TOPICAL REVIEW

Documented Evidence of Agricultural Injury in China*

LIU Jianjun[1], YAO Hongyan[1], ZHENG Wenjing[1] , XIANG Huiyun [2],
[1] Chinese Center for Disease Control and Prevention, Beijing, China
[2] Center for Injury Research and Policy, The Research Institute at Nationwide Children's Hospital, The Ohio State University, Columbus, Ohio, USA

ABSTRACT

Background: Up until 2010, there were more than 1600 peer-reviewed articles on agriculture related injuries around the world. However, relatively few literature reviews existed concerning China's agricultural injuries.

Objective: To describe the documented evidence concerning agricultural injury in China and to identify topics for future research.

Method: Literature search and review were conducted to collect publications that were relevant to agricultural injury in China. The process included defining agricultural injury for the purpose of this study, selecting articles according to inclusion criteria and extracting data from each paper. Descriptive methods were used to analyze the contents, research approaches, distribution of authors, and cooperation percentage of agricultural injury studies.

Results: After applying the inclusion criteria, 89 articles were included in this study. The author collaboration percentage (number of articles with more than one author divided by number of total articles) and the institutional collaboration percentage (number of articles with more than one organization divided by number of total articles) among the 89 articles were 85.4% and 42.7%, respectively. Most of the authors are affiliated with a Center for Disease Control and Prevention (CDC) or an academic institution located in 10 of the 31 provinces in mainland China. Among the 89 articles, only 6 were on injuries related to agricultural work, the rest (83) dealt with injuries among rural residents with or without clarifying occupations or ongoing activities.

Conclusions: Research on agricultural injuries in China is currently in its early stage. More research is needed to obtain evidence that can be used in policy making for agricultural injury control. Our study is the first to describe the documented evidence on agricultural injuries in China and identify topics for future research.

Dr. YAO Hongyan
Deputy Director, Office of Epidemiology, Chinese Center for Disease Control & Prevention
No.155 Changbai Road Changping District
Beijing 102206, China
Email: 2003tb@163.com

INTRODUCTION

Worldwide, agricultural injury has been a significant occupational hazard. Because of the agricultural industry's high mortality rate and high risk for disability, agriculture is considered one of the most dangerous occupations in the world [1]. According to the National Safety Council in America, there were more than 700 agricultural fatalities and 80,000 agricultural disabling injuries occurring in 2007 in the U.S.[1] The recent report of Canada's Agricultural Injury Surveillance System

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(CAISP) stated there were 1,769 agricultural fatalities in Canada from 1990 to 2005, an average of 111 per year [2]. In 2000, a study in Hubei, China, showed that a total of 33% of farmers reported at least one worked-related injury in the 24 months prior to the survey [3].Besides physical impairment, agricultural injuries lead to large economic burdens. In America, the cost of therapy and rehabilitation for agricultural injuries and the subsequent productivity loss due to agricultural injury totaled more than $10 billion annually [4].

China is a vast country with 1.3 billion people, 57% of which live in rural areas. More than half of people living in rural areas either fully or partially engage in agricultural work [5]. The rural setting and lack of emergency care in remote areas leave rooms for health and safety improvement. By the end of 2010, there were more than 1600 agriculture injury related articles published around the world according to the search engine PubMed. Research data on agricultural injuries has focused on developed countries, particularly Canada, the United States, and Australia. In China there were limited number of publications on agricultural injuries within Chinese research databases when the term "agricultural injury" was used in the searches.

The purpose of this study is to describe the characteristics of Chinese agricultural injury related articles published and analyze the current status of research progress to aid future research in agricultural injury control and prevention in China.

METHODS

Definition of agricultural Injury and Inclusion Criteria

There was no consistent definition of agricultural injury commonly used in the agriculture-related injury control and prevention. While determining what constitutes agricultural injury, several priority factors were considered. These included the injury setting, occupation, and outcomes. In this study, agricultural injury was defined as "injuries that occurred during the agricultural working process or during activities related to the agricultural working environment, injuries among farmers or injuries that occurred in rural areas." The reason for selecting a broad definition was that few articles of agricultural injury were found in the main Chinese research database when using "agricultural injury" as the keyword. Data collected for our study were limited to mainland China. In this study, agricultural injury and farm injury are interchangeable.

Data collection methods

We searched the major Chinese databases, such as WANFANG Database（1982-2010）, WEIPU database (1984-2010), CHKD（1993-2010）and so on by using key words of 'agriculture', 'rural area,' and 'farmer' respectively matched with 'injury'[†]. We did not specify dates of publication.

As for the English database, 'agricultural/farm injury' and 'China/Chinese', 'rural', 'injury,' and 'China/Chinese' were used as key search terms in the MEDLINE database. Publication date was not included as part of the search criteria. After collecting the citation information of the articles, we then read the titles and abstracts and deleted those that were duplicate and irrelevant.

In addition to the aforementioned database, we also conducted searches at Google Scholar and file.baidu.com.

Summary record sheet

One summary record sheet was used per article. The criteria included title, date published, authors' full name, author's affiliation, content, number of authors, number of affiliated institutions, number

[†] Note: 中文检索式："农业"、"农村"或"农民"分别与"伤害"进行逻辑"与"的组合。

of references, number of references within last five years, categories/language of references, site/population where the injury took place, type of study design, and type of the journal.

Data management and analysis

First, the articles were read one by one and detailed data for each article was extracted and recorded on the summary record sheet. Second, variables including collaboration percentage of authors and organizations, geographical distribution of the authors, and number of quotations were used in statistical analysis. An EXCEL spreadsheet was used to organize the data. Frequency tabulates were used to describe the variable distribution.

RESULTS

Results of literature search

Figure 1 presents the selection process for including studies in the review. A total of 89 articles [3, 7-94] were selected which were published between 1993 and 2010. Most of these articles were published between the years of 2003-2010. Articles published between 2003 and 2010 accounted for 92.1% (82/89) of the total. The full texts were obtained and read through. The bibliometric parameters and research characteristics were analyzed and described.

Author and institutional collaboration

The majority of the articles involved multiple authors. Among the 89 articles, there were 13 with a single author and the rest had more than one author. The percentage of author collaboration was 85.4% (See Table 1).The average number of authors per article was 4.8 (425/89). There were 38 articles published by authors from two or more institutions. The institutional collaboration percentage was 42.7% (See Table 1).

Characteristics of first authors

Number of published articles and regional distribution of the first author showed the diversity of research levels throughout different institutions and regions. Table 2 showed that only 8 out of 81 (9.9%) authors published more than one paper. These articles accounted for 18% of total articles (16/89).

Table 3 displayed institutional distribution of first authors. Most of the first authors came from the China CDC, a provincial or local CDC, or an academic institution.

Citation analysis

Number of citations refers to the reference literature for each article. This could potentially affect the usefulness of information and distribution capacities. A total of 603 sources were quoted by the 89 articles, at an average of 6.8 sources quoted per article. The Price Index was 56.4% which was more than the average value (50%) [6] for general science articles(Price Index refers to the percentage of references published in the last five years compared with the total quoted number).

Research characteristics

Among a total of 89 articles, only 6 contained injuries related to the agricultural working process, the remaining 83 articles included rural residents with or without clarifying occupations or ongoing activities. There was no article that specially focused on the agricultural working environment or farmers. This shows that more "agricultural injury"-related information is included in injury-related surveys of rural areas. Many of the study designs were surveys (95.5%) based on population or surveillance systems such as National Disease Surveillance Points System (NDSPS). Most of the articles were published in Chinese journals (97.75%) and about 64% were from the Chinese core journals (See table 5).

Figure 1 Flow diagram of study selection

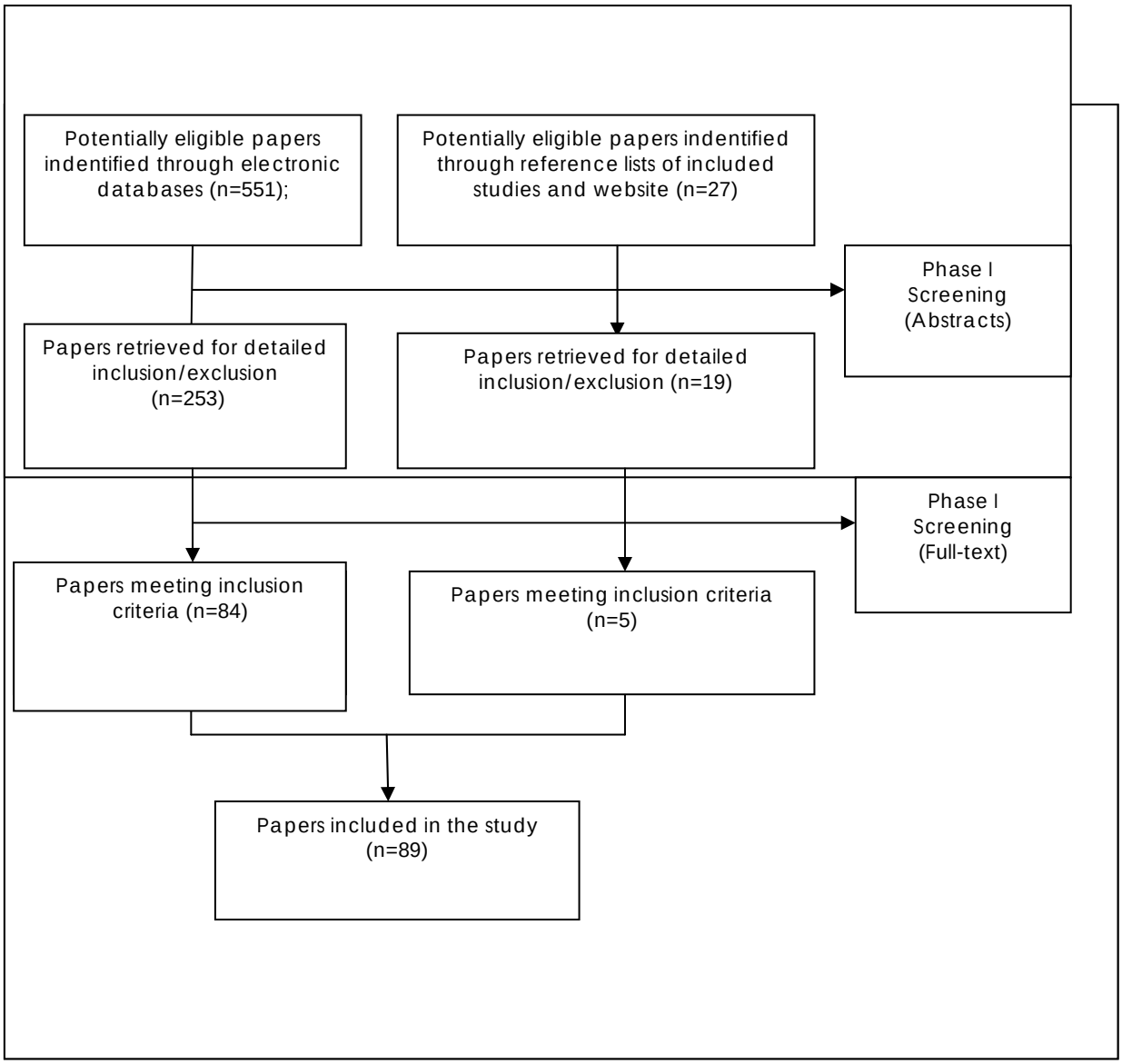

Table1 Frequency of author collaboration and institutional collaboration

No. of authors per article	No. of articles (%)	Person-time of author	No. of institutions per article	No. of articles (%)
1	13 (14.6)	13	1	51 (57.3)
>1	76 (85.4)	412	>1	38 (42.7)
total	89 (100.0)	425	Total	89 (100.0)

Table 2 Number of articles published by the first author in the 89 articles

No. of articles published	No. of first author (%)
1	73（90.1）
2	8 （9.9）
>2	0 （0.0）
Total	81（100）

Note: 'first author' means that they were the first author out of the many authors that contributed to the article.

Table 3 Distribution of first author's Affiliation

Affiliation category	Number of first authors Number (%)	Number of articles Number (%)
CDC	44 (54.32)	49 (55.06)
College/university	25 (30.86)	27 (30.34)
hospital	6 (7.41)	6 (6.74)
academe	4 (4.94)	5 (5.62)
other	2 (2.47)	2 (2.2)
total	81 (100)	89 (100)

Note: CDC refers to various levels of China's Center for Disease Control and Prevention. They could be at the national, provincial, city, or county levels.

Table 4 Distribution of first author's region

Province	Number of first authors Number (%)	Number of articles Number (%)
Zhejiang	11 (13.58)	13(14.61)
Shandong	10 (12.35)	10 (11.24)
Guangdong	8 (9.88)	10 (11.24)
Beijing	8 (9.88)	8 (8.99)
Guangxi	6 (7.41)	8 (8.99)
Hubei	7 (8.64)	7 (7.87)
Henan	5 (6.17)	7 (7.87)
Anhui	5 (6.17)	5 (5.62)
Jiangsu	4 (4.94)	4 (4.49)
Others	3 (3.70)	3 (3.37)
Total	81 (100)	89 (100)

Note: Others include 8 provinces that have one or two first authors.

DISCUSSIONS

Scientific publication is the main channel for disseminating research findings. It is also the key indicator for evaluating research productivities. Results of bibliometrics analysis of published scientific articles could provide evidence for current status of research in some areas.

From this study we can see that there are two main problems in the field of agricultural injury in China. First, our study indicated that research priorities on farm-related injury in China were specific to injuries occurring in rural areas rather than agriculture-specific injuries. Most of these publications specify neither the injured person's occupation nor the activities that caused the injury. Some studies defined occupations such as 'farmers' or 'workers.' We could not discern whether they meant to include agricultural work-related injuries or not. Second, there is a substantial gap between China and developed nations for reported cases of agricultural injuries. There is not yet a clear definition of 'agricultural injury' in China. It is necessary to propose an operational definition of agricultural injury for use in China by considering China's cultural and socioeconomic factors.

Most of the research considered in this review included descriptive statistics which focused on the investigation of epidemiologic characteristics of the injuries or the risk factors for injury. There was a lack of the research on intervention and prevention of injuries.

The percentage of author collaboration is high throughout the publications reviewed. Our study showed that while the percentage of author collaboration was high, the percentage of organization collaboration was low in the agriculture-related injury articles. This might imply that most research involves necessary collaboration between different people or organizations in order to achieve common goals. On the other hand, the lower percentage of organization collaboration suggest that the breadth and depth of the research related to farm injuries in China was not enough to support this type of cooperation.

Our study found that most of the primary authors came from the various levels of CDC, colleges, or universities. This implied that more disease control units and universities are involved in agricultural injury research, perhaps because injuries have been gradually recognized as a public health issue in recent years in China.

Generally for individual researchers, more published papers equates to greater scientific progress. Our study indicated that only 8 out of 81 (9.9%) authors published more than one paper which accounted for 18% of the total articles (16/89). From this, we can infer that a core group of authors devoting research to Chinese agricultural injuries has not yet emerged. It is necessary to attract more injury researchers and public health professionals to this understudied area.

Our study found that the geographic locations of the 79 Chinese authors covered 18 out of the total 31 provinces in mainland China. The majority were concentrated in 10 provinces (80% or more). This shows a geographical disparity in author distribution. There were 13 provinces that had no articles published on farm related injuries.

As China is changing rapidly and moving towards an industrialized country, China's occupational health programs should evaluate injuries to identify the need for additional research on national occupational safety and injury prevention, as other developed and developing countries have done. Though the study on agricultural injuries in China is only beginning, this information can provide some reference for future work. What we currently need most is more convincing data for issue awareness and policy making. We must first conduct more investigations to gain a better understanding of the problem, identify the main causes and risk factors associated with agricultural injury, and give suggestions on prevention and control measures.

Due to a lack of resources to describe the agricultural injury profiles in China, there is little scientific evidence for the prevention and control of agriculture injuries. Our study describes the agricultural injury research in China by bibliometrics analysis. This information can be used as evidence to support future studies and policy making, and will hopefully bring empirical and long-term significance of this public health problem.

CONCLUSION

The ultimate objective of our study is to provide information that can help the officials in Ministries of Health and Agriculture address the serious impact of farm-related injuries and death. Our study described the status of the agricultural injury research in China. We hope to provide information for injury researchers and public health professionals for future research activities on agricultural injury and safety. Some concrete conclusions from our study include the research priorities on farm-related injuries in China were those occurring in rural areas rather than agriculture-specific injuries. There was a lack of research on the intervention of injuries and the research related to farm injury in China lacked breadth and depth. Finally, there was a noticeable geographical disparity in author distribution throughout all publications.

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