Sex-Related Differences in Outcome in Patients with Aneurysmal Subarachnoid Hemorrhage

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Background: Several population-based studies found a higher case fatality after aneurysmal subarachnoid hemorrhage (ASAH) in women than in men. This may relate to differences in prognostic characteristics. We therefore assessed sex differences in prognosticators and outcome in ASAH patients. *Methods:* From a prospectively collected ASAH database, we retrieved data on patients admitted from 1990 to 2010. We calculated prevalence ratios (PRs) with corresponding 95% confidence intervals (CIs) for prognosticators (clinical condition on admission, site and treatment of the aneurysm, and complications during the clinical course) and risk ratios (RRs) for in-hospital death and poor outcome (death or dependence) at 3 months. RRs were adjusted for possible confounding with Poisson regression analysis. *Results:* Of the 1761 included patients, 1211 (68.8%) were women, who were 1.9 (95% CI: .5↔3.3) years older than men. PRs for women for the site of the aneurysm were 1.71 (95% CI: 1.38↔2.13) for the carotid artery, .68 (95% CI: .60↔.77) for the anterior communicating artery, 1.14 (95% CI: .92↔1.41) for the middle cerebral artery, and .85 (95% CI: .63↔1.13) for posterior circulation. PRs of other prognosticators were similar between sexes. The crude RR for in-hospital death for women was .91 (95% CI: .78↔1.05) and for poor outcome at 3 months was .95 (95% CI: .85↔1.06); both remained similar after adjustment. *Conclusions:* In this study, in-hospital death and poor outcome at 3 months did not differ between men and women. Women were slightly older than men and had different distributions of aneurysm sites, but not to an extent that it explained a sex difference in outcome. **Key Words:** Subarachnoid hemorrhage—outcome—case fatality—in-hospital death—sex.

Introduction

In a recent Dutch nationwide cohort of patients admitted with aneurysmal subarachnoid hemorrhage (ASAH), women had a statistically significant higher case fatality than men.[1] Other studies based on administrative registries also found a higher case fatality in women.[2-4] Possible explanations for this higher case fatality in women cannot be studied in these registries because clinical details, and thus information on prognosticators, are lacking.

Because incidence of ASAH above the age of 55 is higher in women than in men and case fatality increases with age,[1,3] the difference between sexes may be explained by a higher age in women or other dissimilarities in prognosticators. We therefore assessed possible sex differences in prognosticators for outcome after ASAH.

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Methods

Following Institutional Review Board approval, data were retrieved from the prospectively collected subarachnoid hemorrhage (SAH) database of the University Medical Center Utrecht. We included patients who had been admitted from 1990 to 2010. Other inclusion criteria were age at onset of 20 years or older, admission at less than 72 hours after the time of onset, SAH blood proven by computed tomography or xanthochromia of the cerebral spinal fluid, and presence of an aneurysm by computed tomography angiography or conventional angiography. Clinical and radiological prognosticators are given in Table 1. Good clinical condition on admission (according to the World Federation of Neurological Surgeons scale) was defined as scores of I-III.[5] Poor outcome was defined as death or dependence on help for activities of daily living after the hemorrhage (Glasgow Outcome Scale scores of 1-3).[6] Follow-up data were collected with a standardized interview by phone with patients or their relatives. The interviews were performed by trained research nurses. Data on loss to follow-up are provided in the results table.

Statistical Analyses

For age-specific analysis of the sex distribution, age at onset was stratified in groups of 10 years and less than 25 years or 85 years or more. We calculated the difference in mean age between women and men with a corresponding 95% confidence interval (CI). Prevalence ratios (PRs) with corresponding 95% CIs were calculated to assess sex differences in prognosticators. Crude risks and risk ratios (RRs) with corresponding 95% CIs were calculated for death at discharge and poor outcome at 3 months. RRs were adjusted for possible confounding by age, neurological condition on admission, and site of the aneurysm with Poisson regression analysis.

Table 1. *Baseline characteristics according to sex*

Characteristics	Women, n (%)	Men, n (%)	PR (95% CI)
Number	1211 (68.8)	550 (31.2)	
Mean age ± SD	55.6 ± 13.8	53.7 ± 13.5	1.9* (.52↔3.26)
WFNS score I-III	730 (62.8)	315 (61.2)	1.03 (.95↔1.11)
Location of the aneurysm			
Carotid artery			
Posterior communicating	232 (19.7)	48 (9.2)	2.15 (1.60↔2.88)
Bifurcation	31 (2.6)	17 (3.3)	.81 (.45↔1.45)
Elsewhere	61 (5.2)	19 (3.6)	1.43 (.86↔2.36)
Middle cerebral artery	249 (21.2)	97 (18.6)	1.14 (.92↔1.41)
Anterior communicating artery	378 (32.2)	247 (47.3)	.68 (.60↔.77)
Pericallosal artery	45 (3.8)	8 (1.5)	2.50 (1.19↔5.26)
Posterior circulation			
Basilar	71 (6.0)	51 (9.8)	.62 (.44↔.87)
Vertebral	47 (4.0)	11 (2.1)	1.90 (.99↔3.63)
Other	61 (5.2)	24 (4.6)	1.13 (.71↔1.79)
Treatment of the aneurysm			
Clipping	650 (53.7)	297 (54.0)	.99 (.91↔1.09)
Coiling	267 (22.0)	112 (20.4)	1.08 (.89↔1.32)
Mean days until treatment (±SD)	5.5 ±7.9	5.4 ±6.7	.09† (−.76↔.93)
No aneurysm occlusion	294 (24.3)	141 (25.6)	.95 (.80↔1.13)
Clinical complications			
None	361 (31.3)	158 (30.9)	1.01 (.87↔1.19)
Rebleeding	162 (14.1)	87 (17.0)	.83 (.65↔1.05)
Delayed cerebral ischemia	287 (24.9)	117 (22.9)	1.09 (.90↔1.31)
Hydrocephalus	323 (28.0)	157 (30.7)	.91 (.78↔1.07)
Other	419 (36.3)	187 (36.5)	.99 (.87↔1.14)

Abbreviations: CI, confidence interval; PR, prevalence ratio unless indicated otherwise; SD, standard deviation; WFNS, World Federation of Neurological Surgeons.

Missing data are less than 5.5%.

*Mean difference in age years.

†Mean difference in days.