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Neuroepidemiology 2010;34:270–277
DOI 10.1159/000310941

Published online: April 14, 2010

The abstracts are only available online, free of charge, under
www.karger.com/doi/10.1159/000310941

Regional North American Annual Meeting of the World Federation of Neurology – Research Group on Neuroepidemiology

Toronto Western Hospital, Toronto, Ont., April 16, 2010

Program and Abstracts

Guest Editors

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Program

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Oral Presentations

O1

Early Detection of Parkinsonism Using a Predictive Self-Administered Questionnaire

J. Lundin, H. Checkoway, B. Evanoff, B. Racette

Seattle, Wash. and St. Louis, Miss., USA

Objective: To develop a self-administered questionnaire to screen manganese exposed workers for parkinsonism. **Background:** Nearly two-million workers worldwide have occupational exposure to manganese, a well established neurotoxin. Most exposure is due to welding. Exposure to levels of manganese fume at or below the OSHA permissible exposure limit for general industry (5 mg/m^3) has been associated with parkinsonian signs. A self-administered tool would be a cost effective means of screening for manganese associated neurotoxicity in these workers. **Methods:** This study evaluated 348 Midwestern male shipyard and fabrication shop workers with manganese exposure through welding. Each subject was examined by a movement disorders specialist using the Unified Parkinson Disease Rating Scale Motor subsection 3 (UPDRS3). Two different case definitions of parkinsonism were used: UPDRS3 ≥ 15 and Moderate Parkinsonism (MP) (presence of three of bradykinesia, rigidity, rest tremor, or postural instability, meeting predetermined UPDRS3 threshold). Normal was defined as UPDRS3 < 6. Workers filled out a validated health status and quality of life questionnaire (PDQ39) designed to detect changes associated with parkinsonism. Areas under receiver operator curve (AUC) were analyzed based on PDQ39 total score, and eight individual subscores, adjusted for age. **Results:** The resulting AUC for the PDQ39 total score was 0.80 ($p \leq 0.001$) for both UPDRS3 ≥ 15 and MP case definitions. The AUC for the individual subscores ranged from 0.74–0.81 (all $p \leq 0.001$); stigma and cognition had the lowest AUC values for both case definitions, followed by emotional well-being and bodily discomfort. The largest AUC subscores (AUC > 0.78 for both case definitions) were activities of daily living, communication, and mobility. Evaluating these three subscores together increased the AUC to 0.82 ($p \leq 0.001$) for both UPDRS3 ≥ 15 and MP. **Conclusions:** These results suggest that administration of a quality of life and health status questionnaire has good sensitivity and specificity to detect parkinsonism associated with occupational manganese exposure.

O2

D1 Dopamine Receptor Polymorphism and Smoking: Differential Effect in Parkinson's Disease

S. Searles Nielsen, L. Gallagher, J. Lundin, C. Zabetian, F. Farin, W.T. Longstreth, Jr., T. Smith-Weller, G. Franklin, P. Swanson, H. Checkoway

Seattle, Wash., USA

Objective: To investigate whether a common functional polymorphism in the dopamine receptor D1 (*DRD1*) gene is associated with Parkinson's disease (PD) or smoking. **Background:** PD risk has been found consistently to be decreased among smokers in a dose-related manner. Whether a biological mechanism underlies this association is unknown, but the dopaminergic system is centrally involved in both PD and nicotine dependence. In the D1 dopamine receptor gene a 3' polymorphism, T1403C (rs686), affects *DRD1* expression and susceptibility to nicotine dependence. **Methods:** Participants were non-Hispanic Caucasian enrollees of Group Health Cooperative in western Washington included in a case-control study of idiopathic PD. Cases (N = 321) were 28–88 years old (mean 66 years). Controls (N = 437) without neurological disorders were matched by age and sex. We ascertained smoking history by in-person interview, and used daily packs of cigarettes (< ½, ½–1, 1–2, >2) as an indicator of relative nicotine dependence when "regularly" smoking. In unconditional or ordered logistic regression models, respectively with smoking or nicotine dependence as the dependent variable, we included a multiplicative interaction term between case status and genotype to test for potential case-control differences in the relationship between rs686 in *DRD1* and smoking. **Results:** Genotype and allele frequencies were similar in cases and controls (minor allele frequency 0.36 and 0.38, respectively; odds ratio = 0.9, 95% confidence interval 0.7–1.2 per allele). Proportionally fewer genotyped cases (50%) than controls (61%) had ever smoked. Among controls, the variant allele was associated with never smoking ($p = 0.08$) and lower nicotine dependence in ever smokers ($p = 0.007$). These associations were not observed in cases. However, only the latter case-control difference was statistically significant (interaction p-values 0.10 and 0.01). **Conclusions:** These exploratory results suggest that the genetics of nicotine dependence and possibly smoking initiation may differ between PD patients and unaffected individuals who attain a similar age.

O3

Cognitive and Motor Functional Activity in Nondemented Community-Dwelling Essential Tremor Cases

E. Louis, J. Benito-León, S. Vega-Quiroga, F. Bermejo-Pareja

New York, N.Y., USA, Arevalo and Madrid, Spain

Objective: We (1) compared functional level in essential tremor (ET) cases vs. controls, assessing functional activities that are cognitively-based (remembering appointments) and those that are dependent upon both motor and cognitive factors (writing

checks), and (2) determined whether lower mini mental status test scores in ET cases have a functional correlate. **Background:** A sizable number of studies have documented mild deficits in ET patients in a range of cognitive measures, indicating that ET is not solely a motor disorder. Yet the functional significance of these deficits is not completely clear. Are these deficits merely subclinical (i.e., only noticeable on neuropsychological test batteries) or are ET patients with lower cognitive test scores aware of more functional difficulty? **Methods:** In a population-based study of people ≥65 years in central Spain (NEDICES), a 37-item version of the Mini-Mental State Examination (37-MMSE) and an 11-item version of Pfeffer Functional Activities Questionnaire (FAQ) were administered to nondemented ET cases and controls. **Results:** FAQ was 55.5% higher (i.e., lower reported function) in 208 cases than 3,616 controls (2.8 ± 4.8 vs. 1.8 ± 4.2, $p < 0.001$). Cases reported more difficulty (i.e., higher FAQ scores) with FAQ items that were cognitive measures ($p < 0.001$) as well as FAQ items that were both cognitive-motor in nature ($p < 0.001$). The 37-MMSE score was lower in cases than controls (27.9 ± 5.8 vs. 29.3 ± 5.4, $p = 0.002$). In cases, lower 37-MMSE was associated with more difficulty on both cognitively-based FAQ items ($p < 0.001$) and cognitive-motor-based FAQ items ($p < 0.001$). **Discussion:** In this large, population-based study, ET cases reported more functional difficulty than controls and this functional difficulty was present in both cognitive and cognitive-motor domains. Lower cognitive test scores were associated with more reported functional difficulty, indicating that lower cognitive test scores in ET, rather than being inconsequential, have a clear clinical-functional correlate.

O4

Amyotrophic Lateral Sclerosis (ALS) Clinical Staging: Algorithm Development and Domain Definition

B. Rix Brooks, E. Bravver, W.L. Bockenek, U. Desai, S. Lindblom, T. Paccico, A.L. Ward, K.C. Duffy, K.A. Wright, N.M. Williams, M.S. Nichol, K. Black, M. O'Neal, K. Walgren, M. Sanjak

Charlotte, N.C., USA

Objective: ALS-associated anatomical or domain [behavior, function] involvement together with progression milestones provide a validated description of the extent of ALS involvement permitting this disease staging system to organize disease outcomes such that treatments may be compared and understood. **Methods:** The development cohort consisted of 264 unselected ALS patients from a large MDA/ALS Center who were analyzed cross-sectionally and prospectively to validate six [6] staging domains. Followup included assessments at 3 month intervals, restaging each patient to death, completion of study or lost to followup. Staging allocation was performed based on validated clinimetric scale [ALSFRS-R, neuropsychological and depression] scores, use of drugs or assistive devices. **Results:** ALS patients at diagnosis [Definite (93/264–34.5%), Probable (109/264–41.3%), Possible (24/264–9.1%) and Suspected (38/264–14.4%)] were classified according to World Federation of Neurology Research Group on Motor Neuron Diseases El Escorial Criteria for the Diagnosis of ALS. Cogntive (C)-impaired, behavior-impaired; Affect (A)-pseudobulbar, -depressed; Bulbar (B)-speech-impaired, -swallow-impaired; Respiratory (R)-impaired, -assisted; Upper Extremity (UE)-impaired, -assisted and Lower Extremity (LE)-impaired, -assisted domains were constructed based on literature cross-sectional samples of 40–2456 patients. C-patients [16.7%] and A-patients [26.5%] were spread throughout B, R , UE and LE domains. B-patients [18.9%] and R-patients [28.7%] free of C- and A-involvement were distributed through UE and LE domains. The remaining UE- and LE-patients had no C-, A-, B- and R-involvement. Progression from initial stages through later stages proceeded over 2–4 years. Change in classification of ALS according to El Escorial criteria did not predict ALS clinical staging according to the CABRUL staging domains. C- and A- domains changed slower with disease progression than B-, R- UE- and LE- domains. **Conclusions:** ALS staging permits definition of disease involvement over 6 domains on a per patient basis. El Escorial classification does not predict ALS clinical staging. Further validation is proceeding with a second validation cohort to confirm this staging system.

O5

Diet and Brain MRI Infarcts

N. Scarmeas, J.A. Luchsinger, C. DeCarli, Y. Stern, Y. Gu, A.M. Brickman

New York, N.Y., USA

Background: We have previously demonstrated associations between a Mediterranean-type diet (MeDi) and Alzheimer's disease and Mild Cognitive Impairment. One of the possible mediating mechanisms for these associations is MeDi-related reduction in cerebrovascular disease burden. There is very limited literature on the association between MeDi and cerebrovascular disease with a single study reporting associations of MeDi with clinical strokes in women. We explored the association between MeDi and subclinical infarcts detected by MRI. **Methods:** High-resolution structural MRI was collected on 707 elderly 65 or older community residents (imaging sub-study of Washington Heights and Inwood Columbia Aging Project in Manhattan New York). Based on dietary questionnaires administered 5.8 yrs (sd. 3.22) before the MRI, participants were divided into low, middle and high MeDi adherence groups. We examined the association of increasing adherence to a MeDi with presence of infarcts on MRI. **Results:** MRI infarcts were detected for 222 participants. Compared to the low adherence group, those in the moderate MeDi adherence group had a 22% reduced odds of having an infarct (OR 0.78 [0.55–1.14]), while participants in the highest MeDi adherence group had a 36% reduced odds (OR 0.64 [0.42–0.97; p for trend = 0.04). In adjusted models (for basic demographics, APOE genotype, caloric intake, BMI, duration between diet evaluation and MRI, smoking, diabetes, heart disease, hypertension, and plasma lipid levels) the association between MeDi adherence and MRI infarcts did not appreciably change. The relation between MeDi adherence and infarcts was comparable to that of hypertension, was somehow stronger for large infarcts, was somehow stronger for women and did not seem to be driven by any particular MeDi component (but instead by the whole dietary pattern). **Conclusions:** One of the potential biological pathways of

the MeDi – neurodegenerative disease association could be a cerebrovascular one: higher adherence to a MeDi is related to lower burden of subclinical brain MRI infarcts.

O6

Long-Term Mortality after a First Unprovoked Tonic-Clonic Seizure: Risk Factors and Treatment Effects

E. Beghi, M. Leone, R. Vallalta, I. Tramacere

Novara and Milano, Italy

Objective: To assess long-term mortality after a first unprovoked tonic-clonic seizure and define predictors. **Background:** Patients experiencing a first unprovoked seizure have a higher mortality than the general population. However, findings from published reports are inconsistent and the role of treatment is unknown. **Methods:** 419 patients aged 2+ years with a first unprovoked tonic-clonic seizure enrolled in a multicenter randomized trial comparing immediate treatment (N = 215) to delayed treatment (is, after seizure recurrence)(N = 204) were followed for 7687 person-years. Demographic (age & gender) and clinical variables (seizure type, previous uncertain seizures, family history of seizures, etiology, abnormal neurological, EEG and imaging findings, acute treatment and first drug) were recorded along with 2- and 5-year remission periods. Mortality was assessed by standardized mortality ratios (SMRs) and cumulative time-dependent probability of death. **Results:** 40 patients (9.6%) died during follow-up (SMR 1.2; 95% Confidence Interval 0.9–1.7). The probability of death was 0% at one year, 3% at five years, 6% at nine years, and 9% at 20 years in the treated arm and 0%, 3%, 3%, and 11% in the untreated (p = ns). The probability of death was 0% at ten years and 3% at 20 years for patients experiencing 5-year remission and 6 and 13% for those not experiencing 5-year remission ($p < 0.005$). Independent predictors of death included documented etiology but not treatment. **Conclusions:** Patients with a first unprovoked tonic-clonic seizure are at higher than expected death risk only if they do not enter 5-year remission and present an underlying etiological factor. Immediate treatment is uneventful.

O7

Mortality Trends by Stroke in Uruguay

H.J. Hackembruch, A. Perna, C. Ketzoian

Montevideo, Uruguay

Objective and Background: Stroke is at present one of the major causes of death. In Uruguay, stroke is the third cause of death after heart and neoplastic diseases. Prevalence and incidence of stroke in our country are 8.6 cases per 1,000 inhabitants and 131 cases per 100,000 inhabitants-year respectively. The purpose of this study is to describe and analyze the time trend of mortality from 1950 to 2008; to describe this trend in relation to the introduction of new international classifications of diseases, new diagnostic and treatment techniques and economic indicators; and to compare the mortality in Uruguay with other countries. **Material and Methods:** The information sources were: stroke as cause of death in Uruguay (Public Health Ministry); death rates due to stroke in other countries (WHO); Uruguayan demographic and socioeconomic data from the gross domestic product (GDP) (National Institute of Statistics and the Central Bank of Uruguay). Mortality rate by stroke was calculated and standardized by age and sex. The time trend of these data and autocorrelation (Durbin – Watson test) was analyzed. **Results and Discussion:** During the period under study, the mortality trend by stroke decreases ($r = -0.697$ $p < 0.0001$); in the time series analysis an increasing trend is observed from 1950 to 1971 ($r = 0.891$ $p < 0.0001$) and then decreasing up to 2008 ($r = -0.983$ $p < 0.0001$).The inflexion point coincides with the introduction of specialized care units and Computed Tomography (CT). The Durbin Watson test result is 0,142. The decreasing trend in mortality rate shows a negative correlation with the GDP ($r = -0.949$ $p < 0.0001$). When comparing Uruguayan mortality rates to those in other countries, we find higher values in relation to North American and West European countries but lower than in East European and some Latin American countries. Factors which could explain these differences are genetic and the quality of health care in the acute phase of stroke.

Poster Presentations

P1

Death Certificate Mortality Causes of Dementia and Alzheimer's Disease in an Elderly Cohort. Data from the NEDICES Cohort Study

C. Sánchez, J. Benito-León, R. Trincado, R. Boix, M.J. Medrano, A. Villarejo, S. Vega, E.D. Louis, F. Bermejo-Pareja

Madrid and El Espinar (Segovia), Spain, and New York, N.Y., USA

Objective: To evaluate the mortality and its causes at ten year follow-up in the Neurological Disorders in Central Spain (NEDICES) Cohort Study. **Methods:** The NEDICES Study is a population-based cohort study in the elderly with 5, 278 screened participants at baseline (1-04-1994). The diagnosis of dementia and its subtypes were established by means of standardised international criteria (DSM-IV and others). The mortality of this cohort and its causes (ICD-9) has been evaluated by linkage to national death registration and death certification of the National Institute of Statistics of Spain until 31-12-2004. **Results:** At baseline we detected 306 dementia cases (206 AD; 44 VaD; 13 mixed; 24 undetermined; 19 miscellaneous). At ten years (mean follow-up time = 8. 6 ± 3.3 years; total observation time = 45,338 person-years), 1,810 participants were dead (151 with AD and 69 with other dementia subtypes). Dementia in both men (HR = 1.49 CI95% 1.11–1.99) and women (HR = 1.49 CI95% 1.11–1.99) were predictors of mortality in Cox regression adjusted by age, sex and co-morbidities. AD was reported in the death certificates in only

the 23.5% of AD diagnosed cases. ICD death diagnosis of cancer was listed less frequently in those with AD (6.1%) than in those without dementia (30 %) ($p < .001$ adjusted by age and sex). **Conclusions:** The diagnosis of dementia is a risk factor of mortality. There is an underreporting of Alzheimer disease in death certificates. Cancer as cause of death is negatively associated with the diagnosis of Alzheimer disease as it has been previously described.

P2

What's in ALS? ALS Clinical Phenotypes in an Italian Register

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Aim: The epidemiological and clinical characteristics of ALS phenotypes in the patients included in an Italian prospective epidemiological register have been assessed. **Background:** The characteristics of ALS clinical phenotypes (bulbar, classical [Charcot], pyramidal, flail leg, flail arm, and respiratory) remain poorly understood. Moreover, no studies have been performed on these phenotypes in an epidemiological setting. **Methods:** The patients prospectively diagnosed and followed-up between 1995 and 2004 in Piemonte and Valle d'Aosta have been classified according to their clinical phenotype. The effect of the phenotypes on ALS prognosis has been also analyzed. **Results:** Of the 1260 incident patients, 1241 (98.5%) had complete phenotypic data. The most common phenotype was bulbar ALS (mean incidence rate 1.1/100,000/year, with no difference between genders) and the second was classic ALS (incidence rate, 1.2 men and 0.9 women; men to women rate ratio 1.7:1). Flail leg syndrome and pyramidal phenotype had a similar frequency in both genders (incidence rate, 0.4 and 0.3, respectively). Flail arm syndrome and respiratory phenotype were largely more represented among male (men to women rate ratio 4.0:1 and 9.0:1, respectively). The oldest age at onset was found in the bulbar phenotype (68.8 years) and the lowest in the pyramidal phenotype (58.3 years). Frontotemporal dementia was more frequent in bulbar phenotype (9.0%) and very rare in the flail arm syndrome (1.4%). Significantly different outcomes were found: pyramidal and flail arm phenotypes had the better prognosis (median survival, 6.3 and 4.0 years, respectively), while bulbar and respiratory phenotypes had the worst prognosis (2.0 and 1.4 years, respectively). **Conclusions:** ALS phenotypes are largely related to a complex interplay between gender and age. The reasons for the strong influence of these factors on ALS biology remains largely unknown. In turn, ALS phenotypes are the amongst the main factors determining the clinical outcome.

P3

A Primary Brain Tumours Registry: Project of Emilia-Romagna Region on Neuro-Oncology (PERNO)

R. D'Alessandro, F. Albani, S. Ferro, E. Baldin, S. Testoni, S. De Pasqua, A. Brandes, A. Baruzzi

Bologna, Italy

Objective: PERNO aims to set up a prospective Registry to estimate the incidence and prognosis of Primary Brain Tumours (PBT) of the neuroepithelial group and to promote an interdisciplinary network for neuro-oncology research and healthcare improvement in the Emilia-Romagna Region, north east Italy (3,983,346 inhabitants). **Background:** No previous Italian prospective population-based Registries of PBT. **Methods:** Medical specialists in Neurology, Neuroradiology, Neurosurgery, Oncology, Radio-therapy, Biomolecular and Anatomical Pathology, and Genetics throughout the Region were invited to participate in the project. They were asked to communicate notify the project website (www.perno.it) of all new adult cases of suspect PBT observed from January 1st 2009. Clinical and demographic findings of confirmed primary brain tumors have been collected through personal contact with physicians following patients. Cases were also collected reviewing PBT ICD codes of hospital discharges in the Emilia-Romagna Region and neighbouring areas. The completeness of recording system will be estimated with the capture-recapture method. **Results:** 351 cases of suspect PBT were enrolled in the Registry during the first year of the study, histological confirmation was obtained in 122 cases (34.8 %), 84 were GBM (68.9%) and 38 other neuroepithelial tumors (32.6%); 25 (7.1%) had only radiological or clinical diagnosis, 17 (4.8%) were excluded because they were not PBT. For the other 187 (53.3%) patients we have currently collected only demographic data. There were 197 males and 150 females (56.3% and 42.5% respectively), in 4 cases data were missing. Mean age was 62.5 yrs, median 65 yrs (range 19–90). The incidence of suspect PBT in the Emilia-Romagna Region was 8.81/100,000 person-years (95% CI: 7.92–9.80). **Conclusions:** The preliminary findings obtained through web recording show incidence values similar to those reported in the literature. Our records will be checked with ICD codes of hospital discharges to verify the degree of completeness of our recording system.

P4

Health-Related Quality of Life and Burden of Spanish Caregivers of Persons with Multiple Sclerosis

J. Rivera-Navarro, J. Benito-León

Salamanca and Madrid, Spain

Objectives: Our aims were to describe the characteristics of a sample of caregivers of persons with MS, assess their perceived burden, health-related quality of life (HRQoL), and investigate factors influencing this burden. **Background:** This condition considerably impacts the health-related quality of life (HRQoL) experienced by their families. Family members are usually burdened with a variety of direct and indirect caregiving tasks that may dis-

rupt normal family life as well as daily work. In general, the literature focusing on the burden and HRQoL outcomes of caregivers of persons with MS is still limited, therefore it is important to understand caregiver characteristics and explore the relationship of their level of burden with their HRQoL. **Methods:** We studied 278 caregivers of persons with MS, recruited from a Spanish cross-sectional survey, measuring HRQoL by the 36-Item Short-Form Health Survey (SF-36) and burden by the Zarit Caregiver Burden Interview. **Results:** 56.8% of caregivers were female and their mean age was 50.1 ± 12.6 years. Their main relationship to the person with MS was spouse/partner (52.9%) and son or daughter (25.9%). Caregiver General Health, Mental Health, Bodily Pain, and Role-emotional Functioning were the most affected dimensions on the SF-36. Multiple regression analysis showed that independent and significant predictors of burden were Role-emotional Functioning and Vitality dimensions SF-36 scores of caregivers, and the Expanded Disability Status scores. The total adjusted variance explained by these variables (adjusted R2) was 0.512. **Conclusions:** Emotional factors and disability of person with MS were major predictors of burden. Psychological and social support should be considered to reduce caregiver burden.

P5

Low Morale is Associated with Increased Risk of Mortality in the Elderly

J. Benito-León, J. Rivera-Navarro

Madrid and Salamanca, Spain

Objective: To assess the association between morale and mortality. **Background:** Morale scale is a measure of Health Related Quality of Life, that may be defined as a basic sense of satisfaction with oneself, a feeling that there is a place in the environment for oneself, and a certain acceptance of what cannot be changed. It is important to assess morale in the elderly. Although it is known that morale is affected in several specific medical diseases, the more general association between lower morale and mortality in the community-dwelling elderly has yet to be assessed. **Methods:** We used data from the Neurological Disorders in Central Spain, a population-based study. Our sample was 2,516 older persons (mean age 75.7 years). Cox models were used to estimate risk of mortality. Morale was assessed using the Philadelphia Geriatric Center Morale scale. **Results:** 489 (21.8%) participants died over a median follow-up of 5.9 years (range 0.1–7.7 years), including 253 (21.8%) deaths among 1,163 participants with low morale scores, 168 (19.3%) among 870 participants with moderate scores, and 68 (14.1%) among participants with high scores. In an unadjusted Cox model, relative risk (RR) of mortality in participants with low morale scores = 1.69 ($p < 0.001$), and RR in participants with moderate scores = 1.47 ($p < 0.01$) compared to the reference group (participants with high scores).In a Cox model that adjusted for a variety of demographic factors and comorbidities, RR of mortality in participants with low morale scores = 1.35 ($p < 0.05$), and moderate scores = 1.16 (not significant) compared to the reference group. **Conclusion:** Low morale may be an independent predictor of mortality in the elderly. By assessing morale, practitioners might be better positioned to identify patients with poorer prognoses.

P6

Incidence of Amyotrophic Lateral Sclerosis in a Multiethnic Health Care Population

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Background: The incidence of amyotrophic lateral sclerosis (ALS) is fairly uniform in Caucasian populations of North America, however, little is known about the incidence of ALS in other racial and ethnic groups. Studies are needed to examine the incidence of ALS in multiethnic populations using uniform methods of case ascertainment. **Objective:** To estimate the incidence of ALS in a multiethnic population comprised of individuals of non-Hispanic White, African American, Hispanic and Asian descent. **Methods:** We sought to identify all incident cases of ALS newly diagnosed during 1996–2000 in the Kaiser Permanente Medical Care Program of Northern California. Potential ALS cases were identified from inpatient, outpatient, and pharmacy utilization databases using ICD-9 codes for motor neuron diseases. Neurology records were reviewed to determine if a neurologist had assigned a clinical diagnosis of ALS and cases were included if they met modified WFN criteria for ALS for up to an 18 month period after the first diagnosis. Direct standardization to the 2000 total U.S. population was use to obtain age- and sex-adjusted incidence rates. **Results:** A total of 190 newly diagnosed ALS cases were identified. The overall annual age- and gender-adjusted ALS incidence rate was 1.7 per 100,000 (95% CI 1.4–1.9), and the male:female ratio of age-adjusted incidence rates was 1.6. No ALS cases were diagnosed prior to 30 years of age. For the age group 30 years and above, adjusted ALS incidence rates were highest among non-Hispanic Caucasians ($3.4/10^5$, 95 % CI 2.9–4.0), intermediate among Hispanics ($2.5/10^5$, 95% CI 0.8–4.3) and Blacks ($2.2/10^5$, 95% CI 1.0–3.4), and lowest among Asians ($0.8/10^5$, 95% CI 0.2–1.4). **Conclusions:** ALS incidence was 60% higher among men compared with women, confirming earlier reports of a male excess. ALS annual incidence varied by race/ethnicity, with the highest rate observed among non-Hispanic Caucasians and lowest rate among Asians.

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