

1: Stroke. 1992 Jan;23(1):24-7.

Seasonal variation of cerebral hemorrhage in 236 consecutive cases in Brussels.

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BACKGROUND AND PURPOSE: Seasonal variation in the incidence of cerebral hemorrhage has been previously demonstrated. In this study, we sought to identify the climatological data best correlated with this seasonal variation. METHODS: In a retrospectively studied sequential series of 236 patients with nontraumatic cerebral hemorrhage observed in Brussels over a period of 8 years, we cumulatively grouped the dates of stroke occurrence into a single calendar year. RESULTS: We found marked seasonal variation in incidence, with the highest value (23%) observed in November-December and the lowest (10%) in July-August. Seasonal variations in incidence of cerebral hemorrhage were shown to be correlated not only with the inverse of ambient temperature, but also with the inverse of hours of sunshine and with ambient humidity. We found no difference between hypertensive and normotensive patients. CONCLUSIONS: Our study fails to bear out the hypothesis that the higher incidence of cerebral hemorrhage in late autumn and winter is due to the influence of low ambient temperature on blood pressure.

PMID: 1731416 [PubMed - indexed for MEDLINE]

2: Stroke. 1990 Sep;21(9):1262-7.

Seasonal variation in stroke incidence in Hisayama, Japan.

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We investigated seasonal variation in the incidence of cerebral stroke among the general population aged greater than or equal to 40 years in November of 1961 in Hisayama, Japan. During the 24-year follow-up period, 311 cases of cerebrovascular diseases occurred. The date or month of onset was determined in 308 cases, of which 51 were classified as intracerebral hemorrhage, 223 as cerebral infarction, and 27 as subarachnoid hemorrhage. We observed a significant seasonality in the incidence of all stroke (p less than 0.01), of intracerebral hemorrhage (p less than 0.05), and of cerebral infarction (p less than 0.01), whereas subarachnoid hemorrhage had no significant seasonal pattern. Subjects less than 64 years of age showed a significant seasonal variation in the incidence of both intracerebral hemorrhage (p less than 0.05) and cerebral infarction (p less than 0.01). A significant seasonal pattern for the incidence of intracerebral hemorrhage was also noted among persons with hypertension (p less than 0.05) or a high serum cholesterol level (p less than 0.05), whereas such a pattern for cerebral infarction was documented among normotensive persons (p less than 0.05) and those with a low serum cholesterol level (p less than 0.01). In addition, the incidences of intracerebral hemorrhage and cerebral infarction were negatively correlated with mean ambient temperature (p less than 0.01 and p less than 0.05, respectively), and all stroke and intracerebral hemorrhage in men were significantly related to intradiurnal temperature change (p less than 0.05 and p less than 0.01, respectively). The significance of the

seasonal occurrence of stroke is discussed in relation to relevant risk factors.

PMID: 2396260 [PubMed - indexed for MEDLINE]

3: Neuroepidemiology. 1988;7(2):89-98.

Comment in:

Neuroepidemiology. 1990;9(3):162.

Seasonal variation of stroke--does it exist?

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A relationship between seasonal climate changes and the occurrence of stroke has been postulated. We reviewed the seasonal occurrence of stroke in 2,960 patients seen at the University of Iowa from 1978 through 1985. Stroke was classified as cerebral infarction (CI; n = 1,357, 46%), transient ischemic attacks (TIAs; n = 913, 31%), subarachnoid hemorrhage (SAH; n = 476, 16%) and intracerebral hemorrhage (ICH; n = 214, 7%). Local climatological data were obtained from the National Oceanic and Atmospheric Administration. Poisson regression was used to analyze the data. The occurrence of TIA and SAH was not influenced by seasonal climatic variables. There was a significant increase in the rate of referral for CI during warmer months (p = 0.027). The amount of rainfall did not influence the rate of CI. Conversely, the rate of referral for ICH was significantly less during warm weather (p = 0.027) and rainy weather (p = 0.014). A possible inverse seasonal relationship in temperate climates between CI and ICH deserves more investigation.

PMID: 3374731 [PubMed - indexed for MEDLINE]

4: Bangladesh Med Res Counc Bull. 2001 Aug;27(2):69-78.

Stroke: seasonal variation and association with hypertension.

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A prospective study was contemplated with 155 patients of acute stroke in the Department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from March 1996 to February 1997. The objective of the study was to find out seasonal variation of stroke occurrence. An attempt was also made to find out the association of hypertension with ischaemic and haemorrhagic stroke during summer and winter. The number of subjects during summer and winter were 121 and 34, respectively. In summer, out of 121 subjects, 87(71.9%) were ischaemic stroke and 34(28.1%) haemorrhagic stroke, of which 32 were intracerebral haemorrhage (ICH) and 2 subarachnoid haemorrhage (SAH). There were 18 (52.9%) ischaemic stroke and 16(47.06%) haemorrhagic stroke (all ICH) among total 34 subjects during winter. The frequency of ischaemic stroke during summer was significantly greater than that during winter (p<0.05). The frequency of haemorrhagic stroke during winter was significantly greater than that during summer (p<0.05). Temperature was positively correlated to ischaemic stroke (p<0.01) and negatively correlated to haemorrhagic stroke (p<0.1). Hypertension was significantly more associated with haemorrhagic stroke than with ischaemic stroke irrespective of season (p<0.05).

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5: Lancet. 1996 Apr 6;347(9006):934-6.

Is stroke incidence related to season or temperature? The Oxfordshire Community Stroke Project.

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BACKGROUND: A winter excess of ischaemic stroke has been found in mortality and hospital-based studies. It is often assumed that this is due to seasonal variation in stroke incidence and several pathophysiological explanations have been proposed. We studied the incidence of stroke in relation to season and outside temperature. METHODS: The data came from a community-based study of first ever in a lifetime stroke in a defined population of about 105 000. 675 such strokes were registered over four years and the month of onset was analysed separately for cerebral infarction, primary intracerebral haemorrhage, and subarachnoid haemorrhage. FINDINGS: There was no significant seasonal variation. The incidence of primary intracerebral haemorrhage was increased at low temperatures, but there was no significant relation between the incidence of ischaemic stroke or subarachnoid haemorrhage and temperature. INTERPRETATION: The widely reported winter excess of ischaemic strokes may be an artifact due to referral bias in hospital-based studies and increased case fatality during the winter in mortality studies.

PMID: 8598757 [PubMed - indexed for MEDLINE]

6: Stroke. 1995 Apr;26(4):569-72.

Weather and stroke in a subtropical area: Ilan, Taiwan.

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BACKGROUND AND PURPOSE: The aim of this study was to clarify the association of weather and stroke occurrence in a subtropical area in Ilan, Taiwan. METHODS: We studied 517 patients with stroke (date of onset, January 1 to December 31, 1991) in Poh-Ai Hospital and St Mary's Hospital: 316 patients (61.1%) with cerebral infarction, 170 (32.9%) with intracerebral hemorrhage, and 31 (6.0%) with other types of stroke. The daily occurrence of cerebral infarction and intracerebral hemorrhage was analyzed and correlated with three major meteorologic factors: air temperature, air pressure, and relative humidity. RESULTS: The occurrence of cerebral infarction was rather uniform in all kinds of weather. The occurrence of intracerebral hemorrhage was approximately twice as great on cold days (0.71 case per day) and high-pressure days (0.73) as on warm days (0.31) and low-pressure days (0.39) ($P < .005$ by chi 2 test). When a linear regression model was used to test whether air temperature or air pressure had more influence on intracerebral hemorrhage, only air temperature showed a significant effect. Regarding intracerebral hemorrhage, the relative risks of cooler and median temperature days versus warmer days were 18.5 and 5.1, respectively. CONCLUSIONS: Intracerebral hemorrhage but not cerebral infarction occurs more frequently on cooler days, with a dose-response relationship, in Ilan, Taiwan.

PMID: 7709398 [PubMed - indexed for MEDLINE]

7: J Neurol. 1995 Mar;242(4):217-21.

Cold: a risk factor for stroke?

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A retrospective study was performed to investigate seasonal variation in stroke incidence and to evaluate the hypothesis that cold might be a risk factor. Data were obtained from the central registry of the Hospital de S. Joao, Porto, Portugal, concerning 4048 patients consecutively admitted for cerebrovascular disease during a period of 33 months. Monthly admissions for stroke and its subtypes were related to mean values of ambient temperature using linear

correlation. There was a strong inverse correlation between average temperature and total admissions for cerebrovascular disease ($r = -0.72$, $P < 0.00005$), intracerebral haemorrhage ($r = -0.66$, $P < 0.00005$), ischaemic stroke ($r = -0.46$, $P = 0.007$) and transient ischaemic attack ($r = -0.41$, $P = 0.017$). These correlations were independent of any seasonal variation in the number of hospital admissions due to all causes. No relation was found between temperature and subarachnoid haemorrhage. The rhythmometric analysis showed the presence of a statistically significant rhythm with an acrophase in the coldest months. These results support the hypothesis of stroke being a chronorisk disease to which cold might represent a triggering factor.

PMID: 7798120 [PubMed - indexed for MEDLINE]

8: Lancet. 1995 Feb 11;345(8946):353-5.

Comment in:

Lancet. 1995 Feb 11;345(8946):337-8.

Temperature extremes and mortality from coronary heart disease and cerebral infarction in elderly Chinese.

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We studied the relation between outdoor temperature and mortality rates from cardiovascular disease in Taiwan from 1981 to 1991. In 11 years, there were

30,085, 21,750, and 39,818 deaths from coronary artery disease, cerebral infarction, and cerebral haemorrhage, respectively, among 7.6 million residents aged 25 and over in selected areas where climate was recorded. A temperature-mortality relation was especially apparent in the elderly. A U-shaped relation was observed between temperature and mortality from coronary artery disease and cerebral infarction. The range corresponding to least deaths from coronary artery disease (26-29 degrees C) and cerebral infarction (27-29 degrees C) was higher than that in countries with colder climates. In the elderly, the risk of cerebral infarction at 32 degrees C was 66% higher than that at 27-29 degrees C; the risk increased by 3.0% per 1 degree C reduction from 27-29 degrees C. The risk of coronary artery disease at 32 degrees C was 22% higher than that at 26-29 degrees C; below 26-29 degrees C, the risk increased by 2.8% per 1 degree C reduction. Mortality from cerebral haemorrhage decreased with increasing temperature at a rate of 3.3% per 1 degree C. These results imply a pathophysiological difference between thromboembolic and haemorrhagic cardiovascular diseases. Poor thermoregulation in older people may precipitate cardiovascular disease events.

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