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Grzegorz Kucaba ^(DEFG), Katarzyna Bebło ^(C), Marek Wojtaszek ^(ADG), Dawid Filip ^(BG),
Marek Muster ^(BG), Maciej Naróg ^(BD), Andrzej Włodyka ^(C)

Evaluation of farmers' first aid knowledge in most common injuries at work in agriculture – a pilot study

Chair of Medical Rescue, Medical Faculty, University of Rzeszów, Poland

ABSTRACT

Introduction. According to the International Labour Organisation (ILO), agriculture is one of the most dangerous industries. The rate of fatal accidents in agriculture is about twice the average for other sectors.

Aim. The aim of this study was to evaluate the level of knowledge of first aid concerning the most common injuries that occur in agricultural work. The analysis of the types of injuries during work in agriculture and their incidence among Polish farmers in the years 2013–2014 made it possible to define the most common types of injuries and their causes for the selected professional group and to draw up a survey for the farmers in order to achieve the main research goal.

Material and methods. The study was conducted in two stages. At first, data from KRUS – Kasa Rolniczego Ubezpieczenia Społecznego (the Polish Agricultural Social Insurance Fund) was analyzed with reference to the incidence and the type of injuries that occurred in agriculture in 2013 and 2014. Then research was carried out by means of a survey based on the data obtained in the first stage. The study was preliminary and it was carried out on a sample of 51 persons.

Results. The most common cause of the 41,702 incidents qualified by the Agricultural Social Insurance Fund as an accident in agriculture in Poland in the years 2013 and 2014 was a fall from heights. Every fourth respondent had witnessed or had been directly involved in an accident in agriculture. Despite the fact that everyone declared familiarity with the principles of first aid, over a half of the respondents had never given it.

Conclusion. All of the respondents declared having knowledge of the principles of first aid, however, research shows that their knowledge is incomplete and not consolidated. Due to the fact that there are few reports on the research topic, it seems advisable to continue it in a larger study group. With reference to pesticide use, despite having knowledge of the hazard of intoxication by organophosphate compounds, a majority of farmers included in the study did not use any personal protective equipment.

Keywords. injuries at work in agriculture, trauma, first aid

Corresponding author: Grzegorz Kucaba, ul. Pigonia 6, 35-310 Rzeszów, Tel. 017 872-11-95, e-mail: gkucaba@ur.edu.pl

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Introduction

Injuries are an integral part of human life at any age. They are distinguished primarily depending on their location and mechanism. Most often they cause wounds, amputations and frequently lead to death. It is for the treatment of the effects of injuries that substantial resources are allocated all around the world. In the United States, these injuries constitute the fourth leading cause of death among all age groups, and at the same time the most common cause of death among children and adults up to 44 years of age. About one third of injuries are incidents involving agricultural machinery. In the UK around 2,500 people die annually as a result of injuries. In Poland there are about 3.5 million injuries a year, and 300,000 victims require specialist treatment.¹

According to the International Labour Organisation (ILO), agriculture is one of the most hazardous industries. Along with mining and construction, it is ranked as one of the three most dangerous sectors. In many countries including Poland, the rate of fatal accidents in agriculture is about twice the average for other sectors.² Pursuant to Article 11, section 1 of the Law on farmers' social insurance, an accident at work in agriculture is defined as a sudden event caused by external circumstances which occurs during the course of work related to conducting agricultural activities or in connection with performance of these activities. This incident must occur on the premises of the farm run by the insured or where they perform their duties on a permanent basis, or in the household directly connected with this farm. In addition, an accident at work in agriculture is defined as an event which takes place during the journey from the place of residence to the farm, or on the way back, as well as while performing routine jobs related to conducting agricultural activity outside its premises, or related to these activities.³

Aim of the study

The aim of this study was to evaluate the level of first aid knowledge among farmers from the county of Tarnobrzeg concerning the most frequent injuries at agricultural work based on the analysis of incidence and the types of injuries that occurred at agricultural work in the years 2013-2014 in Poland.

Material and methods

This pilot study was carried out in two stages. In the first stage, data developed by Kasa Rolniczego Ubezpieczenia Społecznego (KRUS), the Polish Agricultural Social Insurance Fund was gathered and placed on the website: <http://www.krus.gov.pl>. For this purpose a scientific research protocol was drawn up to provide for standardized collection and analysis of retrospective data. At this stage, 45,313 incidents registered by the Agricultural Social Insurance Fund were analyzed as incidents at agricultural work in the years 2013 and 2014. The anal-

ysis was made in terms of the most common causes, the number of reported incidents, as well as the number of incidents, including fatalities, qualified by the Agricultural Social Insurance Fund as an accident at agricultural work within the guidelines of the Law on Farmers' Social Insurance. With relation to the main causes of accidents at work, the analysis was made based on the accepted criteria, including such incidents as 'being hit, crashed, bitten by animals', 'falling objects', 'being caught in or hit by moving parts of machines and devices', 'falling from heights', and 'other'. In the category referred to as 'other', no detailed descriptions of incidents falling into this category were found, thus it was omitted in the construction of the survey questions. It should be emphasized that the classification published by the Agricultural Social Insurance Fund refers only to incidents in which the victims were granted a one-off compensation. On the basis of this data, figures and percentages of the discussed problem were presented.

The study covered 35 women and 16 men; the youngest person was 18, the oldest 56. Most respondents (36 persons) lived in rural areas. The place of residence for a quarter of respondents (13 persons) was a city with up to 10 thousand residents, while for 2 persons it was a city with over 10 thousand residents. Participation in the study was anonymous and voluntary, and the respondents were informed that the results obtained would be used for research purposes only. Criteria for inclusion in the study were to work in agriculture and live in the area of the county of Tarnobrzeg. Studies of figures and graphs were performed using Excel Microsoft Office 2007®.

The study was conducted through a survey of own design, prepared on the basis of data collected from reports published by the Agricultural Social Insurance Fund. The survey comprised 15 questions, of which 6 were related to demographic and social data such as sex, age, education level, place of residence, occupation and number of years of work on the farm. The next 3 questions were formulated on the basis of information contained in the reports published by the Agricultural Social Insurance Fund. They concerned subjective assessment of the most common causes of accidents at agricultural work, whether the respondents had witnessed an accident at agricultural work and whether they knew the principles of giving first aid. Another set of questions made it possible to determine the level of respondents' knowledge on how to deal with victims of the most common injuries that occur as a result of accidents at agricultural work. These questions concerned knowledge of the steps to take in the case of cervical spine injuries, limb fractures, hemorrhages, traumatic amputation, foreign bodies in the wound, the use of plant protection products and the risk of poisoning. For each question, multiple choice answers were given, from which respondents could choose only one, according to their current knowledge.

Results

Based on the analysis of statistics published by the Agricultural Social Insurance Fund, it has been shown that in 2013 and 2014 a total of 45,313 incidents were reported as accidents at agricultural work. Out of these, 41,702 reported cases were qualified as accidents at agricultural work within the guidelines of the Law on Farmers' Social Insurance. In 2013, 21,093 out of 23,374 registered incidents were qualified as accidents at work in agriculture, of which 15,806 were granted compensation.⁴ However, in 2014 out of 21,393 reported incidents, 20,609 cases were qualified as accidents at agricultural work, and compensation was given to 15,649 people.⁵ Both in 2013 and in 2014, out of all reported accidents, 77 were fatal each year, accounting for 0.36% in 2013 and 0.37% in 2014 of all accidents. This data is presented in Table 1.

In the discussed period, the largest number of accidents occurred in the Lubelskie Voivodeship: 2,145 in 2013 and 2,251 in 2014. The fewest accidents were in the Opolskie Voivodeship: 189 events each year, both in 2013 and in 2014. Information on the number of accidents in agriculture in the years 2013–2014 from each voivodeship is given in Table 2.

Among the causes of accidents at agricultural work the following categories were distinguished: being hit, crashed, bitten by animals, falling objects, being caught in or hit by moving parts of machines and devices, as well as a fall from heights. The latter amounted to as many as 8,281 incidents in 2013 and 7,674 in 2014. Another most common cause of accidents in agriculture was being caught in or hit by moving parts of machines and equipment, which accounted for 1,863 of the total number of accidents in 2013 and 2,047 in 2014. Being hit, crashed, bitten by animals accounted for 1,807 accidents in 2013 and 1,876 accidents in 2014. Accidents caused by falling objects were the least common – and occurred 1,266 times in 2013 and 1,320 times in 2014. All of the above incidents were the cause of the total of 13,217 cases in 2013 and 13,917 cases in 2014. Causes referred to as 'other' accounted for 2,589 incidents in 2013 and 2,732 in 2014.^{4,5} This data is presented in Table 3.

Out of 51 people who took part in the survey 29 were aged 18–25 years, 9 were aged 26–35 years and 7 persons were 36–45 years old. The smallest group was made up of persons over 46 years of age – 6 people. In the studied group there were more people with secondary education

Table 1. Accidents at agricultural work in the years 2013 and 2014 in Poland^{4,5}

Accidents at agricultural work	2013	2014
number of incidents reported in the reporting period as accidents at agricultural work	23,374	21,393
number of events qualified as accidents at agricultural work in the reporting period	21,093	20,609
number of decisions with granted compensation	15,806	15,649
Including		
fatal	77	77
number of denied decisions	7,825	7,352

Table 2. Number of accidents in particular voivodeships in 2013 and 2014 in Poland^{4,5}

Voivodeship	Number of accidents			
	2013		2014	
	Total	Including Fatal	Total	Including Fatal
TOTAL	15,806	77	15,649	77
Dolnośląskie	561	1	504	0
Kujawsko-pomorskie	1,003	3	1,002	5
Lubelskie	2,145	9	2,251	15
Lubuskie	193	0	219	0
Łódzkie	1,459	8	1,357	6
Małopolskie	1,307	7	1,180	9
Mazowieckie	2,058	11	2,049	12
Opolskie	189	0	189	2
Podkarpackie	1,127	4	1,067	4
Podlaskie	1,308	5	1,230	2
Pomorskie	616	5	568	2
Śląskie	316	4	284	0
Świętokrzyskie	790	7	836	2
Warmińsko-mazurskie	774	5	775	2
Wielkopolskie	1,720	7	1,907	9
Zachodniopomorskie	240	1	231	1

Table 3. Number and type of accidents at agricultural work in 2013 and 2014 in Poland

Voivodeship	Fall from heights		Falling objects		Being caught in, hit by parts of machines and devices		Being hit, crashed, bitten by animals		Other	
	Year									
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
TOTAL	8,281	7,674	1,266	1,320	1,863	2,047	1,807	1,876	2,589	273
Dolnośląskie	305	256	68	51	71	57	32	33	86	107
Kujawsko-pomorskie	484	481	67	77	119	95	139	152	194	197
Lubelskie	1,203	1,142	171	202	228	294	162	176	381	437
Lubuskie	106	115	18	24	20	26	18	27	31	27
Łódzkie	767	696	135	115	190	192	164	163	203	191
Małopolskie	766	645	91	98	175	181	93	81	182	175
Mazowieckie	1,068	987	145	148	267	287	283	289	295	338
Opolskie	63	75	22	19	39	27	20	21	45	47
Podkarpackie	681	590	76	72	125	149	50	44	195	212
Podlaskie	578	500	101	77	140	151	235	265	254	237
Pomorskie	313	274	39	45	75	68	75	76	114	105
Śląskie	165	122	25	21	33	50	40	36	53	55
Świętokrzyskie	455	447	44	81	98	108	76	74	117	126
Warmińsko-mazurskie	355	344	72	59	70	69	129	146	148	157
Wielkopolskie	854	889	174	207	175	251	268	279	249	281
Zachodniopomorskie	118	111	18	24	38	42	23	14	43	40

(23 people), slightly fewer (18 people) with primary education, 8 people with higher education and 2 people who had basic vocational education. Most of the respondents (27 people), in addition to working in agriculture, continued their education and were enrolled as pupils or students. The rest were blue-collar workers – 15 respondents, or white-collar workers – 8 people, and 1 person was retired. Most respondents (27 people) had been working in agriculture for less than 5 years. The second group of 7 people were persons who had been working in agriculture for 5–10 years. The third group consisting of five people were persons who had been working in agriculture for more than 15 years. Only one person had been active in agricultural work for 10–15 years.

In order to compare the data published by the Agricultural Social Insurance Fund concerning the most common agricultural accidents with the opinions of respondents, the participants of the study were asked what type of incidents they believed occurred most frequently in their work environment. According to 21 people, the most common cause of accidents was 'being caught in and hit by moving parts of machines.' At the same time, 36 out of 51 respondents had never witnessed any accident that would occur due to the operation of farm machinery, whereas 15 people were witnesses to such incidents. Another most common cause of accidents in agriculture mentioned by respondents was 'contact with sharp handheld tools and other sharp objects.' This answer was given by 17 people. The third reason, mentioned by 7 people,

was 'being hit, crashed, bitten by animals,' where a vast majority of study participants, i.e. 41 people, had livestock. A 'fall from heights' was the fourth leading cause of injury mentioned by 5 people, while 1 person considered 'falling objects' to be the most common cause of accidents in agriculture. All of the respondents gave a positive answer to the question concerning knowledge of first aid.

A further part of the survey referred to management of various types of injuries according to the principles of first aid. Respondents were asked about the easiest way to immobilize cervical spine, through a choice of five answers: with own hands or knees, using the Kendrick Extrication Device (K.E.D.), cervical collar, and spinal board. 28 out of 51 people, answered that they would use a cervical collar for immobilization in a suspected cervical spine injury. Only 17 respondents indicated a correct answer, i.e. immobilization of cervical spine with one's hands or knees. According to 4 people, most preferable would be the use of orthopedic boards, whereas two people chose K.E.D. In the opinion of 46 study participants, their knowledge concerning immobilization of a fractured lower or upper limb in the position in which they found the victim after an accident was good. Only 5 people did not know how to immobilize a fractured limb. As the easiest way to stop the bleeding 17 people chose direct pressure on the wound. Another 28 people said they would apply a pressure dressing. According to 4 persons, a tourniquet should be put, one person would apply pressure above the bleeding site and also one per-

son would apply pressure below the bleeding site. With reference to the use of a tourniquet – 26 of all respondents gave a correct answer, i.e. application on the shoulder for upper limb amputation, or on the thigh for lower limb amputation. Another 17 people said the tourniquet should be placed about 10 cm above the bleeding site, 5 persons would put it about 15 cm above the site of bleeding, and 3 people stated that the place of application did not matter. To the question about procedure in the case of an embedded foreign body in the wound (here a knife stabbed into lower leg), 32 people answered they would stabilize the stabbed object, 12 people would remove the knife and dress the wound, and 7 persons did not know what to do in such a situation. With reference to the question on traumatic amputation, 33 respondents answered that they knew what traumatic amputation was, out of whom 17 knew how to protect the amputated part and the stump (they would apply a tourniquet). There was no data in any of the analyzed Agricultural Farmers' Social Insurance reports concerning accidents related to the use of plant protection products, which are used at almost every farm in larger or smaller amounts. Thirty-one people confirmed this fact in the question concerning contact with plant protection products while working in the field. Out of these, 14 people did not use any personal protective equipment. In the studied group, 28 people enumerated excessive sweating, headache, salivation, and watery eyes as first symptoms of pesticide poisoning. According to 16 respondents, the main symptoms of poisoning with plant protection products are muscle tremors, numbness in the limbs, excessive sweating and dizziness. According to 5 people, the first signs are a mild headache connected with a sensation of tension, and visible widening of blood vessels, whereas according to 2 people, the signs of such poisoning are color vision disturbance with reduced sensitivity to red, and tooth loss.

Discussion

The aim of the survey was to present the extent and types of agricultural injuries and assess the level of farmers' knowledge concerning familiarity with and ability to give first aid to victims of the most common injuries that occur in their work environment. Some of the preliminary results of this research coincide with reports of other authors who obtained comparable results in similar studies carried out in developing countries.

It has been observed that compared to 2013, in 2014 there was a drop by 1,981 (6.1%) incidents reported as accidents at agricultural work. The number of incidents qualified by the Agricultural Farmers' Social Insurance as an accident at work in agriculture also went down in relation to 2013, but only by 484 incidents. In 2014 there was an observed decrease by 3.4% in the causes of accidents in agriculture, defined as a 'fall from heights', along with an increase in other causes, from 0.4% in the case of

incidents defined as 'falling objects' to 1.3% in the case of 'being caught in or hit by moving parts of machines and devices.' Similar results were obtained in a study by Fleszar, Chojnacki and Sławinski, who compared accidents in agriculture in 2005 and in 2010-2013, and found that there was a significant improvement in safety in 2013 compared to 2005, observed in the reduction in the number of accidents by some 2.7% per year. This study also shows that in 2010-2013 there was a slowdown in the reduction in the number of accidents to 1.75% annually.⁶

The number of fatal accidents in 2013 and in 2014 was the same, i.e. 77 cases each year. Research conducted in 2012 by the Canadian Agricultural Injury Reporting (CAIR) shows that between 1990 and 2008 as many as 1,975 people were killed as a result of accidents at agricultural work in Canada, which averaged to 104 people per year.⁷ Stawicki, Grieger and Sedlak in their work: 'Analysis of the risk of accidents arising from the operation and use of machinery and equipment' point out that despite the fact that agricultural machinery and equipment rank third among the main causes of accidents at agricultural work, for the victims they were the cause of 54% of all fatal accidents in 2012, whereas in 2014, agricultural machinery and equipment contributed to 27% of all fatal accidents.⁸

Our research shows that there is a large discrepancy between the data presented by the Agricultural Farmers' Social Insurance and the assessment of study participants concerning the most common causes of accidents. In the studied group, the most common cause of accidents in agriculture was 'contact with sharp hand-held tools and other sharp objects', however, according to information published by the Agricultural Farmers' Social Insurance, the most frequent cause of accidents in agriculture is a 'fall from heights'. In a similar study by Molineri, Signorini and Tarabla, carried out in 78 farmers in the province of Santa Fe in Argentina, the most common cause of accidents at agricultural work were wounds and bruises caused by objects (39.7%), the second a fall from heights (26.4%), while in the study conducted in Finland by Taatola, Rautiainen, Karttunen et al., and published in 2012, falling and slipping were the most common mechanisms leading to accidents at agricultural work.^{9,10}

In the studied group, more than a half, i.e. 36 persons had never witnessed an accident at work in agriculture, which is consistent with the results of research by Dąbrowska, which showed that only one in four respondents (26%) witnessed or participated in a serious accident in agriculture.¹¹

First aid, as defined in the Law on State Emergency Medical Services, is a set of actions that can be taken to rescue a person in an emergency. They should be taken by any person present at the scene, including the use of medical devices and medicinal products obtained without prescription, which was confirmed by all respondents.¹²

The outcome is satisfactory, compared with the results of research by Semwal, Juyal, Singh and Kandpal, which showed that knowledge of first aid was declared only by 25.6% of respondents.¹³

Further results of our study indicate that subjective assessment of knowledge on the principles of first aid is not fully consistent with respondents' actual knowledge. For example, in the case of suspected cervical spine injury more than half of the respondents would use a cervical collar to immobilize the victim, which can only be performed by qualified paramedics. Similarly in the case of bleeding, where 26 people would first apply a pressure dressing instead of direct wound compression, which would only be applied by one-third of the respondents. Also, concern remains for the fact that 14 out of 31 people using plant protection chemicals at agricultural work did not use any personal protective equipment. Similar results were obtained by Salemach, Baldi, Brochard, Abi Saleh, who proved that more than 50% of respondents did not apply, or applied inappropriate personal protective equipment while using plant protection products.¹⁴ Remaining satisfactory is the fact that 42 persons out of all respondents could tell the main symptoms of poisoning by plant protection products. In her research based on data from the National Institute of Hygiene, Matyjaszczyk showed that since 2004 in Poland the number of cases of poisoning with plant protection products has been around 100 people per year, whereas fatalities amounted to 8. It is worth noting that the data may be incomplete. However, data from the Agricultural Farmers' Social Insurance reports concerning accidents involving plant protection products shows that they are not classified separately, as is the case with other causes of accidents, which makes it difficult to analyze this type of occurrences. They should be put together with other incidents involving chemical substances as 'accidents resulting from impact of harmful materials'.¹⁵

Results

1. There was no change in the number of fatal accidents at agricultural work in the years 2013-2014.
2. A large discrepancy has been shown to exist between what the study participants identified as the most common causes of accidents at agricultural work and the data presented by the Agricultural Farmers' Social Insurance.
3. All of the study subjects declared that they knew what first aid was and that they would be able to accurately present its scope.
4. Knowledge of first aid among farmers is incomplete and not consolidated.
5. Some respondents did not use personal protective equipment during the use of plant protection products, despite having knowledge on organophosphate compounds poisoning.

Compliance with ethical standards

Conflict of interest: The authors declare that they have no conflicts of interest.

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