on the weight loss observed in 10 institutionalized AD patients compared with 8 patients with vascular dementia (MID) and 11 nondemented control subjects over a 2-year period. These AD patients were 21% lighter than nondemented subjects and the MID patients were 9% lighter. Over the 2 years preceding the documented onset of mental symptoms, only the AD patients had lost weight. Food intakes were similar in all three groups. Laboratory studies of various biochemical and nutritional indices, including hemoglobin, albumin, vitamins, folate, and fecal fat content, revealed no differences among the subject groups. In answer to the authors' query as to why AD patients are thin, one might offer a hypothetical partial answer: Their relative increase in lean body mass leads to a corresponding increment in their energy expenditure and caloric needs.

A new study on dietary intake and nutritional status in demented and nondemented elderly appeared in the British literature in May 1989 (Burns et al., 1989). This study of community-residing and hospitalized AD patients demonstrated that both AD populations were lighter and had lower body mass indices

than control subjects. Yet, in contrast to their lower weight, both groups of demented patients had higher caloric intake than the nondemented comparison group.

In June 1989, Franklin and Karkeck, two dietitians challenged by nutrition management issues in demented patients, published their survey based on chart review of two suburban nursing homes in Seattle, Washington. Sixty-seven patients with diagnoses of senile dementia, AD, and chronic brain syndrome were compared to 31 cognitively intact patients. The AD group showed a higher incidence of underweight on admission to the nursing home and greater weight loss during the period of institutionalization, ranging from 3 to 102 months, with an average of 18 months. The authors considered as a possible explanation for the weight loss that AD patients might have consumed less of the food provided because of agitation, short attention span, and inability to chew or swallow. However, they rejected that hypothesis because well-managed long-term care settings in their community have adequate staff to assist with patient meals. Another explanation proposed a higher caloric expenditure in the AD group because of an increased activity level, agitation, and an increased basal metabolic rate. Decreased absorption of nutrients might also have contributed. This study leaves us with the following questions proposed by the authors: "Can weight loss be delayed or even prevented, or is it inevitable? Is weight loss a symptom of a metabolic disorder inherent in the disease, or is it a matter of inadequate management?"

A month later, Renvall and her colleagues (1989) reported on the nutritional status of community-residing AD patients. Their 22 AD patients showed significantly lower mean values for body weight than the 41 control subjects. Their article focused essentially on self-reported dietary intake and specific changes in nutrients and nutritional parameters rather than on weight. However, they questioned the assumption that energy needs of the AD patients are being satisfied merely because their caloric intake is adequate for the needs of healthy nondemented elderly. These authors speculated that metabolism is altered in AD.

The recent study by Wolf-Klein and associates (1992) evaluated nutritional patterns and weight changes in 34 community-residing AD patients and 60 nondemented controls. The average weight at intake was 121 lb in the AD group and 148 lb in the control group. Over a 1-year follow-up, only one AD patient gained weight, whereas half of the control group gained weight. Interestingly, caregivers reported a craving for sweets in almost half of the AD patients.

In addition to these eight international studies that encompassed community-residing as well as institutionalized patients and focused more specifically on weight changes in AD, several others have reported on nutritional intake of demented patients in nursing home populations and in the elderly in general (Abraham et al., 1977; Asplund et al., 1981; Endres et al., 1982; Exton-Smith, 1980; Hancock et al., 1985; Litchford & Wakefield, 1987; McGandy et al., 1966; Mitchell & Lipschitz, 1982; Morgan & Hullin, 1982; Muckle & Roy, 1985; O'Hanlon & Kohrs, 1978; Parvizi & Nymon, 1982; Shaver et al., 1980;

Stiedmann et al., 1978; Vir & Love, 1978). However, the psychiatric diagnoses and the nature of the dementias either were not sufficiently defined or were not specifically correlated with the nutritional-metabolic outcomes to be usefully detailed in this review. Interestingly, many of these studies mentioned low body weights in the demented subjects. Even death certificates have been interpreted to show an association between dementing illness and nutritional deficiency (Chandra et al., 1986). In this context, Stahelin and colleagues (1983) made an additional interesting clinical point by suggesting that the reduced nutritional status of demented patients may place them at greater risk for significant malnutrition during intercurrent illnesses.

DISCUSSION

The international consensus is that aging in itself increases the risk of developing nutritional deficiencies (Morley et al., 1986). In addition, unexplained weight loss in the elderly is common. It accounted for 24% of cases in a recent study and remained unexplained even after 2 years of intensive clinical investigation (Thompson & Morris, 1991). This unexplained weight loss in the elderly is a predictor of morbidity and mortality (Marton et al., 1981; Rabinovitz et al., 1986). None of these studies on unexplained weight loss included dementia as a possible diagnosis or causal factor, even though it is predictable that a certain percentage of these elderly had cognitive dysfunction in view of the prevalence of dementia in the elderly age group.

There is now a growing awareness that malnutrition is a characteristic of demented populations and, perhaps more specifically, of AD patients. The degree of malnutrition seems substantially greater than that observed in healthy aged controls. Its incidence in demented subjects, and in AD patients in particular, remains to be elucidated, along with its mechanism, its significance, and its management. Further, it is not clear whether the presence of weight loss in AD is generalized or whether it is limited to a specific subgroup of patients. Certainly there are AD patients who do not lose weight, as described in a recent report by Hope and colleagues (1989). They noted hyperphagia with unspecified weight gain in three of four AD patients studied.

The basis for the reported weight loss remains undetermined. Do demented patients in the early stages simply forget to purchase food, or to cook and prepare it? Are their family members unaware of these difficulties and therefore unable to assist in obtaining proper nutrition? Do demented patients forget to eat, or are they too depressed to bother with eating? Later on, as the disease progresses, chewing and swallowing may become difficult. Caregivers report time-consuming feeding sessions in which patients are assisted and encouraged with each mouthful. Is the regulation of food intake (in itself a complex phenomenon) affected in AD, and if so, is this primarily by lesions in brain centers or by more widespread hormonal, transmitter, and intracellular enzymatic changes? Is there a reactive secretion of a cachectin-like appetite-suppressing hormone, as reported recently (Fillit et al., 1991)?

However, in contrast with those who may ignore eating or have swallowing or chewing difficulty, a number of AD patients do eat well and in large quantity (DeAjurriaguerra et al., 1976). In fact, they generally remain physically healthier than age-matched nondemented controls (Wolf-Klein et al., 1988). Increased physical activity by pacing, rocking, or restlessness may increase energy expenditure and thereby provide a reasonable explanation for weight loss in this subgroup of AD patients (Rheaume et al., 1987). This hypothesis was explored in a preliminary study by Prentice and his colleagues in 1989. Five patients with the diagnosis of probable AD, "some" of whom were sedated, had lower observed resting energy expenditure than predicted. In contrast, a recent study by Wolf-Klein and her colleagues on community-residing elderly subjects and institutionalized bedridden, artificially fed patients examined in a metabolic unit reported elevated resting energy expenditures in a group of five nonmedicated AD patients compared with seven nondemented controls, and increased caloric requirements in the demented institutionalized population fed exclusively by gastric tube (Wolf-Klein et al., in press). In this study, AD patients manifested a change in body composition, with a striking proportional decrease in body fat and an increase in lean body mass contrary to the propensity to increase fat mass with normal aging (Chumlea & Baumgartner, 1989; Frisancho, 1984; Heymsfield et al., 1989). Why these metabolic and nutritional changes occur, whether they are part of the pathological process of AD, and what the impact of medical intervention might be are challenging unknowns at this point.

It is of interest that Rohrbaugh and Siegal (1989) reported a case of reversible weight loss with neuroleptic use. However, the role is unclear. There is literature showing that neuroleptics stimulate appetite in some individuals. Also, some patients are delusional about their food being poisoned, and administration of neuroleptics can treat this symptom. A drug that has been suggested to increase appetite is cyproheptadine hydrochloride. It is tempting to speculate that nutritional strategies may affect cognitive function. One report showed a correlation between good nutritional status and cognitive functioning in healthy elderly (Goodwin & Garry, 1983). Rappaport and colleagues (1991) provided evidence suggesting the potential for reversibility of the cerebral metabolic defect in glucose uptake in the visual association area of AD patients, in response to stimulation by a face-matching test. Improved memory function in rats after induced hyperglycemia was reported by Gold and Vogt (1986). We have noted improved memory of recent events in AD patients with glucose loading (Silverstone & Wolf-Klein, 1990). At this point, it is speculative to presume that increasing the brain nutrient supply will materially improve the AD patient's state. However, it seems reasonable to expect that recognition of weight loss and appropriate corrective nutritional management may retard the downward weight trend and delay the nutritional deterioration, with its attendant secondary complications of infections and poor healing.

For the present, it seems fair to accept the premise that there is unexplained weight loss in AD patients. This weight issue is not likely to be accounted for only on the basis of poor access to food, disruption in appetite or food regulation,

and increased physical activity, such as pacing and agitated motions, although these factors may contribute. We remain intrigued by the evidence of metabolic derangement in AD, perhaps partly at a molecular intracellular level and partly by an alteration of body composition, with a relative increase in fast-metabolizing fat-free mass.

REFERENCES

Abraham, S., Carrol, M. D., Dresser, C. M., & Johnson, C. I. (1977, March 30). *Dietary intake of persons 1-74 years of age in the United States* (DHEW Publication No. HRA 77-1647). Advance data from Vital and Health Statistics of the National Center for Health Statistics, No. 6. Rockville, MD: Health Resources Administration, Public Health Service.

Asplund, K., Normark, K., & Pettersson, V. (1981). Nutritional assessment of psychogeriatric patients. *Age and Ageing, 10,* 87-94.

Blass, J. P., & Zemcov, A. (1984). Alzheimer's disease: A metabolic system degeneration? *Neurochemical Pathology, 2,* 103-114.

Burns, A., Marsh, A., & Bender, D. A. (1989). Dietary intake and clinical, anthropometric and biochemical indices of malnutrition in elderly demented patients and non-demented subjects. Section of Old Age Psychiatry, Institute of Psychiatry, London. *Psychological Medicine, 19*(2), 383-391.

Chandra, V., Bharucha, N. E., & Schoenberg, B. S. (1986). Conditions associated with Alzheimer's disease at death: Case-control study. *Neurology, 36,* 209-211.

Chumlea, W. C., & Baumgartner, R. N. (1989). Status of anthropometry and body composition data in elderly subjects. *American Journal of Clinical Nutrition, 50,* 1150-1157, discussion 1231-1235.

DeAjurriaguerra, J., Richard, J., Tissot, J. R., Vengos, P., Luke, A., et al. (1976). Les conduites alimentaires daus les demences degeneratives et mixtes a predominance degenerative du grand age. *Annales Medico Psychologigues, 2,* 213-241.

Endres, J. M., Theobald, L., Galligos, C. R., & Sawicki, M. (1982). Energy nutrient content of menus, food served and foods consumed by institutionalized elderly. *Journal of Nutrition for the Elderly, 2,* 3.

Evans, D. A., Funkenstein, H. H., Albert, M. S., Scherr, P. A., Cook, N. R., et al. (1989). Prevalence of Alzheimer's disease in a community population of older persons. *Journal of the American Medical Association, 262,* 2551-2556.

Exton-Smith, A. N. (1980). Nutritional status diagnosis and prevention of malnutrition. In A. N. Exton-Smith & F. F. I. Caird (Eds.), *Metabolic and nutritional disorders in the elderly* (pp. 66-76). Bristol, England: John Wright & Sons.

Fillit, H., Ding, W., Buee, L., Kalman, J., Altstiel, L., et al. (1991). Elevated circulating tumor necrosis factor levels in Alzheimer's disease. *Neuroscience Letters, 129,* 318-320.

Franklin, C. A., & Karkeck, J. (1989). Weight loss and senile dementia in an institutionalized elderly population. *Journal of the American Dietetic Association, 89*(6), 790-792.

Frisancho, R. (1984). New standards of weight and body composition by frame size and height for assessment of nutritional status of adults and the elderly. *American Journal of Clinical Nutrition, 40,* 808.

Gold, P. E., & Vogt, J. L. (1986). Glucose effects on memory: Behavioral and pharmacological characteristics. *Behavior of Neurological Biology, 46,* 145-155.

Goodwin, J., & Garry, P. (1983). Association between nutritional status and cognitive functioning in a healthy elderly population. *Journal of the American Medical Association, 249,* 2917.

Hancock, M. R., Hullin, R. P., Aylard, P. R., King, J. R., & Morgan, D. B. (1985). Nutritional state of elderly women on admission to mental hospital. *British French Psychiatry, 147,* 404-407.

Heymsfield, S. B., Wang, J., Lichtman, S., Kamen, Y., Kehayias, J., et al. (1989). Body composition in elderly subjects: A critical appraisal of clinical methodology. *American Journal of Clinical Nutrition, 50*(5) (Suppl.), 1167-1175, discussion 1231-1235.

Hope, R. A., Fairburn, C. G., & Goodwin, G. M. (1989). Increased eating in dementia. *International Journal of Eating Disorders, 8*(1), 111-115.

Litchford, M. D., & Wakefield, L. M. (1987). Nutrient intakes and energy expenditures of residents with senile dementia of the Alzheimer's type. *Journal of the American Dietetic Association, 87,* 211-213.

Marton, K. I., Sox, H. C., & Krupp, J. R. (1981). Involuntary weight loss: Diagnostic and prognostic significance. *Annals of Internal Medicine, 95,* 568-574.

McGandy, R. B., Barrows, C. H., Spanias, A., Meredith, A., Stone, J. L., et al. (1966). Nutrient intakes and energy expenditures in men of different ages. *Journal of Gerontology, 21,* 581.

Mitchell, C. O., & Lipschitz, D. A. (1982). Detection of protein-calorie malnutrition in the elderly. *American Journal of Clinical Nutrition, 35,* 398.

Morgan, D. B., & Hullin, R. P. (1982). The body composition of the chronic mentally ill. *Human Nutrition Clinical Nutrition, 36*(C), 439-448.

Morley, J. E., Silver, A. J., Fiatarone, M., & Mooradian, A. D. (1986). Geriatric grand rounds: Nutrition and the elderly. *Journal of the American Geriatrics Society, 34,* 823-832.

Muckle, T. U. & Roy, J. R. (1985). High density lipoprotein cholesterol in differential diagnosis of senile dementia, *Lancet, 1,* 1191-1193.

O'Hanlon, P., & Kohrs, M. B. (1978). Dietary studies of older Americans. *American Journal of Clinical Nutrition, 31,* 1257-1269.

Parvizi, S., & Nymon, M. C. (1982). A dietary study of elderly nursing home residents in Fargo, North Dakota. *Journal of Nutrition for the Elderly, 2,* 15-30.

Prentice, A. M., Leavesley, K., Murgatroyd, P. R., Coward, W. A., Schoran, C. J., et al. (1989). Is severe wasting in elderly mental patients caused by an excessive energy requirement? *Age and Ageing, 18,* 158-167.

Rabinovitz, M., Pitlik, S. D., Leifer, M., Garty, M., & Rosenfeld, J. B. (1986). Unintentional weight loss: A retrospective analysis of 154 cases. *Archives of Internal Medicine, 146,* 186-187.

Rappaport, S. T., Horwitz, B., Grady, C. L., Haxby, J. V., DeCarli, C., et al. (1991). Abnormal brain glucose metabolism in Alzheimer's disease, as measured by positron emission tomography. In M. Vranic, S. Efendie, & C. H. Hollenberg (Eds.), *Fuel homeostasis and the nervous system* (pp. 231-248). New York: Plenum Press.

Renvall, M. J., Spindler, A. A., Ramsdell, J. W., & Paskvan, M. (1989). Nutritional status of free-living Alzheimer's patients. *The American Journal of Medical Sciences, 298*(1), 20-27.

Rheaume, Y., Riley, M. E., & Volicer, L. (1987). Meeting nutritional needs of Alzheimer patients who pace constantly. *Journal of Nutrition for the Elderly, 7*(1), 43-52.

Rohrbaugh, R. M., & Siegal, A. P. (1989). Reversible anorexia and rapid weight loss associated with neuroleptic administration in Alzheimer's disease. *Journal of Geriatric Psychiatry Neurology, 2,* 45-47.

Sandman, P. O., Adolfsson, R., Nygren, C., Hallmans, G., & Winblad, B. (1987). Nutritional status and dietary intake in institutionalized patients with Alzheimer's disease and multi-infarct dementia. *Journal of the American Geriatrics Society, 35*(l), 31-38.

Shaver, H. J., Loper, J. A., & Lutes, R. A. (1980). Nutritional status of nursing home patients. *Journal of Pediatric Endocrinology, 4,* 360-370.

Silverstone, F. A., & Wolf-Klein, G. P. (1990). Glucose interventions in Alzheimer's disease. *1st Toronto-Stockholm Symposium on Perspectives in Diabetes Research*, Toronto, Canada.

Singh, S., Mulley, G. P., & Losowsky, M. S. (1988). Why are Alzheimer patients thin? *Age and Ageing, 17,* 21-28.

Stahelin, H. B., Hofer, H. O., Vogel, M., Held, C., & Seiler, W. O. (1983). Energy and protein consumption in patients with senile dementia. *Gerontology, 29,* 145.

Stiedmann, M., Jansen, C., & Harrill, I. (1978). Nutritional status of elderly men and women. *Journal of the American Dietetic Association, 73,* 132-138.

Tavares, A. R., & Rabins, P. V. (1987). Weight loss in Alzheimer's disease: A longitudinal study. *Zeitschrift für Alternsforsch, 42*(3), 165-167.

Thompson, M. P., & Morris, L. K. (1991). Unexplained weight loss in the ambulatory elderly. *Journal of the American Geriatrics Society, 39,* 497-500.

Vir, S. C., & Love, A. H. G. (1978). Dietary intake of institutionalized and noninstitutionalized aged. *Irish Journal of Medical Science, 147,* 301-307.

Wolf-Klein, G., Leleiko, N. S., Lancey, S., Jaeger, A., & Silverstone, F. A. (Submitted for publication). Energy expenditures in Alzheimer patients.

Wolf-Klein, G., Silverstone, F., Brod, M., Levy, A., Foley, C., et al. (1988). Are Alzheimer patients healthier? *Journal of the American Geriatrics Society, 36,* 3.

Wolf-Klein, G. P., Silverstone, F. A., & Levy, A. P. (1992). Nutritional patterns and weight changes in Alzheimer's patients. *International Psychogeriatrics, 4*(1), 103-117.

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Offprints. Requests for offprints should be directed to Gisele P. Wolf-Klein, MD, The Parker Jewish Geriatric Institute, 71-11 76th Avenue, New Hyde Park, NY 11042, U.S.A.