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Is depression a risk factor for meatpacking injuries?

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Abstract.
BACKGROUND: While meatpacking is a physically demanding industry, the effect of depression on risks for injury has not been studied.
OBJECTIVE: To assess depressive disorders (major depression and dysthymia) using a validated screening tool administered to injured and uninjured meatpacking workers in two Midwestern plants.
METHODS: Matched case-control analyses were conducted among 134 workers to evaluate the association between depressive disorder and the occurrence of laceration injury.
RESULTS: Of the 268 workers, 13.8% screened positive for depressive disorder, whereas the general population prevalence estimate for depressive disorder using the same tool was 3.4%. Depressive disorder was not associated with an increased risk for injury; 17% of cases who experienced a laceration injury and 15% of uninjured controls reported depressive disorder (OR 0.81, 95% CI: 0.39–1.69).
CONCLUSIONS: Evaluation of depression causes among meatpacking workers is needed to elucidate prevention and treatment strategies.

Keywords: Depressive disorder, meatpacking, occupational, laceration

1. Introduction

Depression is highly prevalent among those working at physically demanding jobs [1]. For example, a survey of 590 women in North Carolina found depressive symptoms in 34% of working women. An increased prevalence of depressive symptoms was found among poultry workers compared to women working in non-poultry processing jobs, 48% vs 20% respectively [2]. Depression is associated with overall poor physical health and reduced productivity [3–5], which may make working in a physically demanding environment challenging and could increase risk for injury [5, 6].

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Depression has been associated with occupational injuries in several studies [7–11]. A large case-control study of Iowa farmers found that depressive symptoms were significantly associated with self-reported injury (OR 2.71; 95% CI 1.43–5.13) [12]. Also, a large prospective cohort study found depressive symptoms to be associated with unintentional injury risks in a rural county, and injury rates among participants with depressive symptoms were significantly higher than injury rates among participants without such symptoms [13]. Kubo et al. evaluated the effect of chronic disease such as depression on risk of occupational injuries in manufacturing workers of a global aluminum company. The authors found a 1.25 fold (95% CI: 1.13–1.38) increased risk of occupational injury among those with physician- diagnosed depression, adjusting for calendar year, experience on the job, gender, ethnicity, whether job was first at the company, employees' age at the start of the job, whether the plant was a smelter, whether the plant was a union plant, whether the plant was an original company plant and a frailty term at the employee level [14]. A meta-analysis examining association between chronic health conditions and their treatment on risk of occupational injury indicated a moderate risk of occupational injuries among those with depression based on Center for Epidemiologic Studies Depression Scale (CES-D) (overall OR <1.5, $p < 0.05$), after controlling for age, sex, location, years of experience in job, job demands, weekly work hours, and alcohol consumption. However, the meta-analysis reported a need for further research on association between different chronic health conditions and their treatment on ageing workforce, their productivity, and risk of injuries, illnesses on job [15]. There remains a knowledge gap on prevalence of chronic health conditions such as depression and injury risk in the food manufacturing or specifically animal slaughter and processing industry.

The main objective of this study was to evaluate the association between the presence of depressive disorder and laceration injury occurrence among cases who experienced a laceration injury and uninjured controls in a sample of workers in two pork-processing plants.

2. Methods

The study was conducted during April 2006 -October 2009 among workers from two pork processing facilities in Nebraska and Iowa. The plant operated in two production shifts and was divided into hot site (animal slaughter) and cold site (processing and packaging). Workers from both production shifts and sites were included in this study. Workers speaking English or Spanish; sustaining laceration injury or puncture wound that drew blood, and those working on the plant floor rather than office or loading dock were considered eligible. Details on the plant operations and recruitment methods have been reported previously [16, 17]. Briefly, case (or index) participants were identified by occupational health nurses at plant-based occupational health clinics after being treated for an occupational laceration injury in the two pork processing plants. Control participants were plant workers who had not experienced an injury. Controls were paired with index cases based on plant location and having worked on the same day of the week the index case was injured, within two weeks of the injury. Workers were contacted by an English- or a Spanish-speaking interviewer to obtain informed consent and conduct the phone interview using a structured questionnaire. This study was approved by the Institutional Review Board of the Harvard School of Public Health and the University of Nebraska-Lincoln.

Depressive disorder was assessed using the validated Burnam screening tool, which includes 6 items from the Center for Epidemiologic Studies Depression Scale (CES-D) and 2 items from the Diagnostic Interview Schedule [18]. The six items from the CES-D scale were statements about feelings including: 1) You felt depressed, 2) Your sleep was restless, 3) You enjoyed life, 4) You had crying spells, 5) You felt sad, and 6) You felt that people disliked you. Workers were asked to think back over the past week and report the frequency of feeling each item. Responses ranged from 0 (rarely or none of the time, less than one day over the past week) to 3 (most or all of the time, 5–7 days over the past week). In addition, two items from the Diagnostic Interview Schedule asked about depressive affect in the past year. These items were: '1) In the past year, have you had 2 weeks or more during which you felt sad, blue, depressed, or lost pleasure in things that you usually cared about or enjoyed?' and '2a) Have you had 2 years or more in your life when you felt depressed or sad most days even if you felt ok sometimes?' with a follow-up question '2b) If yes, have you felt depressed or sad much of the time in the past year?'. For these questions, the responses were 'yes' or 'no'.

Workers were classified into '*no depressive disorder*' and '*depressive disorder*' groups according

Table 1
Comparison of injured cases and uninjured controls using conditional logistic regression analyses among pork-processing workers in the Midwest, 2009

Characteristic**	Cases N (%) ($n = 134$)	Controls N (%) ($n = 134$)	Univariate*		Multivariate*	
			OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Age, years; mean (SD)	37.7 (11.1)	40.6 (11.0)	0.97 (0.95–0.99)	0.021	0.99 (0.96–1.01)	0.32
Gender						
Male	92 (69%)	80 (60%)	1	0.088	1	0.12
Female	41 (31%)	54 (40%)	0.63 (0.37–1.07)		0.63 (0.35–1.13)	
Ethnicity						
Non-Hispanic	71 (53%)	77 (57%)	1	0.34	1	0.45
Hispanic	63 (47%)	57 (43%)	1.35 (0.72–2.53)		1.30 (0.66–2.53)	
Job tenure						
≤median (35 months)	76 (57%)	57 (43%)	1	0.032	1	0.057
>median (35 months)	58 (43%)	77 (57%)	0.60 (0.38–0.96)		0.61 (0.36–1.02)	
Depression score$^{\alpha}$						
No depressive disorder (prob <0.06)	117 (87%)	114 (85%)	1	0.58	1	0.98
Depressive disorder (prob >0.06)	17 (13%)	20 (15%)	0.81 (0.39–1.69)		1.01 (0.47–2.18)	

*Estimates were obtained using conditional logistic regression. Univariate and multivariate analyses are presented in this table. All odds ratios were mutually adjusted in the multivariate analysis. **Note the numbers do not add up to column totals because of missing values. α Workers were classified into '*not depressed*' and '*depressed*' groups according to their probability of being depressed as determined by the Burnam methods (14).

to their probability of the depressive disorder as determined by the Burnam methods [18]. We used conditional logistic regression to estimate the associations between depressive symptoms and laceration occurrence in matched case-control analyses.

3. Results

We interviewed 268 participants between 2006 and 2009 (Table 1). One hundred and thirty-four cases who had experienced a laceration injury were matched to 134 uninjured controls. On average, workers were 39.2 years old (SD 11.1). The majority of workers were male (64%), Hispanic (45%) and had a high school or college education (66%) (data not shown). Depressive disorder was identified in 17 men (10%) and 20 women (21%). The median job tenure at the plant was 2.9 years (35 months) and 10 cases (17%) and 12 controls (16%), who had depressive disorder, had worked at the plant for longer than 35 months.

The risk of laceration injury was not significantly associated with gender (OR 0.63, 95% CI: 0.37–1.07) and ethnicity (OR 1.35, 95% CI: 0.72–2.53). Job tenure was significantly associated with injury risk and working for longer than 35 months (median) was protective of laceration injury (OR 0.6, 95% CI: 0.38–0.96).

The prevalence of depressive disorder was similar among cases and controls (OR 0.81, 95% CI: 0.39–1.69). Of the 134 case participants, 17 (13%) screened positive for depressive disorder compared to 20 controls (15%). Depressive disorder was not a significant predictor of laceration injury after adjusting for potential confounders. Presence of depressive disorder was also evaluated as a predictor of laceration injury in a multivariate model (Table 1). Adjusting for age, gender, ethnicity, and job tenure did not change the results. Increasing age (OR 0.99, 95% CI: 0.96–1.01) and female gender (OR 0.63, 95% CI: 0.35–1.13) was in a protective direction for a laceration injury.

4. Discussion

We evaluated the association between depressive symptoms and laceration injury risk. Of the 264 workers, 13.8% screened positive for depressive disorder; 13% among cases (17 workers) and 15% among controls (20 workers). Comparing this estimate to the general population estimate (3.4%) on which the Burnam tool was validated shows that depressive disorder was four times higher among these workers versus the Epidemiologic Catchment Area study [18]. Among cases in our study, 27% of women and 6.5% of men had depressive disorder; among controls, 17% of women and 14% of men reported depressive disorder. The one other study we found in the published literature of depression among meatpacking workers was among female poultry workers and found that 48% had depressive symptoms [2, 19]. Wang et al. conducted

a population-based longitudinal study among randomly selected employees in Alberta, Canada and found that incidence of major depressive disorder was higher among females (4.5%) compared to males (2.9%) [20]. Similarly, a study among public workers in Italy, found higher prevalence of mild and moderate depression in women (22%, and 4%) than men (10% and 3%, respectively) [21].

We expected depression to be associated with injury occurrence because depressive symptoms, such as difficulties with memory, attention, and decision making, may be associated with impairments that increase injury risk [22]. Kessler et al. found that depression was associated with reduced task focus and increased sick leave [23]. Studies among migrant farm workers have shown significant association between depression and daytime sleepiness at work, thereby increasing the risk of injury at work [24, 25]. These factors are likely to increase the risk of occupational injury.

Depressive disorder can also occur as a consequence of an injury and a reduced work schedule that often follows an injury occurrence. It is known that occupational injuries result in lost wages that endure long after recovery from an injury [26]. A pooled panel data analysis of 2005-2006 Medical Expenditure Survey examining differential impact of occupational injuries vs. non-occupational injuries on depression over time suggested that the risk of depression increased by 1.72 times (95% CI: 1.27–2.32) among those with occupational injuries than those with non-occupational injury, adjusting for covariates such as socioeconomic status, smoking and alcohol consumption, exercise, other co-morbidity/disability and self-rated health status [6]. The focus of our study, however, was depressive disorder as a risk factor for occupational laceration injury. Injured workers were interviewed within 14 days of injury and were asked to report the depressive disorder screening items in the week prior to being injured. Recall of symptoms that may have occurred after the laceration injury was likely to be minimal. Assuming positive association between occupational injury and consequent depressive symptoms, bias away from the null would be expected if workers reported symptoms after the laceration and not before, as instructed in the interview.

We frequency-matched our controls based on plant location and having worked on the same day of the week as the index case, within two weeks of an index case sustaining a laceration injury. We have utilized multivariable conditional logistic regression to account for the matched data while adjusting for age, job tenure, gender, and ethnicity. However, as is true for many other epidemiologic studies, some residual confounding may have remained after adjustment [27–29].

Depressive disorder rather than clinically diagnosed depression was reported in this study and it is possible that mild depressive symptoms were missed. We used a validated screening tool among a sample of meatpacking workers. This screening tool has high sensitivity and specificity for major depression and current depressive disorder [18]. A comparison study of depression screening instruments with the Quick Diagnostic Interview Schedule, found that our screening tool performed similarly to CES-D, Beck Depression Inventory, Symptom-Driven Diagnostic System for Primary Care [30].

5. Conclusions

Because depressive disorder may be associated with cognitive function and injuries, and the prevalence estimates in both the injured and uninjured workers ranged between 13–15%, early detection and referral to confidential human resources services for counseling in combination with possible out-patient treatment may be needed. Multidisciplinary teams, which include medical care and workplace support services may be valuable for workers with depression [31]. A combination of empowering individuals, strengthening communities, improving living and working conditions, and promoting healthy policies can be an effective strategy to address stressful psychosocial working conditions [32, 33]. Finally, it is important to identify impairment associated with depression and assess its impact on employment [22].

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