

# PREVALENCE OF STRESS AMONG AGROCHEMICAL RESEARCHERS

By

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## Abstract

**Introduction:** Agrochemical researches are critical for meeting needs in food and fiber production, as well as disease vector control. The agriculture industry is stressful and there is evidence that persistent stress can contribute to the onset or progression of mental health problems. **Aim of Work:** To study the prevalence, sources and level of stress using three indicator tools, and the possible relationship between stress and mental well-being, among a group of agrochemical researchers in Egypt. **Materials and Methods:** A face-to-face interview was performed and the professional life stress (PLSS), the Health and Safety Executive (HSE) indicator tool, in addition to the 12-Items General Health Questionnaire (GHQ-12) were distributed to 94 agrochemical researchers. **Results:** Out of 94 questionnaires; 69 replied (with response rate 73.4%). Stress was not a problem among 47.8% of the participants, whereas 49.3% have a Moderate range of stress. Psychologically distressed personnel constituted 21.7% of the total participants. Change, demand and lack of authorities support were the predominant sources of stress among the studied population. Demand and relationships were statistically significant among the problematic stressed personnel than the others. Psychological distress was significantly higher among problematic stress group compared to the other two groups. **Conclusion and Recommendations:** Stress reported by the studied agrochemical researchers was mostly of Moderate and Non-problematic level. Demand and relationships were significant stressors for problematic stress, and psychological distress. The current study may be considered as the first step in implementing a stress management program to be followed by targeted interventions as group discussions and awareness sessions, organizational change and other aspects of stress prevention/ management programs.

**Key words:** Work related stress; Stressors; Mental wellbeing and Agrochemical researchers.

## Introduction

Agrochemicals, principally pesticides and fertilizers, are used regularly to control crop pests and to improve crop productivity and yield. However, resistance is rapidly spreading to existing agrochemical products in trade (Sparks and Lorschbach, 2017).

As a result, the introduction of a prospective strategy to identify agrochemicals with new modes of action continues to play a prominent role. Traditionally, new agrochemicals are discovered by testing a variety of compounds directly on the whole organism, such as fungus, weeds, or insects, in order to generate new leads (Chen et al., 2019).

Agriculture has been characterized as being stressful and evidence suggests that chronic stress may have a role in the development or advancement of mental health issues, including anxiety and depression (Rudolphi et al., 2020). There have been several attempts to explore stress related factors in researchers (Tabolli et al., 2010; Herbert et al., 2014).

Stress is defined by the Health and Safety Executive (HSE, 2001) as an undesirable reaction to excessive

pressures placed on persons. Although there are many models and hypotheses for why people experience work-related stress, one of them is that it might be a psychological condition that reflects how people interact with their workplace (Mensah, 2021). Long-term work-related stress can lead to less effectiveness at work, poorer productivity, and increased sickness absence if it's not properly managed (Bryan et al., 2021).

Workplace stress and its impact on employees' physical and mental health have come under closer investigation. According to figures found in the literature, occupational stress is a major cause of chronic and long-term illness, with stress levels being greatly influenced by demographic and occupational variables (Roelen et al., 2018).

Work demands (long working hours, and work overload) and its impact on personal lives, lack of control over work, lack of participation in decision making, low occupational social support, and unclear management and work role are all work aspects linked to psychological ill-health (Michie and Williams, 2003). Neuroendocrinal disturbance, mediated by psychological pathways including

self-esteem and puzzling sentiments about work, is thought to strengthen the links between work quality and mental health (Stansfeld and Candy, 2006).

Individuals' and organizations' health can be influenced by work-related stress leading to suboptimal performance for both of them. This can aid in influencing enterprises to address the stress problem, by looking into the links between psychosocial working circumstances, psychological suffering and an individuals' ability to work (Guidi et al., 2012).

To the authors knowledge this research wasn't addressed by previous studies evaluating work related factors of stress among agrochemical researchers in Egypt.

### **Aim of Work**

To study the prevalence, sources and level of stress using three indicator tools, and the possible relationship between stress and mental well-being, among a group of agrochemical researchers in Egypt.

### **Materials and Methods**

**Study design:** It is a cross sectional study.

**Place and duration of the study:**

The study was carried out in an agrochemical research station in Cairo, Egypt. The study was done between March and September 2020.

The Research Station carries out laboratory and field research into new product as well as studying all aspects of the products' crop behavior ensuring they can safely be used for human and animal consumption.

**Study sample:** The total number of agrochemical researchers was 94 who worked 8 hours/day for 5 days/week, with at least one year working duration. Only 69 researchers agreed to participate in the study and to return back the anonymous questionnaires making the study sample a convenient one. Inclusion criteria: Any agrochemical researcher with at least one year working duration who agreed to participate in the study and to return back the anonymous questionnaires. Exclusion criteria: Includes those with history of mental, nervous diseases, or use of chronic medication for any psychiatric illness.

### **Study Methods:**

1-All employees were informed about the stress research study through a **series of meetings** in which the

purpose of the research was discussed as well as the Arabic questionnaires were introduced and clarified.

**2- A questionnaire** was answered by face to face interview to take personnel, past, occupational histories and the history of any previous diseases (especially mental, nervous diseases) and medicine taken.

**3- Clinical examination** to all participants to exclude any neuropsychiatric disorders.

**4- An Arabic questionnaires** were distributed to the participants, which included three sections: Professional Life Stress Scale questionnaire (PLSS), the Health and Safety Executive (HSE) indicator tool and the 12-Item General Health Questionnaire (GHQ-12) translated questionnaires.

**PLSS questionnaire** is 22-items self-administered questionnaire that measure the level of stress among working professionals. Many various characteristics are included, such as other people's perceptions of your personality, a positive outlook on life, individual and professional satisfaction, professional harmony, and so forth. The scores categorize the stress level into: Non-problematic where stress isn't a

problem in one's life with score ranges from zero up to 15 "referred as group 1"; Moderate range (16-30) where stress is moderate and can be sensibly reduced "referred as group 2"; Problematic (31-45) where stress is clearly a problem that requires treatment "referred as group 3"; and Major problem (46-60) where stress is a significant problem that necessitates intervention. The total score is 60 (Prathyusha et al., 2015).

**The HSE indicator tool** entails a 35-items questionnaire with seven scales, each representing a different possible stressor, with lower scores indicating a higher risk of work-related stress. Some items are graded on a five-point likert scale, while others are graded on a five-point frequency scale that ranges from 1 (never) to 5 (always). Mean scores were calculated across all the categories. The HSE indicator tool aims at identifying the sources of stress, assisting organizations in managing and addressing them with a focus on improving psychosocial working conditions (MacKay et al., 2004). Workload, work routines, and the work environment all fall under the category of "Demand". "Control" includes how much control the employees have about the way they work "Managers'

Support” involves the encouragement, sponsorship and management supplied resources; the “Peer’s Support” embraces encouraging, mentoring and resources provided by the colleagues; “Relationship” includes encouragement of positive work to avoid conflict and address unacceptable behaviors; “Role” ; if people understand their role in the organization and the organization makes sure that they do not have contradictory roles; “Changes”: how corporate changes (large or small) are managed within the organization (Brookes et al., 2013).

**The GHQ-12** is the most widely used screening instrument for common mental diseases, as well as a more general measure of psychiatric well-being. It is widely regarded as the most accurate tool for estimating the impact of stress on psychological health, containing 12 stress manifestations (Jackson, 2007). Respondents were asked to rate their own experience with each of these manifestations during the weeks preceding the study period. The questions ask about self-confidence, mood, sleep disorders, ability to concentrate and problem solving abilities. Subjects choose from four responses to each question: ‘not at

all’, ‘no more than usual’, ‘rather more than usual’ and ‘much more than usual’. Responses were graded using a binary scoring system 0-0-1-1. The two least symptomatic replies receive a score of zero, while the two most symptomatic answers receive a score of one; hence, responses can only be assessed as zero or one. Using this method, a participant could have been scored between 0 and 12 points. Participants were categorized as Non-distressed (GHQ-score: 0–3) and Psychologically distressed with overall questionnaire score of 4 or more (Goldberg et al., 1997).

### **Consent**

The study participants were informed about the research plan and requirements. Informed consent was obtained from all contributors.

### **Ethical Approval**

The study was carried out in accordance with the principles of the Helsinki Declaration and following the guidelines of the Department of Occupational and Environmental Medicine, Faculty of Medicine, Cairo University, Egypt’s internal Ethical Committee.

### **Data Management**

The entered coded data was

analyzed using IBM Corp. statistical software for the Social Sciences (SPSS) version 26 . Mean and standard deviation (SD) were calculated for quantitative data. Categorical variables were given frequencies (number of cases) and relative frequencies (percentages). When comparing two groups, an unpaired t test was used, and

when comparing more than two groups, an analysis of variance (ANOVA) was used, with post hoc test (Chan, 2003a). The Chi square ( $\chi^2$ ) test was performed to compare categorical data. When the anticipated frequency is less than 5, the exact test was utilized instead (Chan, 2003b). Statistical significance was defined as a p-value of less than 0.05.

## Results

**Table (1): The study population's demographic characteristics**

Demographic characteristics		No	%	
Sex	Male	62	89.9%	
	Female	7	10.1%	
Marital Status	Single	6	8.7%	
	Married	63	91.3%	
Smoking	NO	34	49.3%	
	Yes	35	50.7%	
Type of smoking	Cigarette	30	43.5%	
	Shisha	4	5.8%	
	Combined	1	1.4%	
	<b>Mean</b>	<b>SD</b>	<b>Minimum</b>	<b>Maximum</b>
Age	40.70	9.96	1.00	59.00
Smoking Index	155.70	269.13	0.00	1200.00
Duration of work /years	16.86	10.33	0.17	37.00

\*SD = standard deviation

Smoking Index: No of cigarette/day x years

The respondents to the questionnaires were 69 out of 94 personnel with response rate 73.4%. Participants had a mean age of  $40.70 \pm 9.96$  years; the mean duration of work was  $16.86 \pm 10.33$  years, 89.9% of the participants were males, 91.3% were married, and 50.7% were smokers as shown in Table (1).

**Table 2: PLSS questionnaire, HSE management tool domains and GHQ among the studied participants.**

		No (%)	Mean	SD	Minimum	Maximum
PLSS score category	Group 1	33 (47.8%)	11.03	2.98	5.00	15.00
	Group 2	34 (49.3%)	20.79	3.05	16.00	27.00
	Group 3	2 (2.9%)	36.00	1.41	35.00	37.00
HSE	Demand	--	3.20	0.53	1.38	4.38
	Control	--	3.71	0.69	2.00	4.83
	Authorities support	--	3.67	0.72	1.40	4.80
	Colleague support	--	3.75	0.73	1.50	5.00
	Relation	--	3.93	0.67	2.50	5.00
	Role	--	4.45	0.54	3.20	5.00
	Changes	--	2.65	0.70	0.75	3.75
	Total HSE score	--	3.71	0.41	2.71	4.40
GHQ	Psychologically distressed	15 (21.7%)	6.73	2.22	4	10
	Non-distressed	54 (78.3%)	0.93	0.89	0	3

Group 1: non-problematic stress, Group 2: moderate stress, Group 3: problematic stress  
SD = standard deviation, PLSS: Professional Life Stress Scale questionnaire,  
HSE: Health and Safety Executive, GHQ: General Health Questionnaire

Table (2) showed that the mean  $\pm$  SD of the total PLSS score was  $16.57 \pm 6.61$  with minimum score 5.00 and maximum score 37.00 so that it represent only three levels of stress, with no score denoting the fourth level. Stress is not a problem in the life of 47.8% of the participants (group 1), while 49.3% have a Moderate level of stress (group 2). Meanwhile stress is clearly a problem for participants of group 3 (2.9%) with apparent need for remedial action.

It also showed that HSE (Health and Safety Executive) questionnaire for the domains of stress, the lowest mean score was for the “change” that includes the management of the organizational changes; then the “demand” that involves

workload and working patterns; followed by “authorities support” that comprises the organizational management’s level of support in terms of resources, sponsorship, and encouragement, were the predominant sources of stress among the studied population.

According to the General Health Questionnaire; the psychologically distressed personnel were 21.7% of the total participant with higher Mean  $\pm$  SD score of  $6.73 \pm 2.22$ .

Mean  $\pm$  SD of GHQ total score  $2.19 \pm 2.73$  with minimum 0.00 score and maximum 10.00 (un-tabulated data).

**Table 3: Association of different stress level to HSE domains and psychological distress.**

	PLSS category						p value
	Group 1		Group 2		Group 3		
	Mean	SD	Mean	SD	Mean	SD	
<b>Demand</b>	3.44	0.39	3.06	0.48	1.88	0.71	<b>&lt; 0.001*</b>
<b>Control</b>	3.70	0.74	3.77	0.64	2.83	0.00	0.177
<b>Authorities support</b>	3.59	0.83	3.77	0.62	3.20	0.00	0.388
<b>Colleagues support</b>	3.67	0.76	3.85	0.72	3.38	0.53	0.491
<b>Relation</b>	4.09	0.59	3.85	0.69	2.88	0.18	<b>0.021*</b>
<b>Role</b>	4.56	0.49	4.34	0.58	4.40	0.57	0.265
<b>Changes</b>	2.56	0.77	2.75	0.64	2.38	0.18	0.470
<b>Total HSE score</b>	3.77	0.44	3.70	0.34	2.99	0.02	<b>0.028*</b>
<b>GHQ classification</b>	<b>Count</b>	<b>%</b>	<b>Count</b>	<b>%</b>	<b>Count</b>	<b>%</b>	<b>p value</b>
<b>Psychologically distressed</b>	2	6.1%	11	32.4%	2	100.0%	<b>&lt; 0.001*</b>
<b>Non-distressed</b>	31	93.9%	23	67.6%	0	0.0%	

Group 1: non-problematic stress,      Group 2: moderate stress,      Group 3: problematic stress  
 SD = standard deviation      \*: Statistically significant,      GHQ: General Health Questionnaire  
 PLSS: Professional Life Stress Scale questionnaire,      HSE: Health and Safety Executive

Table (3) displays that according to PLSS questionnaire (demand related to workload, characteristics, and work environment), relationships that supports positive working and total HSE score have statistically significant lower score in group 3 of problematic stress than the other 2 groups. Psychological distress was significantly higher in problematic stress group compared to the other two groups.

**Table 4: Post hoc pair wise comparisons between different levels of stress among the studied group.**

		Group 1	Group 2	Group 3
<b>Demand</b>	<b>Group 1</b>		<b>0.003*</b>	<b>&lt; 0.001*</b>
	<b>Group 2</b>	<b>0.003*</b>		<b>0.001*</b>
	<b>Group 3</b>	<b>&lt; 0.001*</b>	<b>0.001*</b>	
<b>Relation</b>	<b>Group 1</b>		0.362	<b>0.033*</b>
	<b>Group 2</b>	0.362		0.121
	<b>Group 3</b>	<b>0.033*</b>	0.121	
<b>Total HSE score</b>	<b>Group 1</b>		1.000	<b>0.024*</b>
	<b>Group 2</b>	1.000		<b>0.044*</b>
	<b>Group 3</b>	<b>0.024*</b>	<b>0.044*</b>	

Group 1: Non-problematic stress, Group 2: Moderate stress, Group 3: Problematic stress  
 HSE: Health and Safety Executive, \*: Statistically significant

Table (4) showed that demand, relation and total HSE scores were statistically significantly lower in group 3 of problematic stress compared to the other 2 groups.

**Table 5: Association of psychologically distressed personnel to the different domains of HSE.**

	GHQ classification				p value
	Psychologically distressed (>3)		Non-distressed		
	Mean	SD	Mean	SD	
<b>Demand</b>	2.68	0.62	3.35	0.39	< <b>0.001*</b>
<b>Control</b>	3.48	0.73	3.77	0.67	0.147
<b>Authorities support</b>	3.53	0.70	3.70	0.73	0.424
<b>Colleagues support</b>	3.82	0.62	3.73	0.77	0.694
<b>Relation</b>	3.35	0.55	4.10	0.61	< <b>0.001*</b>
<b>Role</b>	4.35	0.55	4.47	0.54	0.425
<b>Changes</b>	2.65	0.54	2.65	0.74	0.993
<b>Total HSE score</b>	3.46	0.33	3.78	0.40	<b>0.007*</b>

\*SD = Standard deviation

\*: Statistically significant

HSE: Health and Safety Executive

GHQ: General Health Questionnaire

Table (5) showed that according to the general health questionnaire the increased demand, as well as the relation, in addition to the total HSE score were statistically significantly higher among psychologically distressed personnel when compared to non-distressed.

## Discussion

Research in agrochemistry is essential for addressing needs in the production of food and fiber as well as the control of disease vectors. The agriculture industry is stressful, and there is evidence that ongoing stress may be a factor in the development or advancement of mental health issues (Rudolphi et al., 2020).

The objectives of the current study were to find out the prevalence, level, and sources of stress among agrochemical researchers and explore the relationships of psychological well-being and stress.

The majority of the studied researchers was males (89.9%) and married (91.3%) as represented in (Table 1). The response rate of the studied group was satisfactory (73.4%) if compared to the study done by Sidhu et al., 2020 in India that investigates the impact of gender and marital status on managing job stress and detected from a total of 621 employees; males represent (91%), married (71.8%), and response rate was 59.09%.

As regards the level of stress, the results revealed that the level was Moderate (49.3%) and Non-

problematic (47.8%) ( Table 2). Using PLSS questionnaire Aciksari and Karatepe (2020) observed that 28% of their study participants had non-problematic stress, whereas stress was seen as a Moderate problem in the lives of 66.7% of the participants. Also Arasu and his colleagues in (2019) interviewed 105 employees and found that 68% were in Mild degree of stress, 32% had Moderate degree of stress and none of the participants had high degree of stress.

The Health and Safety Executive (HSE) indicator tool domains were statistically significantly higher among Problematic stressed personnel (Table 3, 4), as well as among Psychological distressed individuals (Table 5). This was in accordance with the results obtained by Guidi and his colleagues (2012) that only four of the HSE subscales were shown to be substantially linked with the GHQ scores in the regression model. Demands, control, role and change were among them.

Workplace and social support are positively linked to well-being, reduced levels of depression, burnout and psychological discomfort and higher levels of life satisfaction (Lopes et al., 2012; Biggs et al., 2014). Main

and his colleagues (2005) also linked HSE subscales to stress-related work outcomes using the GHQ as an outcome measure.

Relationship conflicts, and demands concerning the workload, job routines and the working environment among the studied group, had statistically significant lower mean score among Psychological distressed agrochemical researchers (Table 5). Payne and Kinman in (2019) studied 909 firefighters in UK and they partially agreed with the current work that the mean scores of job demands did not meet HSE benchmarks. They determined that the main risk factors for the participants' poor work-related well-being were relationship conflicts and affective rumination, whereas role clarity, job control, and problem-solving contemplating were beneficial.

Previous researches found strong links between the 'job content' (i.e. demands, control and support) and negative health consequences (MacKay et al., 2004). Kerr and his colleagues (2009) in their study on work related health outcomes from UK; noticed that demands had a significant negative link with both job-related anxiety and depression, whereas control and peer

support had no significant relationships and managers' support showed just a modest relationship with job-related depression. Interestingly, they also discovered that the 'job context' which included the role, relationships and change, had a more consistent and unfavorable relationship with the ill-health measurements. In contrast Pelfrene et al., (2002) detected a negative link between employee mental health and a lack of job control.

In consistent with the present study Blair and Littlewood (1995) recognized that work relationships are potential stressor and they concluded that this is due to disagreements with coworkers as well as lack of support from management. Lack of understanding and support from managers, as well as, demands at work (i.e. workload, work patterns and work environment), have been identified as major contributors to work-related stress (WRS) (HSE, 2001). Employees who believe their workload is excessive are more likely to experience WRS, especially if their burden exceeds their abilities to handle it. Control refers to how much say and engagement employees have in how they carry out their duties (HSE, 2001). According to Asplund and his

colleagues (2022), employees' health, family lives, and ability to work are all being impacted by an imbalance between job demands and resources.

### **Conclusion**

The agrochemical researchers' self-reported stress was mostly of moderate and non-problematic level. "Change", "demand" and "authorities support" were the predominant sources of stress among the studied population. Demand and relationships were remarkable among problematic stressed personnel than others, and among psychologically distressed individuals as well.

### **Recommendations**

It is recommended to perform effective stress management program, including education in stress management skills, to defend against job stress and its detrimental health and performance implications. Studies including management line should be established to develop and test such intervention to promote positive mental health among agrochemical researchers. The cohort of respondents who willingly participated in the current study might be followed up over time to see if the cross-sectional relations identified were causal and whether if there will be a

change of possible causal relationships after this interventional program.

### **Conflict of interest**

None declared.

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