The Impact of Migraine on Health Status

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Problems.—What is the effect of migraine on health status, defined as the patient's physical, psychological, and social functioning? And, suppose that the health status of migraine sufferers appears to be impaired, to what extent is this a consequence of migraine-associated comorbidity rather than of migraine itself?

Methods.—A group of 846 migraineurs, selected from the general population following IHS criteria, and a control group were surveyed with the Medical Outcomes Study 36-item Short-Form Health Survey, Nottingham Health Profile, EuroQol instrument, and the COOP/WONCA charts. Questions on demographic characteristics and comorbidity were included.

Results.—The health status of migraineurs appeared to be significantly impaired in comparison to the control group. Because statistical significance is distinct from relevance, effect size estimators were employed. Although the direction of the differences indicated consistently a worse health status of the migraineurs, regardless of the instrument used, the sizes of the differences were small to medium. Self-reported comorbidity, especially depression, was more prevalent in the migraine group. However, this offered only a partial explanation for the impaired health status of the migraine group.

Conclusions.—Migraine has an independent moderately deteriorating effect on the daily functioning of individuals.

Key words: migraine, health status, comorbidity, SF-36, Nottingham Health Profile, EuroQol COOP/WONCA charts

Abbreviations: IHS International Headache Society, SF-36 Medical Outcomes Study 36-item Short-Form Health Survey, MOS-20 Medical Outcomes Study 20-item instrument, NHP Nottingham Health Profile, GHQ General Health Questionnaire, COOP/WONCA charts Dartmouth COOP Functional Health Assessment Charts/ WONCA, MCA Multiple Classification Analysis

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The burden of migraine, a chronic, attack-wise, and presumably disabling disease, should not be underestimated. The reported 1-year prevalence in adults exceeds 10%, with a male to female ratio of about 1:2 to 3.[1] People in the age range 15 to 55 years are predominantly afflicted, ie, those in the work force. Long-term consequences of migraine may result from interference of frequent attacks with daily life, thus precluding optimal functioning. We designed a study to quantify the burden of migraine both in terms of its economic consequences and in terms of its impact on health status. The economic part of the study, published in detail elsewhere, showed that direct costs of migraine in the Netherlands accounted for 0.3% of the total health care costs in 1988, 80% of which could be attributed to "alternative" medical practice. Indirect costs, due to absence from work and reduced productivity, were estimated to amount to at least 542 million Dutch guilders per year (in 1988, $1 = 1.9 guilders)[2].

Health status, the focus of the present paper, is defined as physical, psychological, and social functioning. Osterhaus and Townsend concluded from a survey of 845 migraineurs (meeting IHS criteria[3]) using the Medical Outcomes Study 36-item Short-Form Health Survey (SF-36) that "although migraineurs may be physically able to function, they function behaviorally at a level well below their physical capabilities, and for some domains even worse than patients suffering from arthritis, gastrointestinal disorders or diabetes."[4] Solomon et al assessed the health status of 208 patients attending a headache center with the Medical Outcomes Study 20-item instrument (MOS-20). The authors conclude "that chronic headache disorders are associated with significant limitations in all measured dimensions of patient well-being and functioning when compared to patients with no chronic condition; and that patients with chronic headaches have a level of function worse than that of patients suffering from diabetes, arthritis, depression, and

back problems."[5] Jenkinson reported the results of interviewing 80 women attending a migraine outpatient clinic (diagnosed as suffering from migraine by a neurologist) with the Nottingham Health Profile (NHP) and the General Health Questionnaire (GHQ; a screening instrument for nonpsychotic psychiatric disturbance).[6] General Health Questionnaire scores were indicative of mood disturbance in no less than 41% of the subjects. In a Dutch study among elderly patients (age range 55 to 79 years), only 9% of those who stated they suffered from "migraine or severe headache" reported physical limitations, and 10% gave a negative evaluation of their general health. However, 45% regarded their psychological well-being as being impaired by their headache complaints.[7] Overall, these studies are indicative of a worse functioning of migraine sufferers. However, controlled studies, enabling a comparison between migraine sufferers and non-afflicted subjects and an estimation of the size of the effect of migraine on health status, are not known to us.

It has been recognized that migraine often occurs in association with other conditions, like mood disturbances (depression, anxiety),[8-10] allergic phenomena (atopy, asthma, food allergy),[11,12] and vasospastic disorders (Raynaud's phenomenon).[13-15] This higher prevalence of comorbidity was confirmed in a recent Dutch survey on socioeconomic health inequalities in a representative sample of the general population (n=15973; age range 15 to 64 years). The prevalence of self-reported migraine (no check on IHS criteria) was 12% for women and 5% for men. Women with migraine reported no other chronic condition in 39% of cases, while 15% reported two or more; for women without migraine these figures are 60% and 5%. The largest difference in prevalence of a specified chronic condition was for "depression/nervous exhaustion" (22% for women with migraine, 6% for women without migraine). Similar figures held for men with and without migraine in this study (K. Stronks, Department of Public Health, Erasmus University Rotterdam; personal communications, 1994).

With regard to the *causal* relationship between migraine and comorbid conditions, several authors have proposed a common disposition or a common pathogenetic defect.[12-16] Information about the *consequences* of the higher prevalence of comorbidity in migraine sufferers is scarce. In particular, the relative contribution of migraine and other conditions to the lower level of functioning by migraine patients has not been investigated previously.

In the present study, the health status of migraine patients is compared with that of a control group. We intend to answer the following questions: (1) What is the health status of migraine sufferers compared with a control group that is comparable in age, sex, and employment status? (2) Are the differences between migraineurs and controls consistent if measured with different generic instruments? and (3) What is the relative contribution of migraine and associated comorbidity, especially self-reported depressive disorders, to the impaired health status of migraine sufferers?

METHODS

Samples.—Migraine patients were selected from a series of face-to-face interviews with a representative sample of the Dutch general population (n = 10480), avoiding the selection of only severe cases who sought medical care, during the period October 1992 to February 1993. Subjects were included as migraine patients if they met the IHS criteria[3] and had experienced at least one attack of migraine during the 12 months prior to the interview. Nine hundred ninety-two migraine sufferers met these criteria (1-year prevalence, 9.5%). Of these sufferers who were all invited to participate in a second study, viz, the actual investigation on health status and (in)direct costs, 85% (n = 846) actually agreed to cooperate.

The control group was selected from the subjects in the survey who did not meet the criteria for migraine by frequency matching to the migraine group on 5-year age class, sex, and employment status.

Instruments.—Generic instruments for health status assessment measure basic values (physical, psychological, and social functioning) which are relevant for everyone's health status.[17] There is general agreement that the primary source for such information is to be found in the subjects themselves. Generic questionnaires are nondisease specific, enabling comparison of health status data across the borders of specified diagnoses. A combination of four generic questionnaires, the SF-36, the NHP (Dutch adaptation), the EuroQol descriptive instrument, and the COOP/WONCA charts, was applied to investigate whether differences between migraineurs and controls were consistent if measured with different instruments. Data were also analyzed to compare testing properties of these questionnaires.

The *SF-36* was developed in the United States from the Medical Outcome Study General Health Survey Instrument.[17-20] It consists of 36 items, assigned to the domains of physical functioning (10 items), social functioning (2), role limitations - physical problems (4), role limitations - emotional problems (3), mental health (5), vitality (4), pain (2), general health perceptions (5), and health change (1). The numbers of response categories per item range from 2 to 6. The end score is an eight-dimensional profile. The Dutch version we used was developed as a part of the IQOLA project, which aims to translate, validate, and normalize the SF-36 in a range of languages and cultural settings.[21]

The *NHP* was developed during the 70s in the United Kingdom as a measure for perceived health, to be used in population surveys.[22] Part 1 of the NHP consists of 38 dichotomous items, covering the domains of physical mobility (8 items), pain (8), energy (3), sleep (5), social isolation (5), and emotional reaction (9). Part 2 consists of seven items on problems because of health in seven specified areas of life. The Dutch version, the NHP-DA, we used has been tested in several patient populations.[23,24]

The *EuroQol* classification consists of five items (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression), each following the general form: no problems - some

problems - extreme problems.[25] Additionally, evaluation of one's own health is assessed with a visual analogue scale ranging from 0 (worst imaginable health state) to 100 (best imaginable health state). The EuroQol instrument was developed by the International EuroQol Group as a standardized, nondisease-specific measure for description of health status. EuroQol health state descriptions can be linked directly to empirical valuations of health states by the general population, which makes it especially interesting for the economic evaluation of medical interventions.

The *COOP/WONCA charts* were developed to assess health status of patients in primary care.[26] There are six charts, covering the areas of physical fitness, feelings, daily activities, social activities, change in health and overall health. The levels on the scales are illustrated with pictograms.

Comorbidity was assessed by the list of chronic conditions as included in the Dutch Health Interview Survey of the Dutch Central Bureau of Statistics. This list counts 28 conditions in lay terms (like "asthma, chronic bronchitis, or COPD", "diabetes", "varicose veins"). Respondents are asked to indicate for each condition whether they have it now or if they have had it in the year prior to assessment.

Questionnaire Layout and Mailing Scheme.—We used four different questionnaires, two for the migraine group and two for the control group. All versions contained the SF-36, EuroQol, and questions relating to comorbidity and demography. The two migraine versions differed from each other, one containing the COOP/WONCA charts, the other the NHP. The two control group versions differed in the same way. Both migraine versions contained additional questions on the number of attacks during the year prior to assessment and on medical consumption.

Questionnaires were sent by mail in June 1993, with reminders 2 weeks (a postcard) and 5 weeks (a complete questionnaire) later.

Analysis.—To investigate any selectivity of response, nonresponse analyses were conducted by comparing and testing (chi-square test) the distributions of age, sex, social class, and degree of urbanization of addressees and respondents.

Scores were declared as missing values if nothing was filled in or if ambiguous information was provided. Because of generally low missing value rates, we did not impute constructed values for missings. Scale scores for the SF-36 and NHP were based on complete records only.

The Mann-Whitney *U* test was applied for testing differences in scores of continuous nonnormally-distributed variables between migraine group and controls. To avoid the effect of multiple testing, $P < 0.01$ was regarded as statistically significant. Given the large sample size, statistical significance may be misleading: relatively small mean differences will achieve conventional levels of statistical significance without representing meaningful differences in functioning. We employed an estimator of effect size *d* for continuous variables, which relates the differences in mean scores to the dispersion of the scores. A $d = .2$ indicates a small effect, a $d = .5$ a medium effect, and a $d = .8$ a large effect.[27]

The chi-square test was used to test for proportional differences in contingency tables. Again, $P < 0.01$ was regarded as statistically significant. The effect size estimator *W* for contingency tables has a different interpretation: $W = .1$ indicates a small effect, $W = .3$ a medium effect, $W = .5$ a large effect.[27]

Multiple classification analysis (MCA) was applied to explore the relative effects on health status of migraine and associated comorbidity.[28,29] In essence, MCA is multiple regression analysis using dichotomous predictor (or explanatory) variables. We used "migraine - yes/no", "depression - yes/no" and "diseases of the skin - yes/no" as predictor variables. The choice of the latter two conditions was based on significant differences of their prevalences in the migraine group and the control group. The scale scores of the SF-36, NHP, and EuroQol (valuation of one's own health) that showed the largest differences between the migraine group and the control group were used as dependent (or explained) variables in separate MCAs. It can be argued that log-linear analysis would be more appropriate, because for MCA a continuous and normal distribution of the dependent variable is required. Application of log-linear analysis did not change the conclusions. We have chosen to present MCA results as they are easier to interpret.

RESULTS

Response.—The questionnaire was mailed to 846 migraine sufferers as identified by the diagnostic interview. Sixty-five of them returned it, indicating they did not have migraine. A number of migraineurs, as classified by the diagnostic interview, probably did not label their headaches as migraine themselves. After exclusion of these 65 and after correction for wrong addresses, the crude response rate was 63%. Of these, 90% were usable (n=436). There were no significant differences in response rates between the two migraine groups (questionnaire with COOP/WONCA charts or NHP respectively). Eight hundred forty-three questionnaires were mailed to the control group. After correction for wrong addresses, the crude response rate was 72%. All but 10 were usable (n=575). As in the migraine group, there were no significant differences in response rates between the two control groups.

Due to the different composition of the questionnaires, the following numbers per instrument were available for analysis: SF-36 and EuroQol, 436 in the migraine group and 575 in the control group; for NHP-DA, 225 in the migraine group and 287 in the control group; for COOP/WONCA 211 in the migraine group, and 288 in the control group.

The nonresponse analyses did not show significant differences between addressees and respondents in either the migraine group or the control group, suggesting no selective nonresponse.

Respondents' Characteristics.—Demographic characteristics and data relating to the prevalence of self-reported comorbidity are presented in Table 1. The differences between the respondents in the migraine group and the controls were not significant for sex distribution, age, employment status, or educational level. However, after exclusion of "migraine" and "severe headache," the respondents in the migraine group reported significantly more chronic conditions now or in the past year. Especially "diseases of the skin/eczema" (14% in the migraine group, 9% in the control group) and "depression/nervous exhaustion" (29% in the migraine group, 16% in the control group) were more prevalent in the migraine population.

The migraine patients reported an average number of 13 attacks of migraine during the past 12 months (41%, 4 or fewer; 18%, 5 to 9; 23%, 10 to 19; 18%, 20 or more). About 70% of the migraine

Table 1. — Respondents' Characteristics

Feature	Migraine Group (n=436)	Control Group (n=575)
Sex (% female)	84	80
Age, y (mean [SD])	40 (13)	41 (14)
Employment status (% with paid job)	47	44
Education		
Low (%)	34	31
Medium (%)	38	38
High (%)	28	31
Comorbidity (excluding migraine and headache)		
0 conditions (%)	29	43
1 condition (%)	31	27
2 conditions (%)	22	14
> 2 conditions (%)	19	16
Number of conditions (mean[SD])	1.50 (1.54)	1.15 (1.40)

patients consulted a general practitioner for their headaches. Only half of them did so during the past year, and only 6% of them consulted a neurologist during that year.

Health Status: SF-36.—The results of the SF-36 (see Table 2 and Figure 1) show statistically significant worse functioning for the migraine group in all eight domains. The differences are small to medium-sized. The differences between migraine patients and controls are the largest for pain, social functioning, vitality and role limitations due to physical problems.

NHP-DA.—The NHP-1 results (Table 3 and Figure 2) show significant results only for the scales "energy" and "emotional reaction." The effect sizes are small. The results for the NHP-2 (Table 4)

Table 2. — SF-36 Results

Dimensions*	Migraine Group n=436 mean (SD)	Control Group n=575 mean (SD)	MWU *P*/values	Effect Size (*d*)**
Physical functioning	85 (19)	86 (21)	.006	.07
Social functioning	76 (21)	85 (21)	<.001	.39***
Role limitations (physical)	63 (40)	77 (36)	<.001	.34***
Role limitations (emotional)	75 (38)	81 (34)	.007	.17***
Mental health	72 (19)	77 (18)	<.001	.25
Vitality	62 (19)	68 (18)	<.001	.35
Pain	65 (22)	78 (22)	<.001	.57
General health perceptions	68 (20)	73 (18)	<.001	.29

* 0 indicates poor functioning, 100 indicates optimal functioning.
** *d* = .2, small effect; *d* = .5, medium effect; *d* = .8, large effect.
*** Because of nonnormal or noncontinuous distribution of the data of these scales, use of effect size *W* is generally more appropriate. However, computation of *W* did not change the conclusions.

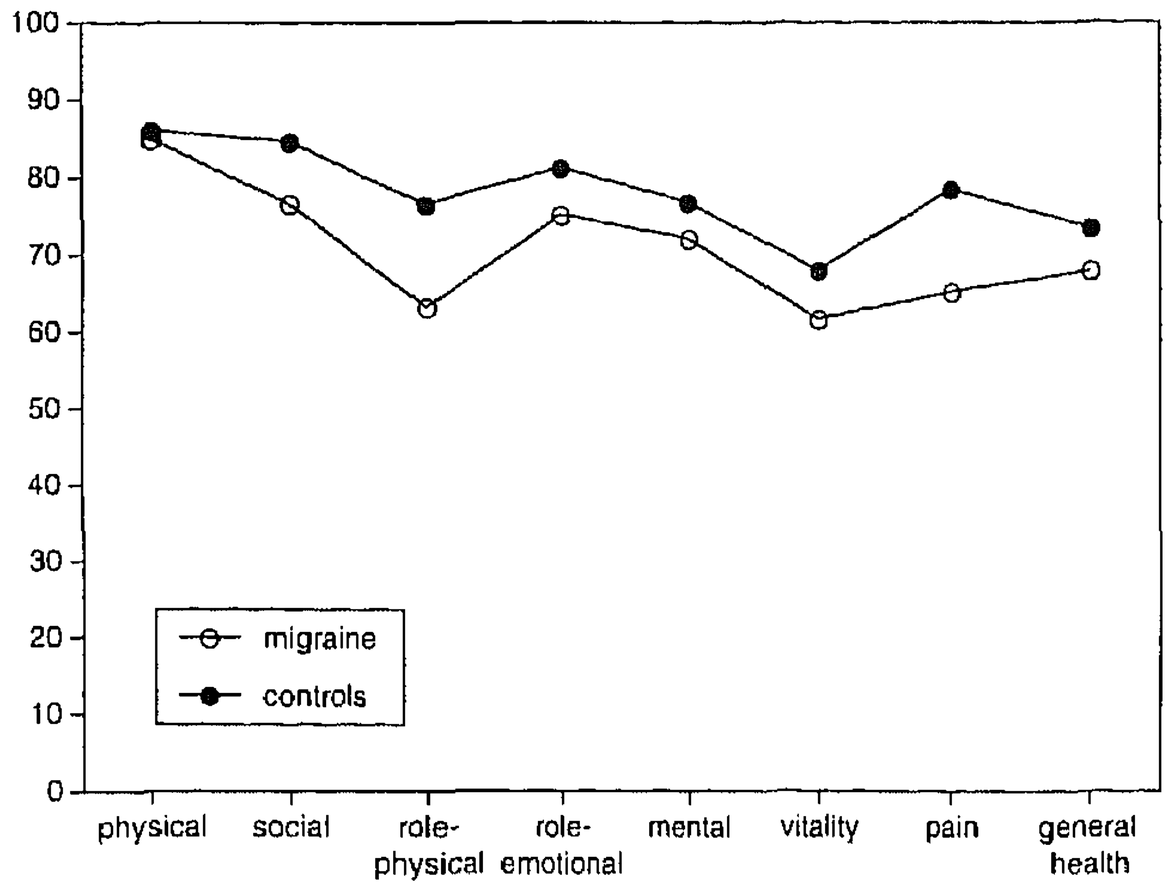

Fig 1.—SF-36 scores. Migraine group (n=436) and control group (n=575).

Table 3 — Nottingham Health Profile - DA (Part 1)

Dimensions*	Migraine Group n=225 mean (SD)	Control Group n=287 mean (SD)	MWU *P* values	Effect Size (*W*)**
Mobility	9 (15)	6 (13)	.013	.12
Energy	20 (29)	12 (24)	.001	.15
Pain	11 (21)	7 (16)	.029	.12
Sleep	13 (24)	11 (22)	.221	.07
Social isolation	8 (18)	5 (14)	.031	.10
Emotional reaction	12 (18)	8 (17)	<.001	.21

* 0 indicates optimal level, 100 indicates worst level.
** *W* = .1, small effect; *W* = .3, medium effect; *W* = .5, large effect. *W* was used here instead of *d* because of nonnormally or noncontinuously distributed data.

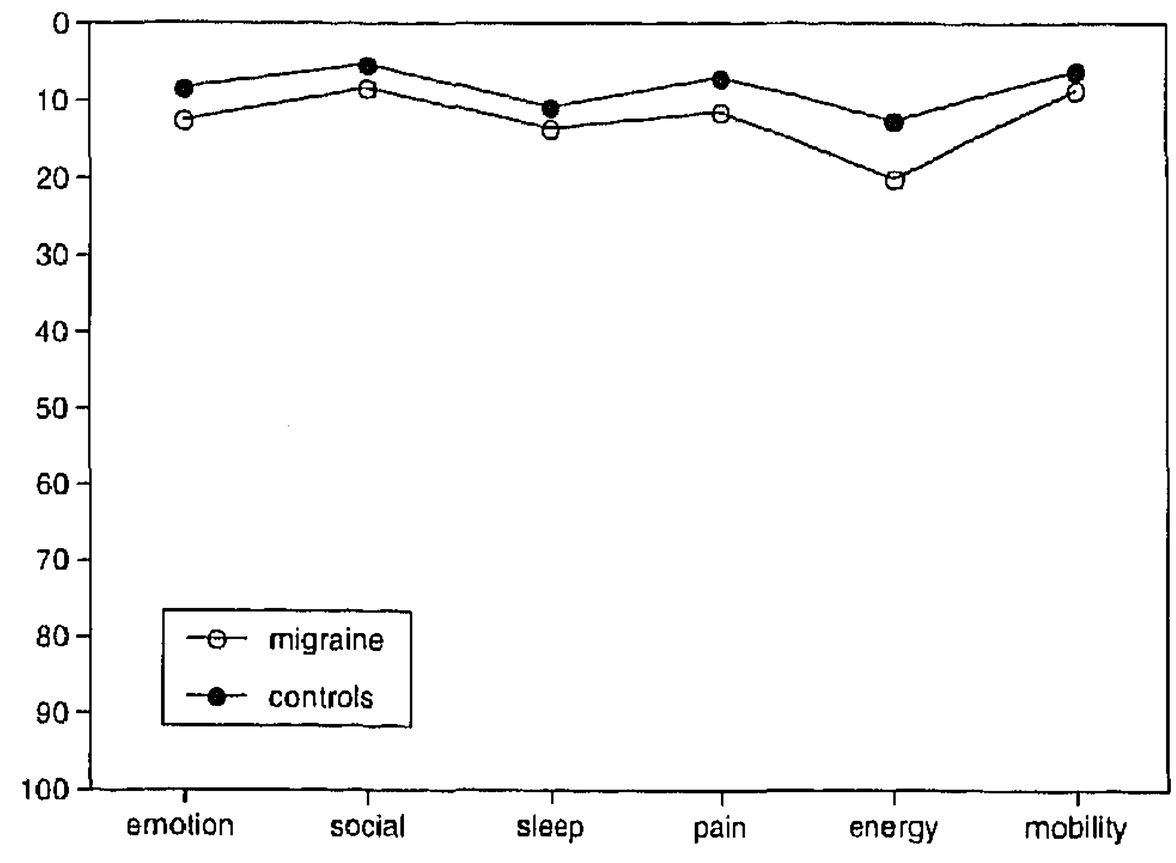

Fig 2.—NHP-DA scores. Migraine group (n=225) and control group (n=287).

Table 4. — Nottingham Health Profile - DA (Part 2)

	Migraine Group n=225 (% yes)	Control Group n=287 (% yes)	Chi-square *P* values	Effect Size (*W*)*
Health Causes Problems For				
Paid job	22	11	.34	.14
Household work	33	15	<.001	.21
Social life	25	11	<.001	.18
Home life	29	8	<.001	.27
Sex life	21	10	<.001	.15
Hobbies	22	14	.025	.10
Holidays	7	5	.335	.04

* *W* = .1, small effect; *W* = .3, medium effect; *W* = .5, large effect.

show that migraine causes significant problems for household work, social life, home life, and sex life; the largest effects are medium-sized (household work and home life).

EuroQol.—Table 5 shows the EuroQol classification scores. The scores of the migraine group are indicative of significantly worse health status of the migraine group for the items "usual activities," "pain/discomfort" and "anxiety/depression" as well as for the "valuation of own health." The effect sizes of these differences are small to medium.

Table 5. — EuroQol Classification Scores

Items	Migraine Group (%) n=436	Control Group (%) n=575	Chi-square *P*/values	Effect Size (*W*)**
Mobility*				
No problems	83.0	87.4	.051	.06
Some problems	16.3	12.4		
Confined to bed	0.7	0.2		
Self-care				
No problems	97.2	98.0	.386	.03
Some problems	2.8	2.0		
Unable to	0	0		
Usual activities				
No problems	72.4	83.3	<.001	.15
Some problems	26.4	14.8		
Unable to	1.2	1.9		
Pain discomfort				
None	49.5	67.4	<.001	.19
Some	46.6	31.2		
Extreme	3.9	1.4		
Anxiety depression				
None	73.0	85.3	<.001	.15
Some	24.6	13.7		
Extreme	2.5	1.1		
Valuation of own health				
0-100 mean (SD)	77 (17)	83 (15)	<.001	.38 (*d*)***

* 1 = optimal level, 3 = worst level.
** *W* = .1, small effect; *W* = .3, medium effect; *W* = .5, large effect.
*** *d* = .2, small effect; *d* = .5, medium effect; *d* = .8, large effect.

COOP/WONCA Charts.—The scores of the migraine group and the control group for the COOP/WONCA charts are shown in Table 6. The lower level of functioning of the migraine group is significant for two of six items, viz, daily activities (small effect) and overall health (medium effect).

Table 6. — COOP/WONCA Charts

Items*	Migraine Group n=211 mean (SD)	Control Group n=288 mean (SD)	MWU *P*/values	Effect Size (*d*)**
Physical fitness	1.7 (1.0)	1.7 (1.1)	.981	.00
Feelings	2.0 (1.0)	1.8 (0.9)	.031	.22
Daily activities	1.9 (0.9)	1.6 (0.8)	<.001	.29
Social activities	1.6 (0.8)	1.5 (0.8)	.210	.19
Change in health	2.6 (0.8)	2.7 (0.8)	.098	.10
Overall health	2.9 (0.9)	2.5 (1.0)	<.001	.39

* 1 = optimal level, 5 = worst level.
** *d* = .2, small effect; *d* = .5, medium effect; *d* = .8, large effect.

Consequences of Comorbidity on Functioning of Migraine Patients.—The results of the study as described above showed worse functioning of the migraine group and a higher prevalence of self-reported comorbid conditions, especially "depression/nervous exhaustion" and "diseases of the skin/eczema." We examined the extent to which the impaired health status of the migraine sufferers could be attributed to migraine and to the most relevant comorbid conditions respectively. We did seven consecutive MCAs with pain(SF-36), role limitations physical(SF-36), vitality(SF-36), social functioning(SF-36), general health perceptions(SF-36), energy(NHP) and valuation of own health(EuroQol) as dependent variables respectively. Each of these MCAs showed significant coefficients for the explanatory variables "migraine" and for "depression" ($P < 0.001$), but insignificant coefficients for "diseases of the skin." The effect of "depression" was larger than the effect of "migraine," except for pain(SF-36). For some of the dependent variables (social functioning(SF-36), valuation of own health(EuroQol), role limitations-physical(SF-36), the interaction effect (migraine* depression) was significant ($P < .01$, .01, and .02 respectively), which indicates that the detrimental effect of the presence of both conditions on the dependent variable is larger than the additive effect of each of them.

COMMENTS

Our study shows that the health status of migraineurs is significantly impaired in comparison with a control group. The direction of the differ-

ences consistently indicated a worse health status of the migraineurs, regardless of the instrument used. The fact that these differences were found with generic instruments, which are meant for assessment of health status ranging from "very bad" to "very good" is an indication that they are real differences. Because statistical significance is distinct from relevance, the differences between the migraine group and the control group were placed in perspective by effect size estimators. The sizes of the differences were small to medium. This finding has face validity; despite the impaired functioning of migraineurs, migraine is generally not a severely incapacitating condition like, for example, end-stage cancer. Comparison of the results of the health status assessments of the migraine sufferers with published results for other patient groups are likely to be flawed to some extent because of different composition of the groups regarding, for example, age and sex. With this precaution in mind, the NHP-DA scores of the migraine group in our study are in the same range as those of a group of Dutch patients with mild airflow obstruction.[30]

The largest differences between migraine sufferers and controls were observed in the areas of pain(SF-36), and to a lesser extent pain/discomfort(EuroQol), role limitations - physical(SF-36), household work(NHP-2); social functioning(SF-36), home life(NHP-2); vitality(SF-36) and energy(NHP), overall health(COOP), and valuation of own health(EuroQol). The unexpected lack of a difference on pain(NHP) can be attributed to the fact that many of the items of this scale relate to pain when walking or standing; pain(SF-36) refers more generally to the amount of bodily pain experienced in the past 4 weeks and its interference with normal work.

Additionally, we explored whether (self-reported) depressive disorders and diseases of the skin, which have a higher prevalence among migraineurs, could explain their health status impairment. The effect of migraine on health status remained significant after correction for these two conditions, which means that migraine has a consistent independent, though moderate, impact on health status.

The relevance of the presented results is twofold. First, the impairment of the overall functioning of migraine patients has been quantitatively documented. Secondly, we showed the effect of migraine on health status to be independent of two relevant comorbid conditions, viz, self-reported depression and diseases of the skin. The impact of migraine on health status justifies the continuing search for cost-effective remedies for this condition. Treating migraine will probably improve the sufferer's functioning. However, migraineurs are at a greater risk of depression and other comorbid conditions, some of which have an additional detrimental effect on health status. Clinical awareness may result in a higher opportunity of treating these associated conditions, with probably additional positive effects on the daily functioning of migraine sufferers.

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