

Migraine and non-migrainous headaches

A community survey in Jerusalem

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SUMMARY The epidemiology of migraine and non-migrainous headaches (NMH) was investigated in a community survey in a neighbourhood of western Jerusalem in 1969–71. Diagnoses were based on histories taken by physicians. Prevalence rates among persons aged 15 and over were 10·1% for migraine (including classical migraine, 2·1%) and 25·6% for frequent NMH (more than once a month). Both migraine and frequent NMH were more prevalent among women. Migraine showed a peak of prevalence among women aged 35–44. Both migraine and NMH were associated with negative self-appraisals of health, emotional symptoms, reports of unsatisfactory present and past life situations, and a reported tendency to 'try harder' and 'hurry more'. No significant relationships were found with blood pressure, education, region of birth, marital status, number of pregnancies, pregnancy status, oral contraceptives, menopause, cigarette smoking, diabetes, preference for a high or low pressure of activities, or the importance attached to striving for achievement. Headaches accompanied by nausea and visual aura occurred four times as often as might have been explained by a chance concurrence of these features, and the occurrence of these symptoms conformed with a Guttman scale. The findings support the concept of migraine as a specific entity, which should possibly be considered as part of a single continuum of headache and related manifestations.

A community health survey conducted by the Department of Social Medicine of the Hebrew University-Hadassah Medical School and Hadassah University Hospital in a neighbourhood of western Jerusalem in 1969–71 provided an opportunity to study the prevalence and correlates of migraine and non-migrainous headaches (NMH) in a population mainly comprising Jewish immigrants from central and eastern Europe, North Africa, and Middle Eastern countries, and their offspring. The study design and factors affecting response have been described elsewhere.¹

Methods

The population studied consisted of all residents aged 20 or over and a 50% sample of those aged 15–19. The investigation comprised an interview at home by a trained lay interviewer and a subsequent examination by a doctor.

The interview schedule included questions on headaches and associated phenomena (see Appendix). People with headaches that were unilateral or associated with nausea or visual disturbances, or who reported 'shining lights' or sudden blindness without headaches, were subsequently questioned on these points by a physician. The diagnosis was based upon the physician's history, using the following criteria:

- (1) *Migraine*—people with headaches sometimes associated with nausea, a visual aura, or both. This category included *classical migraine* which was defined as the occurrence of headaches sometimes associated with both nausea and a visual aura.
- (2) *Non-migrainous headaches (NMH)*—people with headaches but with no associated nausea or visual aura. This category included *frequent NMH*—people with NMH reported as occurring more than once a month.

The strength of associations with other variables was expressed by odds ratios. To control effects connected with age, weighted means of the odds ratios in separate age strata were used.² The odds ratio for migraine is the ratio of the odds in favour of migraine in one group (that is, the number who had migraine in the group divided by the number who did not) to the odds in favour of migraine in another group.

In testing the statistical significance of associations with single independent variables, we controlled for effects connected with age or sex by using the Mantel-Haenszel test² when the independent variable was dichotomous, and Mantel's³ extension of this test when there were more than two orderable categories. Analysis of variance was performed with the ANOVA subprogramme (classic experimental approach) of the SPSS.⁴ Guttman scales were tested by the coefficients used in the SPSS.

Results

The response rate for interviews was 89% and of those interviewed 89% were examined by a doctor, a total response rate of 80%. In this paper we report the results for 4899 people who were both interviewed and seen by a doctor.

Migraine was diagnosed in 10.1% of the respondents, including 2.1% with classical migraine; 65.7% had non-migrainous headaches (NMH) and this proportion included 25.6% with frequent NMH; 24.2% stated that they never had headaches (Table 1).

The prevalence of migraine was 14.5% among women and 5.1% among men. This female preponderance applied to all forms of migraine (Table 1). When age was controlled, the odds in favour of having migraine were 3.8 times as high

Table 1 Numbers and prevalence rates of persons with migraine (by symptom pattern) and non-migrainous headaches (by frequency)

Study respondents	Prevalence rate per cent*		
	Male (n=2248)	Female (n=2651)	Total (n=4899)
MIGRAINE			
With nausea and visual aura (classical migraine)			
Sometimes unilateral	0.5	1.6	1.0
Never unilateral	0.6	1.6	1.1
Total	1.1	3.2	2.1
With visual aura only			
Sometimes unilateral	0.3	0.6	0.4
Never unilateral	0.4	1.2	0.8
Total	0.6	1.8	1.3
With nausea only			
Sometimes unilateral	1.2	3.4	2.4
Never unilateral	2.2	6.1	4.4
Total	3.5	9.5	6.7
Total migraine	5.1	14.5	10.1
NON-MIGRAINOUS HEADACHES			
Frequent (more than once a month)	21.1	29.8	25.6
Infrequent (once a month, or less)	43.8	36.4	40.1
Total non-migrainous headaches	64.9	66.1	65.7
TOTAL HEADACHES	70.8	80.7	75.8

* Number of affected persons per 100 people aged 15+ years. Sex-specific rates are age-standardised, using the total group of examined subjects as the standard population. In calculating the rates for both sexes combined, the data for persons aged 15-19 were weighted in accordance with the 50% sampling ratio in this age group.

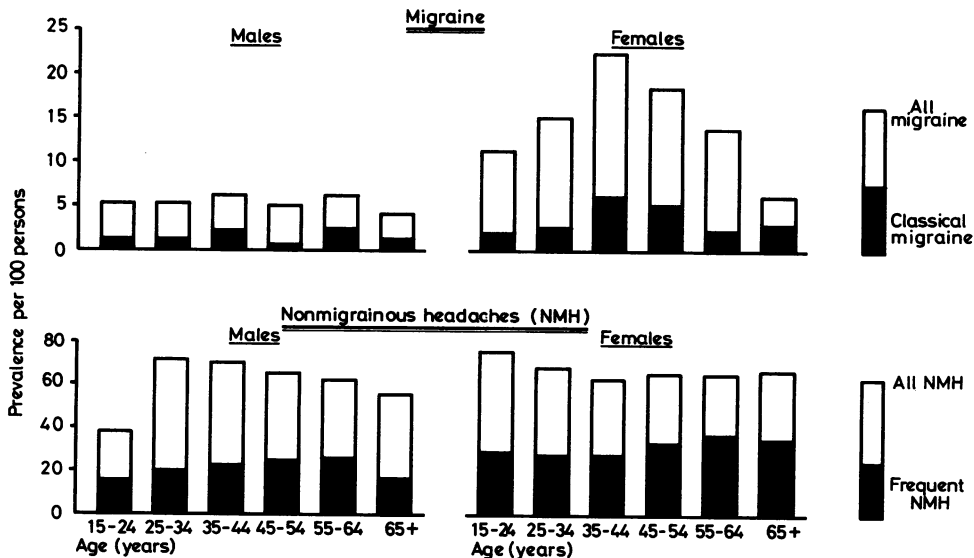


Figure Prevalence of migraine and non-migrainous headaches by sex and age.

among women as among men. For classical migraine the corresponding odds ratio was 3.1, and for frequent NMH it was 1.8.

Among women the prevalence of migraine was highest in middle adult life (Figure). This applied both to classical migraine and to other symptomatic forms. In both sexes the rate was lowest among the elderly. The prevalence of frequent NMH showed a slight tendency to rise with age in each sex, whereas infrequent NMH showed a reverse trend.

Migraine and frequent NMH manifested very similar associations with other variables when controlled for age and sex (Table 2). Both forms of headache were significantly more prevalent among people who appraised their health as poor, those with many emotional symptoms, those who reported current problems and, in the case of women, family disharmony, and those who said their lives had been hard. In addition, both conditions were more frequent, although not always significantly so, among people who felt they applied more effort than others to tasks, those who reported symptoms of angina pectoris, and men in Social Classes IV and V. Relationships with 'trying harder' and 'hurrying more' tended to be stronger for migraine than for NMH. The same relationships were found with classical migraine as with migraine as a whole.

No significant age-independent relationships were found between migraine or NMH and blood pressure, education, region of birth, marital status, parity, pregnancy, oral contraceptives, menopause, cigarette smoking, diabetes, a preference for a high or low pressure of activities in daily life, or the importance ascribed to striving for achievement.

Table 2 Associations with migraine and frequent non-migrainous headaches. Odds ratios adjusted for age

Characteristic	Migraine		Non-migrainous headaches ^a	
	Male	Female	Male	Female
Poor health (self-appraisal)	3.1***	2.3***	2.4***	2.3***
Four or more emotional symptoms ^b	2.7***	—	2.5***	—
Current problems ^c	2.0**	1.5**	1.4**	1.5***
Frequent serious quarrels in family	1.3	1.8**	1.4	2.0**
Had a hard life ^c	2.8***	2.2***	1.7*	2.4***
Drive ('tries harder than others') ^c	2.0**	1.6**	1.2	1.5**
Needs to hurry more than others ^c	1.8*	1.6**	1.4*	1.1
Angina pectoris ^d	1.6	2.0**	1.6	1.6*
Low social class ^e	1.8*	—	1.3	—

* P < 0.05 ** P < 0.01 *** P < 0.001

- People with migraine were excluded from this analysis.
- Data not available for women.
- More than two response categories. Odds ratio based on comparison of extreme categories; significance tested by Mantel's extension of Mantel-Haenszel test.
- Categories: definite (grades I and II, as defined by Rose and Blackburn⁹), doubtful, and absent.
- Social Classes IV–V compared with Social Classes I–III; data not available for women.

The results of analyses of variance are summarised in Table 3. When effects connected with self-appraisal of health, current problems, family disharmony, and a hard life were controlled, age was significantly related to migraine but not to NMH, and only among women. Both disorders were significantly associated with the self-appraisal of health in each sex, and with family disharmony among women. The effects of current problems and a hard life were not statistically significant. There were no noteworthy interactions. When the age-specific rates were adjusted by multiple classification analysis so as to control for effects connected with the other factors included in the analysis of variance, the rates for migraine were similar to the unadjusted rates shown in the Figure. Among women there was a peak prevalence of 22% at ages 35–44.

Table 3 Associations with migraine and frequent non-migrainous headaches. Analysis of variance: beta values^a

Main effects	Migraine		Non-migrainous headaches ^b	
	Male	Female	Male	Female
Age	0.08	0.16***	0.05	0.09
Self-appraisal of health	0.12***	0.13***	0.16***	0.16***
Frequent serious problems in family	0.01	0.04*	0.01	0.06**
Current problems	0.05	0.01	0.04	0.04
Difficulty of past life	0.06	0.06	0.04	0.07

Statistical significance based on *F* tests: * P < 0.05; ** P < 0.01; *** P < 0.001.

- The data for each factor are adjusted for effects connected with all four other factors (see Methods). Beta values are standardised partial regression coefficients.
- People with migraine were excluded from this analysis.

Discussion

Widely divergent prevalence rates have been reported for migraine, ranging from under 1%⁶ to over 20%.⁷ This variation can be largely ascribed to differences in study methods and diagnostic criteria.⁸ There is thus little point in comparing the rates found in this study with those reported elsewhere. Although there is a fair consensus on the conceptual definition of migraine, no generally accepted operational definition exists.

SEX AND AGE

Migraine and frequent NMH were more prevalent, migraine markedly so, among women than among men. This is the usual finding in surveys of migraine⁸ and headache.^{9 10}

Migraine, but not NMH, manifested a peak among women aged 35–44, which remained apparent in the analysis of variance. Migraine frequently occurs at about the time of menstruation, as do non-migrainous headaches.¹¹ However, when age

was controlled we found no association with menopause, current pregnancy, or parity. The surveys⁹ of migraine by Waters and O'Connor in England and Wales do not show consistent age relationships.

The low prevalence of migraine observed among the elderly may be explained by a tendency, noted by Fry¹² for many cases, to remit after 10–15 years. Among patients with severe migraine, Whitty and Hockaday¹³ found that vomiting and aura tended to disappear with advancing age.

PSYCHOLOGICAL DISTRESS

The associations observed with poor subjective health and with reports of emotional symptoms and difficulties in the life situation conform both with everyday experience and with the results of other studies of migraine and NMH.^{14–16} The observed relationships of angina pectoris with migraine and NMH may reflect the common role of psychological distress in producing all three sets of symptoms.

Relationships with drive ('trying harder') and time pressure ('hurrying more') tended to be stronger for migraine than for NMH.

BLOOD PRESSURE

No relationships were found with blood pressure. This accords with the findings of other population surveys of migraine and NMH,^{17, 18} and of headaches in general.¹⁹

SMOKING

There is conflicting evidence on the role of smoking. Like the present study, a population study in Finland showed no relationship with headache,⁹ but associations with migraine and NMH were found in a population-based survey of young men in Sweden,¹⁸ as was an association with migraine symptoms among young women in the United States of America.¹⁴

IS MIGRAINE A SPECIFIC ENTITY?

Waters¹⁶ has considered the possibility that migraine may not be a true syndrome, but a chance concurrence of various features of headache. He found only slight evidence for a true syndrome in his postal survey in Pontypridd, Wales. A principal components analysis by Ziegler *et al*²⁰ of the symptoms of patients with recurrent headaches revealed no single factor that brought together nausea, visual scotomata before a headache, and unilateral pain, or any pair of these three features.

The present study provides stronger support for a migraine syndrome. People with headaches associated with both a visual aura and nausea were four times as numerous as might have been explained by a chance concurrence (Table 4). Controlling for

Table 4 Observed and expected numbers with both visual aura and nausea

	Male	Female	Total
Observed	24	84	108
Expected*	2.7	22.7	25.4
Ratio observed:expected	9.0	3.7	4.3

* Calculated from the age- and sex-specific prevalence rates of visual aura and nausea among people reporting headaches.

age and sex, the odds (for a person with headaches) in favour of having either one of these features were raised 13.6-fold when the other feature was present ($P < 0.000001$). This stronger support for a migraine syndrome may be due to the use of information obtained by physicians. When the home interview data were used the association between nausea and visual disturbances was less strong, although still highly significant (odds ratio = 2.8; $P < 0.000001$). It is of interest that calculations based on a study of headaches among general practitioners in England²¹ show more clustering of symptoms than the population survey in Pontypridd; among male doctors with headaches the concurrence of pain, warning, and nausea was 2.4 times the chance expectation, compared with 1.6 times in Pontypridd. Information obtained by physicians may be of higher validity than questionnaire data from laymen, especially with regard to aura. In our study, the number of people who reported visual symptoms in the home interview was 100% higher than the number with visual aura according to the physicians' histories; for nausea the corresponding excess was 36%.

The findings are reminiscent of those in a previous survey²² in this population, in which the association between morning stiffness and diagnoses of rheumatoid arthritis, based upon subsequent clinical, serological, and radiological examinations, was far stronger when the information on morning stiffness was obtained by a physician than when the symptom was reported in a home interview; morning stiffness was over three times more frequent according to home interviews than according to questioning by physicians. We have, however, no independent criteria of the validity of data on concomitants of headaches, and we cannot exclude the possibility that the association between symptoms may be at least partly caused by bias resulting from the physicians' preconceived opinions.

Nausea and visual aura were not only associated but also tended to occur in a specific pattern. Among people with headaches these manifestations showed a good fit with the model of a Guttman scale, suggesting that nausea and aura not only 'hang together', they mark successive points along a single dimension. Only 62 people (1.7%) failed to fall into

the perfect scale types shown in the first three lines of the following table:

<i>Nausea</i>	<i>Aura</i>	<i>No.</i>
+	+	108
+	-	330
-	-	3217
-	+	62

These data yielded high coefficients of reproducibility (0.98) and scalability (0.80); values exceeding 0.90 and 0.60 respectively are generally regarded as indicating satisfactory conformity with a Guttman scale. The coefficients were almost identical among men and women. The first scale type represents classical migraine, the second common migraine, and the third NMH.

Waters¹⁶ has raised the possibility that migraine may be 'an extreme in a continuum rather than a completely distinct clinical entity'. This hypothesis need not clash with the concept of migraine as a specific entity. Classical and common migraine, migrainous phenomena (for example, scintillating scotomata) without headache, and headaches unaccompanied by specific features of migraine might have enough common elements in their aetiology or pathogenesis to be considered as a single continuum; and yet the total constellations of causes that lead to migraine and to other headaches might be sufficiently different, in quantitative or qualitative terms, to warrant consideration of migraine as a specific entity.

In the present study, when the Guttman scale described above was extended by adding frequency of headaches (more than once a month), an acceptable three-item scale was produced, with coefficients of reproducibility and scalability of 0.96 and 0.82 respectively:

<i>Frequent</i>	<i>Nausea</i>	<i>Aura</i>	<i>No.</i>
+	+	+	75
+	+	-	226
+	-	-	1264
-	-	-	1953
-	+	-	104
-	+	+	33
+	-	+	32
-	-	+	30

This suggests that these three items are measures of a single dimension. The four perfect scale types (the top four lines) represent classical migraine, common migraine, frequent NMH, and infrequent NMH. This evidence for a single continuum is, however, less convincing than it may appear, since the 199 people in non-scale types constituted no less than 40% of the 500 who had migraine. The data may represent a combination of two overlapping spectra, one for migraine and one for NMH.

Like the Guttman scale analysis, the pattern of relationships observed with migraine and NMH

supports the existence of a specific migraine entity, without being inconsistent with the concept of migraine as part of a continuum. The differences between migraine and frequent NMH in their sex and age relationships—the more marked female preponderance exhibited by migraine, and the prevalence peak of migraine among women in middle adult life—suggest that migraine and NMH as defined in this study are different entities, in the sense that they have at least some distinct aetiological features. Yet in other respects there was a striking similarity in the patterns of relationships. This applied to almost every association examined (other than sex and age), and presumably means that these disorders have some common causes. This finding is consistent with the concept that these disorders form a unified continuum. It does not, however, inevitably lead to this conclusion, since the similarity of relationships might reflect misclassification caused by imperfect discrimination between migraine and NMH, or it could be an expression of a non-specific propensity to complain. Whatever the explanation, the finding has the practical if truistic implication that psychological and situational factors require consideration in the management and prevention of all common forms of recurrent headache.

This study was supported by the United States Public Health Service (PL480 counterpart funds, Research Agreement No. CD-IS-20) and the Bureau of the Chief Scientist of the Israeli Ministry of Health. Professor Abramson is an established investigator of the Chief Scientist's Bureau.

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Appendix

The interview schedule included the following questions (literally translated from the Hebrew). Questions (b), (c), and (d) were asked only if headaches were reported. All subjects, including those without headaches, were asked questions (e) and (f).

- How often do you have headaches—once a month, less than once a month, more than once a month, or never?
- Do you usually have the pain on one side or on both sides?
- Is the headache ever associated with nausea or vomiting?

- (d) Is the headache ever associated with shining lights before the eyes?
- (e) Have you ever had blindness that started suddenly?
- (f) Have you ever felt shining lights before your eyes?

If there was a report of headaches that were unilateral or associated with nausea or 'shining lights', or of 'shining lights' or sudden blindness without headaches, the examining physician was informed that a history suggesting possible migraine had been given, and was asked to clarify the situation by further questioning and to provide the following information:

- Does the person have headaches?
- If so, are they usually predominantly unilateral?
- Are they ever accompanied by nausea or vomiting?
- Are they ever preceded by a scintillating scotoma or other temporary visual disturbances?

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