Work stress as a risk factor for major depressive episode(s)

JIANLI WANG*

*Departments of Psychiatry and of Community Health Sciences, Faculty of Medicine,
University of Calgary, Calgary, Alberta, Canada*

ABSTRACT

Background. Major depression is a prevalent mental disorder in the general population, with a multi-factorial etiology. However, work stress as a risk factor for major depression has not been well studied.

Method. Using a longitudinal study design, this analysis investigated the association between the levels of work stress and major depressive episode(s) in the Canadian working population, aged 18 to 64 years. Data from the longitudinal cohort of the Canadian National Population Health Survey (NPHS) were used ($n = 6663$). The NPHS participants who did not have major depressive episodes (MDE) at baseline (1994–1995 NPHS) were classified into four groups by the quartile values of the baseline work stress scores. The proportion of MDE of each group was calculated using the 1996–1997 NPHS data.

Results. The first three quartile groups had a similar risk of MDE. Those who had a work stress score above the 75th percentile had an elevated risk of MDE (7·1%). Using the 75th percentile as a cut-off, work stress was significantly associated with the risk of MDE in multivariate analysis (odds ratio = 2·35, 95% confidence interval 1·54–3·77). Other factors associated with MDE in multivariate analysis included educational level, number of chronic medical illnesses and child and adulthood traumatic events. There was no evidence of effect modification between work stress and selected sociodemographic, clinical and psychosocial variables.

Conclusions. Work stress is an independent risk factor for the development of MDE in the working population. Strategies to improve working environment are needed to keep workers mentally healthy and productive.

INTRODUCTION

Major depression is one of the most prevalent mental disorders and has a multi-factorial etiology. In addition to genetic factors, childhood traumatic events and recent stressful life events have been found to be strong risk factors for major depression (Kendler *et al.* 2002). In the workplace, however, one important risk factor for depressive disorders may be work stress. The demand–control model posits that the situations in which one's control over one's work is low and the psychological demands imposed by one's work are high may lead the negative outcomes, such as fatigue and depression (Karasek & Theorell, 1990). Previous studies indicate that work stress increases the risk of physical illnesses (Theorell *et al.* 1998; Melamed *et al.* 1999; Myers *et al.* 1999) and of psychological distress (Matthews *et al.* 2001; Bultmann *et al.* 2002) and is associated with the level of depressive symptoms (Iwata *et al.* 1988; Stansfeld *et al.* 1997, 1999). However, work stress as a potential risk factor for major depressive episodes (MDE) has not been examined.

* Address for correspondence: Dr JianLi Wang, Department of Psychiatry, Peter Lougheed Centre, Room 3645, 3500-26 Ave NE, Calgary, Alberta, Canada, T1Y 6J4.
   (Email: jianli.wang@calgaryhealthregion.ca)

In occupational health research, work stress has been commonly measured by the Job Content Questionnaire (JCQ; Karasek et al. 1998) or by its modified versions based upon the demand–control model. The JCQ assesses work stress in six dimensions: skill discretion, decision authority, psychological demand, job insecurity, physical exertion and support from supervisor or co-workers. Cross-sectional studies using the data from the Epidemiological Catchment Area study (Mausner-Dorsch & Eaton, 2000) and from the Canadian National Population Health Survey (NPHS; Wang & Patten, 2001) reported that certain dimensions of work stress were associated with MDE. A longitudinal study using the NPHS data found that MDE was associated with high levels of work stress in skill discretion, psychological demand, job insecurity and support from supervisors or co-workers as measured by the abbreviated version of the JCQ (Wang, 2004a). Identifying specific job characteristics associated with poor mental health may assist in re-designing organizational structure to improve workers' productivity. However, the work stress dimensions are likely to be correlated to each other. Thus, investigating the relationship between overall work stress and depression will improve our understanding about the etiology of depressive disorders. Additionally, the median value of work stress has been used as a cut-off point for defining high and low levels of work stress in the literature (Achat et al. 2000; Mausner-Dorsch & Eaton, 2000; Rosvall et al. 2002; Eaker et al. 2004). The justifications for such a classification schema were not sufficient. Investigating the relationship between overall work stress and MDE from a longitudinal perspective may shed light on this important methodological issue.

Using the data from the longitudinal cohort of the NPHS, the objectives of this analysis were to:

(1) investigate the relationship between the levels of work stress and later occurrence of MDE, and

(2) examine if work stress interacts with baseline sociodemographic, clinical and psychosocial factors to increase the risk of MDE.

It was hypothesized that individuals who were at a high level of work stress were more likely to have had MDE and that work stress did not interact with baseline sociodemographic, clinical and psychosocial factors to increase the risk of MDE.

MATERIALS AND METHOD

Population and design

The NPHS initiated in 1994–1995 is a national health survey using stratified two-stage random sampling procedures (Statistics Canada, 1996). The target population consisted of household residents in all Canadian provinces, excluding those living on Indian Reserves, Canadian Forces bases, in long-term institutions and in certain remote areas in Quebec and Ontario (Statistics Canada, 1996). Within provinces the sample was distributed proportionally to the population size. In the first stage of sampling, homogeneous strata based upon geographic and/or socio-economic status were formed and independent samples of clusters (usually Census Enumeration Areas) were drawn from each stratum. In the second stage, dwelling lists were prepared for each cluster and dwellings or households were selected from the lists. The participants in the 1994–1995 NPHS formed a longitudinal cohort which was re-interviewed every 2 years. The baseline NPHS interviews were conducted face-to-face by interviewers trained by Statistics Canada. Telephone interviewing was the major data collection method in subsequent surveys (Swain et al. 1999). After a complete description of the study to the subjects, written informed consent was obtained.

The longitudinal response rate for the 1995–1996 NPHS was 93·6% (Swain et al. 1999). For this analysis, data from the 1994–1995 NPHS (baseline) and the 1996–1997 NPHS were used. In the baseline survey, 17 276 participants were interviewed. Among these, 6633 were aged between 18 and 64 years, were employed at the time of the interviews, provided complete information about work stress and had not had MDE in the 12 months prior to the interviews. These subjects were included in this analysis.

MDE

MDE in the past 12 months was evaluated in the NPHS using the Composite International Diagnostic Interview – Short Form for Major Depression (CIDI-SFMD) which was derived from the World Health Organization's Composite International Diagnostic Interview. The

CIDI-SFMD was developed and validated against the full version of CIDI (Kessler *et al.* 1998). A probability of 0·9 based on the CIDI-SFMD was defined the 'caseness' of MDE, based upon the criteria of DSM-III-R (APA, 1987). This cut-point corresponds to reporting 5 out of 8 depressive symptoms outlined in the DSM, at least one of which must be depressed mood or loss of interest. This choice of a cut-point can be justified by its face validity for the DSM-IV criteria (APA, 1994).

Work stress

The NPHS used a brief version (12 items) of the JCQ (Karasek *et al.* 1998) to measure work stress in six dimensions. The 12 questions used in the NPHS are as follows.

Skill discretion

(1) Your job required that you learn new things.
(2) Your job required a high level of skill.
(3) Your job required that you do things over and over.

Decision authority

(4) Your job allowed you freedom to decide how you did your job.
(5) You had a lot to say about what happened in your job.

Psychological demands

(6) Your job was very hectic.
(7) You were free from conflicting demands that others made.

Job insecurity

(8) Your job security was good.

Physical exertion

(9) Your job required a lot of physical effort.

Social support from co-workers and supervisors

(10) You were exposed to hostility or conflict from the people you worked with.
(11) Your supervisor was helpful in getting the job done.
(12) The people you work with were helpful in getting the job done.

The answer to each question was based upon a 5-point scale (0 = strongly agree, 1 = agree, 2 = neither agree nor disagree, 3 = disagree, 4 = strongly disagree). The scores were reversed for items 3, 6, 9 and 10. The total score of the JCQ was 48, with a high score indicating a higher level of work stress. In the 1994–1995 NPHS, the abbreviated version of the JCQ had a moderate internal consistency ($\alpha = 0.48$). However, the moderate internal consistency does not necessarily mean that the abbreviated version of the JCQ was insensitive. According to McDowell & Newell (1996), an internal consistency is related to the number of items of the measurement, that a moderate internal consistency may indicate that there is no redundancy in the measurement and that each item adds new information to the measure. If an instrument covers several dimensions (in the JCQ, six dimensions of work stress are assessed), it is reasonable to expect a moderate internal consistency (Boyle, 1985). All eligible participants provided information about work stress.

Sociodemographic variables

Sociodemographic variables included in this analysis are: gender, age, marital status, levels of family income and education, race (white *versus* non-white). The NPHS categorized family income into five levels based on total family income and the number of people in the household. In this analysis, the five levels were grouped into two categories (low family income *versus* middle and high family income). In the NPHS, the non-white category included 11 different groups, i.e. Chinese, Native, Black, Latin American, South Asian, Arab/West Asian, Filipino, South East Asian, Japanese, Korean and others. Because of small numbers of participants with these ethnic backgrounds, they were combined into one group (the non-white). In this analysis, educational levels were grouped into secondary school graduation or less *versus* higher than secondary-school graduation. Secondary-school graduation is equivalent to 13 years of education in Canada.

Clinical and psychosocial variables

Clinical and psychosocial variables include number of long-term medical illnesses, child and adulthood traumatic events, recent life events and baseline and subsequent mental health service use. Long-term medical illnesses refer to illnesses diagnosed by health professionals, which were expected to last 6 months or longer.

Psychological variables included recent negative life events which had occurred in the past 12 months (10 questions about physical abuse, unwanted pregnancy, abortion or miscarriage, major financial difficulties and serious problems at work or in school); childhood and adult trauma (seven questions about parental divorce, a lengthy hospital stay, prolonged parental unemployment, frequent parental alcohol or drug use and physical abuse). The childhood and adult traumatic events referred to events that occurred while the participant was a child or a teenager or before he/she moved out of the house. Specific questions about recent negative life events and childhood trauma can be found in Statistics Canada's document (Statistics Canada, 1995). In this analysis, an answer of 'yes' to any question in each domain was defined as having experienced negative life events and childhood trauma. In the NPHS, subjects were asked 'In the past 12 months, have you seen or talked on the telephone to a health professional about your emotional or mental health?' and 'Did you use antidepressants in the past month?' Since antidepressants can only be prescribed by physicians, both reported contacts with health professionals about emotional or mental health problems or the use of antidepressants in the preceding month were used to define baseline mental health service use in this analysis.

Analysis

Preliminary analysis showed that the distribution of work stress was not normal. Participants were classified into four groups based on the quartile values of the work stress of the participants (25th percentile value $=16$; 50th percentile value $=19$; 75th percentile value $=23$; 100th percentile value $=45$). The incidence of MDE based on the 1996–1997 NPHS data was calculated for each group. Using the first quartile group as the reference, the association between the levels of work stress and MDE was estimated in the form of odds ratio (OR). To control for the effects of sociodemographic, clinical and psychosocial variables, the adjusted association was estimated using logistic regression modeling. This was to determine if work stress was associated with the risk of MDE and if there was a dose–response relationship between levels of work stress and MDE. The effects of baseline and subsequent mental health

service use were controlled, because the risk of having MDE might be affected by these factors (Wang, 2004b). In the logistic regression, age and number of long-term medical illnesses were analyzed as continuous variables. Stratified analyses were carried out to examine possible effect modifications between work stress and selected variables. Logistic regression modeling was used to identify independent factors associated with MDE.

The NPHS used multiple-staged, stratified random-sampling procedures, and so sampling weights provided by Statistics Canada were used in the analysis. The proportions reported in this analysis were weighted to account for the uneven sampling probability and for non-response. The 95% confidence intervals (CIs) were calculated using the bootstrap technique to account for the design effect. This analysis was conducted using STATA 7.0 (StataCorp, 2003).

RESULTS

Among the participants selected ($n = 6633$), 534 (8·1%) did not provide information about MDE in the 1996–1997 NPHS. The number of participants who provided complete information about MDE ($n = 6099$) in each quartile group by baseline work stress score was 1701, 1359, 1759 and 1280 respectively. The participants with incomplete information about MDE were significantly more likely to have had a baseline work stress score above the 75th percentile [$\chi^2(1) = 9·60$, $p = 0·01$]. These participants were excluded from the calculation of MDE incidence.

The data showed that the relationship between work stress and the risk of MDE was not linear. The incidence of MDE in each quartile group was 2·0, 2·6, 3·0 and 7·1% respectively. Compared to the first quartile group, after adjusting for the effects of sociodemographic, clinical and psychosocial variables, participants in the second (OR 1·16, 95% CI 0·55–2·20) and the third (OR 1·61, 95% CI 0·76–2·88) quartile group had a similar risk of having had MDE in the past 12 months. However, those who had a work stress score higher than the 75th percentile had an elevated risk of MDE (OR 2·98, 95% CI 1·62–4·97), compared to the reference group.

The first three quartile groups were combined because of the similar risk of MDE. Work stress

Table 1. *Summary of the results of the logistic regression*

Variables	Odds ratio (95% confidence interval)
Work stress[a]	2·35 (1·54–3·77)**
Gender	1·11 (0·68–1·75)
Age	0·98 (0·96–1·00)
Marital status	0·92 (0·56–1·50)
Family income	1·13 (0·57–1·87)
Race	0·93 (0·41–1·75)
Education levels	1·72 (1·14–2·59)*
Number of long-term medical illnesses	1·17 (0·99–1·33)*
Childhood and adult traumatic events	1·54 (1·07–2·59)*
Subsequent mental health service use	16·79 (11·29–23·93)**

[a] Work stress scores above the 75th percentile *versus* scores at the 75th percentile and lower.
* $p < 0.05$, ** $p < 0.001$.

was strongly associated with MDE (crude OR 2·95, 95% CI 1·89–4·19, $p < 0.01$). Stratified analyses found no evidence of effect modification between work stress and the selected sociodemographic, clinical and psychosocial variables. Work stress was an independent risk factor for MDE (OR 2·29, 95% CI 1·44–3·73), controlling for the effects of other variables. In the multivariate analysis, low educational level (OR 1·70, 95% CI 1·16–2·65), number of long-term medical illnesses (OR 1·15, 95% CI 1·00–1·33), reported childhood and adult traumatic events (OR 1·51, 95% CI 1·00–2·41) and subsequent mental health service use (OR 16·94, 95% CI 10·01–25·88) were positively associated with MDE. Recent negative life events and baseline mental health service use were not associated with MDE. They were excluded from the model. Although other sociodemographic variables were not significantly associated with MDE, they were retained in the model because of the importance of these variables in population health. In the model without recent negative life events and baseline mental health service use, the association between work stress and MDE did not change dramatically (Table 1). A high level of work stress, a low educational level, the number of chronic illnesses, reported childhood and adult traumatic events and subsequent mental health service use were positively associated with MDE. Results from the model showed no evidence that the sociodemographic, clinical and psychological variables acted as confounders in the relationship between work stress and MDE.

DISCUSSION

Using a large representative community-based sample, this analysis demonstrates that a high level of work stress is associated with an elevated risk of MDE. This finding is in line with the existing theory (Karasek & Theorell, 1990). The relationship between work stress and the risk of MDE is not linear.

The NPHS data showed that only those who scored above the 75th percentile on the work stress scale had an elevated risk of MDE in the follow-up period. Although the full and abbreviated versions of the JCQ have been used extensively, no attempts have been made to determine to what extent a work stress score may indicate a high level of stress. Based on the results of this analysis, the 75th percentile may be considered as a threshold for defining a high level of work stress in future studies. It should be noted, however, that the results of this analysis did not consider the effect of specific professions. For certain types of professions, one could be at the 50th percentile but have an increased risk of MDE.

The literature indicates that various sociodemographic, clinical and psychological factors are associated with major depression. The results of this analysis showed that work stress did not interact with selected sociodemographic, clinical and psychosocial variables to increase the risk of MDE. There was no evidence that the relationship between work stress and MDE was confounded by the effects of these variables. Work stress, a low educational level, number of long-term medical illnesses and childhood traumatic events were independent risk factors for MDE in the working population.

The underlying mechanisms, whereby work stress affects the development of major depression, is not clear. Biologically, there may be many pathways leading to the onset of a depressive syndrome, but major depression is increasingly viewed as an abnormality of stress-adaptation systems in the brain (Shelton, 2000). Work stress may simply represent an important category of stressful life event. There is evidence that work stress may, in certain circumstances, overwhelm the body's neuroendocrine systems (Kunz-Ebrecht *et al.* 2004), which may lead to the development of a depressive disorder. An alternative explanation about the association

between work stress and MDE might be that individuals with a history of mental health problems were more likely to experience and to report a high level of work stress. It is well recognized that past mental health problems are strongly related to the development of major depression. Unfortunately, as a general health survey, the NPHS did not collect information about the history of mental health problems. Although, a low educational level cannot be a direct cause of major depression because of a lack of biological basis, people with a low educational level are more likely to be exposed to a stressful environment and expose themselves to unhealthy health behavior, both of which have more direct impacts on mental health (Adler & Newman, 2002).

In the multivariate analysis, subsequent mental health service use was strongly associated with MDE. In this longitudinal cohort, this might be because subsequent mental health service use referred to the same time period as MDE. It was reasonable to expect that individuals with MDE were more likely to use mental health services, compared to those who did not have MDE.

Patten (2000) reported that women had a higher incidence of major depression than men. De Graaf and colleagues (2002) found that, in The Netherlands Mental Health Survey and Incidence Study, gender difference in the incidence of major depression persisted even after the effects of socio-economic status, recent life events and traumatic events were controlled. An interesting finding of the current analysis was that, in the logistic regression models, gender was not associated with MDE. This particular result suggests that gender difference in the incidence of MDE might be due to the joint confounding effects of work stress, psychosocial and clinical variables. This needs to be investigated in future studies.

This analysis had several limitations, which might cause biases. First, the NPHS data were self-reported. Therefore, there was a possibility of reporting bias. Second, the work stress scale used in the NPHS is a brief version of the JCQ. It might not capture all important aspects of work stress. Similarly, only 10 questions about recent negative life events in the past 12 months were asked in the NPHS. This might partly explain the non-significant association with MDE.

Third, in the NPHS, MDE referred to a major depressive episode in the past 12 months. The NPHS longitudinal cohort was interviewed every 2 years. Information about MDE in the year immediately after the baseline survey was not available. Therefore, the term 'incidence' used in this analysis was different from that traditionally used in epidemiology. Fourth, MDE was measured by the CIDI-SFMD derived from the full version of CIDI. MDE in the NPHS may represent a broad spectrum of mood disorders. Nevertheless, work stress was found to be strongly associated with MDE in this longitudinal analysis. This was consistent with the theoretical frameworks and the findings from the cross-sectional and longitudinal studies. Finally, approximately 8·1% of the eligible participants did not provide complete information about MDE in the 1996–1997 NPHS. Compared to those with complete information, these participants were more likely to have had a work stress above the 75th percentile. If individuals with a work stress score above the 75th percentile were more likely to develop MDE, the association between work stress and MDE observed in this analysis could well have been underestimated.

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DECLARATION OF INTEREST

None.

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