

Effects of Occupational Exposure on Health of the Workers of Cricket Bat Manufacturing Industries in Kashmir (India)

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Abstract: The purpose of the present study is to investigate the general working conditions of the workers of cricket bat industry of Kashmir (India) and to assess the health risk factors of the workers working in this industry. The study has been conducted in ten cricket bat industries of Kashmir valley situated in India. The prepared questionnaire was circulated among workers to assess the health risk factors of these workers. Noise level, temperature and dust concentration in air were measured with the help of sound level meter, thermo-hygrometer and handy air sampler, respectively. The present investigation indicates that the majority of the workers of this industry were illiterate. Most of them were suffering from health problems like eye irritation, injuries, difficulty in hearing, back pain, allergies, respiratory problems and general weakness. The presented results demonstrate that the health and working conditions of the workers in cricket bat industries in Kashmir (India) were found to be unsatisfactory. Every worker on an average suffered from 3-5 health-risk factors. Personal protective equipments should be provided to the workers to reduce the risk factors.

Key words: Cricket bat industry • Employment • Health risk factors • Personal protective equipments • Kashmir (India)

INTRODUCTION

Kashmir (India) possesses substantial resource in men and materials which if tapped and mobilized by judicious planning will result in the development of small scale industries which can confidently look to the market both in India and abroad. Giving suitable guidance and necessary facilities, the people of Kashmir can easily produce sophisticated goods in a cost effective manner. The origin of Kashmir's cricket bat industry is supposed to be from Sialkot Pakistan, when British officers stationed in the region for colonial rule demanded it and the technical knowhow was imported from England. In due course of time this trade flourished in those areas of Kashmir where the raw material was substantially available. Those persons who at that time were financially sound established their units at Halmullah, Bijbehara and started converting wooden logs into clefts. The first cricket bat unit was established by the name Dar sports Industry at Halmullah. This unit turned out to be the mother of all the other cricket bat units in Kashmir. More and more people especially at Halmullah, Sangam,

Bijbehara, Charsoo, Sather, Mirzapora of district Anantnag and Pulwama, got attracted towards this trade and established their units. Presently the industry has a turnover of 114.49 lakhs / year. It may be pertained to mention here that during the course of more than one century of bat making, Kashmir has gained a name and fame.

The distribution and the growth of bat manufacturing units in districts of Anantnag and Pulwama from 1975 – 2008 at the interval of five years is shown in the Fig. 1. It shows that starting from the 25 units in 1975 – 80; it has grown to 273 by the end of 2008.

It may be however of importance and concern to see that all the registered units are not functioning presently. About 39 of them have no relict evidence while 31 are not found to be functional. The registered, functional, non functional and nonexistent units are indicated in Fig. 2.

The cricket bat industry in Kashmir is already employing over 10,000 people (www.planningcommission.com) and collectively exports nearly a million cricket bats per year at a price ranging

Growth of cricket bat manufacturing units of Kashmir province

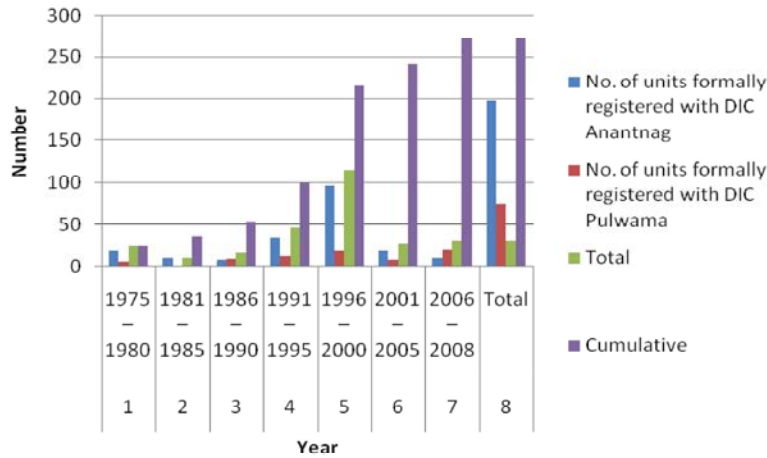


Fig. 1: Shows the illustrative growth of cricket bat manufacturing units in Anantnag and Pulwama district of Kashmir province Source: DIC Anantnag and Pulwama

Number of registered, functional and non existing units

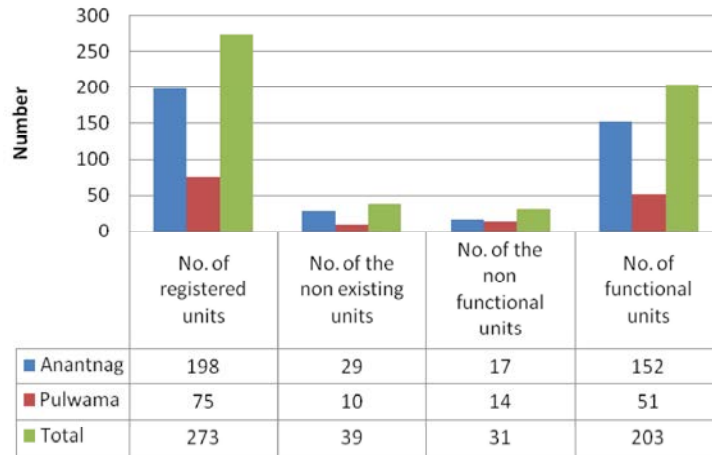


Fig. 2: Information regarding the Registered and functional units of cricket bat manufacturing cluster Source: Field survey 2008 – 2009

from INR 100–1000 per bat. The cricket bats are mostly being manufactured from willow trees (*Salix alba*) which grows only in Kashmir (India) after Essex (England) [1]. The cricket bat manufacturing industry has a strong linkage to rural agro based families tending to cultivate willow on their private lands. Growing of willow plants for cricket bat manufacturing will help them to generate their income. This industry has also provided good opportunities to the local Kashmiri youth who manage to earn about INR 3500–7000 per month.

However, the owners and workers reported that instead of helping this industry to prosper, the government has allowed sending unlimited clefts to Jalandhar and Meerut where they are doing export business at the cost of Kashmiri bat manufacturing units and Kashmiri willow, however the concerned department denied the allegation.

A large number of the cricket bat manufacturing workers are exposed to several physical and ergonomic hazards, while shaping, cutting or working with wood for

making the cricket bats thus, causing a great concern for the other people who are interested to earn their livelihood from this industry. Moreover, no heating arrangement was provided to the selected cricket bat units. About 70 % of these units even lack proper toilet and bathroom facilities. The proper arrangements for storage and disposal of waste materials were not also adequate at these units.

MATERIALS AND METHODS

The present study was conducted in ten cricket bat industries of Kashmir valley. Altogether 182, 192, 150, 130 workers in spring, summer, autumn and winter respectively participated in the present investigation and their selection was based on random sampling technique. The questionnaire was structured as per the guidelines published earlier [2] with slight modification. The target group was the workers of the age between 18–36 years. Noise level, temperature and dust concentration in air were measured with the help of sound level meter (4010 SL, Cal Right Instruments, California, USA), Thermo-hygrometer (288, CTH, Instruments and Machinery Corporation, Maharashtra, India) and Handy air sampler (7A, HS, Kdm Instruments, New Delhi, India), respectively.

Study Area: The present study was carried out in Pulwama and Anantnag districts of Kashmir (India), as 90% of the cricket bat units are concentrated in these two districts. Anantnag district is situated 55 kms south-east of Srinagar (i.e., the capital of the state of Jammu & Kashmir, India) with a total area of 3,984 sq. kms and population of 11, 72,434, while Pulwama district is situated 32 kms north of Srinagar with a total area of 1,370 sq. kms and population of 6,52,607. Both of these districts fall under the category of industrially developed districts of the state.

Physical Characters of Workers: The workers engaged in the cricket bat units were in the age group of 18-36 years. They have 3 to 15 years of work experience in the cricket bat industry. All the workers were male. Due to availability of wood, the cricket bat industries were operated for about 300 days- 320 days in a year and 6-10 hours per day. The Table 1 shows the physical characters of the weavers. There is no significant difference between workers during the four seasons.

Noise: The noise level at the different cricket bat units of Kashmir valley during the four seasons of the year does not show any significant difference. The workers were exposed to noise of continuous type in the cricket bat units. The noise level 96.26 ± 0.73 to 97.90 ± 3.07 dB (A) in these units is beyond the standards set by central pollution control board (CPCB). Moreover, these units were located 5-10 meters away from the National Highway (NH1, India) that also aggravated the already existing noise level of high magnitude. The value of noise level in decibels is presented in the Table 2.

Suspended Particulate Matter: There are five to nine types of machines used in the cricket bat manufacturing for sawing, shaping, pressing, finishing the cricket bats, which produce a lot of dust. The concentration of suspended particulate matter was in the range OF $0.4-0.6 \text{ mg m}^{-3}$ with highest being in the winter months. Table 3 shows the amount of dust concentration during the four seasons of the year.

Thermal Comfort: Based on ASHRAE definition the zone of thermal comfort is the span of conditions where 80 % of sedentary or slightly active persons find the environment thermally acceptable [3]. In terms of climatic conditions the acceptable ambient temperature of comfort would be slightly higher in the summer than in winter, being $23-27^\circ\text{C}$ and $25-25^\circ\text{C}$, respectively [3]. The average temperature at the cricket bat units was recorded in the range of 4.14 ± 0.16 in winter to 20.67 ± 1.78 in summer with the maximum temperature ranged between 15 ± 2.66 in winter to 30.39 ± 2.57 in summer. However, the minimum temperature was recorded between 6.15 ± 1.5 in winters to 16.51 ± 2.62 during summer in the cricket bat units of Kashmir valley. The observed maximum and minimum mean humidity were also not found to be favorable for human beings performing different kinds of activities at the studied work places. The humidity at the units averaged between 58.9 ± 5.79 in spring to 83.25 ± 5.05 in winter (Table 4).

Health Risk Factors: The prevalence of different physical and ergonomic diseases / risks among the cricket bat manufacturing workers was found to be high [Table 5]. The highest prevalence of different physical and ergonomic diseases was found in winter season followed by autumn, spring and summer. Allergic reactions 47.39% in summer to 77.69% in winter, Injuries 51.04% in summer

Table 1: Demographic characters of workers

Parameters	Sex	Spring	Summer	Autumn	Winter
Age	Male	32 ±2.5	32.4± 3.7	32.5±2.4	31.2±3.7
Height	Male	5.5±0.3	5.4±0.23	5.4±0.3	5.3±0.43
weight	Male	59.5±3.4	58.3±5.3	53.3±1.2	62.4±7.8
Exposure	Male	7.4±0.9	9.3±0.4	7.2±1.2	7±0.4

Table 2: The intensity of Noise in dB(A) during the four seasons

Season	Minimum dB(A)	Maximum dB (A)	Average dB (A)	ANOVA
Spring	94.4±2.06	96.99±2.97	96.26±0.73	F= 0.59
Summer	86.2±0.91	92.09±2.02	88.66±1.76	P=0.57
Autumn	92.32±4.30	103±2.45	97.90±3.07	f-crit= 4.25
Winter	90.95±1.69	103.07±2.30	96.6±3.52	

At 5% significance level

Table 3: Amount of dust in mg/m³ at different cricket bat units

Season	Minimum dB(A)	Maximum dB(A)	Average dB(A)	ANOVA
Spring	0.468	0.906	0.718±.042	F=3.62
Summer	0.499	0.906	0.740±.041	P=0.069
Autumn	0.531	0.874	0.715±0.032	Crit.value=4.25
Winter	0.906	0.718	0.812±0.26	

At 5% significance level

Table 4: Temperature and humidity at cricket bat units

Parameters	Spring	Summer	Autumn	Winter
Average Tempt.	14.12±0.49	20.67±1.78	17.82±1.07	4.14±0.16
Max. Tempt at Unit °C	21.21±0.41	30.39±2.57	20.86±4.82	15±2.66
Min Tempt at Unit °C	13.25±0.72	16.51±2.62	10.62±2.03	6.15±1.5
Humidity (%) at unit	58.9±5.790	72.6±6.320	69.5±2.540	83.25±5.05

Table 5: Prevalence of different diseases in cricket bat units

Disease	Spring N= 182	Summer N=192	Autumn N=150	Winter N= 130
Hearing problem	117(64.28)	116(61.05)	68(102)	82(63.07)
Allergic reactions	96 (52.74)	91 (47.39)	99(66)	101(77.69)
Trouble smelling odor	23 (12.63)	21 (10.93)	42(48)	47(36.15)
Asbestosis:	0(0)	0(0)	0(0)	0(0)
Asthma:	47 (25.82)	39 (20.31)	76 (50.6)	87(66.92)
Chronic bronchitis:	23 (12.63)	15 (7.81)	33(22)	30(23.07)
Shortness of breath	65 (35.71)	58 (30.20)	81(54)	87(66.92)
Shortness of breath when walking fast or slow	85 (46.70)	73 (38.02)	93(62)	95(73.07)
Coughing that produces phlegm	44 (24.17)	42 (21.87)	55(36.6)	56(43.07)
Wheezing	2 (1.09)	0(0)	0(0)	0(0)
Chest pain when you breathe deeply:	36 (19.78)	18 (9.37)	61(40.6)	78(60)
Injuries	125(68.68)	98 (51.04)	111(76)	115(88.46)
Swollen torsils	0(0)	0(0)	0(0)	0(0)
Swelling in your legs and feet	0(0)	3 (1.56)	0(0)	0(0)
Wear glasses	26 (14.28)	21(10.93)	47(31.3)	37(28.46)
Eye irritation	102(56.04)	88 (45.83)	107(71.3)	97(74.61)
Pain at wrist	1 (0.54)	3 (1.56)	0(0)	0(0)
Skin allergies and rashes	65 (35.71)	63 (32.81)	78(52)	88(67.69)
Anxiety	54 (29.67)	57 (29.68)	69(46)	51(39.29)
General weakness and fatigue	102(56.04)	112 (58.33)	96(64)	86(66.15)
Weakness in any of your arms	71 (39.01)	68 (35.41)	71(57.3)	81(62.30)
Back pain	100(54.94)	89 (46.35)	111(74)	101(77.69)
Difficulty in fully moving the your arms and legs	51 (28.02)	42 (21.87)	53(35.3)	44(33.84)
Pain when you lean forward and backward at the waist	3 (1.64)	0(0)	0(0)	0(0)
Difficulty in moving your head up and down	32 (17.58)	24 (12.5)	29(19.3)	27(20.76)
headache	25 (13.73)	32 (16.66)	15(10)	8(6.15)
Joint pain	34 (18.68)	56 (29.16)	39(26)	59(45.38)

Each value represents the number (%) of the subjects

to 88.46% in winter, respiratory problems and eye irritation are most common in the cricket bat workers of Kashmir valley Table 5. Subjective complaints of fatigue, general weakness, body ache, irritation and depression of workers related to different psychological and physical among the cricket bat manufacturing workers. Various incidents of injuries have been reported in these industries in which a person has lost his fingers and limbs by blades of saw mills, some workers have lost their eye sight when woodchips and fragments have dashed into their eyes.

DISCUSSIONS

The present investigation reveals that almost every worker suffered from 3-5 diseases and also the reported events of accidents were common in these units. However, no preventive measures have been taken so far to minimize such events. The use of personal protective equipments was found to be almost negligible. Moreover, the workers were not exposed to proper training and awareness programmes in the related area. It has been found that all the workers were male and most of them were without primary education.

The use of chemicals in cricket bat manufacturing process typically timber preservatives, varnishes and lacquers may cause various types of respiratory problems and allergic reactions in the workers [4-9]. The workers in the cricket bat units are exposed to a cold environment of 4.14 ± 0.16 during winter months. The prevalence of allergic reactions in winter may be due to the abnormal skin responses to a temperature of 0 to 15°C for prolonged periods [10].

The prevalence of eye irritation was very high among the workers and the observed excessive amount of dust (Table) and excessive glare in these industries may be the probable reason for inducing this problem among the workers. Suffering from hearing problem was found to be significant in the analyzed subjects. This may be due to the continuous exposure of the workers to high noise level (96.26 ± 0.73 to 97.90 ± 3.07 dB (A)) for eight hours each day. The exposure of workers with such noise level may cause permanent hearing impairment and may even result in deafness and tinnitus [11-15]. Improper and inadequately guarded cricket bat manufacturing machinery may lead to laceration, amputation and severe fingers as well. The prevalence of injuries (88.46%) in winter months can be attributed to the cold environment of the valley. It should be noted that a decrease of 1°C in core temperature may markedly impair performances and could increase the risk of occupational injuries and accidents [16]. It is also evident that during summers when climatic conditions are suitable to perform this kind of work, the rate of injuries (51.04%) has declined. Saw mills are considered by far the most dangerous workplace in this sector [17]. It has been observed during the present investigation that the workers adopted different awkward postures [Fig. 3] to shape, cut and handle the cricket bats during their working hours that resulted in different injuries [18] to them and other musculoskeletal problems. Further, the environmental conditions were beyond the individual's thermal comfort zone (i.e., 20°C – 24°C , at 30% humidity). Cold indoor work is characterized by adjusted and constant low temperatures and sometimes damp/wet/moist conditions.



Fig. 3: Posture of the worker of a cricket bat manufacturing

The cold environment in winter months exposes these workers to various musculoskeletal disorders. In these conditions the combined effect of cold exposure and the repetitive work results in increased muscle strain and fatigue [19]. The observed general weakness of the workers may be due to the increase in mean humidity of the environment. It has been reported that increase in the humidity may decrease physical strength, increase fatigueness and may alter the alertness and mental capacity among the workers (www.spiritus-temporis.com), which may reduce the working capabilities of workers. The prevalence of diseases in winter may be associated with the breathing cold and dry air which causes physiological changes in the upper and lower respiratory tract [20].

There is an immediate need of legal mechanisms to provide opportunity of growth and safety at the work place in cricket bat manufacturing industries situated in Kashmir (India). The management should also provide a minimum working system and suitable environmental conditions which may not only help in improving the health conditions of the workers but also may help in increasing the effectiveness of the working conditions leading to quality performance of the workers. Personal protective equipments (*viz* mask, gloves, ear muffs and goggles etc.) and heating arrangements in winter should be provided to the workers in order to reduce the risk factors.

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