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# Does the Perception of Psychosocial Factors Increase the Risk of Pesticide Exposure among Seasonal Hispanic Farmworkers?

DL Levesque<sup>1</sup>, AA Arif<sup>2</sup>

## Abstract

**Background:** Migrant farmworkers are prone to several psychosocial stressors.

**Objective:** To investigate the effect of perceived psychosocial factors on pesticide exposure among seasonal migrant Hispanic farmworkers in North Carolina, USA.

**Methods:** A cross-sectional interview survey of 187 seasonal migrant farmworkers of Mexican descent, identified from labor camps located in rural counties in North Carolina, was conducted using nonprobability purposive sampling approach. Multivariable ordinal logistic regression analysis was used to determine the relationship between perceived control over the harmful effects of pesticide exposure, lack of social support, and the impact of anxiety on perception of pesticide exposure.

**Results:** More than 20% (n=39) of farmworkers reported frequent or constant contact with pesticides while working in the fields. More than 68% of farmworkers reported they believe they have control over avoiding harmful effects of pesticide exposure; the odds of pesticide exposure were 55% lower in this group (adjusted OR: 0.45; 95% CI: 0.22–0.91). No significant relationship was observed between farmworkers perception of lack of social support and presence of anxiety with odds of on-field pesticide exposure.

**Conclusion:** The study results suggest that perception of control is an important predictor of reduced pesticide exposure among seasonal migrant farmworkers.

**Keywords:** Psychology; Risk factors; Behavior; Occupational exposure; Chemically-induced disorders; Hispanic Americans; Safety

## Introduction

Agriculture is ranked as one of the most hazardous industries and farmworkers face numerous health and safety challenges each day while per-

forming farmwork. Based on most recent data from the Occupational Injury Surveillance of Production Agriculture survey in 2009, more than 47 000 nonfatal work-related injuries occurred on farms which translated into 5.4 injuries every hour<sup>1</sup> and

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<sup>1</sup>College of Health Sciences, DeVry University, Decatur, Georgia, USA  
<sup>2</sup>Department of Public Health Sciences, University of North Carolina, Charlotte, North Carolina, USA



Correspondence to  
Ahmed A. Arif, MBBS,  
PhD, CPH, FACE,  
Associate Professor  
of Epidemiology, UNC  
Charlotte, Dept. of  
Public Health Sci-  
ences, CHHS 429, 9201  
University City Blvd,  
Charlotte, NC 28223,  
USA  
Tel: +1-704-687-7561;  
Dept: +1-704-687-8742  
Fax: +1-704-687-6122  
E-mail: aarif@uncc.edu  
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pesticide poisoning rates are much higher for agricultural workers compared to all other industries.<sup>2</sup>

Farmworkers are prone to several psychosocial stressors such as anxiety, lack of social support, and limited or no job control.<sup>3,4</sup> Despite the fact that the majority of farmworkers in the USA are of Mexican origin, few epidemiological studies to date have investigated the psychosocial determinants of pesticide exposure in this population.<sup>5,6</sup> In our earlier study, using the same study population as in this paper, we reported that migrant and seasonal farmers were living and working under less than ideal conditions.<sup>7</sup> The majority of labor camps that we visited had substandard housing conditions with as many as 11 workers sharing a single dwelling. More than 25% of the study population reported never using any personal protective equipment during work.<sup>8</sup> Poor living and working conditions can contribute to psychosocial stress that can place farmworkers at risk of workplace injuries and harmful exposure to pesticides. Understanding how psychosocial factors affect farmworker workplace performance is essential for developing effective farmworker health and safety programs in order to reduce pesticide exposure among farmworkers and their families.

The objective of this study was to explore the influence of perceived psychosocial factors such as work control, social support, and anxiety on the risk of on-field pesticide exposure among migrant and seasonal farmworkers.

## Materials and Methods

Detail description of this study is provided elsewhere.<sup>7</sup> Briefly, we conducted a cross-sectional interview survey of 187 seasonal migrant farmworkers of Mexican descent. The sample consisted of all men 18 to 62 years old currently working in agriculture

selected using nonprobability purposive sampling approach. We identified labor camps located in four rural counties in North Carolina using the North Carolina Department of Labor Migrant Housing Site map and visited the camps and surrounding Mexican restaurants, stores, and supermarkets. Surveys were administered face to face to all study participants, at the place and time of their convenience, by bilingual interviewers.

The primary dependent variable in this study was “contact with pesticide while working in fields,” hereafter referred to as “pesticide exposure.” The study participants were asked “how often are you in contact with pesticides while working in the fields?” The responses were coded on an ordinal scale as “never” (coded as ‘1’), “sometimes” (coded as ‘2’), “frequently” (coded as ‘3’), and “constantly” (coded as ‘4’).

Three questions on the survey measured perceived psychosocial risk factors. These include: 1) “Do you believe that you have control over avoiding the harmful health effects of pesticides?” 2) “Do you believe that lack of social support increases risk of pesticide exposure?” and 3) “Do you believe anxiety increases risk of pesticide exposure?” The responses were coded as “yes” (coded as ‘1’) and “no” (coded as ‘0’).

Farmworkers were also asked about their age in years, number of years of education they have completed, number of years they have worked in agriculture in the USA, and number of people living in the same quarter where they sleep.

The study was approved by the Walden University institutional review board.

## Statistical Analysis

Univariate analysis was used to capture the frequencies and percentages of all variables. Bivariate analysis was used to determine the relationships between perceived control over the harmful effects of

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**Table 1:** Descriptive characteristics of the study sample. Values are mean±SD or median (IQR).

Variable	Pesticide Exposure				
	All (n=187)	Never (n=14)	Sometimes (n=134)	Frequently (n=28)	Constant (n=11)
Age (yrs)	34.8±9.1	31.2±8.2	35.1±9.2	32.4±8.4	42.3±7.6
Education (yrs)	7.6±2.7	5.8±1.8	7.8±2.9	7.7±1.5	7.0±2.6
Agricultural background (yrs)	7.0 (4.0–11.0)	5.0 (4.0–10.0)	7.5 (4.0–11.0)	6.0 (3.5–10.5)	12.0 (8.0–14.0)
Number of people living in the same quarter	6.5±2.2	6.7±2.3	6.4±2.2	6.9±1.9	5.8±2.0

pesticide exposure, lack of social support, and the impact of anxiety on perception of pesticide exposure. Since the outcome variable, pesticide exposure, was ordinal, multivariable ordinal logistic regression analysis was used in the study. The analyses were adjusted for potential confounding effects of age, education, agricultural background, and number of people living in the same quarter. Stata SE<sup>®</sup> ver 12.0 statistical software was used for data analysis.

### Results

All farmworkers (n=187) reported that they were Hispanic males and 95% (n=177) reported Mexico as their permanent home.

More than 20% (n=39) of farmworkers reported frequent or constant contact with pesticides while working in the fields. The mean±SD age of study participants was 34.8±9.1 years; those who reported in constant contact with pesticides while working in fields were on average 10 years older than those who were never exposed to pesticides. The farmworkers had an average of seventh grade education, were working in agriculture in the USA for eight years and were sharing their sleeping quarters with at least five other farmworkers (Table 1). All of the participants reported working in fields and 93% (n=174) were under a work contract from Mexico (data not shown).

More than 68% of farmworkers perceived having control over avoiding harmful effects of pesticide exposure and a significant (p<0.001) relationship with their report of on-field contact with pesticides was observed in the study. Similarly, 57% of farmworkers believed that anxiety increases the risk of pesticide exposure and a significant (p=0.034) relationship with their report of on-field contact with pesticides was observed in the study. No significant association was observed with their perception of a lack of social support (Table 2).

#### TAKE-HOME MESSAGE

- Understanding factors that may reduce pesticide exposure can help avoid adverse health consequences.
- Seasonal migrant farmworkers who believed that they have control over avoiding pesticides are less likely to be exposed to on-field pesticides.
- Perceived lack of social support and anxiety were not associated with on-field pesticide exposure.

**Table 2:**  $\chi^2$  relationship between psychosocial risk factors and pesticide exposure (n=187)

Psychosocial Factors	Pesticide Exposure*				p value
	Never n (%)	Sometimes n (%)	Frequently n (%)	Constant n (%)	
Perception of control					
Yes	6 (4.7)	104 (81.3)	15 (11.7)	3 (2.3)	<0.001
No	8 (13.6)	30 (50.9)	13 (22.0)	8 (13.6)	
				p value for trend	0.020
Perception of lack of social support					
Yes	10 (7.5)	98 (73.1)	21 (15.7)	5 (3.7)	0.260
No	4 (7.6)	36 (67.9)	7 (13.2)	6 (11.3)	
				p value for trend	0.233
Perception of anxiety					
Yes	4 (3.8)	84 (79.3)	12 (11.3)	6 (5.7)	0.034
No	10 (12.4)	50 (61.7)	16 (19.8)	5 (6.2)	
				p value for trend	0.927

\*Pesticide Exposure: Contact with pesticides while working in fields

The unadjusted odds of pesticide exposure were 50% lower among farmworkers who perceived that they have control over avoiding harmful effects of on-field pesticides exposure. The odds ratio remains unchanged when adjusted for age and sharpened when adjusted additionally for education, years worked in agriculture in the USA, and number of people living in the same sleeping quarters (OR: 0.45, 95% CI: 0.22–0.91, adjusted for age, education, agricultural background, and number of people sharing the sleeping quarters). No significant associations were identified between their perception of lacking social support and presence anxiety with odds of on-field pesticide exposure (Table 3).

## Discussion

Findings from this study indicated that farmworkers who perceived that they have control over avoiding the harmful effects of pesticides were less likely to come in contact with pesticides while working in fields. This effect is independent of age, education, agricultural background, and number of people sharing the sleeping quarters.

There is paucity of literature related to effects of psychosocial stress on pesticide exposure among farmworkers. Although, it may be inevitable for farmworkers to come into contact with pesticides at some point while working in fields, having knowledge about adverse effects of pesticides may allow them to take some safety measures

**Table 3:** Multivariable ordinal logistic regression analysis for the relationship between psychosocial factors and pesticide exposure (n=187). Values are OR (95% CI).

Psychosocial Factors	Model 1*	Model 2†	Model 3‡
Perception of control	0.50 (0.25–0.98)	0.51 (0.25–1.00)	0.45 (0.22–0.91)
Perception of lack of social support	0.75 (0.37–1.50)	0.77 (0.38–1.54)	0.71 (0.34–1.48)
Perception of anxiety	0.94 (0.50–1.79)	0.91 (0.48–1.72)	0.94 (0.48–1.83)

\*Model 1 reports unadjusted OR  
 †Model 2 reports OR adjusted for age  
 ‡Model 3 reports OR adjusted for age, education, agricultural background, and number of people sharing the sleeping quarters

while performing their tasks. In a study on 180 Hispanic orchard workers from three counties in Washington State, Keifer, *et al.*,<sup>5</sup> found that more than 80% of participants felt orchard work was dangerous and they were limited in what they could do to prevent injuries from occurring. Such lack of control can place heavy psychological and physical burden on farmworkers predisposing them to adverse exposure to pesticides<sup>9</sup> and affect farmworkers perceptions of their ability to perform pesticide safety practices. Hence, it is importance to consider psychosocial effects of work when designing health and safety interventions for farmworkers.

Psychosocial stress has been shown to adversely affect mental health including increased levels of anxiety and depressive symptoms among farmworkers<sup>10</sup> and can affect workplace performance and job safety.<sup>11</sup> We earlier reported, using the same study population, that the majority of farmworkers worked under adverse conditions such as no place to shower or bathe after work, lack of water, soap, and single use towels to wash hands with while working in the fields, and lack of toilet facilities near the fields.<sup>7</sup> The majority worked 10 to 12 hours a day and seven days a week during the season. Working in such demanding conditions is likely to increase farmworkers' perception of anxiety as

was observed in the  $\chi^2$  analysis ( $p=0.036$ , Table 2). However, it is possible that no “dose-response” relationship exists as evident by non-significant p value for trend (0.927, Table 2) and odds ratio (adjusted OR: 0.94, 95% CI: 0.48–1.83, Table 3).

No significant finding was revealed in the present study between the perceived lack of social support and pesticide exposure among farmworkers. Social isolation has been shown to contribute to psychosocial stress. Since, in this study on an average more than six farmworkers were sharing the sleeping quarters, it is likely that they have adequate social support.

Several limitations in this study should be noted. We only asked about farmworkers' perception. How closer such perception is to reality, should be explored in future studies. We did not take any biological sample to measure pesticide levels. This could have led to misclassification bias. However, such bias is likely to be non-differential resulting in attenuation of point estimates. The cross-sectional survey used convenience snowball sampling approach, which limits generalizability of our findings.

In conclusion, findings from this study suggest that perception of control is an important predictor of reduced pesticide exposure among seasonal migrant farmworkers. Exposure to pesticides has long-



term health consequences. Understanding factors that may reduce pesticide exposure can help potentially avoid those adverse health consequences.

**Conflicts of Interest:** None declared.

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