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Analysis of Agricultural Injuries Occurrences among Rural Residents in Two Counties of Hainan Province Based on Follow-up Survey

Lixia Wang, Weiling Xu, Qiao Li*

International School of Public Health and One Health, Hainan Medical University, Haikou, 571199, China

**Corresponding author*

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Abstract: To understand the epidemiological characteristics of agricultural injuries among rural residents in Hainan Province and to providing a solid and scientific foundation for the prevention and control of agricultural injuries in Hainan Province and further in-depth research. Among the 5 counties selected for the baseline survey, 2 counties were randomly chosen for a one-year follow-up survey utilizing a self-designed injury questionnaire administered to the personnel included in the baseline survey, with follow-ups conducted monthly. EpiData 3.1 was used for double entry of the data, and the data was analyzed using SPSS 20.0 after cleaning. Descriptive analysis methods were used for the follow-up data on agricultural injuries. The combined valid follow-up cases in this study were 587, with 238 people experiencing agricultural injuries. The most agricultural injuries occurred in July, with 35 people, accounting for 22.7%. The most common type of injury was lacerations (42.4%), with the vast majority (92.6%) of agricultural injuries occurring in the fields or greenhouses. 193 people (81.1%) were injured while working in the fields, and the most common injured body part was the upper limb (42.0%). Among the 154 people who were injured, 150 (63.0%) had fully recovered, and the majority (62.1%) chose outpatient treatment after being injured. Agricultural injuries have become an important factor affecting the quality of life of rural residents in Hainan Province and have also caused certain economic losses to families, requiring further effective intervention measures for control.

1. Introduction

Agricultural injuries are one of the major public health issues that harm the people of countries around the world, seriously impacting the quality of life of people worldwide. Agricultural injury, as an important occupational hazard, is recognized as one of the most dangerous occupations in the world due to its widespread occurrence, high frequency, high disability rate, and high fatality rate [1]. Currently, the incidence of injuries among rural residents in China is high, and it has become a common disease and a major cause of death in rural areas [2]. Rural residents engaged in agricultural production activities face high health risks, even life-threatening risks. In addition to causing direct

physical injuries, agricultural injuries also impose heavy economic and healthcare burdens on the families and the country [3]. As agriculture serves as the foundation, pillar, and advantageous industry of Hainan Province's economy, with a large population engaged in agricultural labor, research on agricultural injuries in Hainan is scarce. This article provides a descriptive analysis of the epidemiological characteristics of agricultural injuries among rural residents in two counties of Hainan Province, aiming to provide a scientific basis for further formulation of preventive measures for agricultural injuries.

2. Objects and Methods

2.1. Study Subjects

Among the 5 counties selected for the baseline survey, 2 counties (Qiongzhong and Ledong) were randomly selected. In 2021, a self-made injury questionnaire was used to conduct a one-year follow-up survey on the personnel selected for the baseline survey, with monthly follow-ups.

2.2. Survey Content

① Basic information of the survey subjects: gender, ethnicity, average annual household income, marital status, educational level, etc. ② General injury situation: whether injuries have occurred, frequency, types of injuries, locations of injuries, body parts affected, types of injuries (falls, bruises, cuts, poisoning, etc.), activities at the time of injury, post-injury treatment, and recovery status.

2.3. Statistical Analysis

EpiData 3.1 was used for double entry of the data, and SPSS 20.0 was used for data analysis after data cleaning. Descriptive analysis methods were used for the follow-up data on agricultural injuries.

3. Results

3.1. General Situation of Follow-up Survey

In this study, a one-year follow-up was conducted from January 2021 to December 2021, with monthly follow-ups, totaling 12 times. There were 587 effective follow-up cases, including 253 from Ledong, accounting for 43.1%, and 334 from Qiongzhong, accounting for 56.9%. Among them, there were 306 males, accounting for 52.1%, and 281 females, accounting for 47.9%. The average age was (43.19 ± 14.350) years. There were 497 Li ethnic people, accounting for 84.7%, and 10 people from other ethnic groups, accounting for 15.3%. Among the participants, 62 had no formal education, accounting for 10.6%, 169 had primary school education, accounting for 28.8%, 265 had junior high school education, accounting for 45.1%, 80 had senior high/vocational school education, accounting for 13.6%, and 11 had associate's degree or higher, accounting for 1.9%.

3.2. Occurrence of Agricultural Injuries in the Follow-up Survey

During this follow-up, agricultural injuries occurred every month. From January to June, the highest number of agricultural injuries occurred in June, with 30 cases, accounting for 33.7%, while the lowest number occurred in February, with 4 cases, accounting for 4.5%. In the second half of the year, the highest number of agricultural injuries occurred in July, with 35 cases, accounting for

22.7%, while the lowest number occurred in December, with 12 cases, accounting for 7.8%. Among the types of injuries, the top four types among the 238 individuals who experienced agricultural injuries were cutting injuries (42.4%), sprains (22.6%), abrasions (11.7%), and blunt injuries (8.8%). The vast majority (92.6%) of agricultural injuries occurred in fields or greenhouses, while the remaining injuries were scattered across other locations. Among the 238 people who experienced agricultural injuries, 193 (81.1%) were injured while working in the fields, 17 (7.1%) were injured during machinery maintenance, and 14 (5.9%) were injured while transporting agricultural products. The injured body parts were upper limbs (42.0%), lower limbs (34.0%), waist (8.8%), and simultaneous injuries to multiple body parts accounted for 7.5%, with scattered occurrences in the neck, chest, abdomen, and other areas. The treatment outcomes showed that out of the 154 people who suffered agricultural injuries, 150 (63.0%) had fully recovered, 45 (18.9%) had not fully recovered, and 46 (19.3%) had residual sequelae. The majority chose outpatient treatment after the injury, with 148 people (62.1%) opting for this, followed by 85 people (35.7%) who treated themselves. Please refer to Tables 1, 2, 3, 4 for more details.

Table 1: Agricultural Injury Incidents in Follow-up Survey from January to June 2021

Items		Follow-up months (1 to 6)						Total	Percentage (%)
		1	2	3	4	5	6		
Number of injuries (n)		7	4	16	13	19	30	89	100.0
Types of injuries (n)	Lacerations	2	1	5	5	8	19	40	44.9
	Twists and strains	1	2	4	4	2	7	20	22.5
	Blunt force injuries	0	0	0	0	1	2	3	3.4
	Abrasions	1	0	3	1	6	2	13	14.6
	Falls	1	0	2	2	1	0	6	6.7
	Crush injuries	0	1	0	1	0	0	2	2.2
	Animal-related injuries	1	0	1	0	0	0	2	2.2
	Punctures	1	0	0	0	1	0	2	2.2
	Burns or scalds	0	0	1	0	0	0	1	1.1
Total		7	4	16	13	19	30	89	100.0
Locations of injuries (n)	Fields or greenhouses	5	2	15	12	18	28	80	89.9
	Roads	1	1	0	0	0	0	2	2.2
	Processing plants	0	1	0	0	1	0	2	2.2
	Breeding farms	1	0	0	0	0	0	1	1.1
	Home	0	0	1	1	0	2	4	4.5
Total		7	4	16	13	19	30	89	100.0
Activities at the time of injury (n)	Farm labor	6	2	14	9	18	23	72	80.9
	Machinery maintenance	1	0	0	0	1	4	6	6.7
	Transporting agricultural products	0	1	2	1	0	1	5	5.6
	Processing agricultural products	0	0	0	1	0	2	3	3.4
	Road transportation	0	1	0	2	0	0	3	3.4
	Other	0	0	0	0	0	0	0	0.0
	Resting	0	0	0	0	0	0	0	0.0
Total		7	4	16	13	19	30	89	100.0

Table 2: Agricultural Injury Incidents in Follow-up Survey from July to December 2021

Items		Follow-up months (7 to 12)						Total	Percentage (%)
		7	8	9	10	11	12		
Number of injuries (n)		35	29	26	32	20	12	154	100.0
Types of injuries (n)	Lacerations	12	14	12	12	7	5	62	40.3
	Twists and strains	12	3	8	4	4	3	34	22.1
	Blunt force injuries	4	4	0	5	1	3	17	11.0
	Abrasions	3	3	2	6	2	0	16	10.4
	Falls	0	1	3	2	3	1	10	6.5
	Crush injuries	2	2	0	2	1	0	7	4.5
	Animal-related injuries	1	2	0	0	1	0	4	2.6
	Punctures	1	0	1	0	1	0	3	2.0
	Burns or scalds	0	0	0	1	0	0	1	0.6
Total		35	29	26	32	20	12	154	100.0
Locations of injuries (n)	Fields or greenhouses	33	28	24	30	19	11	145	94.2
	Roads	0	0	1	1	1	0	3	1.9
	Processing plants	0	1	1	0	0	1	3	1.9
	Breeding farms	2	0	0	0	0	0	2	1.3
	Home	0	0	0	1	0	0	1	0.7
Total		35	29	26	32	20	12	154	100.0
Activities at the time of injury (n)	Farm labor	27	22	23	27	12	10	121	78.6
	Machinery maintenance	2	6	1	1	3	0	13	8.4
	Transporting agricultural products	4	0	1	1	2	1	9	5.8
	Processing agricultural products	1	0	0	2	0	1	4	2.6
	Road transportation	0	0	1	1	2	0	4	2.6
	Other	0	1	0	0	1	0	2	1.3
	Resting	1	0	0	0	0	0	1	0.7
Total		35	29	26	32	20	12	154	100.0

Table 3: Agricultural Injury Incidents and Prognosis in Follow-up Survey from January to June 2021

Items		Follow-up months (1 to 6)						Total	Percentage (%)
		1	2	3	4	5	6		
Frequently injured body parts (n)	Upper limbs	1	2	4	3	10	13	33	37.1
	Lower limbs	4	1	6	6	5	11	33	37.1
	Waist	0	1	2	0	2	2	7	7.9
	Multiple body parts	1	0	3	2	1	2	9	10.1
	Abdomen	1	0	0	1	1	1	4	4.5
	Buttocks	0	0	0	1	0	0	1	1.1
	Back	0	0	0	1	0	0	1	1.1
	Neck	0	0	0	0	0	0	0	0.0
	Shoulders	0	0	0	0	0	0	0	0.0
	Chest	0	0	0	0	0	0	0	0.0
	Perineum	0	0	0	0	0	0	0	0.0
Total		7	4	16	13	19	30	89	100.0
Outcome after recovery (n)	Completely Healed	4	2	7	8	11	24	56	62.9
	Not Healed	2	1	2	3	3	2	13	14.6
	Left with Sequelae	1	1	7	2	5	4	20	22.6
Total		7	4	16	13	19	30	89	100.0
Treatment after injury (n)	Outpatient treatment	5	2	11	7	14	15	54	60.7
	Self-treatment	1	0	5	5	5	15	31	34.8
	Hospitalization	1	1	0	1	0	0	3	3.4
Total		7	4	16	13	19	30	89	100.0

Table 4: Agricultural Injury Incidents and Prognosis in Follow-up Survey from July to December 2021

Items		Follow-up months (7to 12)						Total	Percentage (%)
		7	8	9	10	11	12		
Frequently injured body parts (n)	Upper limbs	15	12	13	16	6	6	68	44.2
	Lower limbs	14	9	4	10	8	2	47	30.5
	Waist	1	2	3	2	3	4	15	9.7
	Multiple body parts	0	4	3	1	1	0	9	5.8
	Abdomen	1	0	1	2	0	0	4	2.6
	Buttocks	0	2	0	1	1	0	4	2.6
	Back	2	0	0	0	0	0	2	1.3
	Neck	1	0	1	0	0	0	2	1.3
	Shoulders	0	0	1	0	0	0	1	0.7
	Chest	0	0	0	0	1	0	1	0.7
	Perineum	1	0	0	0	0	0	1	0.7
Total		35	29	26	32	20	12	154	100.0
Outcome after recovery (n)	Completely Healed	28	20	13	19	8	6	94	61.0
	Not Healed	3	2	6	10	8	4	33	21.4
	Left with Sequelae	4	7	7	3	4	2	27	17.6
Total		35	29	26	32	20	12	154	100.0
Treatment after injury (n)	Outpatient treatment	22	14	15	21	13	9	94	61.0
	Self-treatment	12	14	9	11	6	3	55	35.8
	Hospitalization	1	1	2	0	1	0	5	3.2
Total		35	29	26	32	20	12	154	100.0

4. Conclusions

The current follow-up study found that the peak time for agricultural injuries occurred in July. This can be attributed to the peak periods of planting and harvesting of crops in Hainan, which typically takes place from June to September. During this time, the labor intensity is high, leading to increased exposure and subsequently a higher incidence of injuries. Conversely, the lowest occurrence of injuries was in February, which corresponds to the winter season when agricultural labor is relatively reduced, resulting in fewer agricultural injuries.

The most common types of agricultural injuries were cutting and sprains. Both Qiongzhong and Ledong, the two areas covered in this follow-up, cultivate rubber, betel nuts, and rice. Cutting injuries may result from manual harvesting of rubber or rice, or from mechanical mishaps. This may be associated with the relatively low level of mechanization in impoverished rural areas of Hainan, where residents make extensive use of knives and sharp tools. This finding is similar to the results of previous studies by Zhou Lina[4] and Hou Juwang[5]. Qiongzhong and Ledong are part of the impoverished central region of Hainan. For low-income populations, increasing labor intensity may be one way to improve income levels[6]. Additionally, with limited agricultural machinery, villagers often manually handle heavy items, potentially leading to sprains during lifting.

The most common locations for agricultural injuries were fields or greenhouses, consistent with the activities reported during the follow-up, which mainly involved fieldwork. In agricultural activities, the upper limbs were frequently injured, followed by the lower limbs, far exceeding other body parts. Given the manual nature of agricultural planting and harvesting in Hainan, residents frequently use their limbs to operate, leading to an increased risk of limb injuries[7]. As mechanization in rural Hainan is limited, the likelihood of upper limb injuries during agricultural activities is high, and there are also cases of injuries resulting from manual operation of machinery. During the follow-up, over half of the injured villagers had already recovered, while a significant number had not. This may be due to the monthly data collection, resulting in new injuries that have

not fully healed. The high proportion of villagers choosing outpatient or self-treatment is related to their economic capacity and the remote location of their villages from hospitals.

In rural Qiongzhong, Hainan, the incidence of agricultural injuries is high, with injuries primarily occurring during peak agricultural seasons, mainly presenting as cutting injuries in fields, and affecting the upper and lower limbs. Attention should be given to agricultural injuries by relevant professionals and departments. Strengthening agricultural labor safety education for rural residents and improving agricultural tools specific to the region should be considered to reduce the occurrence of agricultural injuries.

Agricultural injuries have become an important factor affecting the health and quality of life of rural residents in Hainan Province. The occupational health of agricultural workers not only concerns the individuals but also impacts the sustainable development of the agricultural industry. Protecting the occupational safety and health of agricultural workers is essential[8]. While the occurrence of agricultural injuries has a certain level of randomness and unpredictability[9], most of these injuries are preventable. Many countries have incorporated agricultural injuries as an important part of national disease prevention and control efforts. However, in China, agricultural injuries have not received sufficient attention from relevant authorities. The economic losses and long-term hazards caused by agricultural injuries should not be underestimated. Preventing and controlling injuries is a long-term endeavor that requires the participation of the whole society[10]. It is essential to promptly strengthen education and publicity on agricultural production safety for rural residents, implement effective intervention measures, control the occurrence of agricultural injuries, reduce the economic burden on rural residents, and improve their quality of life.

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