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Health-related quality of life among Canadians with migraine

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Abstract The objective was to determine the impact of migraine on health-related quality of life (HRQOL) among Canadians. Analysis was based on the public use microdata set of the Canadian Community Health Survey (CCHS), limited to those aged ≥ 15 residing in Manitoba. HRQOL was measured using the SF-36 survey, which covers 8 health concepts. Multivariate linear regression was used to model each SF-36 scale against age, gender, education, income, migraine status and presence of mood or anxiety disorders. Of the 7236 CCHS respondents, 9.7% reported a diagnosis of migraine. Reported migraine pre-

dicted statistically significant ($p < 0.0001$) lower HRQOL in all SF-36 domains with profound impairment of physical role, bodily pain and general health. Those reporting a mood disorder scored significantly lower in all domains with pronounced effects on emotional role, social functioning and general health. Reported anxiety disorder was associated with lower HRQOL in 6/8 domains. Canadians with migraine report significant impairment in HRQOL compared to the general population, independent of psychiatric morbidity.

Keywords Headache · Migraine · Health-related quality of life · SF-36

Introduction

Migraine affects 3%–10.6% of the population and results in substantial morbidity and economic burden [1]. The impact of migraine may reach far beyond the episodic pain associated with headache attacks. From the patients' perspective, the effects are dramatic and migraine-related disability has both physical and emotional dimensions. The effect on perceived quality of life may persist between migraine headaches because of their inherent unpredictability. As a public health concern with enormous potential impact on society, a better understanding

of the effect of migraine on quality of life may improve the allocation of appropriate resources and research directed towards migraine.

Health-related quality of life (HRQOL) refers to the patient's perception of the overall effect of illness and its treatment on his or her ability to live a fulfilling life [2]. As a concept it closely resembles the World Health Organization's definition of health itself [3]. Traditional measures of clinical efficacy such as reduction in headache frequency, duration or severity fail to fully assess the patient's perspective of living with migraine. Over 50 years ago, Lembecke expressed a holistic approach when he wrote: "the best measure of quality is

not how well or how frequently a medical service is given, but how closely the result approaches the fundamental objectives of prolonging life, relieving distress, restoring function and preventing disability” [4]. There has been a recent renewal of interest regarding the impact of migraine on HRQOL. HRQOL measurement tools communicate the impact of illness on the patient’s well-being, providing unique insight into the evaluation and management of migraine. Previous studies have indicated significant reductions in HRQOL among subjects with migraine [5–10]. Despite the episodic nature of migraine, HRQOL has been shown to be comparable to living with chronic diseases such as diabetes and arthritis [5]. However, the majority of these studies have been conducted in clinic-based settings, which potentially select for more severe or more disabling migraines.

It is well known that migraine is strongly associated with anxiety and depression. A recent Canadian-based population study confirmed the frequent co-occurrence of migraine and major depression [11]. However, little is known about the impact of anxiety and depression on migraine-related disability and quality of life. Lantéri-Minet et al. [12] found increased migraine disability and greater impairment in HRQOL when migraine was associated with anxiety and depression. The complex interaction of such characteristic psychiatric disorders with migraine subjects’ well-being and functional status is poorly understood and under-recognised.

In this study we compare HRQOL using the SF-36 among Canadians reporting migraine with the general population in the province of Manitoba, correcting for the impact of mental health.

Materials and methods

To assess HRQOL, we used the Medical Outcomes Study 36-Item Short Form (SF-36), which is a well established measure of

HRQOL with excellent reliability and validity [13]. It is considered a generic measure of HRQOL because the categories of functional status and well-being are not age-, disease- or treatment-specific [13]. The SF-36 covers 8 health concepts related to functional status, well being and overall evaluation of health by asking subjects to self-rate 36 items reflecting these health domains (Table 1). All domains are scored on a scale of 0 to 100, with 100 indicating the best possible health state [13]. The SF-36 also includes two summary scores: one for physical health and another for mental health. Normative data for the SF-36 health survey is available for age group, gender and country.

The Canadian Community Health Survey (CCHS) is a cross-sectional survey that collects information related to health status, health care utilisation and health determinants for the Canadian population. A stratified cluster sample design is used to obtain information on Canadians aged 12 years or older living in private dwellings in the ten provinces and the three territories, exclusive of persons living on First Nations Reserves or Crown lands, residents of institutions, full-time members of the Canadian Armed Forces and residents of certain remote regions. Information is collected every 2 years [14, 15].

Our analysis was based on the public use microdata set of the Canadian Community Health Survey, Cycle 2.1 (2003) [16]. Within this survey, there are question sequences addressed to all respondents, and sections that are addressed to specific sub-populations, generally to residents of specific provinces or health districts. All respondents were asked, “Do you have migraine headaches?” SF-36 data were available for all respondents residing in the province of Manitoba. All Manitoba residents had been asked “Do you have a mood disorder such as depression, bipolar disorder, mania or dysthymia?” and “Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder or a panic disorder?” These questions could be validated against other specific mental health data such as medication use, visits with mental health professional and the depression scale within other sub-populations in the same survey.

The data were analysed using Systat v9.0 [17]. Weights were recoded to reflect the sample size (an average weight of 1). As there have been previous reports of the association of migraine with the SF-36 scores and known correlation between variables (for example education and household income), we patterned our analysis on these previous reports using multivariate linear regression with similar variables, namely age (15–79 years in 5-

Table 1 Description of the SF-36 Health Survey

SF-36 health domain	Number of items	Definition
Physical functioning	10	Capacity to perform a variety of physical activities
Role disability due to physical problems	4	Extent to which physical health interferes with usual daily activities
Bodily pain	2	Extent of bodily pain in the past 4 weeks
General health	5	Overall ratings of health in general
Vitality	4	General energy, tiredness in past 4 weeks
Social functioning	2	Extent to which health interferes with normal social activities
Role disability due to emotional problems	3	Extent to which emotional problems interfere with usual daily activities
Mental health	5	General mood or affect, including depression, anxiety and positive well-being in the past 4 weeks

year increments, >80 years), gender, education (less than secondary, secondary graduate, some post-secondary, post-secondary graduate) and household income (no income, CDN\$ 15 000–29 999, 30 000–49 999, 50 000–79 999, 80 000+). As the stratification and clustering involved in the sample design is only partially incorporated by the provided weights in the public use datasets, the underlying sample variances were still likely to be underestimated. Because of this, and the application of multiple statistical tests, we chose 0.0005 as a threshold alpha for statistical tests involving discrete factors within multivariate regression analysis of the SF-36 scales. We limited our analysis to respondents aged 15 through >80 years. The validation data of the self-reported mood and anxiety disorders are presented as odds ratios. All analyses were performed within the parameters outlined for analysis of Statistics Canada microdata files.

Results

There were a total of 7243 respondents from Manitoba. Data were missing on migraine status for 0.1% ($n=7$) and these respondents were excluded from the analysis. Data were missing on marital status for 0.5%, education 1.9%, income 18%, mood disorder 0.2% and anxiety disorder 0.2%.

Of the remaining 7236 respondents, 699 (9.7%; 95% CI: 8.9–10.5) reported migraine headaches, with a gender distribution of 79.2% female. In the non-migraine group, 47.9% were female ($p=0.001$). There were no significant

differences in marital status, education levels or income bracket in migraineurs vs. the normative Manitoba data (Table 2). The migraine group reported higher frequencies of both mood disorders (11.4% vs. 4.1%) and anxiety disorders (7.1% vs. 2.8%) ($p<0.001$).

A comparison of SF-36 health scores for migraineurs vs. the normative Manitoba data is presented in Figure 1. In a multivariate analysis, reported migraine diagnosis predicted statistically lower HRQOL scores across all 8 health domains ($p<0.0001$) and lower summary measures of both physical and mental health (Table 3). In 6 of 8 HRQOL domains, reductions in scores were greater than 5 points, which is recognised as a clinically significant reduction in both univariate (Fig. 1) and multivariate analysis (Table 3) [13]. Migraine was associated with the most dramatic impairment in the domains of physical role, bodily pain and general health perceptions, while mental health scores were least affected.

The presence of a mood disorder dramatically decreased all 8 HRQOL scores ($p<0.0001$) with large reductions in scores ranging from 5.4 to 22.3. Mood disorders were associated with profound impairment in the domains of emotional role, social functioning and general mental health. Reporting an anxiety disorder also significantly impaired 6 of 8 HRQOL domains, with less impact on physical functioning and vitality. Anxiety disorder had most pronounced effects on physical role, emotional role and general mental health.

Table 2 Demographic characteristics and comorbidities of migraine vs. non-migraine populations

	All	Migraine	Non-migraine
Age (years), mean (quartiles)	43 (29.5, 57)	44 (27, 43)	43 (29.5, 58)
Gender, female, %	50.9	79.2*	47.9
Marital status			
Married, %	56.5	53.1	56.8
Common-law, %	5.2	9.2	4.8
Widowed, separated, divorced, %	12.0	8.5	12.3
Single, %	26.4	29.2	26.1
Education			
Less than secondary, %	27.5	22.5	28.0
Secondary graduate, %	21.6	24.2	21.3
Other post-secondary, %	8.4	8.5	8.4
Post-secondary graduate, %	42.5	44.7	42.3
Income			
<15 000, %	6.1	6.6	6.0
15 000–29 999, %	15.1	14.1	15.2
30 000–49 999, %	24.8	27.4	24.6
50 000–79 999, %	27.2	24.7	27.5
>80 000, %	26.8	27.2	26.7
Mood disorder, %	4.8	11.4*	4.1
Anxiety disorder, %	3.2	7.1*	2.8

* $p<0.001$

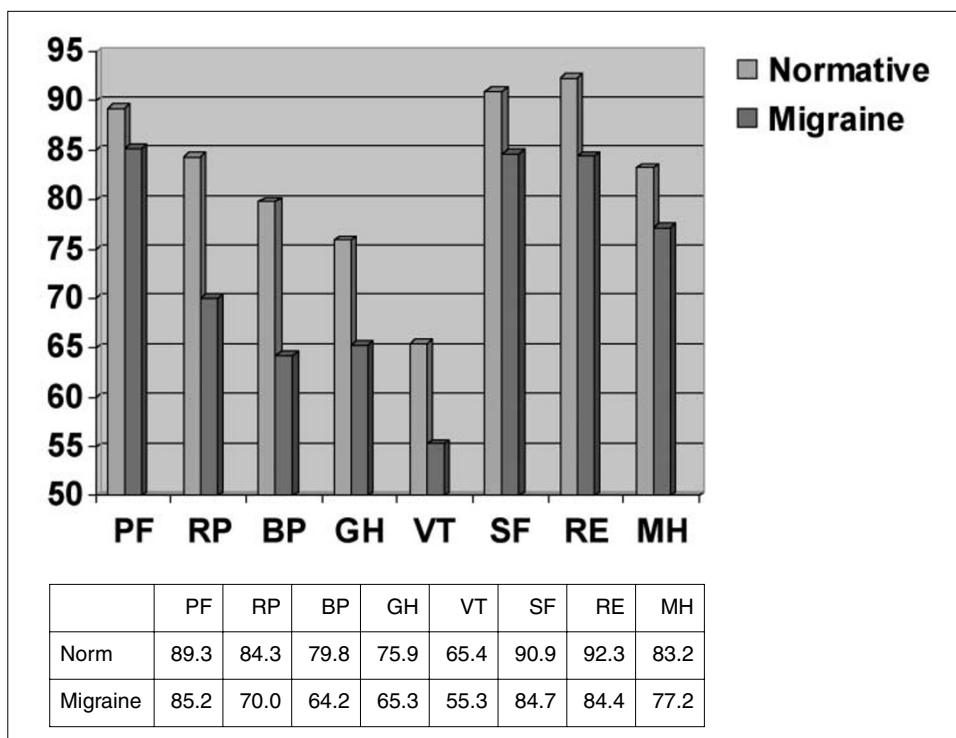


Fig. 1 SF-36 scores for subjects with migraine vs. the general population in Manitoba
PF, physical functioning; *RP*, role-physical; *BP*, bodily pain; *GH*, general health; *VT*, vitality; *SF*, social functioning; *RE*, role-emotional; *MH*, mental health

Table 3 Results of multivariate linear regression analyses to test migraine and mood/anxiety disorders as predictors of each SF-36 scale score

	Physical functioning	Role-physical	Bodily pain	General health	Vitality	Social functioning	Role-emotional	Mental health	Summary physical health	Summary mental health
Constant	96.4	89.2	85.7	77.3	66.8	90.2	91.9	81.2	56.5	55.4
Age category	-2.17**	-1.07**	-0.98**	-1.00**	-0.18	-0.30*	0.46**	0.41**	-0.28**	0.80**
Gender (declines with female gender)	-3.62**	-2.28	-1.67	-0.24	-4.14**	-1.06	-0.91	-1.40	-1.68*	-1.21
Education	1.38**	0.35	0.37	1.19**	0.12	0.34	0.58	0.05	0.43	0
Household income	1.99**	1.56*	0.75	1.47**	1.10**	1.53**	-0.21	0.71**	-0.07	-0.51
Migraine	-5.79**	-13.64**	-17.1**	-11.43**	-9.34**	-4.46**	-5.17**	-4.29**	-6.67**	-2.70**
Mood disorder	-5.41**	-12.88**	-6.46**	-9.89**	-12.16**	-16.14**	-22.28**	-15.0**	-1.37	-8.01**
Anxiety disorder	-2.92	-11.65**	-8.37**	-6.35*	-3.81	-8.49**	-11.00**	-8.63**	-2.30	-4.53**

* $p < 0.0001$; ** $p < 0.00001$

SF-36 scores were generally lower for females, as previously reported in Canadian normative data [18]. This effect was primarily in physical functioning and vitality scores. Increasing age categories significantly lowered all SF-36 domains, with the exception of vitality. There was a decline in scores with each 5-year age category. Increased education levels predicted higher physical functioning and general health perception scores. Advances in household income level also had a positive effect on all domains except role disability due to emotional problems and a mild effect on the bodily pain scale (Table 3).

The validity of a self-reported mood disorder was established by correlation with tranquilliser use (OR 8.9, $p < 0.0001$), antidepressant use (OR 56.8, $p < 0.0001$) and contact with a mental health professional (OR 23.3, $p < 0.0001$). Those reporting a mood disorder also scored higher on the depression scale, with an average score of 2.88; where a score of 3 represents a 50% likelihood of depression [19]. Similarly, the validity of self-reported anxiety disorder was established by correlation with tranquilliser use (OR 9.9, $p < 0.0001$), antidepressant use (OR 19.9, $p < 0.0001$) and contact with a mental health profes-

sional (OR 11.1, $p < 0.0001$). Of those reporting a mood disorder, one third also report on anxiety disorder.

Discussion

In this large population-based study we observed substantial HRQOL morbidity with migraine across all SF-36 health domains. The presence of a mood and/or an anxiety disorder also negatively affected HRQOL, but the effect of migraine was independent, remaining highly significant after correcting for mental health disorders.

Several previous studies have shown lower HRQOL for migraineurs. Monzon and Lainez [6] showed lower SF-36 scores for migraine patients compared to healthy controls across all 8 domains. A population-based study using the RAND-36 (a Dutch translation of the SF-36) similarly demonstrated decreased scores on all 8 health domains for migraineurs [7]. We have observed a comparable trend with statistically significant reductions in all 8 subscales for subjects with migraine compared to their non-migraine counterparts. Migraine was associated with clinically significant reductions in 6 of 8 subscales, while mood disorders were associated with clinically significant declines in all HRQOL domains. To put these reductions in perspective, a drop of 20 points on the mental health scale is consistent with a tripling in the probability of suicidal ideation and doubling of the probability of depression [13]. Such a reduction in HRQOL could be easily observed with combined impact of migraine and mood disorder, for example.

It is well recognised that psychiatric comorbidity may confound studies of migraine HRQOL. Therefore, it is critical to account for the potentially confounding effects of mood and/or anxiety disorders that also negatively impact HRQOL. As expected, we observed high comorbidity for migraine and mood/anxiety disorders. Mood and anxiety disorders were associated with significant decrements in HRQOL. Our results are compatible with a previous US/UK population-based study, which showed migraine and depression to each have a significant and independent negative impact on HRQOL [8]. Our multivariate models demonstrate that subjects with migraine have reduced HRQOL independent of comorbid depression or anxiety.

Migraine had the greatest negative impact in role physical, bodily pain and general health perceptions. A similar trend was observed by Osterhaus et al. [5], who conducted the SF-36 survey in a migraine population recruited from general practitioners, newspapers and referrals, and showed the greatest reductions in the bodily pain and role physical scales among migraineurs. Role

physical and bodily pain have substantial validity as measures of physical health [13]. Mood disorders had the most impact on social functioning, role emotional and general health domains, while anxiety had the greatest impact on role physical, role emotional and general mental health. According to Ware, mental health is best evaluated by the mental health, role emotional and social functioning domains of the SF-36, while the general health measure encompasses both physical and mental health [13]. Migraine and mood/anxiety disorders tend to affect different HRQOL domains and therefore the presence of both disorders may have a profound effect on quality of life.

Although HRQOL instruments like the SF-36 provide insight into the impact of migraine on functional status and well-being, they are potentially affected by other individual factors (e.g., finances, relationships, accommodation, recreational activities). Because HRQOL is a global measure of well-being, advances in education and income level are, not unexpectedly, associated with improved quality of life. In our study, however, there were no significant differences in income or level of education among migraineurs vs. non-migraineurs. This is in contrast to a previous multi-national study, where 39% of migraine patients reported a negative impact on job or school performance and 16% reported that migraine prevented them from achieving career goals [20]. However, this study was limited to women between 18 and 35 years old with migraine and based on subjective responses regarding impact of migraine on job, education and career goals, while our study assesses more objective measures of income and education level.

The diagnosis of migraine in our patients was based on a diagnosis by a health practitioner rather than on specific criteria. To our knowledge, the question about migraine used in the CCHS has not been validated against an external standard. A similar question, "Have you ever had migraine?", has been validated against a diagnostic telephone interview administered by physicians trained in headache diagnosis, with a sensitivity of 75.8% (95% CI: 72.4–79.0) and specificity of 86.4% (95% CI: 84.3–88.3) [21]. In an Internet-based study of subjects reporting migraine, after reviewing subjects' narrative description of headache qualities, a neurologist assigned a high or moderate probability of migraine to 97%, and to 97% using IHS criteria [22]. These studies suggest that the question used in the CCHS may be valid. Despite the self-reporting of migraine diagnosis in our study, the prevalence and gender distribution are compatible with published Canadian data [23].

Our study was based on a large cross-sectional, provincially representative population with a remarkably complete dataset. The representativeness of the sample and high participation rate are superior to studies done within a

clinical setting as there is little potential for bias. Such provincially representative datasets are designed to guide health policy. Supplementary analyses of these same datasets have the potential to answer clinically relevant, important questions. One drawback to these supplementary analyses is that relevant and pertinent questions may not have been asked of the respondents within the original survey. We were unable to assess the effects of migraine severity or frequency on HRQOL as this data was not collected in the CCHS. One previous population-based study has examined the impact of migraine frequency, duration and severity on HRQOL and identified frequency as an important predictor of mental and physical HRQOL [8].

In this population-based study, Canadians with migraine report clinically and statistically significant

impairment in HRQOL compared to those without migraine. This effect is independent of psychiatric comorbidities such as depression and anxiety. Nearly 10% of the Canadian population report a diagnosis of migraine with the potential for substantial HRQOL burden. Incorporation of HRQOL instruments into the assessment and management of migraine will undoubtedly become an essential part of migraine evaluation and treatment. Given the frequently observed detrimental impact on physical components of the SF-36 among migraineurs, these HRQOL dimensions may play an integral part in optimising therapeutic goals for individuals with migraine. Efforts at migraine management should include lifestyle strategies aimed at improving well-being for those with migraine.

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