THE INCIDENCE OF INJURIES AND THEIR DETERMINANTS IN AKAKI TEXTILE FACTORY

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THE INCIDENCE OF INJURIES AND THEIR DETERMINANTS IN AKAKI TEXTILE FACTORY A.A.REGION

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ABSTRACT

A descriptive and case control study was done to observe the incidence of injuries and their determinants in Akaki textile factory. There were a total of 143 accidents during the study period giving an incidence density of 200 per 1000 person years. This is very high in comparison to developed countries. The most frequent cause of injury was machinery (29.4%), and hit by/against objects (20.3%). Most of the accidents occurred in the Weaving department (109.2 per 1000 exposed workers). From our study, we found out that most accidents occurred on Mondays (35.7%) and on Fridays (17.5%). The most common time of accidents was from 8am to 10am. The most common parts of the body which were affected by accidents were finger (42%), lower leg (18.9%), hand (13.3%). The most frequent type of accidents were prick (32.9%), laceration (30.8%), and bruise (16.8%). From the result of our study, 87.4% of the interviewed workers were not wearing personal protective devices and 86.1% had not taken safety training. 1001 total man days was lost due to 143 accidents over a period of 12 weeks. More injuries occurred in those workers who were below the age of 30 years as compared to those above 30 year ($p < .05$), and more injuries occurred in those workers who were above 6^{th} grade ($p < .05$). Recommendations in how to reduce the rate of accidents are made.

INTRODUCTION

In the developing countries, the function of occupational health services in the place of employment is based on International Labour Organization (ILO) recommendation No.112 taking into account their resources, as well as special problems relating to those developing countries. The ILO recommendation No.112 recommends essential functions which must be carried out by occupational health services on site such as: 1.administering emergency treatment, 2.carrying out medical examinations prescribed by national laws or regulations, 3. exercising surveillance over hygiene conditions in the undertaking (1).

The occupational health service must play a part in applying the general principles of preventive medicine. They should be active in the prevention and treatment of occupational diseases and injuries and should make efforts to adapt the work to the man and the man to the job.

When a developing country is entering a period of rapid industrialization, health service and welfare conditions must be developed at the same speed as the industrialization. Otherwise many serious health problems may arise. If occupational health service are not developed together with industry during industrialization, the industrial worker will have to

face the health problems relating not only to the general morbidity of the population but also those related to the new occupation.

The benefit of occupational health service in developing countries is seen locally as well as on a national level. The positive impact of occupational health service locally may be observed in reduced morbidity and lower frequency of occupational injuries. In addition this also means fewer losses to employer and worker as there will be a reduction of wage losses and decreased compensation costs. The reduction of absenteeism is of great importance concerning skilled labour, especially so in countries where there is a shortage of skilled labour.

When industry is further developed and the country's labour force is gradually more and more engaged at work in factories, some activity on the national level will often take place; starting with legislation for workers protection. These laws generally define minimum standard of safety and health for the place of employment, often beginning with factories.

Occupational accidents and disease are costly, For the community as a whole, they represent a burden which is constantly growing and which affects the standard of living of everyone. An occupational injury involves for the worker temporary or permanent adverse consequences of

an objective or subjective nature, at both the personal and occupational levels. Most of these consequences may have repercussions on the family. The psychological impact of injuries cannot be ignored.

In developing countries like Ethiopia, the experience in the practice of occupational health is limited. Records of occupational diseases and injuries are lacking and the magnitude of this problem is not known.

In this study, we have tried to identify the incidence and risk factors associated with injuries in Akaki Textile Factory. In the three months follow up, 143 injuries were found. This cases were compared with systematically selected controls. The total number of workers, who work in the production process (excluding adminstrative staff) during the study period were 3100. After results have been analyzed and interpreted, recommendation were given. to the factory management.

HISTORY AND DEVELOPMENT OF THE AKAKI TEXTILE FACTORY

Textile Factories in Ethiopia were mainly developed in Ethiopia between 1950 and 1970. Akaki Textile mill was founded in 1958 as a Joint-venture between Ethiopian and Indian share holders and was called originally the Indo - Ethiopian Textile share company. After the 1974 revolution, the company was nationalised and is now under the control of the National Textiles Corporation of

Ethiopia. The plant is the second biggest in the country after the textile mills of Diredawa. It is situated 20kms south of Addis Ababa. From the very beginning this plant was designed to satisfy the basic needs of the population of Addis Ababa, and the neighbouring areas, with cheap grey, fabrics.

The plant had been managed solely by the Indians with the target of producing quantity regardless of quality. After the revolution production gradually increased from 40.9 mill Br. to 88.3 mill Br. (These figures are not corrected for inflation. The corrected figures are not available) The final products of the factory are combed yarn for knitwear, grey fabric for low income consumer, bleached and dyed fabrics for general consumptions (drill, poplin, Mohammedi), towels, canvas and cotton blankets.

Working Environment in the Factory

The roof is made of galvanized corrugated iron with a rather thin gauge (32 gauge). It is widely rusted and damaged which has led to leaks. During rainy season water overflows inside the mills. There is no free access to the roof which makes regular inspection and cleaning difficult. The floor of the factory is composed of concrete slab laid on a compacted base. However the floor slab is severely damaged in parts and causes hazard for movement and invites accidents.

Accoring to the factory sanitarian , present water consumption is 2000 m^3 per day of river water .Out of which, only 1000 m^3 flows through the effluent treatment plant. The rest runs out on to the ground, forming pools of water, which are likely to be breeding sites for malaria transmitting mosquitos.(15).

Most of the areas in the spinning mill are laden with dust and waste.According to a study done about 2 years ago (1988) by a French group, in carding, drawing and spinning, the dust concentration exceeds the maximum permissible concentration at the work place for cotton dust which is 1.5 milligrams/cubic metre.(16). This dust concentration is due to :

1. The air conditioner which is running only at a low capacity due to the collapse of a compressor.
2. Outlets of the return channel in different sections are not cleaned regularly and therefore covered with a thick layer of fine dust.
3. The bad floor conditions which have contributed to the accumulation of dust and impurities in the air.

<u>The Health Services of the Factory</u>

The factory has one big clinic. The clinic has a well equiped laboratory, pharmacy and in- patient department as well as out patient department. The in-patient department has 20 beds. The staff consist of one physician, one health officer, 5 nurses, and 10 health

assistants, one lab-technician and one sanitarian.

From the 1989 record of the factory clinic, the total number of workers who had accident in 1989 was 1354. In the same year 34,405 Br. were paid for insurance due to accident and 6,107 working days have been lost due to accidents. Accident is one of the top ten diseases in the factory clinic.

The health personnel have no training on occupational health. In order to promote the occupational health service, the factory health personnel must be trained by experts about preventive, promotive, rehabiltative aspect of health.

STATE OF KNOWLEDGE

Today some countries (Japan, U.S.) regularly report over 2 million occupational accidents a year. According to the 1983 International Labour Office manuals, about 1000 people are killed at their work place yearly. Each year losses due to occupational accidents are staggering. In 1986, an estimated 5.6 million work related injuries occurred in the United States. This represents an industry wide average case rate of 7.9 injuries per 100 full time employees per year. Roughly 46% of all injuries nationwide in 1986 were severe enough to require workers to take time off from work or be restricted in work activity beyond the day of the injury. The financial cost of these untoward events is large. The national safety committee of America estimated the financial burden of work injuries in America at $34.8 billion in 1986. The accident rate had slowed down in most of the industrialized counties and had risen in the developing countries from 1945 to 1985 because protective laws may not exist or if they do, they are rarely enforced (2).

Purschothma conducted a study on accidents in Indian cotton textile factories . This study was conducted in weaving preparatory and weaving process mills. It showed an accident rate of 94,97, 87, 78 and 130 per 1000 workers in the five different mills (3). Another study

was conducted in the same year in the 5 mills of the cotton finishing process in India. This study was conducted by Bhotio and the accident rate was 302,197, 178, 177 and 198 per 1000 workers in the five different mills (4).

According to the study by the Ministry of Industry of Ethiopia, the injury rate among industrial workers in Addis Ababa was calculated to be 294 per 1000 person years (5).

Abera's study revealed an accident rate of 80 per 1000 exposed workers in one year in 11 urban factories of Addis Ababa (6). In the same year Kitaw conducted a study in Assab Port and found an accident rate of 265 per 1000 exposed workers.(7).

The Women's Bureau of U.S has published a number of bulletins on industrial injuries to women in America. It has been showed in that literature that women and men are equally exposed to accident. (8). The findings in the Assab Port study suggest also no difference in the rate of accident between males and females ($p > .05$) (7).

There is a difference in the rate of accident amongst diffrent age groups. According to the study in 11 urban factories in Addis Ababa, the highest accident rate occurred in the age group 15 - 19 years (6). The age group 18 - 24 years are the group which was more affected by accidents in the Assab Port study (7). From

the 1989 report of Dire Dawa Textile factory 67% of injury was among the age group 18 - 30 years (9).(although no information was given on the age distribution of the workforce.) Figures from the United States have revealed that younger workers have more accident than older workers (10).

In the Assab Port study (1988), workers with no formal education had the highest rate of accidents.(7). According to the study in the 11 urban factories in Addis Ababa , the accident rate was highest among those with primary education and junior secondary education level (6).

There are different causes of injury. It can be environmental or human causes. Different studies have shown different causes of injuries.

In the study conducted by Muraschetty , unsafe physical or mechanical condition were the major cause in 60.5% of the accidents in spinning department of Indian cotton textile factories. The second part of his study in the weaving department showed the major causes in 51.3% of the accidents to be due to unsafe action and in 48.7% due to unsafe conditions (11). The American women's Bureau survey indicated that machinery, falls and handling objects were the principle causes of accidents to woman (8). According to the study of Ministry of Industry in Addis Ababa, the commonest agents leading to

accidents were machinery (18.02%), hand tools (11.88%) and collision (10.9%) (5). In the data from Dire Dawa textile factory (1989), the commonest causes of accidents were machinery (20.51%) collision (19.4%) and flying fragments (14.17%) (9). In the study of 11 urban factories in Addis Ababa, Hit by or against object and fall were the commonest cause of accident (6) According to the Assab Port study, the major cause in 57.7% of the accident were both hazardous conditions and unsafe acts. In 25.7% the cause was hazardous conditions alone and in 16.6% the cause was unsafe acts alone.(7)

In the study conducted by the Ministry of Industry in Addis Ababa in 1985, the commonest part of the body affected were fingers (37.2%) hands (11.6%) and toes (12.4%) (5). According to Dire Dawa data of 1989, the most affected part of the body were finger (32.05%) leg (19.58%) and hands (17.72%) (9). The Women Bureau survey in America revealed that the upper extremities are the parts most frequently affected by accidents (8).

Similar type of accidents have been observed in different studies. In Dire Dawa textile factory the type of accidents observed were laceration (65.26%) and prick (15.15%).(9). In the study of 11 urban factories in Addis Ababa, the injury sustained were mainly abrasion (38.9%) and laceration (27.3%).(6). According to the Woman Bureau publication in America bruise and contusion were the

most common type of injury.(8).

The occurrence of injury varies during the days of the week. In some studies, the highest number occur on Mondays and then decline steadily. In a British floor study, from 2367

accidents at work, the highest accident rates was found on Mondays and the lowest on Thursdays and Fridays (12). In the s tudy of 11 urban factories in Addis Ababa, 23.3% of the accidents were observed on Mondays and 13% on Fridays (6). According to the Assab port study in 1988, the accident frequency was highest on Mondays and fell to its lowest level at mid-week with an increase once more on saturday (7).

When we observe the frequency of injury according to the time of occurrence, the following findings were observed from different studies. In a British shop floor study, more accident occured in the morning than in the afternoon, with a peak time for accidents occurring after mid-morning (12). This was also the findings of Letterman in his of mines study in early 1950 in Sweden (12). The Assab Port study showed highest accident rate in the second shift (10.6/ 100,000 man-hours) and the first shift (9.7/ 100,000 man-hours).(the first shift is from 7.00am -3.00pm and the second shift is from 3.00pm - 10.00pm)(7).

In the study conducted in India, Munaschetty reported 12.4 average man-days lost per accident per year (11). In the same year, Puruschothma reported 10 average man-days lost per accident per year.(3). (both studies have been conducted in textile factories) According to Assab port study the average man-days lost per accident work out to 6.5 (7).

The study conducted by Larson in Sweden (1988) showed the risk of having a severe injury the first day on the job is 40 times higher than after 3 months (14). In the study of 11 urban factories in Addis Ababa the highest accident rate occurred in those who had worked 5 or less years. There was a gradual decrease in the accident rate with increase in years of service and age (6). According to the Assab Port study, the estimated relative risk of accidents decreases with an increase in the total work experience.(7).

Accoring to the study in U.S.,exposure to steady state noise at 90 db. will result in significant hearing loss to 27%of the exposed workers .If the working life time eposure is 95 db., 36% of the group will show siignificant hearing loss. Exposure to sound levels below 70 db. can be assumed to be safe and will notproduce any permanent hearing loss.(20)

Workes in many industries have a high incidence of noise induced hearing loss. In the U.S. approximately 15

million workers are currently exposed to hazardous noise at work,and the prevalence of noise-induced hearing loss has increased . In 1986 ,an estimated 6 million U.S.workers were affected with this disability (21).

OBJECTIVE

The objective of the study is to determine the incidence density of all types of injuries in Akaki Textile Factory and to determine risk factors associated with them.

Specific Objectives

- To describe the working environment of the factory
- To determine the incidence rate of injuries
- To analyse the occurrence of injuries in relation to work site, social, and demographic characteristics of the workers.

Hypotheses

H1. The frequency of injury is higher in those workers with low educational status (Illiterate, Literate, 1 - 6^{th} grade) versus > 7^{th} grade.

H2. The incidence rate of injury is higher in those young workers (age below 30 years) and fewer year of service than those $\geq$ 30yrs. and more year of service.

METHODS

Study Design

The study is a descriptive & case-control study (refer to figure 1). It measures the incidence of injury in the Akaki textile factory. The cases are those Akaki Textile Factory workers who have been injured at work and have been treated for the injury during the study period. The controls are selected from those workers who are currently working in the textile factory in different departments, who did not have accidental injury at work.

The contols have been selected by systematic sampling from the payroll. They were selected at the end of the three months follow up.One control is selected for each case.Population

Study Population. All factory who sustained an injury for the duration of this study were entered.

Sample Size. The source population and the study population are the same because we are studying all factory workers but the power of the study is important to know.Although the normal workforce of akaki textile factory is about 5850,due to temporary layoffs at the time of the study the workforce was about 3750.

Taking the 2nd hypothesis where

alpha error = 0.05

beta error = 0.10

P1 = anticipated proportion of control = 0.50

P2 = Anticipated proportion of cases = 0.70

Since we are able to do the study for 3 months and the number of workers has decreased,we estimated that there will be 135 accidents during this time period.(1 to 2 accidnet per day)

Power of the study

$$ZB = \frac{n(p2 - p1)^2}{2p.\ q} - Zx$$

n = 135

p = 0.5

p = 0.7

$$= \frac{143\ (.7 - .5)^2}{2\ (.6)\ (.4)} - 1.96$$

q = 1-p

p = 1/2 (p1 + p2)

= 1.49

We have 85% power Inclusion Criteria. All sex and age group, who are currently working in the factory. Workers who are directly involved in the production process.

Exclusion Criteria. Factory workers, who are not directly involved in the production process such as administrative staff. There was one control for one case. All cases and controls were interviewed and physically examined. The diagnosis and type of injuries were made by nurses who had been trained for the purpose of the study and supervised by medical doctors. The controls were systematically selected and physically examined and interviewed at the end of the study.

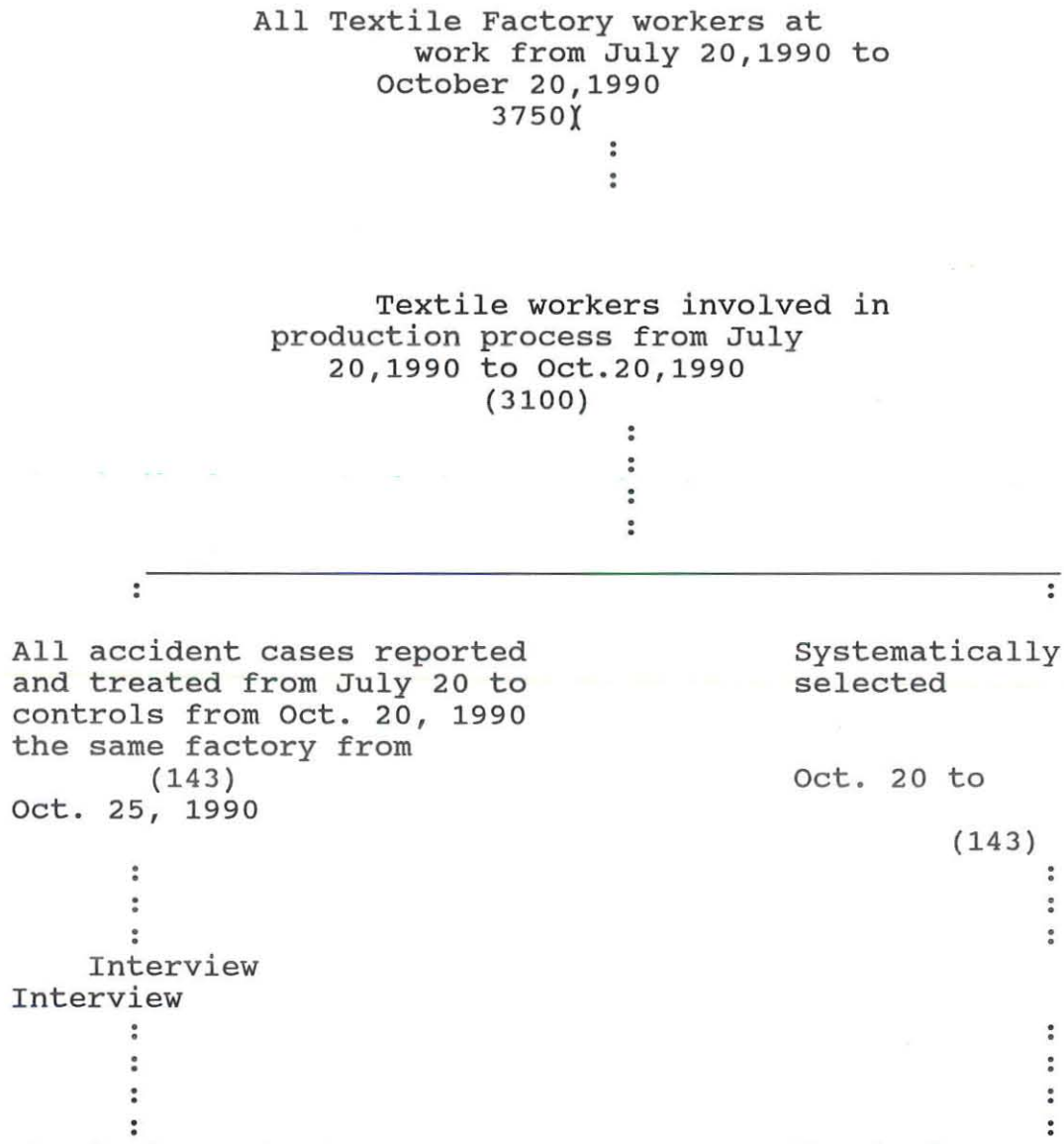

Figure 1. Study Population in Akaki Textile Factory (1990)

The questionnaire was developed and was translated from English to Amharic. It consisted of demographic data, time of accident, type of injuries, work experience of the worker, place of work etc. It has been pretested in the same factory on about 20 workers and then revised.

During the month of August, the lighting and sound of each department were measured using a photometer and a sound meter. The interviewer and physical examiner (Nurses) were trained for four days. The training was conducted by the investigator (medical doctor). Man-hour was calculated as following:

no.of weeks of study period (12) x no.of days per week (6) x no. of hours per day (8) x number of workers - The sum of (days with absentee workers x number of workers absent on that day x 8)

Consent and Ethical Approval

The purpose of the study was explained to the factory manager, workers association and safety committee. After the consultation their agreement was requested and obtained.

The study protocol was also reviewed for ethical standards by the graduate committee of the Department of Community Health of Addis Ababa university.

Methods of Analysis

The steps followed in the analysis of the results of this study were the following.

Descriptive Analysis. Describing the incidence of accidents and factory condition , Describing the occurrence of accidents by Age, Sex, educational status. Describing the occurrence of accident according to cause, type, department.

Bivariate Analysis. To determine any association between injury and other variables such as educational status, age, year of experience.

Data was entered on an SPSS PC+ program and EPI INFO program and analyzed using standard statistical techniques.T-test and chi-square were calculated.

RESULTS

In our study, the total number of workers who have been followed for 3 months were 3,100. From this 2,430 (78.4%) were male and 670 (21.6%) female. There were a total of 143 accidents during the study period giving an incidence density of 200 per 1000 person years and 8 per 100,000 man -hours. By chance,one person had only one accident (during the study period). As summarized in table 1. from the study group, 24.8% were above 6th grade.

In table 2 are found the cause and number of injuries. The most frequent cause of injury is machinery 42(29.4%). Hit by/ against objects accounts for 29 (20.3%). Most of the accidents occur in the Weaving department 71(49%).

As seen in figure 2, from our study, we found out that most accidents occured on Mondays 51 (35.7%) and on Fridays 25 (17.5%). The most common time of accidents is from 8am to 10am. The most common parts of the body which were affected by accidents were: finger 60 (42%), lower leg 27(18.9%), and hand 19(13.3%). This is summarized in table 3.

The most frequent type of accidents, as outlined in table 4 are prick 47 (32.9%) laceration 44 (30.8%) and bruise 24 (16.8%).

From the result of our study, it was found out that 87.4% of the interviwed workers were not wearing personal protective device and 86.1% have not taken safety training. Analysis of man days lost showed 1001 total man days to be lost due to 143 accidents over a period of 12 weeks and the medical and man-days lost expense excluding insurance payment and other indirect cost is 12,010 birr. The average cost per accident during the 12 weeks was 83.9 birr.

In Akaki Textile Factory, all the sections have poor lighting. It is within the range of 60 to 80 Lux.

The ILO recommends 150 -200 Lux for working areas. In Blanket and Weaving 1 the noise levels were 100 ^{db} and 94 ^{db} respectively. where as the legal limit of noise for factories is 90 ^{db}.

When injury was cross tabulated with various determinant variables, statically significant Chi square values were found for the following ($p< .05$); educational status, age groups, and working department.(Refer to tables 5 through 8 and figure 3.)

When we compare the occurrence of injury among cases and controls in age groups >30 year and <30 year the difference was statically significant. More injury occurrrd in those who are below the age of 30 years as compared to greater than 30 years ($p< .05$). T-test was also calculated and was found to be statistically significant ($p< .01$).

It was found out that there was a difference in the occurrence of injury among those who are above 6th grade and below 6th grade ($p< 05$). More injury occurred in those who are above 6th grade.

There is statistically significant difference in the occurrence of injury in different department ($p< .01$). More injuries occur in Weaving department (refer to table 8).

Relationship of injury with year of service was

examined (table 9). T-test was calculated to find out the difference in the occurrence of injury among workers in respect to their years of service ($p < .05$). The mean number of years was less for those who were injured.

There is no statistically significant difference in the occurrence of accidents among male and female workers ($p > .05$) (refer to tables 10 and 11).

During the study period, the rate of accident in the first and second workshift were 43.6 and 21.3 per 1000 exposed workers respectivly (see table 12).

The highest rate of accident is in Weaving department.

It is 109.2 per 1000 eposed workers during the study period. (see table 13.). The odds of being injured in Weaving department as compared to Dyeing department is 17.2 . There 4 to 5 sections in one department.

Table.1. Educational Status of Study Group Akaki Textile Factory, 1991.

Educational Status	No.	%
Illiterate	28	9.8%
Literate	78	27.3%
1 - 6th grade	109	38.1%
7 - 12th grade	68	23.8%
12 +	3	1.0%
Total	286	100.0%

Table 2 . Distribution of Injuries by Causes

	No.	%
Machinery or Electric	42	29.4
Hit by/against Object	29	20.3
Step on Objects	28	19.6
Fall	23	16.1
Hit by Falling Object From Height	5	3.5
Others	5	3.5
Fire or Explosive	4	2.8
Transport Vehicles	3	2.1
Hand Tools	2	1.4
Chemical or Acid	1	0.7
Steam	1	0.7
Total	143	100.0

INJURY BY THE DAY OF THE WEEK

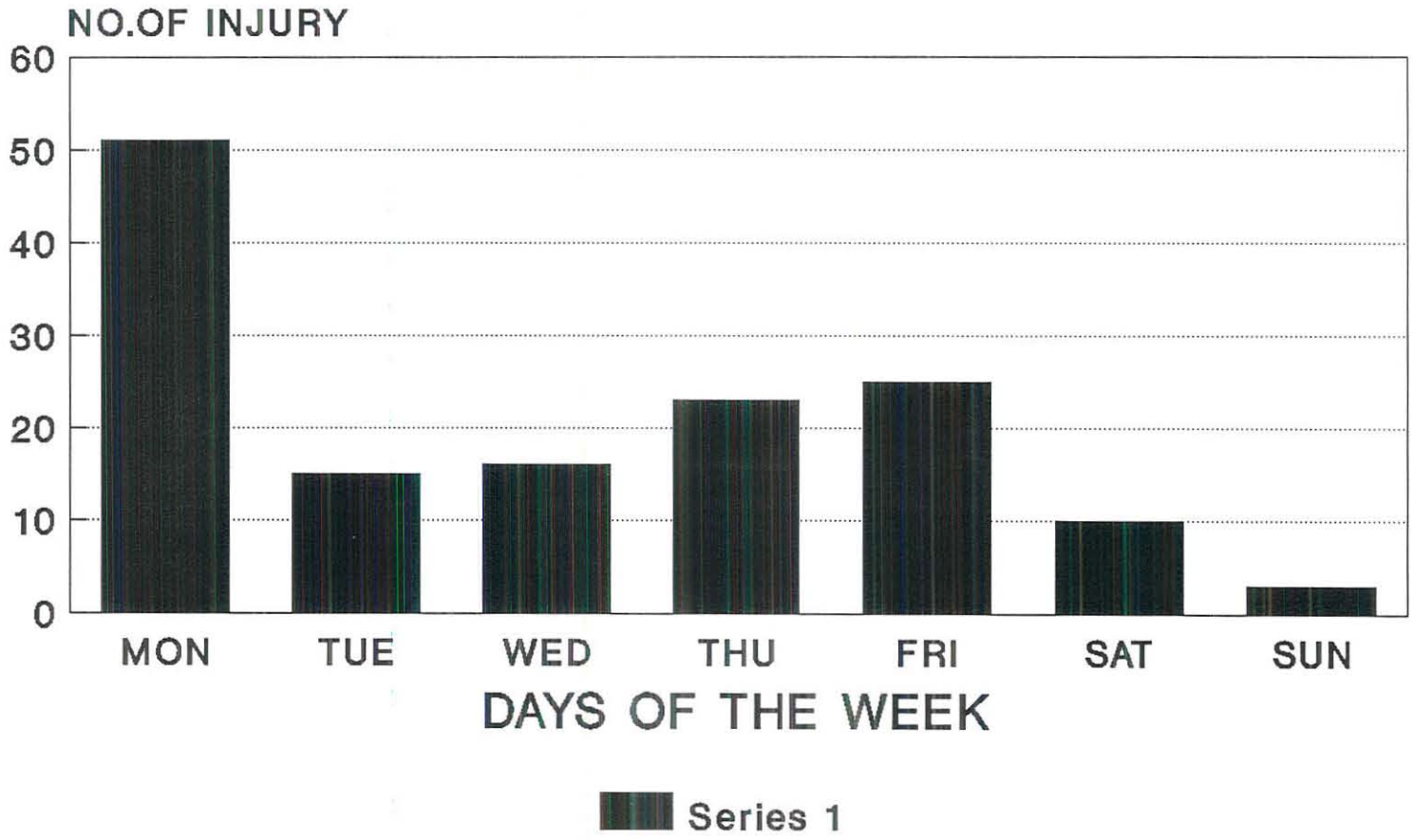

Table 3. Distribution of Injury by Part of the Body Affected

Body Part	No.	%
Finger	60	42.0
Lower Leg	27	18.9
Hand	19	13.3
Toes	10	7.0
Lower Arm	6	5.6
Head	5	3.5
Upper Arm	4	2.8
Trunk	3	2.1
Eye	2	1.4
Tooth	2	1.4
Knee	2	1.4
Chest	1	0.7
Total	143	100.0

Table 4. Distribution of Injury by type

Type	No.	%
Prick	47	32.9
Laceration	44	30.8
Bruise	24	16.8
Burn	7	4.9
Joint dislocation	6	4.2
Others	6	4.2
Sprain	5	3.5
Amputation	3	2.1
Eye injury	1	0.7
Total	143	100

Table 7. Occurrence of injury among cases and cntrols in diffrent age group.

Age group	Case	Control	OR	95% CI
<30 years	67	45	1.92	(1.15,3.20)
>30 years	76	98	-	-
Total	143	143		

P<.05

INJURY BY AGE GROUP

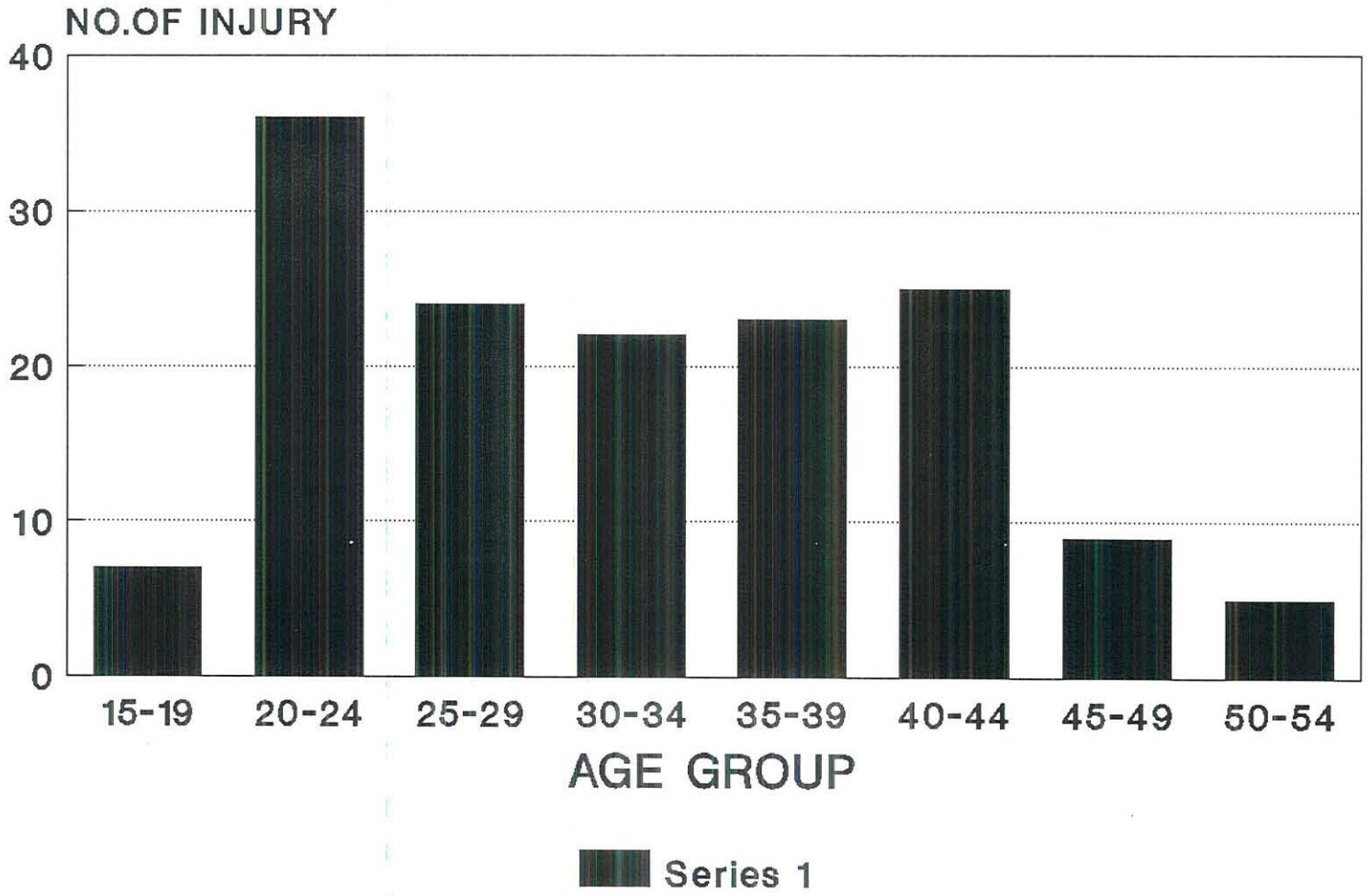

Table 9. Relationship of Injury With Year of Service.

Year of Services	Case	Controls	Odds Ratio	95% CI
0 - 1	26	17	-	-
5 - 9	39	22	1.15	(0.48, 2.08)
10 - 14	29	41	0.46	(0.02, 1.08)
15 - 19	16	21	0.49	(0.18, 1.33)
20 - 24	20	17	0.77	(0.29, 2.06)
25 - 29	6	14	0.28	(0.08, 0.99)
$\geq$ 30	7	11	0.42	(0.12, 1.47)
Total	143	143		

Table 10. Occurrence of injury among Male and Female.

	Case	Control	Total
Male	106	92	198
Female	37	51	88
Total	143	143	286

P is not significant

Table 11. Rate of Accidents by Sex.

Sex	Exposed workers	Man-hours worked	Rate of Accidents Per 100,000 man Hours Worked	Rate of Accidents Per 1000 Exposed Workers
Male	2430	1399680	7.57	43.6
Female	670	385920	9.58	55.2
Total	3100	1785600	8.00	46.1

Table 12. Rate of Accidents by Workshift, Akaki Textile Factory

Shift of Work	Worker Exposed	Man Hour Exposed	Rate of Accident Per 100,000 Man-hour	Rate of Accident Per 1000 Worker
First Shift	1740	1399680	7.57	43.6
Second Shift	1360	783360	3.07	21.3
Total	3100	1785600	8.00	46.1

Note. First Shift - 07.00 Hrs. to 15.00 Hrs.
Second Shift - 15.00 Hrs. to 23.00 Hrs.

Table 13. T-test results for different continuous variables.

	Mean of Cases	Mean of Controls	P Value
Age	32.9	35.9	p< .01
Year of service	12.4	14.7	p< .05
Educational status	4.9	3.4	p< .05
No.working days lost in past year	5.4	3.9	p> .05
Salary	222.0	235.2	p> .05

DISCUSSION

In the study, the accident rate was found to be 200 per 1000 person year, 46.1 per 1000 exposed workers in 12 weeks. It is similar to Assab Port study namely 265 per 1000 exposed worker (7), but markedly greater than the study of 11 urban factories in Addis Ababa (80 per 1000 exposed workers per year) (6). The study by the Ministry of Industry (7) and Bhotio in India (4) showed higher accident rate than this study.

There is seasonal variation in the occurrence of injury in Akaki Textile Factory. During the rainy season (July, August) supply of raw materials (cotton) is limited and more workers are given their annual leave. This may lead to low freqency of injury, due to less activity and less crowding of the workers.

In this study, there was no statistically significant variation in the occurrence of injury among males and females. This result is consistent with the Women Bureau publication in America (8) and the findings of Assab Port study (7).

Age is one of the most common factors associated with accident rates. In this study, high number of accidents occurred in those who are <30 year of age($p<.05$). It may be due to various reasons such as lack of safety training, experience and not wearing personal protective device. Since the managerial body

gives no safety training, the young unexperienced workers are prone to accidents. There is high correlation between age and year of service. Workers with more years of service are relatively old and the occurence of injury is less in those workers who have more year of service and old. The safety committee non-functionality in the factory has aggravated the problem. It is the duty of the safety committee to supervise and ensure the performance of safety training program according to the schedule.

The health personnel in the factory also need occupational health service training.

Similar findings were detected in different studies. Figures from the U.S. (2), Assab Port study (7) the data from Dire Dawa Textile Factory (9) and the study of 11 urban factories in Addis Ababa revealed similar result (6).

In this study, a high number of accidents occurred in those who had high educational status (above 6th grade). The study indicates that more accidents occur in those who have formal education. Similar findings were observed in the study of 11 urban factories of Addis Ababa (6). In contrast, the Assab Port study revealed the risk group was workers with no formal education (7).

In our study, the most frequent causes of injury were machinery (29.4%), and hit by/against objects (20.3%). The reasons can be due to machine parts which are not guarded, or unsafe act of the workers.

Akaki Textile Factory roof is rusted and during the rainy season water flow inside the mills and due to that the floor slab is severely damaged and cause difficulties in movement and invites accident.

Poor lightning condition of the working area may make the situation worse. In the study conducted by Muraschetty, unsafe physical or mechanical conditions were the major cause in 60.5% of the accidents in Indian cotton textile factories (18). The study conducted by the Ministry of Industry in Addis Abeba (5), data from Dire Dawa Textile factory survey (9) and the women's bureau survey in the United States (8) revealed the same result namely machinery as the most frequent cause of injury.

In this study, the largest number of accidents occurred on Monday (35.7%). The reasons may be due to absenteeism and that leads to the substitution of other workers in the absent colleague's place. Alcohol use on weekends may contribute this situation.

The British shop floor study (12), the Assab Port study (7) and the study of 11 urban factories in Addis Abeba (6) have also shown the highest accident rate on

direct exposure to the machines such as finger, hand will be more affected by the accident. From our study group, 87.4% of them were not wearing personal protective devices. They were not using it because the protective devices are too heavy, unpractical or uncomfortable to use. This practice will expose the worker to different accidents. The Woman Bureau survey in America (8), the study of Ministry of Industry in Addis Ababa (7) and in the data of Dire Dawa Textile Factory (9) finger was the commonest part of the body affected by accident.

A total of 1001 / man-days was lost due to 143 accidents in Akaki Textile Factory during the study period. The average man-days lost per accident was 7. This result is similar to Assab Port study (6.7) but the Indian studies by Purschothma and Muraschetty showed much higher average man-days lost per accident (man-days lost were 9 and 13)(3,11).

In this study, the most frequent types of accident are prick (32.9%), laceration (30.8%) and bruise (16.8%). Pricks are usually due to the sewing machine needles. Similar types of accidents were observed in different studies (6,8,9).

According to our study, the more years the worker has worked at the factory, the less they will be affected by injury. The findings indicate a human

factor as a determinant in the incidence of accidents. Lack of experience due to short period of service exposes the workers to different accidents. According to Larson's study in Sweden, risk of injury was found to be high in new employees (14). The findings of Assab Port study (7) and 11 urban factories in Addis Abeba (6) are similar to our study. There was a gradual decrease in the accident rate with increase in years of service and age.

In Akaki Textile Factory, all sections have inadequate light. Experimental work has demonstrated that the best vision results when the working area is slightly brighter than its surrounding. The worker's attention is held most easily and distraction is avoided if the working area is illuminated to a preferentially high brightness so that the eyes are drawn to it naturally and without strain (17).

In Blanket and Weaving 1 Sections the sound was found to be more than 90 db. Employees must not be directly exposed to noise over a legal limit. This limit is generally 90 db. If the noise level is higher than this value, unprotected employees should not spend more than 8 hours in the environment. The higher the noise level the shorter the time allowed. If a sound level increases by 10 db anywhere within the range of hearing, the ear perceives it as a doubling in loudness

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Annex 1

Sound and Light Measured in Different Section of Akaki Textile Factory.

Sections	DB	Lux	No	Sections	DB	Lux
Boiler	82	75				
Blanket Blow	75	70				
Blanket Simplex	80	75				
Blanket Weaving	94	70				
Blanket Finishing	78	75				
Ring Frame	82	80				
Carding	77	70				
Blowing	79	70				
Winding	78	60				
Warping	72	75				
Sizing	73	75				
Drawing in	67	80				
Weaving 1	100	80				
Weaving 2	90	80				
Weaving 3	90	75				
Weaving 4	94	75				
Dye - House	73	80				
Artos Finishing	73	75				
Folding	64	75				
Foundry	82	75				
Metal Work shop	75	70				
Spinning	77	80				

Note. Normal Sound = 90 db
Industrial Standard illumination = 150 - 20 Lux

100 Lux = 10 Foot Candle Source.
ILO 1962.

Annexe.2

1962, ILO Classification

Cause of Injury

1. Electric or Machinery
2. Chemical or Acid
3. Fire or Explosive
4. Fall
5. Flying Fragments
6. Hit by Falling Objects from Height
7. Sprain/ Strain
8. Drawing
9. Poisoning
10. Transport (Vechiles)
11. Hit by /Against Objects
12. Hand Tools
13. Step on Objects
14. Others

Body Affected

1. Head
2. Eye
3. Ear
4. Tooth
5. Abdomen
6. Thorax
7. Finger
8. Toe
9. Hand
10. Upper Arm
11. Lower Arm
12. Upper Leg
13. Lower Leg
14. Knee
15. Trunk
16. Chest
17. Others

Type of Accident / Injury

1. Bruise
2. Burn
3. Laceration
4. Prick
5. Joint Dislocation
6. Fracture
7. Sprain
8. Injury of the Eye
9. Injury of the Ear
10. Suffocation
11. Death
12. Other
13. Amputation

QUESTIONNAIRE TO CASES AND CONTROL

Code

1. I.D. Number ____ ____ ____ ____ (1 2 3 4)
2. Age ____ ____ (5 6)
3. Sex M F ____ (7)
   1 2
4. Educational Status
   Illiterate 0 Literate 1 Grade ____ ____ (8 9)
5. Place of Accident ____ ____ (10 11)
6. Day of Accident
   M TU W TH F SA SU ____ (12)
   1 2 3 4 5 6 7
7. Time of Accident ____ ____ ____ ____ (13 14 15 16)
8. Years of Services ____ ____ (17 18)
9. Worker Category
   Skilled 1 Unskilled 0 ____ (19)
10. Salary ____ ____ ____ ____ (20 21 22 23)
11. Department
    1 Spinning 2 Weaving 3 Dying
    4 Finishing 5 Blanket 6 Others ____ (24)
12. Number of Working days lost in the past 1 year due to illness ____ ____ ____ (25 26 27)
13. Accident Type ____ ____ ____ (28 29 30)
14. Part of the body affected ____ ____ (31 31)
15. Did worker take safety training
    0 No 1 Yes ____ (33)
16. Did worker drink alcohole before coming to work
    0 No 1 yes ____ (34)
17. Did the person wear personal protection device during the accident
    0 No 1 Yes ____ (35)
18. Lighting condition of the work place
    1 Very poor 2 Poor 3 Good ____ (36)
19. Cause of injury ____ ____ (37 38)