

# A Cross-sectional Study to Estimate the Prevalence of Mechanical and Biological Hazards in Agricultural Workers of Kancheepuram District

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## ABSTRACT

**Introduction:** The majority of the Indian population is dependent on the agricultural industry, whether directly or indirectly but only a little attention is paid to their health needs. This study was conducted to estimate the prevalence of mechanical and biological hazards among agricultural workers and to determine the factors associated with their work-related injuries in Kancheepuram district of Tamil Nadu, India.

**Methodology:** A community-based cross-sectional study was done in the Kancheepuram district of Tamil Nadu, India, over a period of 18 months. The villages under the Thiruporur block were selected by proportional systemic random sampling method. Assuming that 80% is the power of the study and a 95% confidence interval (CI), the minimum sample size required for the study was calculated to be 377. Statistical significance was taken as  $p < 0.05$ . The data were analyzed using the statistical package for the social sciences (SPSS), version 16. Microsoft Excel 2010 was used to generate charts.

**Results:** All participants were full-time agricultural workers. About 37% have accidental injuries and among them 63% of injuries were minor and 37% were major injuries. When comes to animal bites, about 81% of the study participants had insect bites, about 30% had a bee sting and about 21% had snakebites. Among the risk factors, those individuals with age above 51 years, female gender, and socioeconomic class of more than 4, have a statistically significant association with the presence of type 2 diabetes mellitus. Those individuals with age above 51 years, male gender, Hindu, with a habit of drinking alcohol, the habit of smoking, and socioeconomic class of 1 and 2, have a statistically significant association with the presence of hypertension.

**Conclusion:** More than three-fourths of agricultural workers have morbidity related to musculoskeletal injuries, electric hazards, injury due to sharp instruments, heat-related stress, and skin morbidities. Since agriculture plays a key role in the country's economy, the health of the agricultural workers should be sustained and it remains a key priority for the country.

**Keywords:** Comorbidities, Farmers, Hazards, Occupational injuries.

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## INTRODUCTION

The Joint International Labour Organization (ILO)/World Health Organization (WHO) Committee on Occupational Health defined occupational health in 1950<sup>1</sup> as "Occupational health should aim to promote and maintain the highest level of physical, mental, and social well-being among workers in all occupations; to prevent workers from becoming ill as a result of their working conditions; to protect workers in their employment from health risks, and to place and keep workers in an occupational environment that is suited to their physiological and psychological needs."

According to the Occupational Safety and Health Convention, 1981 (No. 155), the term "occupational disease" refers to any disease that develops as a result of exposure to factors found in the workplace.<sup>2</sup>

Following the industrial uprising, the morbidity of occupational disorders has increased dramatically. According to the International Labour Organization, about 120 million work-related accidents occur each year, resulting in 12 million permanent disabilities. Employees are also vulnerable to occupational diseases in addition to these accidents. The World Health Organization estimates that between 68 and 157 million new cases of work-related diseases occur each year. Nearly 10% of these diseases result in long-term disability and 0.5–1% in deaths.<sup>3</sup> Around 350,000 people die each year worldwide as a result of fatal workplace injuries.<sup>4,5</sup>

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Previously, occupational health was assumed to be limited to factories and coal mines, leading to the coinage of the words "industrial hygiene" and "industrial health." Recent occupational health perspectives cover a wide range of occupations, including

trading and marketable companies, service exchanges, forestry, and agriculture, as well as industrial sanitation, industrial illnesses, and industrial calamities, toxicology associated with special threats, industrial recovery, and work-related psychology. Farm laborer occupational health is still a relatively new notion.<sup>1,6</sup>

Agriculture, as stated by the Department of Agricultural Research and Education, is extremely important to our nation's economy. Agriculture employs roughly 54.6% of inhabitants, as per the Census of India 2011. Agriculture accounts for 17.4% of our country's gross domestic product. About 60% of the land is arable, making it the world's second-largest country in terms of total arable land.<sup>7,8</sup> Agricultural laborer play a critical role in improving the nation's financial situation; as a result, it is critical to improving the health and welfare of agricultural workers.<sup>9,10</sup>

Agriculture has some characteristics that jeopardize workers' health and wealth, including exposure to unapproved pesticides, organic products, animals, long working hours, uncomfortable positions, and the usage of hazardous instruments and equipment. Furthermore, these farmers live in rural areas where public health issues including infectious diseases, poor nutrition, poor sanitation, and a lack of access to health care add to the burdens and have an impact on their health and illness.<sup>3, 8-12</sup>

In India, the workplace safety and health situation are complicated. For India, occupational safety and health is a development instrument as well as an empowering movement.<sup>13</sup> The assessment of occupational dangers in the workplace is a major topic nowadays. Hence, this study was conducted to estimate the prevalence of mechanical and biological hazards among agricultural workers and to determine the factors associated with their work-related injuries in the Kancheepuram district.

## METHODOLOGY

A community-based cross-sectional study was done to estimate the prevalence of mechanical and biological hazards among agricultural workers in the Chengalpattu district. over the period of 18 months (January 2020 to August 2021). In Chengalpattu district, there are eight blocks, namely, Acharapakkam, Chithampur, Kattankulathur, Lathur, Maduranthagam, St. Thomas Mount, Thiruporur, and Thirukalukundram. Thiruporur block and the villages under were selected by multistage sampling method (Fig. 1).

Assuming that 80% is the power of the study and 95% CI, the minimum sample size required for the study was calculated to be 377. Both male and female workers involved in cultivation, harvesting, fertilizer application, and handling of crops above the age of 18 years, those who understand and speak Tamil, and those who are willing to participate in the study and gave informed consent have been included in the study. Landlords who are not working in the field, Farmers not involved in agriculture for the past 1 year, Houses that were locked during three consequent visits, and chronically ill patients were excluded from the study. The research protocol was presented to the Institutional Ethical Review Board and due permission was obtained to undertake the study. Statistical significance was taken as  $p < 0.05$ . The data was analyzed using SPSS, version 16. Microsoft Excel 2010 was used to generate charts.

## RESULTS

In this study total 400 individuals participated. Among them, about 80% of the study participants belonged to age-group between 40

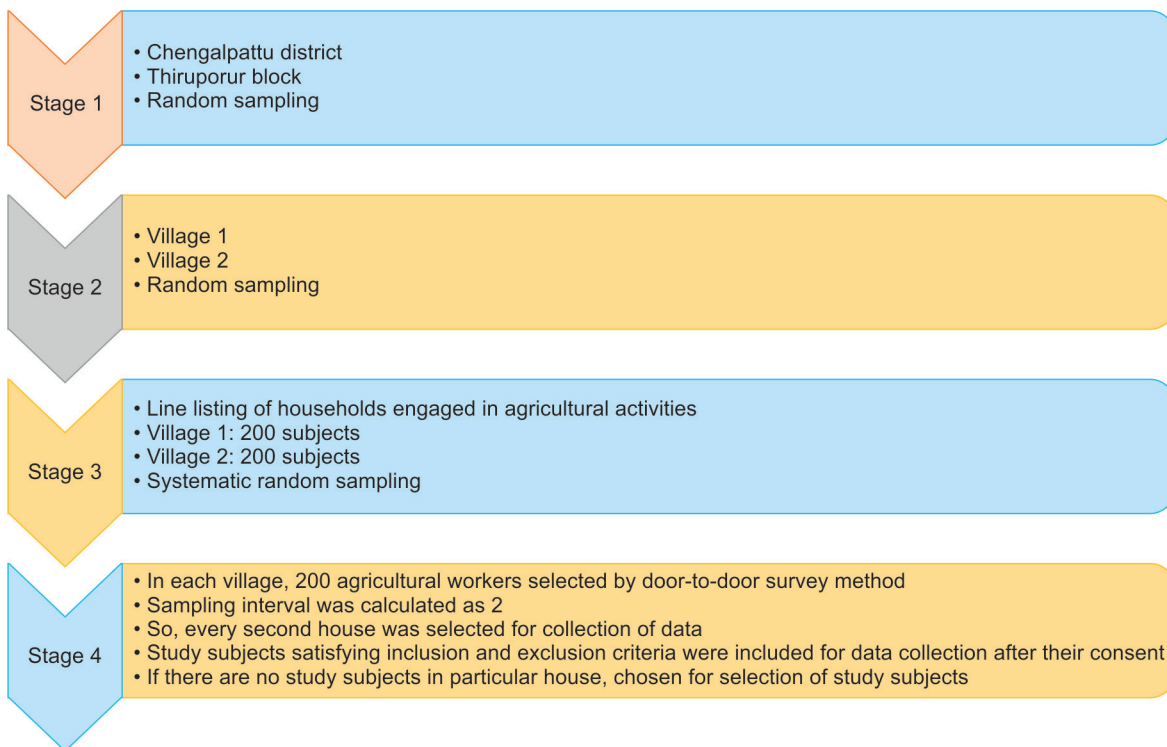
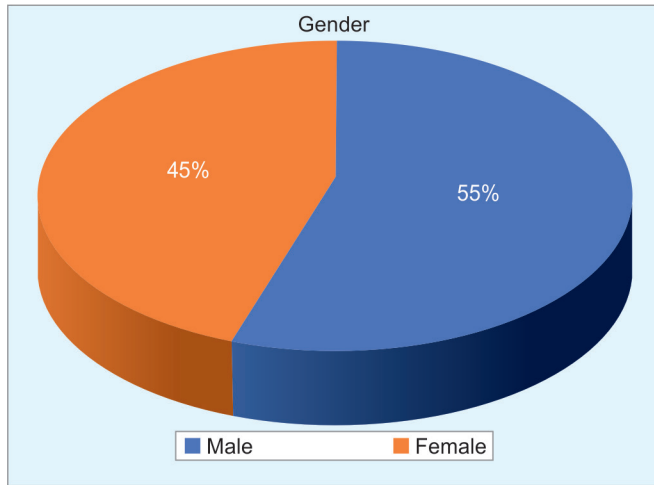


Fig. 1: Multi-stage sampling method

**Table 1:** Age distribution of the participants

Characteristics	Subgroups (years)	Frequency	%
Age	≤30	4	1.00
	31–40	28	7.00
	41–50	160	40.00
	51–60	164	41.00
	>61	44	11.00



**Fig. 2:** Gender distribution of the study participants (N = 400)

**Table 2:** Description of study participants according to their lifestyle factors

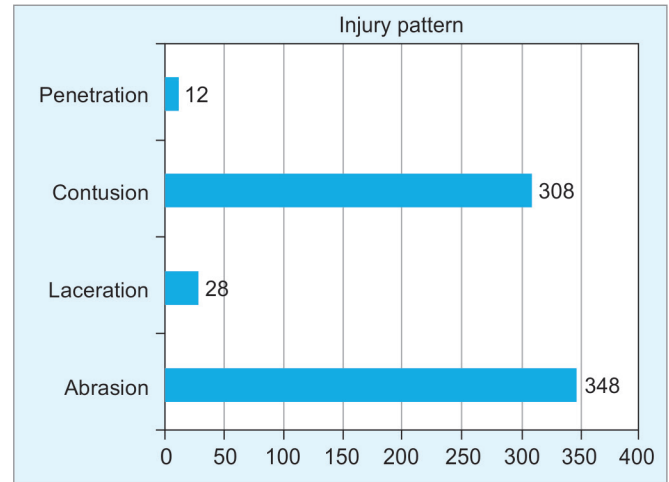
S.No.	Characteristics	Subgroups	Frequency	%
1	Alcohol intake	No	272	68.00
		Yes	128	32.00
2	Duration of alcohol intake	>5 years	128	100.00
3	Frequency of alcohol intake	Daily	25	19.53
		Alternate days	42	32.81
		Biweekly	31	24.22
		Occasionally	30	23.44
4	Tobacco usage	No	293	73.25
		Yes	107	26.75
5	Type of tobacco	Cigarette	96	90.65
		Beedi	10	9.35
6	Duration of tobacco usage	≤5 years	0	0.00
		>5 years	108	100.00
7	Sleep duration	≤8 hours/day	400	100.00
		>8 hours/day	0	0.00
8	Diet	Vegetarian	60	15.00
		Non-vegetarian	0	0.00
		Mixed	340	85.00

and 60 years and only 8% belonged to age-group below 40 years. Table 1 shows the age distribution of the participants. When comes to religion, about 83% of the study participants were Hindu, and about 6% belonged to the Muslim religion. When comes to marital status, about 77% were married and about 5% were widowed. The educational level of the study participants, 80% were not finished their primary education and only 4% of individuals passed the

**Table 3:** The prevalence of comorbidity among the study participants (N = 400)

Characteristics	Subgroups	Frequency	%
Comorbidities	Diabetes mellitus	316	79.00
	Hypertension	167	41.75
	CAD	9	2.25
	Stroke	0	0.00
	Tuberculosis	20	5.00
	Bronchial asthma	52	13.00
	Bronchitis	19	4.75
	Osteoarthritis	164	41.00

CAD, coronary artery disease



**Fig. 3:** Prevalence of injury due to sharp objects among the study participants (N = 400)

middle school. Figure 2 shows the gender distribution among the participants.

Given alcohol intake about 32% of study participants had the habit of drinking alcohol and about 26.75% had the habit of using tobacco. Among the individuals who have a habit of drinking alcohol, about 32.81% were drinking alcohol on alternate days, and among the tobacco users, about 90.65% were smoking cigarettes. Table 2 shows the description of study participation according to their lifestyle factors.

Considering comorbidity, about 79% of study participants have diabetes, about 41.75% have hypertension and 41% of individuals have osteoarthritis. The prevalence of comorbidity is shown in Table 3.

About heat-related illness, almost all participants admit fatigability, about 75% have heat cramps, about 77% have tanning and 74% have burning. Among the study participants, almost all individuals have not adopted any preventive measures. When comes to skin disorders, about 99% of individuals suffer from itching, about 29% of the individuals have a rash, 16.75% of individuals have crusts and about 12% have blisters. None of the participants were following adoptive preventive measures.

When comes to injuries obtained due to sharp instruments, about 87% of the study participants have abrasions, about 77% have contusions and about 7% have lacerations as shown in Figure 3. When comes to electrical accident morbidities, about 21% have been involved in an electric accident and among them, about 8.33% were major accidents. The prevalence of accidental

morbidity among study participants were shown in Figure 4. When comes to animal bites, about 81% of the study participants had insect bites, about 30% had bee sting and about 21% had snake bites as shown in Table 4.

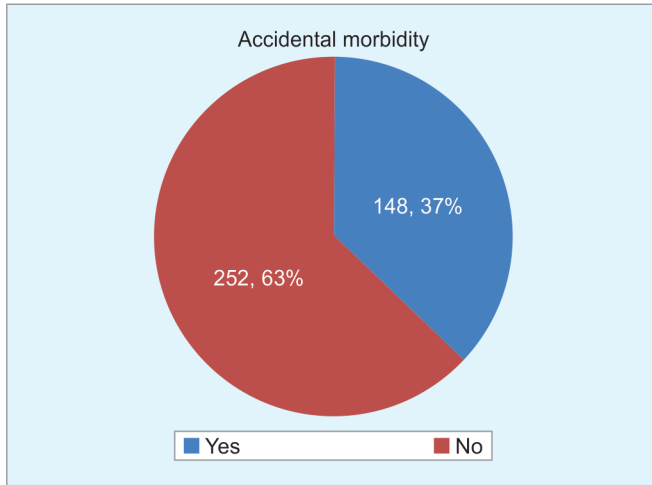


Fig. 4: Prevalence of accidental morbidities among the study participants (N = 400)

Table 4: Prevalence of animal bite among the study participants (N = 400) (multiple options)

Characteristics	Subgroups	Frequency	%
Animal bite morbidities	Snake	84	21.00
	Insect	324	81.00
	Scorpion	60	15.00
	Bee sting	120	30.00

Table 5: Description of health-seeking behavior among the study participants (N = 400) (multiple options)

S.No.	Health-seeking behavior	Subgroups	Frequency	%
1.	Place of first professional care seeking	Allopathic	200	50.00
		AYUSH	36	9.00
		Faith-based medicine	44	11.00
		Self-treatment	58	14.50
		No treatment	62	15.50
2.	Type of medical care institution	Government	169	42.3
		Private	66	16.4
		Both	165	41.3
3.	Medical expenditure means	Insurance	36	9.00
		Out of pocket Expenditure	364	91.00

AYUSH, ayurveda, yoga, unani, siddha and homeopathy

Table 6: Association between age-group and knee pain among the study participants (N = 400)

Age category	Knee pain		Total n (%)	Chi-squared test value	p-value
	Yes n (%)	No n (%)			
≤30 years	8 (66.7)	4 (33.3)	12 (100)	18.953	<0.001
31–40	72 (100)	0 (0)	72 (100)		
41–50	208 (98.1)	4 (1.9)	212 (100)		
51–60	96 (96)	4 (4)	100 (100)		
>60 years	4 (100)	0 (0)	4 (100)		

Among the health-seeking behavior of the participants, about 50% of the study participants prefer allopathic medicine, and 14.5% took self-treatment which is shown in Table 5.

Considering knee pain, all persons aged 31–40 years and aged more than 60 years and 98.1% of persons aged 41–50 years suffer from knee pain when compared to other age groups, and the difference in proportion among the above age groups is statistically significant according to Chi-squared test ( $p < 0.001$ ). This association is shown in Table 6.

Among the risk factors, those individuals with age above 51 years, female gender, and socioeconomic class of more than 4, has a statistically significant association with the presence of type 2 diabetes mellitus by using the Chi-squared test. This association is shown in Table 7.

## DISCUSSION

In our study, about 55% of the study population were females. A study done by Pradyumna et al.<sup>14</sup> In the watershed development WSD project site at Kolar, India found that about 88% of the study population were females which is almost similar to our study. This similarity could be due to the work timings, safety, and nearby work from the home. Duty off as per convenience could be an additional factor.

When the prevalence of alcohol intake comes to the habits of the study participants, in our study is 32%. A cross-sectional study by Ghosh et al.,<sup>15</sup> among 228 individuals in Kolkata, India, states that the prevalence of alcohol consumption is 65.8% with alcohol dependence of 14%.

About heat-related illness, in our study, the prevalence of fatigability is 100%. In contrast to this study, a study done by Sadiq et al.<sup>16</sup> in Nigeria conclude that the prevalence of tiredness is 48.5%. This difference may be due to the topographical variations between the places.

Considering the respiratory morbidities, in our study the prevalence of cough is about 21%. Similarly, a study done by Woldeamanuel et al.,<sup>17</sup> among 288 agricultural farmers, conclude that the prevalence of cough is 20.5%. Thus, these results indicate the importance of including agricultural workers as a high-risk population for respiratory diseases.

In India, a study done by Jain et al.<sup>18</sup> in Jaipur, among 138 manual working farmers, states that the prevalence of low back pain is 71.4 and 55% have wrist pain. In this study, about 31% of the study participants had wrist pain. A study done by Jain et al.,<sup>19</sup> in Rajasthan, among farmers states that the prevalence of back pain and wrist pain is more than 50%. Thus, every farmer experience one or another form of musculoskeletal disorder. This indicates that special attention to be given to early diagnosis, treatment, and rehabilitation services among agricultural workers.

**Table 7:** Association of risk factors with diabetes among the study participants (N = 400)

Risk factors		Diabetes			Chi-squared test value	p-value
		Yes n (%)	No n (%)	Total n (%)		
Age	≤30 years	0 (0)	4 (100)	4 (100)	28.218*	<0.001
	31–40	16 (57.1)	42.9 (40)	28 (100)		
	41–50	120 (75)	40 (25)	160 (100)		
	51–60	144 (87.8)	20 (12.2)	164 (100)		
	> 60 years	36 (81.8)	8 (18.2)	44 (100)		
Gender	Male	108 (60)	72 (40)	180 (100)	71.215	<0.001
	Female	208 (94.5)	12 (5.5)	220 (100)		
Religion	Hindu	260 (78.3)	72 (21.7)	332 (100)	0.577	0.750
	Christian	36 (81.8)	8 (18.2)	44 (100)		
	Muslim	20 (83.3)	4 (16.7)	24 (100)		
Socioeconomic status	Class 1	4 (80)	1 (20)	5 (100)	51.135	<0.001
	Class 2	26 (61.9)	16 (38.1)	42 (100)		
	Class 3	65 (59.6)	44 (40.4)	109 (100)		
	Class 4	174 (89.7)	20 (10.3)	194 (100)		
	Class 5	47 (94)	3 (6)	50 (100)		
Tobacco	Yes	91 (85)	16 (15)	107 (100)	3.219	0.073
	No	225 (76.8)	68 (23.2)	293 (100)		

### Limitations

The correlation revealed in this study cannot be presumed to represent the causative agent because it is a cross-sectional study. Because this is a community-based study, it will require a large number of similar studies to back up its conclusions. Respondents from two villages were only interviewed, this would not be a final one in other rural villages in the same district.

### CONCLUSION

The use of tobacco and the consumption of alcoholic beverages is very common among people residing in these villages. Fatigability and myalgia are common ailments among farmers. Morbidity connected to musculoskeletal injuries, electric risks, injury from sharp instruments, heat-associated disease, animal bites, and skin morbidity affects more than three-quarters of agricultural laborers. Every farmer must be checked for musculoskeletal morbidities as well as other comorbidities such as diabetes and hypertension. The complications among agricultural employees will be delayed or halted as a result of this.

### Recommendations

Since agriculture plays a key role in the country's economy, the health of the agricultural workers should be sustained and it remains a key priority for the country. Since most of the agricultural workers are illiterate educational assistance should be provided by the government along with private partnerships. Conducting outreach camps involving mobile health units at their field level where the facilities should include laboratory investigations, health check-ups, distribution of drugs, etc. Conducting periodic training at the institutes regarding the importance of wearing personal protective materials and proper handling of machinery. Make use of "Makkalai thedi maruthuvam" for the screening of non-communicable diseases and thereby reducing complications.

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