

# **Occupational Safety and Health Practices among Farmers in Wadi Al Far'a Area, Palestine \***

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## ممارسات السلامة والصحة المهنية

بين المزارعين في منطقة وادي الفارعة، فلسطين

### ملخص:

## Abstract

**Background:** Agriculture is considered a vital sector and it is ranked as the fourth cause for occupational non- fatal injury in the Palestinian society.

**Methods:** A quantitative study in Wadi Al Far'a area was implemented in 2017. Four hundred farmers were interviewed and completed a questionnaire. The researcher requested information about the farmers and their work, along with a description of the injury and its seriousness and whether they were injured during the past twelve months. Moreover, information regarding farmer awareness about the preventive measures was taken. A descriptive analysis,  $\chi^2$  testing and binary logistic regression were conducted using SPSS (version 20).

**Results:** The analysis showed that 71% of the interviewed farmers were injured, of which 51% of the injuries were concentrated in the hands of the farmers, while 36% of the farmers were injured by stab wounds from sharp objects, and 45% of the accidents were caused by hand equipments. The analysis also showed that 4.2% of the farmers reported that the injuries were serious and needed hospital treatment, while 47.6% needed a rest for a day or less and 2% were left with long-term injuries accompanied by medical certificates. Fewer injuries were found among farmers who attended an occupational safety course and who wore protective uniforms. The binary regression results revealed that farmers coming from big families, who own the farms and work as full time farmers in big fields, were at a higher risk to become injured. While elderly farmers were at a lower risk to be injured.

**Conclusion:** Strengthening the National Committee for Occupational Safety combined with safety education; through the use of safety equipment and the improvement of preventive measures that are needed to improve occupational safety for farmers at the Palestinian level.

**Key words:** Accident; Injury; Farmer; Agriculture Worker; Safety.

الخلفية: تُعدُّ الزراعة قطاعاً حيوياً وتصنف كسبب رابع للإصابة المهنية غير المميتة في المجتمع الفلسطيني. المنهجية: تم تنفيذ دراسة كمية في منطقة وادي الفارعة في عام 2017. وأجريت مقابلات مع أربع مائة مزارع بالإضافة إلى تعبئة استبيان. وتم طلب معلومات عن المزارعين وعملهم، ووصفاً عن الإصابة وخطورتها بالإضافة إلى بيان إذا ما أصيبوا خلال الاثني عشر شهراً الماضية. وعلاوة على ذلك، قام البحث بجمع معلومات بشأن وعي المزارعين بالتدابير الوقائية. وعليه تم إجراء تحليل وصفي واختبار  $\chi^2$  والانحدار اللوجستي الثنائي باستخدام منظومة SPSS الإصدار رقم 20.

النتائج: تبين أن 71% من المزارعين الذين أجريت معهم المقابلات تلقوا إصابات مختلفة، حيث أصيب 51% منهم بإصابات في أيديهم، وتعرض 36% منهم للطعن بسبب الأدوات الحادة وعانى 45% منهم من إصابات بسبب الاستخدام غير السليم للمعدات اليدوية. ومن بين هذه الإصابات، أعلن 4.2% من المزارعين أن الإصابات كانت خطيرة وتحتاج إلى علاج في المستشفى، في حين أن 47.6% أجبروا على نيل الراحة لمدة يوم أو أقل وحصل 2% منهم على عواقب طويلة الأمد ترافقها تقارير طبية. أما بالنسبة للمزارعين الذين شاركوا في دورة السلامة المهنية والذين كانوا يرتدون الملابس الواقية فبينت النتائج أنهم حصلوا على إصابات أقل من غيرهم. وكشفت نتائج الانحدار الثنائي أن المزارعين من العائلات الكبيرة، الذين يمتلكون مزارع ويعملون كمزارعين متفرغين في حقول كبيرة، كانوا أكثر عرضة لخطر الإصابة أما المزارعين كبار السن فكانوا أقل عرضة لخطر الإصابة.

الخلاصة: يجب العمل على تعزيز عمل اللجنة الوطنية للسلامة المهنية ودمجها بالتعليم المبني على ممارسات السلامة من خلال استخدام معدات السلامة وتحسين الإجراءات الوقائية لتحسين السلامة المهنية للمزارعين على المستوى الفلسطيني.

الكلمات المفتاحية: حادثة، إصابة، مزارع، عمال الزراعة، السلامة.

## 1. INTRODUCTION

Agriculture is an old profession with about 2.7 billion people worldwide working in some form of agricultural activity (Perry, 2008). Even though people working in the agricultural sector had lower mortality and morbidity rate due to mental or cardiovascular disorders (Stiernstrom et al., 2001); they face many health risks at work including physical, biological and chemical hazards (Rautiainen et al., 2004; Holen et al., 2017; Rezaei et al., 2018). Agriculture ranks among the most dangerous professions worldwide (Pickett et al., 1995; Schelp, 1992; Colemont et al., 2008; Kuta et al., 2015; Janssen and Nonnenmann, 2017), and workers worldwide suffer different injuries from accidents related to their work type such as handling of animals, chemicals, machinery use and fall accidents (Schelp, 1992). In Norway, a study found that 9.2% of surveyed farmers had one or more work-related injuries. It was shown that 17.5% of them had a consequence of sick leaves or a more serious result (Svendsen et al., 2014). Another study in China, that assessed farmers and retailer knowledge and awareness of the risks using pesticide, found that protective measures were inadequate; 65% of farmers never used any protective measures during spraying. The washing of hands was the most common mode of personal hygiene for most of them, for >70% (Yang et al., 2014). Many studies were conducted to assess the different risk factors that farmers are exposed to during their work, while other studies were conducted to assess the effectiveness of the protective measures and how to create and adjust work condition and tools for each farmer to prevent these injuries (Narasimhan et al., 2010; Wibowo and Soni 2016; Tinc et al., 2018).

Farming in the Palestinian society is a vital sector. It comprises many facets, including productive farming, forestry and agricultural services like; co-ops, veterinarians and fertilizer dealers. Because of its broad scope, this sector possesses a multitude of dangers including machinery, falls, burns, livestock, poisonings, and environmental hazards. Those factors contribute to an unsafe work environment combined with a limited work force, seasonal time pressures, and dependency on weather conditions and variations. Add to that the unstable economy powered by the

Israeli competition for productive farm areas. For that, according to the Palestinian Central Bureau of Statistics (2017a) only 7.5% of the Palestinian labor force is employed in the agriculture sector with a 2.6% of the sector contribution to the Gross Domestic Product (GDP) (Palestinian Central Bureau of Statistics, 2017b).

Regarding the injuries, the Ministry of Labor (MoL) documents revealed that there were no fatal injuries registered from agricultural activity between 2011 and 2016. Nonetheless, agriculture was classified as the fourth workplace for the non-fatal injuries between 2013 and 2016 with percentages of 6%, 7%, 13% and 11% respectively (Ministry of Labor, 2011-2016).

However, there is a lack of reported injuries to the MoL following the rule of law. There is also poor coordination between the relevant authorities caused by the lack of knowledge on injuries in agriculture and a shortage in formal documents.

The aim of this study is to assess the occurrence and nature of occupational hazards among farmers in Wadi Al Far'a area in order to improve this profession, especially since this category has not received adequate attention from researchers.

## 2. METHODOLOGY

### 2.1. Procedure

Data was collected between March and May, 2017 through direct personal interviews with 400 farmers to fill a special questionnaire. The questionnaire is designed to solicit the views and experiences of farmers working in Wadi Al Far'a area in relation to the themes of occupational health and safety, after reviewing previous studies in this regard. The questionnaire was piloted through performing interviews with 10 farmers and then adjusted accordingly.

The questionnaire consisted of three parts; the first included the farmers demographical data; age, gender, marital status, educational attainment, family members, socio-economic status and general information about their workplace such as working hours and days, owning a farm, having an assistant, the production area and its types. The

second part was about the actual experience of accidents, injuries and occupational diseases. In the event that the farmer reported an injury during the past 12 months due to farm work, he/she was asked questions about the cause of the injury, the place in which the injury was obtained, the objects involved in causing the injury, the affected part in the body, and the severity of the injury. The severity was assessed by the knowledge of the place where the injury was treated; whether at the hospital, on farm or at home, the resting days and their ability to perform work after that injury. The third part assessed the farmer awareness about the preventive measures; in terms of wearing protective clothes, attending occupational safety courses, having labor or medical insurance and their willingness to attend occupational safety activity if they had the opportunity to participate.

The research population included all farmers in Wadi Al Far'a area for implementation of this research. In this area, the dominant economic sector is agriculture; it has a large and fertile agricultural area which covers 20,000 dunums (1 dunum = 1000 m<sup>2</sup>). Moreover, Wadi Al Far'a area is suffering from various environmental problems many of which result in agriculture-related health problems.

## 2.2. Sample

A statistically representative sample size was calculated. The method proposed by Herbert Larkin was applied, in accordance with the following equation (Hassan, 2007):

$$n = \frac{p(1-p)}{(SE+t)+[p(1-p)+N]} \quad (1)$$

Where n is the sample size, t is the value for a specific confidence level, p is the proportion of respondents who selected a specific choice and SE is the confidence interval or margin of error. Taking a confidence level of 95% (t = 1.96), the maximum possible proportion of 50% (p = 0.5) that gives the largest sample size and a margin of error of 5% (SE = 0.05), N is the population size = 28500 farmers, a minimum sample size of 379 is needed. The simple random sampling method was used in sample selection, and four hundred farmers were interviewed. An informed consent was taken from each responder.

## 2.3. Statistical Analyses

The data was analyzed using the Statistical Package for Social Studies program (SPSS) version 20. Descriptive analysis was performed to inspect farmers' demographical data, the injuries description and seriousness for those injured. Chi-square test of significant was performed to assess the relation between the injured farmers and other different characteristics. Then, binary logistic regression with 95% CI level was done to identify confounders and to locate associated factors.

## 3. RESULTS AND DISCUSSION

### 3.1. Distribution of the Study Sample

Four hundred farmers were interviewed and completed the questionnaire from 10 different localities in Wadi Al Far'a area. The percentage of the study population was as follows; 75.5% of the study population was males and the rest were females. Most of them, around 83.3% were full time farmers while the remaining had other jobs. The farmers there produce seven different agricultural types including cattle, poultry, vegetables, olives or citrus fruit trees, wheat and feeding plants. Some farmers have more than one production type on the farm. Demographical data are shown in Table 1 and other general information is shown in Table 2.

### 3.2. Description of the Injuries

During the past 12 months, 221 (55.3%) farmers experienced illness, and 284 (71%) were injured due to their agricultural work nature. Among those 284 injured farmers, half (51.4%) reported that the injury was concentrated in their hands, legs and feet. Figure 1 shows the percent of the injuries according to the body parts. Revising the labor injuries reports published by the MoL between 2011 and 2016 showed that around half of the work injuries were in the upper extremities rather than the lower ones, which is conform to our results. They referred these injuries to the misuse of machinery and equipment (Ministry of Labor, 2011-2016). Pickett et al. (1995) findings are consistent with our results that most of the farmer injuries were in the upper and lower limbs

rather than back pains. Wibowo and Soni (2016) also said in their study that most of the injuries were incurred in the hand. However, a Swedish study revealed that the main injured parts of the body were; the head (39%) then the upper and lower extremities (30%, 26%) respectively (Schelp, 1992).

**Table 1.**  
Distribution for farmers according to their demographical characteristics

Variable	Frequency (Percentages %)				
Age	17- 29		30- 49		50 and more
	116 (29%)		199 (49.8%)		85 (21.3%)
Sex	Male			Female	
	302 (75.5%)			98 (24.5%)	
Educational attainment	Illiterate	Primary	Preparatory	Secondary	Diploma or higher
	28 (7%)	87 (21.8%)	124 (31%)	98 (24.5%)	63 (15.8%)
Marital status	Single			Ever married	
	112 (28%)			288 (72%)	
Family members	Less than 4 members		4-6 members	Seven members and more	
	62 (15.5%)		198 (49.5%)	140 (35%)	
Socioeconomic status	Poor	Second	Middle	Fourth	Rich
	34 (8.5%)	77 (19.3%)	138 (34.5%)	145 (36.3%)	6 (1.5%)
Having medical insurance	Yes			No	
	240 (60%)			160 (40%)	

**Table 2.**  
General data of the interviewed farmers

Variable	Frequency (Percentages %)					
Job	Full- time farmer			Has other work		
	333 (83.3%)			67 (16.8%)		
Working alone	Working alone			Has an assistant		
	62 (15.5%)			338 (84.5%)		
Sharing farm ownership with other farmers	Yes			No		
	261 (65.3%)			139(34.8%)		
Working hours per day	6 hours or less		7-8 hours	9-10 hours	More than 10 hours	
	104 (26%)		139 (34.8%)	114 (28.5%)	43 (10.8%)	
Working years in agriculture	Less than 6 years	6-10 years	11-15 years	16-20 years	21-25 years	More than 25 years
	68 (17%)	84 (21%)	56 (14%)	67 (16.8%)	51 (12.8%)	74 (18.5%)
Agriculture area available to farm	10 dunums or less		11-20 dunums	21 dunums or more		
	192 (48%)		130 (32.5%)	78 (19.5%)		



Variable	Frequency (Percentages %)						
Person working vs. taking a vacation	Yes			No			
	234 (58.5%)			166 (41.5%)			
Production types	Cattle	Poultry	Vegetables	Wheat & barley	Olive	Citrus fruit	Feeding plants
	171 (42.8%)	116 (29%)	233 (58.3%)	109 (27.3%)	40 (10%)	44 (11%)	2 (0.5%)
Wearing protective clothes	Yes			No			
	166 (41.5%)			234 (58.5%)			
Attending an occupational safety course	Yes			No			
	79 (19.8%)			321 (80.3%)			

The research shows that 35.9% of the injuries happened due to accidental stabbing by sharp object, while 16.9% were due to severe bruising or 14% by fall accidents. These percentages are consistent with Xiang et al. (2000) results. However, these results oppose the data found in the registered formal annual reports of the MoL, that state that accidents from falls are the first leading cause of work injuries in general among Palestinian workers, due to the absence of appropriate safety work environment (Ministry of Labor, 2011-2016).

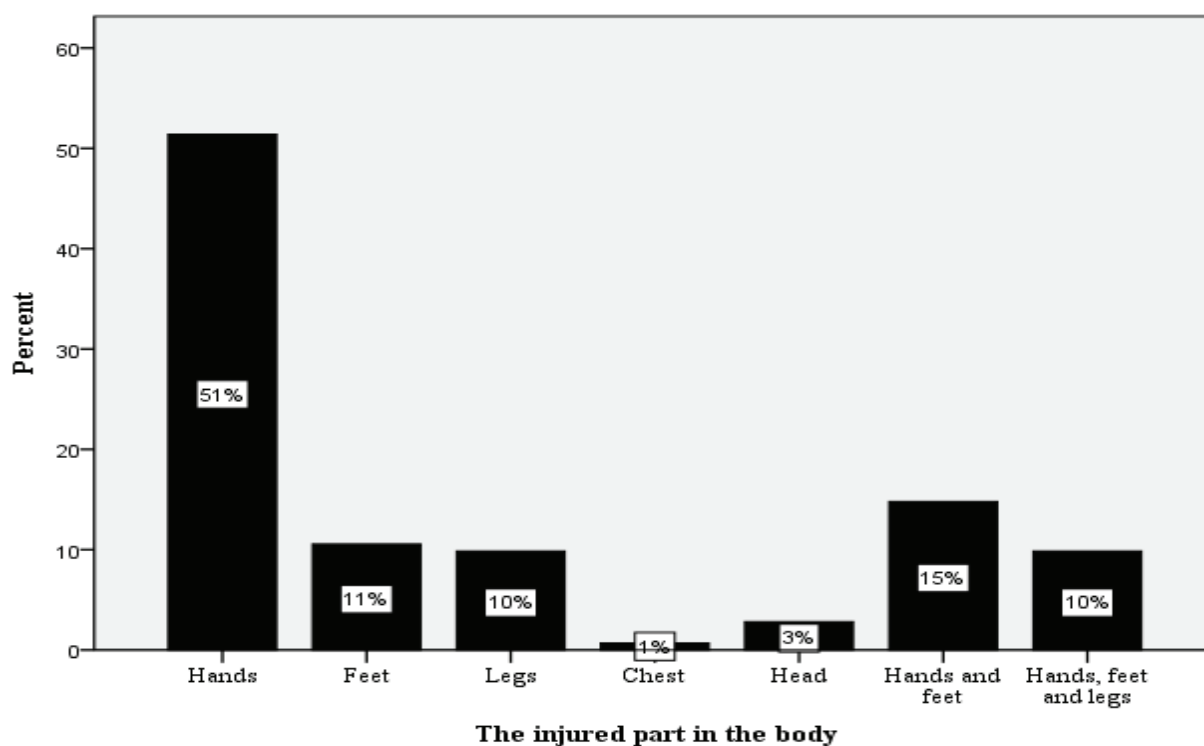


Figure 1: The distribution of the injuries in the body parts.

Pickett et al. (1995) associated fall accidents with the elderly, as they are more susceptible to it. Moreover, the main external cause of injury was the misuse of hand equipment, which clarifies why most of the injuries were found in the upper and lower extremities. O'Connor et al. (1993) showed that 24% of the farm injuries were caused by farm machineries while 10% was caused by the use of tractors. On the other hand, Hopkins (1985) revealed that farm tractors were the first cause of injuries in Athens

County between 1980- 1985 amounting to 39.5% of the injuries, followed by other farm equipment, all adding up to other sources of dangers to farmers. Wibowo and Soni (2016) found that Indonesian farmers prefer safe hand tools that are easy to use and fit into the hand combined with other properties and anthropometric dimensions to decrease injuries from their use. Other accidents and external causes are presented in Figures 2 and 3. Regarding the place of injury occurrence, 67.6% of the farmers reported that the injuries happened out in the field, while 16.2% were experienced inside of cowsheds. Road traffics and the bird

farm yards amount to 5.6% of the accidents each. While the least accidents prone places were in the country yard (3.5%) or in the bird farms (1.4%). Svendsen et al. (2014) reported that most of the Norwegian farmers injuries happened inside the outbuilding then out in the courtyard or field, and only 1% of the injuries were road traffic accidents. This difference may be dependent on the type of activities and equipments available for each.

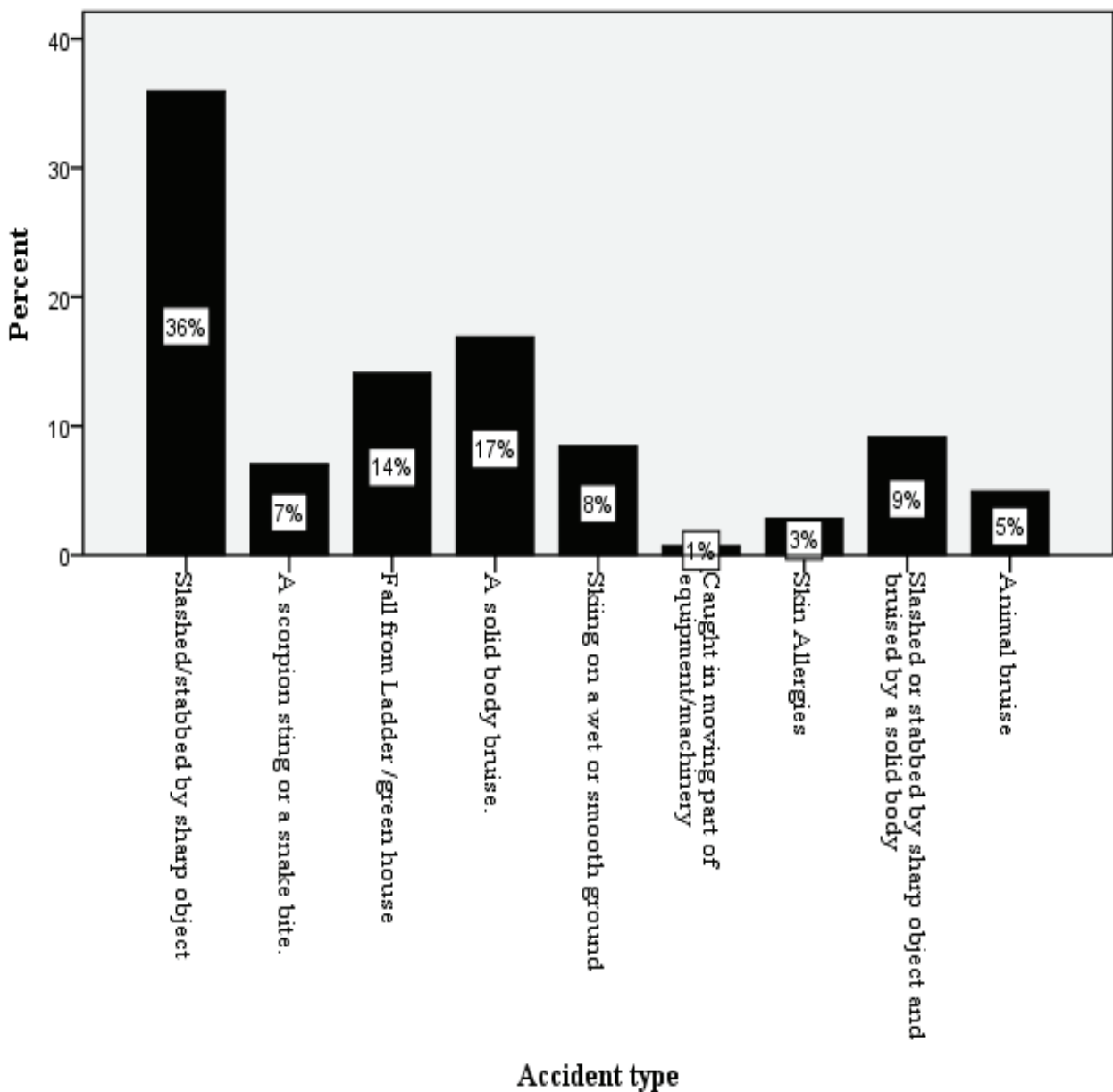


Figure 2: Percentage of types of accidents experienced by farmers

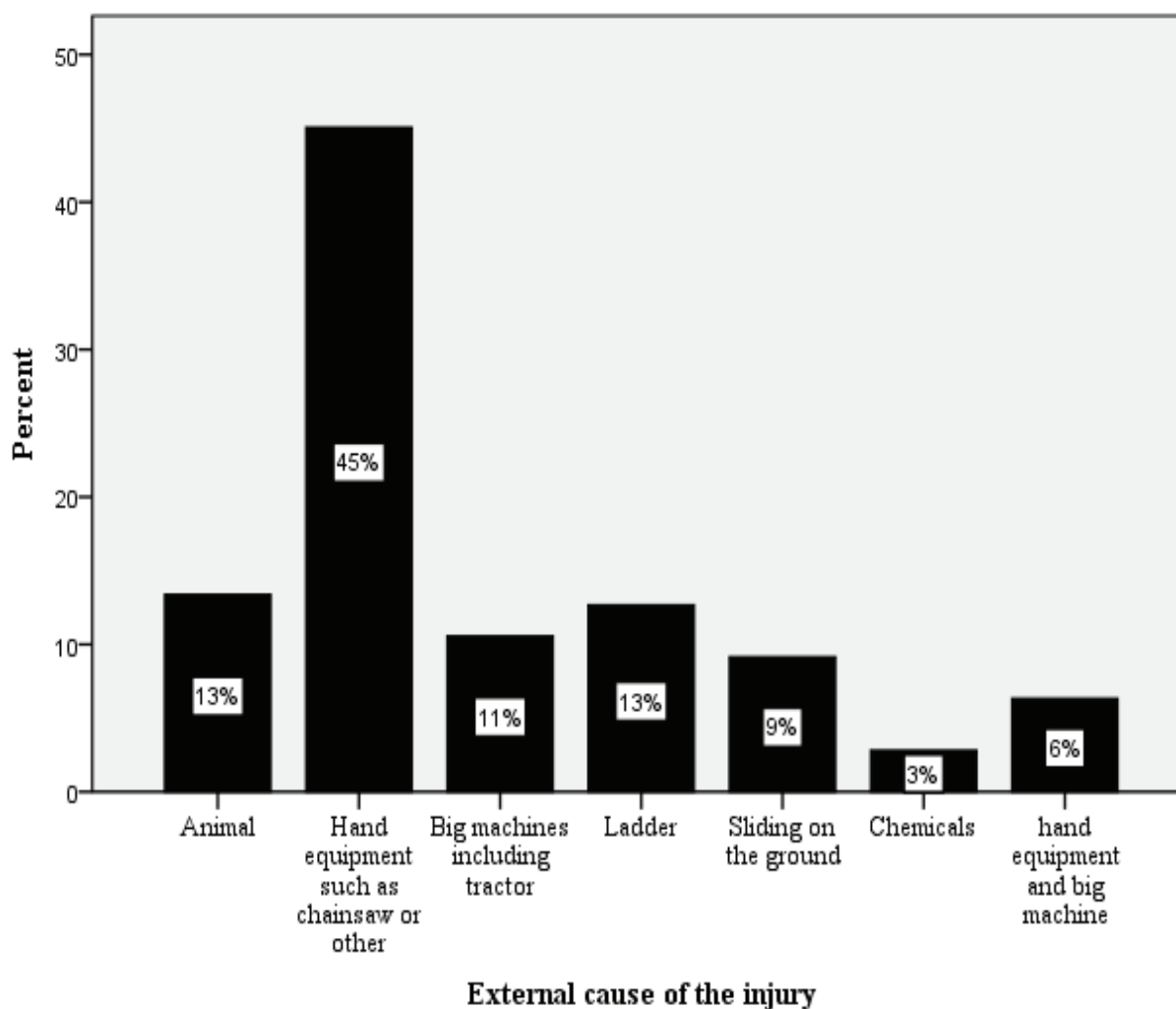


Figure 3: External causes of injuries among farmers

### 3.3. Seriousness of the Injuries

Regarding accidents seriousness, as shown in table 3, most of the injuries did not have many serious consequences on the farmers' health. Results showed that 84.4% of the farmers performed their works without problems after treatment, 4.2 % reported that the injury was serious and needed hospital treatment and 2.1% reported that they were left with long-term injuries accompanied by medical certificates. Schelp's (1992) study results show that most of the injuries (81%) were minor and only 3% were severe. On the other hand, 164 (41%) farmers reported that they had to stop their work and take a rest, were 78 (47.6%) of them had to rest only for one day or less. Pickett et al. (1995) found that 17% of the injured farmers in Ontario had more than one week of rest, and 10% - 17% were hospitalized.

Logistic regression analysis revealed a statistically significant association between seven variables (Table 4) and being injured due to the agricultural work during the past 12 months. Farmers aged 50 years or more were less likely to be injured compared to the young ones, in accordance with MoL annual reports results (Ministry of Labor, 2011-2016), and they referred that to the absence of cumulative experience and the negligence of wearing protective clothes by the young farmers. Other authors (Browning et al., 1998; Marcum et al., 2011) added other factors as; health status, less risky behavior, performed tasks types and lower working hours per week. The illiterate farmers were more likely to be injured compared to others who completed primary, preparatory, secondary or higher education levels. Percentages revealed that farmers who completed primary education had



a lower risk of injuries compared to others. The relationship between education (school years) and work-related injuries was inconsistent with Xiang et al. (2000), and Patel et al. (2010) findings. They reported that farmers with less than twelve school years of education were at a higher risk for injury than others. Xiang et al. (2000) explained that mere comparison among educational status might not provide a clear vision, that farming activity is different among various conditions. Farmers from big families (seven members or more) were more likely to be injured compared to small families (three members or less). Farmers working at big fields (eleven to twenty dunums) were more likely

to be injured compared to workers in small field (ten dunums or less). That is in harmony with Pickett et al. (1995) findings, which demonstrates that increasing farming area will mean more employees and will in turn increase the chance of injuries. Farmers having other types of works were less likely to be injured compared to full time farmers, and shared land owners were less likely to be injured compared to individual owners. The last two results are absolutely combined with working hours, since more working hours are positively associated with work related injuries (Pickett et al., 1995).

**Table 3**

**Distribution for injuries and its consequences on farmer health**

Variable	Frequencies (percentages %)				
<b>Injury severity</b>	<b>Slight (didn't deserve a treatment)</b>	<b>Medium (treated at home or on the farm)</b>	<b>Medium (treated by a doctor)</b>	<b>Medium (treated in hospital)</b>	<b>Serious (treated in hospital)</b>
	76 (26.8%)	112 (39.4%)	42 (14.8%)	42 (14.8%)	12 (4.2%)
<b>Absence from work</b>	<b>Less than 0.5 day</b>	<b>0.5 to 1 day</b>	<b>2 to 7 days</b>	<b>8 to 29 days</b>	<b>Month to 6 months</b>
	14 (8.5%)	64 (39%)	62 (37.8%)	14 (8.5%)	10 (6.1%)
<b>Consequences of the injury on health</b>	<b>Perform ordinary work without problems</b>	<b>Perform ordinary work, but with problems</b>		<b>Long-term injuries accompanied by medical certificate</b>	
	238 (84.4%)	38 (13.5%)		6 (2.1%)	

**Table 4.**

**Different significant variable with occupational work injuries during the past 12 months obtained by binary logistic regression (odds ratios and 95% confidence intervals).**

Variable	p-value	OR (95% CI)
<b>Age</b>	<b>17-29</b>	<b>Reference</b>
	30-49	0.917 (0.341-2.467)
	50 or more	8.609 (2.069 -35.827)
<b>Educational attainment</b>	<b>Illiterate</b>	<b>Reference</b>
	Primary	52.775 (11.933-233.395)
	Preparatory	7.713 (1.787-33.289)
	Secondary	31.401 (6.839-144.169)
<b>Family members</b>	Diploma or higher	14.215 (2.374-85.105)
	<b>3 or less</b>	<b>Reference</b>
	4-6	0.860 (0.382-1.937)
	7 or more	0.162 (0.064-0.469)

Variable		p-value	OR (95% CI)
Having medical insurance	Yes		Reference
	No	0.003	0.272 (0.114-0.647)
Agriculture area available to farm	10 or less		Reference
	11-20	0.004	0.358 (0.179-0.718)
	21 or more	0.083	0.510 (0.238-1.091)
Job	Full time farmer		Reference
	Has other work	0.004	3.420 (1.472-7.947)
Sharing farm ownership	Yes		Reference
	No	0.029	0.426 (0.198-0.916)

### 3.5. Farmer Awareness About the Preventive Measures

It was clear that farmers (62.7%) who attended an occupational safety course made an important step in lowering injuries risks, while farmers (73.5%) who did not attend any safety course were prone to injuries. It is worth mentioning that an effective training program is of great importance and can result in the reduction of the number of deaths and injuries, illnesses, property damage, legal liability workers' compensation claims, and missed time from work. Safety training courses help create a safety culture among farmers (Wikipedia, 2017; Holte and Follo 2018). Furthermore, 315 (78.8%) farmers showed their desire to attend activities related to occupational safety measures. Uninsured farmers were more likely to be injured compared to those with insurances (Table 5). To enforce health-protecting actions; the farmer himself needs to believe that he/she could be susceptible to injuries

with serious consequences on health, if he/she does not take the appropriate protections which in turn will reduce the possibility of injuries (Pickett et al., 1995). Moreover, the use of safety devices on machines and routine machinery maintenance are other factors that help reduce the injury risks (Narasimhan et al., 2010). Lesser injuries (62.7%) were found between farmers wearing protective clothes, and 76.9% between those not wearing them, and that is logically because wearing protective clothes is important to decrease the chemical poisons, but not sufficient. As preventing measures, farmers need to take a shower or at least wash their hands in a right manner which is consistent with other studies (Xiang et al., 2000). Our study also found that chemicals were seen as a main cause in 2.8% of the injuries. The MoL annual report (2012) revealed that chemicals caused 22% of the farmers' injuries, nonetheless no poisoning accidents were registered in the MoL annual reports between 2013-2016 (Ministry of Labor, 2011-2016).

**Table 5.**

Distribution of farmer awareness measures with occupational work injuries during the past 12 months.

Variable	Being injured due to the agricultural work during the past 12 months		p- value
	Yes n (%)	No n (%)	
Having medical Insurance	Yes	146 (60.8%)	0.000
	No	138 (86.2%)	
Attending an occupational safety course	Yes	48 (60.8%)	0.025
	No	236 (73.5%)	

Variable	Being injured due to the agricultural work during the past 12 months		p- value
	Yes n (%)	No n (%)	
Wearing protective clothes	Yes	104 (62.7%)	0.002
	No	180 (76.9%)	

#### 4. CONCLUSIONS AND RECOMMENDATIONS

The majority of the interviewed farmers were injured or complained from a disease related to their farming work. Most of these injuries were caused by farming equipment and 2% of the farmers reported that the injury was serious and had long-lasting symptoms accompanied with medical reports. On the other hand, fewer injuries were found among farmers who attended occupational safety courses and wore protective uniforms while performing their work. The binary regression results revealed that farmers from big families, who own the farm and work as full time farmers in a big field were at a higher risk for injuries, while elderly farmers were at a lower risk to be injured.

One cannot overlook that farming is a vital sector for Palestinians even though the injuries resulting from farming are of a high percentage and are not formally documented. After 2015, the formal registry for farming prone injuries has improved and the incidents from occupational injuries become slightly lower as documented by the MoL annual reports. This is due to the scientific practices of implementing the Occupational Health Program in 2015. More safety education, better supervision, the use of safety equipments and the improvement of preventive measures are needed to target the agriculture sector, in parallel with strengthening the National Committee for Occupational Safety and Health and the National Safety Center that helps improve occupational safety among farmers at the Palestinian level.

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