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Original Article

Prevalence of Occupational Injuries in selected Coir Industries in Sri Lanka: a cross-sectional study

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ABSTRACT

Introduction: The coir industry processes coconut fibers, and many are employed in this industry in Sri Lanka. This study aimed to find the prevalence of occupational injuries among coir workers.

Methods: This cross-sectional study was performed in 2021, in six medium-sized coir industries in Sri Lanka, each with 15-100 employees. The workers who were present at work on the two days the researchers visited the respective industries (128 of a total 214 workers) were interviewed on socio-demographics, work tasks they normally perform and occupational injuries they had experienced the last three months. Independent T-tests and Chi-square tests were used to analyze for differences between groups.

Results: The mean age of the 128 interviewed workers was 45 years and 53.9% were male. 34 (26.6%) of the workers had experienced at least one injury each during the past three months. Women reported significantly more injuries than men (38.9% vs 15.9%). The workers operating machines reported significantly more injuries than workers who performed other types of work (42.3% vs 22.0%). Slipping, tripping, and falling (64%) were the most common events of injuries seen among the injured workers, followed by cuts from sharp objects or machines (20%). The most common type of injury among the workers were cuts and bruises (50%).

Conclusion: At least one injury in the past three months had been experienced by 26.6 percent of the coir workers, mostly women and workers operating machines. Preventive measures are needed to minimize the risk of injuries.

Keywords: Coir industry, Occupational injuries, Sri Lanka

Introduction

The coir industry processes fibers from coconuts, also known as coir. India and Sri Lanka contribute about 90% of the total global coir fiber production of 350,000 metric tons per year.[1] In Sri Lanka, there are around 1040 coconut-based industries that employ almost 500,000 workers where 75% of them are females working part-time.[2] Most of the workers work for their family business or are self-employed. Coir-related exports account for 6% of total agricultural export and 0.35% of the GDP in Sri Lanka.[3] Thus, the coir industry plays an important role in sustaining the livelihood of many people in Sri Lanka although the working conditions are reported to be poor and productivity low.[1,2] However, very few studies have focused on working conditions and occupational injuries in this industry.

The coir fibers are extracted from the outer part, the husk of coconuts, and comprise brown and white fibers.[4] The brown coir is, for instance, used for upholstery padding (car seats), sacking, and horticulture. On the other hand, white coir is used to manufacture fine brushes, strings, ropes, and fishing nets, among other items.[5]

The coir industry in Sri Lanka includes two main types of workplaces: Factories and domestic work. The factory work in the coir industry is modernized, mechanized, and export-oriented. Particularly the brown-fiber production in the North-Western Province produces coir in factories. Domestic coir work is mainly performed by women in the Western and Southern regions of Sri Lanka and is a traditional, labor-intensive white-fiber industry.[3] The coir fiber extraction is processed through four main steps; Harvesting and husking, retting, defibering, and finishing.[6] Recently, mechanical techniques have been developed to speed up or eliminate the retting process. Small and medium-scale industries still extensively use the traditional drum system for fiber extractions where the workers put husks manually into the machines and pull them out after crushing the coir into fibers. The machines are considered very dangerous and unsafe for the workers.[7]

About 1,300 work-related accidents are reported in Sri Lanka annually, and about 80 are fatal accidents. In 2019, 18 non-fatal occupational injuries and one fatal occupational injury per 100 000 workers were reported from Sri Lanka. [8] However, these statistics probably do not reflect the accurate picture as reporting of occupational accidents is poor in Sri Lanka, and there is no information on how many injuries are reported from the coir industry.[9]However, we know that similar industry types, like sisal and jute, cause many and serious injuries among the workers, and it is likely that accidents and injuries constitute a problem also in the coir industry.[10, 11]

Therefore, the objective of this study is to obtain information about occupational injuries among coir workers. More knowledge from the industry could be useful in plans for the prevention of occupational injuries in the coir industry.

Methods

This cross-sectional study was performed over four weeks in February 2021. Six medium-sized industries, each with 15-100 employees, were randomly selected from a list of industries in the Western (Gampaha district) and North-Western provinces of Sri Lanka (Puttalam and Kurunegala districts). The study was planned by researchers in Norway and Sri Lanka. Due to the Covid-19 pandemic, the Norwegian researchers could not visit Sri Lanka, and the planning and education of assistants were performed online in close cooperation with the researcher in Sri Lanka. The researcher in Sri Lanka was responsible for contact and communication with the industries. In agreement with the owners of the industries, the workers were gathered for oral information about the project. The workers present at work on the days that the researchers visited the respective industries (128 of a total of 214 workers) were interviewed during working hours on occupational injuries they had experienced in the last three months. The interview of each worker was performed by two data assistants in a quiet part of the industry site with no employer present. The interviewer asked questions about the background of the worker (sex, age, education, years at work, and type of work) and any personal experienced injury in the past three months. They were also asked about which tasks they normally performed. The workers who had experienced an injury were asked to describe what happened (injury event like slipping, tripping, fall, cut by a sharp object, etc.) and the type of injury (cut, bruises, fracture, etc.). There were no suitable interview guides published on this topic for this setting. Thus, the project group developed relevant questions for the coir industry. This interview guide was developed in English but later translated into the local language by two native speakers. The procedure was to translate the interview back again to English by two other people. Afterward, the interview was adjusted to function optimally.

The study protocol received ethical clearance from both the Regional Committee for Medical and Health Research Ethics, Western Norway and the

Sri Lankan Committee, Faculty of Medicine, University of Kelaniya, Ragama, Sri Lanka. All participating workers signed informed consent after the purpose and the methods of the study were clearly explained to them.

Independent T-tests were used to compare the age, work year, years of school, years of work in the coir industry, and hours of working per day between the genders. The chi-square test was used to assess the difference in injuries last three months between groups. A significance cut-off point of $p \leq 0.05$ was used to determine significance. Data were analyzed by IBM SPSS Statistics for Windows (version 25), and tests were considered significant at $P < 0.05$.

Results

From the six selected coir industries, a total of 128 workers were interviewed, 53.9% were male, and 42.2% were female. Information about gender was missing from five people since the data assistants forgot to note the gender of four participants (Table). Information from these five participants was used in the descriptions and analyses where gender was not taken into account.

The mean age of the workers was 45 years, and on average they had worked for five years in this industry. The mean number of school years was seven years, ranging from zero to 12 years. The mean number of working hours per day was 8 hours, and it varied from 4 to 11 hours. There were no significant differences between males and females regarding age, work years, school years, and working hours (*T-test)*. About 65.6% had a permanent job in the factory, while the rest (31.3%) was temporary workers.

The most common work tasks reported were packing of coir (39.4%), operating machines (20.5%) and a combination of drying and packing of coir (17.2%) (Table 2). Among the male workers, 15.9% performed drying of coir, while no female workers were involved in this work task. Operating machines (34%) and packing of coir (34%) were the tasks most often reported by the females. They also worked in transportation (20.8%) and maintenance (11.2%), where no males were engaged. Most of the workers wore casual T-Shirts and pants and no proper work clothing. Protective gloves and shoes were not seen in five out of six factories.

Table 1: Socio-demographic characteristics of interviewed coir workers (n=128)

Variable	All	Male	Female	p-value*
		AM (SD) range	AM (SD) range	
Age (years)	45 (11) 17-73	46 (10) 28-73	44 (11) 17-63	0.29
Work years	5 (6) 0.25-30	4 (5) 0.25-30	5 (6) 0.25-30	0.50
School years	7 (3) 0-12	6 (2) 0-12	8 (3) 0-12	0.10
Working hours per day	8 (1) 4-11	8 (1) 4-10	8 (1) 4-11	0.17

Variable		No (%)
Gender	Male	69 (54)
	Female	54 (42)
	Missing	5 (4)
Permanent job	Yes	84 (66)
	No	40 (31)
	Missing	4 (3)

*AM: Arithmetic mean; SD: standard deviation; *Independent T-test*

Table 2: Type of work performed in the industry among 127* of 128 interviewed workers.

Type of work	Total /Percent N (%)	Male N (%)	Female N (%)
Drying of coir	11 (8.7)	11 (15.9)	0
Packing of coir	50 (39.4)	30 (43.5)	18 (34.0)
Operating machines	26 (20.5)	7 (10.1)	18 (34.0)
Transport	11 (8.7)	0	11 (20.8)
Maintenance	7 (5.5)	0	6 (11.2)
Drying and packing of coir	22 (17.2)	21 (30.5)	0
Total	127 (100)	69 (100)	53 (100)

** Missing data (Total n=1)*

Table 3: Injuries at work in the last three months in all industries

Factory	Total number of workers	Interviewed workers (% of total number)	Number (%) of persons with at least one injury in last 3 months among the interviewed
1st	15	15 (100)	8 (53.3)
2nd	100	46 (46.0)	13 (28.2)
3rd	31	31 (100)	4 (12.9)
4th	20	17 (85.0)	4 (23.5)
5th	28	15 (53.6)	5 (33.3)
6th	20	4 (20.0)	0 (0)
Total	214	128 (59.8)	34 (26.6)
Gender			
Male	88	69 (78.4)	11 (15.9)
Female	126	54 (42.9)	21 (38.9)
Work task			
Operating machines		26	11 (42.3)
Other work tasks		100	22 (22.0)

Totally 128 of the 214 workers (60%) in the six factories participated in the interview on injuries (Table 3). The participation rate in the factories varied between 20% and 100%. We have no information about why some of the workers did not want to participate in our study, but the need for high production in the industries might have influenced the participation rate. Among the 128 interviewed workers, 34 (26.6%) had experienced at least one injury each during the past 3 months, but the percentage varied from 0 to 53.3% between the factories.

A higher number of female than male workers reported having experienced at least one injury in the last 3 months (Table 3). The difference was significant, using a Chi-square test, p=0.004. The workers operating machines reported more injuries than workers who performed other types of work (Table 3). Using a Chi-square test, the difference was found to be significant (p=0.026).

Table 4 shows that the overall major injury event among the workers reporting at least one injury was slipped, tripped, and fall (64%), and this was the most frequent type of event among both males (71.4%) and females (56.3%). The next most frequent injury event in both genders was cut by a sharp object or machine, which accounted for 14.4% in males and 25% in females.

Furthermore, Table 4 shows that the most common type of injury among the workers reporting injuries were cuts and bruises (50%). The females were more likely to suffer from cuts and bruises (55%), often due to handling sharp tools like the combing machine. Other types of injuries comprised bruises (18.8%), cuts (15.6%), fractures (12.5%), cuts, bruises and fractures (3.1%).

Table 4: Type of injury events and injury

Type of Injury event*	**Total /Percent N (%)**	**Male N (%)**	**Female N (%)**
Slipped, tripped, and fall	16 (64.0)	5 (71.4)	9 (56.3)
Cut by a sharp object or machine	5 (20.0)	1 (14.3)	4 (25.0)
Pressure damage by machine	3 (12.0)	1 (14.3)	2 (12.4)
Trapped by the assembly line	1 (4.0)	0	1 (6.3)
Total	25 (100)	7 (100)	16 (100)
Type of Injury**			
Cut	5 (15.6)	2 (20.0)	3 (15.0)
Bruises	6 (18.8)	3 (30.0)	3 (15.0)
Fracture	4 (12.5)	1 (10.0)	2 (10.0)
Cut and bruises	16 (50.0)	4 (40.0)	11 (55.0)
Cut, bruises and fracture	1 (3.1)	0	1 (5.0)
Total	32 (100)	10 (100)	20 (100)

** Missing data for the Total type of injury event is 9 and gender is missing for 2, among 34 who had experienced at least one injury, because the data assistants did not note the information during the industry visit.*

** *Missing data for the Total number of types of injury is 2 and 4 were missing gender information combined with these injury figures, among 34 who had experienced at least one injury, because the data assistants did not note the information during the industry visit.*

Discussion

More than one-fourth (26.6%) of the coir workers in this study reported having been injured in the last three months. This indicates a high injury risk. To our knowledge, no previous studies on occupational health in the coir industry have specifically focused on occupational injuries among workers, and it is hard to find comparable studies. There are studies about different types of health issues among coir industry workers from India, but they consider other aspects of health than workplace injuries, like allergies, and neurological examinations.[13,14] Also, there is a study from the Solomon Islands about injuries among children who have experienced traumas from coconuts, but no similar study among adults.[15] However, studies are confirming that occupational injuries may have a high prevalence among workers performing strenuous physical work in low-income countries in work situations resembling the work in the coir industry.[16,17] For instance, an Ethiopian study in the textile industry shows an occupational injury one-year prevalence of 42.7 and a two-week prevalence of 6.7.[16] These figures are not directly comparable with our present study of a 3 months prevalence, but they show that occupational injuries are a large problem. A study from India shows that iron and steel industry workers have a one-year prevalence of 28%. [17]

A study among construction workers from Gondar in Ethiopia shows a three-month incidence of occupational injuries of 39%, which is higher than in our coir study.[18] The Gondar study included 566 construction workers from eight construction sites, and the workers were interviewed using a structured questionnaire. The methods were quite similar to the present coir study. The reason why the injury reporting was different might be explained by the different types of work. The construction industry might be more dangerous, with many falls from heights.

According to our study findings, the most common events causing injuries are slipping, tripping, and falling (50%). Many workers worked prolonged periods in hazardous conditions such as uneven floors or grounds and dusty floors, where they may easily slip, trip, and fall, resulting in injuries. Slipping, tripping, and falling are among some of the most common injuries reported in a wide variety of industry contexts.[16,19,20]

In the present study, cuts, and bruises were the most common injuries, accounting for 50% of the total. Fractures had a lower incidence (12.5%) than the other types of injuries in our study, but they must be considered more serious than most other types of injuries. However, this cannot be told with certainty, as the location of the injuries was not reported. On the other hand, serious fractures might not have been reported since these workers might not have returned to work within three months. A strength of this study is the topic itself, as injuries among coir workers are not much discussed in previous literature. This is probably because the coir workers in general represent a low societal class, where funding for research is hard to obtain. The methods of interviewing the workers were chosen as no statistics were available. Some of the workers were illiterate and self-reports by a written questionnaire were not possible. It is a limitation of our study that the interview guides used were not validated or standardized, as there were no such instruments available. This may raise questions of whether we registered the experienced injuries correctly. However, the questions were developed in cooperation with a physician who knew the industry and type of workers well, and by using an interview, we could make sure that the interviewers explained the questions to the workers. We decided to ask for 3 months of prevalence, due to the high risk of information bias in this group of workers. It might be difficult for the workers to remember their injuries for longer periods.

The external validity of this study is limited to coir workers in Sri Lanka in similar industry environments with similar demography and similar regulatory requirements. Only 6 industries were asked to participate, but they were randomly selected and are likely to be representative of the medium-sized industries in Sri Lanka. We do not know about any type of selection of the studied

industries, and they probably show how a coir industry in this country is organized and how the injuries are experienced.

With scarce resources and restrictions during the Covid 19 pandemic, data collection was done by data assistants while parts of the research team were in Norway. This may have led to the occurrence of missing data. The data collectors failed to fill out some of the information in the questionnaires. However, we did not see any specific pattern of which data were missing and do not think it influenced the results very much.

Another weakness of the study was the selection of workers with only one injury in the previous three months, while the plan was to record all injuries experienced by the workers. Also, there may have been some incidences of workers underreporting injuries as they might have been apprehensive of the consequences from the management. On the other hand, some workers may have over-reported injuries as they wanted to underline the need for prevention. We do not know if any of these options occurred in the present study, but we suggest further studies to observe the workplace over time to avoid self-reports and interview situations.

Our findings have created concern when considering occupational injuries among the workers in the coir industry of Sri Lanka. More studies are needed to map the working environment and find the reasons for the high number of injuries. However, operating hazardous machines seem to be a risky job in this industry, mainly affecting female workers. The high injury rate among the workers might put a heavy burden on the coir workers, their families as well as on the health systems of Sri Lanka. We suggest workplace improvements in the machine areas. The machines should be checked, and proper safeguards for the machines should be installed, if not present. A workplace safety and health program could be an important method in this industry to protect employees from the potential risks of injuries at work.

Conclusion

Among the 128 interviewed workers, 34 (26.6%) have experienced at least one injury each during the past 3 months, indicating a high injury risk. This raises concerns and highlights the need for preventive measures to minimize risks.

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