

Analysis of Factors Affecting Agricultural Injuries among Rural Residents in Two Counties of Hainan Province Based on Follow-up Data

Kang Lu, Weiling Xu, Qiao Li*

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

**Corresponding author: lqny178@163.com*

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Abstract: This study aims to analyze the situation and influencing factors of agricultural injuries among rural residents in Hainan Province based on follow-up data, providing reference for the prevention of agricultural injuries in Hainan Province. Based on the baseline survey, rural residents from two cities and counties in Hainan Province were randomly selected as the subjects of this follow-up survey. The basic information and life stress of the subjects, their safety education, and whether injuries occurred and the frequency of occurrences were recorded. The statistical analysis used chi-square test. The injury rate during the one-year follow-up was 40.5%. The agricultural injury rates of residents of different ages, educational levels, marital status, and residential areas differed ($P < 0.05$). When preventing agricultural injuries, attention should be paid to older individuals, those with lower education levels, and widowed individuals. More attention should be given to individuals with these characteristics.

1. Introduction

Hainan Province is one of the earliest provinces to carry out research and practice on modern agriculture with Chinese characteristics, starting in the early 1990s^[1]. From 2005 to 2018, the rural workforce in Hainan Province increased from 5.256 million to 6.1958 million^[2]. Injuries are a serious public health issue that requires significant social and economic costs^[3]. Injuries are not randomly distributed; they affect identifiable at-risk populations^[4]. Therefore, to a certain extent, injuries can be prevented or reduced. Globally, agricultural injuries are a common social issue and lead to increased socio-economic burdens^[5]. Studies have shown that in China, the standardized mortality rate for rural injuries is higher than that of urban areas, and the rate of decrease is slower than in urban areas^[6]. In China's rural areas, injuries result in direct medical costs of up to 65 billion yuan, and work-related losses exceed 6 billion yuan^[7]. Such significant losses and burdens will affect economic development. Therefore, relevant measures should be taken to prevent and control the occurrence of injuries, thus reducing the socio-economic burden caused by injuries. However, the occurrence of agricultural injuries is related to many factors. This study aims to analyze the situation and influencing factors of agricultural injuries among rural residents in Hainan

Province based on follow-up data, providing a reference for the prevention of agricultural injuries in Hainan Province.

2. Object and Methods

2.1. Research Subjects

The subjects of this study are rural residents in Hainan Province. The follow-up period for the survey started in January 2021 and ended in December 2021. The follow-up period of this study was 1 year, with monthly follow-ups, totaling 12 times.

2.2. Sampling Method

Based on the baseline survey, two cities and counties in Hainan Province were selected using a random digit method, and a portion of the population from these two cities and counties was randomly chosen as the subjects for this follow-up survey.

2.3. Survey Content

The basic information of the subjects, such as gender, date of birth, average annual household income, marital status, educational level, as well as their life stress and safety education, were investigated. Additionally, whether injuries occurred and the frequency of occurrences were recorded.

2.4. Quality Control

A designated injury follow-up person was selected in each selected area to register the situation monthly check for any information omission or error on the spot, and promptly resolve any issues that arise on the spot. Before the follow-up survey, surveyors participating in the follow-up were trained in survey techniques to ensure uniform methods. Inclusion criteria: completion of all questionnaire items and not meeting the exclusion criteria. Exclusion criteria: completely identical answers selected in the basic information form; data entry errors or omissions.

2.5. Statistical Analysis

The data was double-entered using EpiData 3.1, and after organizing the data, SPSS 20.0 was used for data analysis. Statistical description of the follow-up data was performed, and statistical analysis was conducted using the chi-square test with a significance level of $\alpha=0.05$.

3. Results

3.1. Basic Demographic Characteristics of Survey Subjects

Considering the possibility of repeated injuries among some individuals, the combined effective person-times amounted to 587, with 306 males (52.1%) and 281 females (47.9%). The average age was (43.19 ± 14.35) years. The Li ethnic group had the largest number of people, accounting for 497 (84.7%), and the most common educational level was junior high school, with 265 individuals (45.1%). Among the marital status, the largest number of residents were married, totaling 437 individuals (74.4%), as shown in Table 1.

Table 1: Basic Demographic Characteristics of Survey Subjects

Variables		Ledong		Qiongzong		Total
		Number of Individuals	Percentage (%)	Number of Individuals	Percentage (%)	
		253	43.1	334	56.9	587
Gender	Male	129	51.0	177	53.0	306
	Female	124	49.0	157	47.0	281
Age (years)	≤18	3	1.2	4	1.2	7
	19~36	105	41.5	104	31.1	209
	37~54	105	41.5	133	39.8	238
	≥55	40	15.8	93	27.8	133
Ethnicity	Han	7	2.8	21	6.3	28
	Li	243	96.0	254	76.0	497
	Miao	0	0.0	59	17.7	59
Educational Level	No formal education	32	12.6	30	9.0	62
	Primary school	72	28.5	97	29.0	169
	Junior high school	118	46.6	147	44.0	265
	Senior high/vocational	27	10.7	53	15.9	80
	College or above	4	1.6	7	2.1	11
Marital Status	Unmarried	66	26.1	56	16.8	122
	Married	170	67.2	267	79.9	437
	Divorced	7	2.8	1	0.3	8
	Widowed	10	4.0	10	3.0	20

3.2. Agricultural Injury Incidence among Rural Residents with Different Characteristics in Follow-Up Counties

During the one-year follow-up of this study, 238 individuals (40.5%) experienced various types of agricultural injuries. The incidence of agricultural injuries among rural residents differed based on their age, educational level, marital status, and residential areas ($P < 0.05$). Trend chi-square tests were conducted for the injury incidence rates among rural residents of different ages, showing an increasing trend in injury incidence rates with advancing age. For rural residents with different educational levels, a trend chi-square test showed a decreasing trend in injury incidence rates with higher levels of education. A chi-square test comparing the injury incidence rates among rural residents with different marital statuses indicated that widowed rural residents had the highest injury incidence rates, followed by married rural residents. A chi-square test comparing the injury incidence rates among rural residents in the two follow-up areas showed that the injury incidence rate was higher in Qiongzong than in Ledong. Additionally, there was no statistically significant difference ($P > 0.05$) in the occurrence of agricultural injuries among residents of different genders, life stresses, alcohol consumption, family economic burden, and whether they had received safety education. See Table 2.

Table 2: Comparison of Agricultural Injury Incidence Rates among Rural Residents with Different Characteristics

Demographic Characteristics		Count (n)	Injury Incidence Rate (%)	χ^2	P
Gender	Male	306	130(42.5)	0.996	0.318
	Female	281	108(38.4)		
Age	≤18	7	1(14.3)	10.111#	0.001*
	19~36	209	69(33.0)		
	37~54	238	104(43.7)		
	≥55	133	64(48.1)		
Educational Level	No formal education	62	29(46.8)	4.80#	0.028*
	Primary school	169	76(45.0)		
	Junior high school	265	101(38.1)		
	Senior high/vocational	80	31(38.8)		
	College or above	11	1(9.1)		
Marital Status	Unmarried	122	38(31.1)	12.02	0.007*
	Married	437	183(41.9)		
	Divorced	8	3(37.5)		
	Widowed	20	14(70.0)		
Residential Area	Ledong	253	89(35.2)	5.314	0.021*
	Qiongzong	334	149(44.6)		
Life Stress	Very high	159	59(38.6)	2.167	0.539
	High	343	144(42.0)		
	Moderate	76	31(41.3)		
	None	16	4(25.0)		
Alcohol Consumption	Yes	298	127(42.6)	1.190	0.275
	No	288	110(38.2)		
Family Economic Burden	Very heavy	188	76(40.0)	0.775#	0.856
	Heavy	318	132(41.5)		
	Moderate	72	26(36.1)		
	None	9	4(44.4)		
Received Safety Education	Yes	123	48(39.0)	0.149	0.669
	No	464	190(40.9)		

Note: # indicates the use of the chi-square trend test; * indicates the statistical significance of the difference.

4. Discussion

In this follow-up study, it was found that out of 587 individuals followed up for one year, 238 experienced agricultural injuries, resulting in an agricultural injury incidence rate of 40.5%. The agricultural injury incidence rate was 35.2% in Ledong and 44.6% in Qiongzong. It can be observed that the agricultural injury incidence rates in the two counties of Hainan were relatively high during the one-year follow-up. Particularly, the higher occurrence of agricultural injuries in Ledong compared to the baseline survey suggests the possibility of recall bias among villagers during the baseline survey.

The results of this study showed that the agricultural injury incidence rates among rural residents varied based on different age groups, marital statuses, educational levels, and residential areas. Conversely, no statistically significant differences were found in the agricultural injury incidence rates among rural residents based on gender, life stress, alcohol consumption, family economic burden, and whether they received safety education. The differences in agricultural injury incidence rates between the two different residential areas during this follow-up were statistically significant. The relatively higher incidence of agricultural injuries in Qiongzong, compared to Ledong, may be attributed to the fact that rubber planting is the main agricultural activity in the Qiongzong area. The major rubber planting areas in Hainan Province are located in the central and western regions, with the most significant rubber cultivation in Danzhou, Baisha, Chengmai, and Qiongzong. In 2020, due to the impact of the pandemic, the demand for latex gloves and other medical supplies increased, leading to a rise in rubber prices^[8]. The increased time spent on rubber tapping by villagers, often in the evenings with reduced visibility, may contribute to the increase in injury incidents. Different genders also exhibited distinct agricultural injury incidence rates, with males having a higher rate than females, consistent with previous studies^[9-11]. Additionally, residents with different educational levels experienced varying incidences of agricultural injuries, consistent with conclusions from a study involving rural residents in Shandong, Henan, and Hebei provinces. Furthermore, older individuals are more susceptible to experiencing agricultural injuries^[12]. Therefore, attention should be paid to populations with higher agricultural injury incidence rates. Relevant authorities should take effective intervention measures to reduce the incidence of agricultural injuries.

This survey was a follow-up study with monthly data collection, which to some extent, mitigated recall bias among residents. However, the study only covered two counties, and as such, the results may be somewhat biased. Further research is needed to confirm whether the results can be representative of the overall situation of rural residents in Hainan Province.^[13]

5. Conclusions

This investigation conducts an exhaustive assessment of agricultural-related injuries among the rural populace of Hainan Province, utilizing longitudinal data. The study uncovers a noteworthy incidence rate of 40.5% for agricultural injuries during a one-year observational period. It is of particular interest that the prevalence of these injuries demonstrates significant heterogeneity among various demographic segments, evidenced by disparities linked to age, educational attainment, marital status, and geographic locality. These empirical insights highlight the imperative for devising intervention strategies that are demographically targeted. The research advocates for a strategic emphasis on subpopulations characterized by advanced age, lower educational backgrounds, and widowed status in the implementation of agricultural injury prevention initiatives. Concentrating efforts on these identified at-risk groups could lead to the development of more efficacious and bespoke measures, aimed at mitigating the prevalence of agricultural injuries within Hainan Province.

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