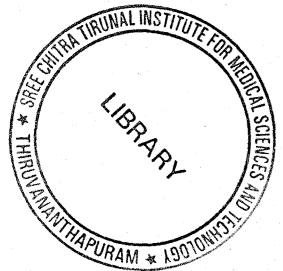


Morbidity profile in handloom weavers of Hooghly district, West Bengal, India, 2008

By

Bijay Prasad Mukhopadhyay
(MAE-FETP Scholar 2007-2008)



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Dissertation project submitted in partial fulfillment of the requirements for the degree of
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DECEMBER 2008

CERTIFICATION

This is to certify that this dissertation, entitled 'Morbidity profile of handloom weavers, Hooghly district, West Bengal, India, 2008', submitted by Dr. Bijay Prasad Mukhopadhyay, in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology, is the original work done by him and has not been submitted earlier, in part or whole, for any other (Publication or degree) purpose.

Date 31.1.19


Director

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Dr. Bijay Prasad Mukhopadhyay

Contents

Title	Page No.
1. Abstract	7 - 7
2. Scientific writing	9 - 18
2.1 Introduction	8 – 9
2.2 Methodology	9 - 10
2.3 Results	10 - 12
2.4 Discussion	12 - 13
2.5 Tables	15 - 19
3. Review of literature	21 – 24
4. Consent form	25 - 27
5. Questionnaires	28 – 31
6. Random numbers	32 - 33

Abstract

Background:

Handloom weaving is a common cottage industry in Hooghly district of West Bengal. The occupation involves two components namely spinning and looming. The objective of the study was to delineate the morbidities in handloom weavers and to identify the determinants associated with those morbidities.

Methods:

This cross sectional study comprised of 598 adult handloom weavers with at least one year weaving exposure in Hooghly district. We collected information on the demographic and occupational characteristics along with duration of work. We examined them clinically to identify various morbidities. We used Epi Info to estimate prevalence odds ratios and chi-square for trend.

Results:

Overall, 82 % handloom weavers had one or more morbidity symptoms. Musculoskeletal pain (43%) and backache (12%) were most common. Backache was more likely among weavers aged 41 years or more (adjusted P.O.R. 4.1, 95 % C.I. 2.3 – 7.3) and spinners (adjusted P.O.R. 2.5, 95 % C.I. 1.2 – 4.9). These factors were also significantly associated with diminished visual acuity. Musculoskeletal pain was higher in females (adjusted P.O.R. 1.6, 95 % C.I. 1 – 2.7), general caste (adjusted P.O.R. 3.7, 95 % C.I. 1.7 – 8.1) and education above primary level (adjusted P.O.R. 2.6, 95 % C.I. 1.4 – 5). Increase in years of looming was significantly associated with backache, diminished visual acuity, COPD and musculoskeletal pain. The risk of morbidities did not differ in terms of age and gender.

Conclusion:

Majority of the handloom weavers had some morbidity. The morbidity profile varied for looming and spinning activities that have different ergonomic characteristics. The increase in backache and diminished visual acuity with increase in years worked suggested a cumulative effect of workload.

Key words: morbidity, epidemiologic factors, handloom weavers, West Bengal

Morbidity profile in handloom weavers of Hooghly district, West Bengal, India, 2008

Introduction

Hand loom weaving is an age old cottage industry¹ in which weavers knit the cotton threads to make cloth pieces of various designs. Weavers purchase the raw threads from the market and after applying some stiffening agent, process them in a household spinning machine, called '*Charkha*'. The knitting machine (called loom, handloom or small power loom) is an operating device where a spindle (a bipolar shaped device wrapped with knitting threads) moves to and fro through parallel cotton threads, (after the initial framing of parallel cotton threads). Weavers usually put the loom machine in a separate room or extra space like outside if room is not available. All adult family members learn the basic spindling operation (loom) while experts design loom thread (framing). Members do looming in spare times, usually after the routine household works are over.

India has 6.5 million weavers, mainly distributed in north eastern states and some southern states like Andhra Pradesh, Karnataka and Maharastra² producing 22 % of the indigenous cloth production of the country³. 'Bengal handloom' has a rich british heritage background and even now both the organized and non organized handloom sectors in the state export 27 % of the total cloth productions and compete with neighboring countries internationally. The state government markets some handloom products through two co operative societies named *Tantuja* (meaning "originated from fibre") and *Tantushree* (meaning "beautified with fibers"). There are 6000 weavers' families in West Bengal, distributed in 3 districts⁴ namely Hooghly, Burdwan and Nadia of south Bengal and Jalpaiguri district of north Bengal. The existing health insurance schemes announced by the state government cover only 10 % weavers in general and 30 % in Co operative sectors⁵

Studies in textile industry and weaving sector have identified some health related problems. They are (1) musculo skeletal problems confined to pain, tingling sensation and numbness in the upper limbs⁶, (2) backache⁷ due to monotonous work in a particular uncomfortable position⁶, (3) respiratory morbidity in the form of chronic obstructive pulmonary diseases (COPD) due to handling of raw cotton threads while procuring from the market⁸, and (4) visual morbidity^{3,7} in the form of diminished visual acuity due to continuous close work.

In 2007, Hooghly district had 2149 weaver families distributed in three blocks namely Jangipara, Haripal and Dhaniakhali⁹. The objectives of the present study were (1) to delineate the morbidity pattern among adult handloom weavers and (2) to identify the determinants of morbidity pattern in handloom weavers of Hooghly district, West Bengal, India.

Methodology

We conducted a cross sectional analytical study among weavers aged 18 years and above of Hooghly district, engaged in looming and/or spinning for at least one year on or before 31st May, 2008. Considering 15 % single disease prevalence in this population⁶, confidence coefficient of 95 % and 80 % power, we calculated the sample size to be 544. Taking into account non response of 10 %, the final sample size was 598. In Hooghly district, all handloom weavers resided in 18 villages of three blocks. We enumerated all the weaver households of 18 villages through local informants and electoral roll. We then selected 598 households through simple random sampling and again randomly selected one eligible weaver from each household as the study subject.

We trained one enumerator and the community health worker of the area along with one or two local representatives about the data collection procedure with practical demonstrations, wherever applicable. We translated the structured questionnaire into the local language, Bengali and then back translated to English to ensure its consistency. After obtaining written informed consent, we interviewed each selected weaver about general demographic information, weaving related activities (looming and spinning) and work place characteristics. We enquired about the current illnesses of backache, diminished visual acuity, COPD, musculo skeletal pains and additional symptoms (system wise). We conducted physical examination of the symptomatic participants, including recording of distant vision and near vision, straight leg rising (SLR) test^{*}, Schober's test[†] (for persons with backache)

^{*} In straight leg raise (SLR) test, the individual is asked to lie relaxed on the bed and asked to raise one leg straight at a time and the maximum degree between the bed and the leg is noted. An angle less than sixty degree is considered significant as severe grade and also indicate nerve irritation.

[†] Schober's test is helpful in mild to moderate grade of backache where two points are marked at ten centimeter above and five centimeter below sacral one vertebra. The person is then asked to bend forward as much as possible and the distance between the two points is noted. Any increase of less than five centimeter is considered as restricted lumbar movement.

and auscultation of the chest. We labeled a person as having backache if s/he had the symptom of low back pain and a restricted lower limb movement of 60° on straight leg rise (SLR) test or positive Schober's test¹⁰. Distant vision less or equal to 6/9¹⁰ and the near vision less than N₉ was considered as diminished visual acuity. The near vision criteria were developed in consultation with an ophthalmic surgeon. We defined COPD as recurrent cough for consecutive three days in a week for two weeks in a month for at least three months in a year with or without dyspnoea at rest or exertion and any one of the following findings such as, i) chest expansion less than three centimeter, ii) ratio of expiration and inspiration greater than 3:2, iii) presence of rhonchi, iv) presence of cyanosis, clubbing^{8, 10}. Musculo skeletal pain was defined as pain in upper and lower limb persisting for six hours after cessation of the daily handloom activities.

We entered data in Excel software and analyzed using Epi Info version 6. We estimated the prevalence of morbidities, including backache, COPD, diminished visual acuity and musculo skeletal pain. We identified the demographic and occupational determinants of the specific morbidities health problems by calculating prevalence odd ratios (P.O.R) and 95 % confidence intervals (C.I). We also analyzed the effects of duration of weaving activities using Chi square test for trends and odds ratio for the selected exposures. Previously recognized risk factors and those with p value <0.2 in univariate analysis were put into the multiple logistic regression model (Table 3).

The study was cleared by the ethical committee of National Institute of Epidemiology (ICMR), Chennai.

Results

Of the 598 handloom weavers in the study area, more than half (53 %) were older than 41 years. Five hundred and thirteen (86 %) participants were educated upto primary level, more so among the females (93 %). Overall, 540 (90 %) participants belonged to general caste with 10 (4.5 %) females and 48 (13 %) males belonging to scheduled / other backward caste ($p = 0.002$). Median income of the participants from the handloom work was Rs. 375 per month. Of the 598 participants, 467 (78 %) were involved in looming and 284 (48 %) in spinning. Among males 292 (78 %) were only looming category whereas 118 (53 %) females

were exclusively spinner. Among the loomers, 46 (45 %) females had been working for more than 10 years, compared to 61 (17 %) males ($p=0.0001$). Two hundred twenty (60 %) males did more than 9 hours looming per day compared to only 20 % females ($p = 0.0001$). Of the 284 spinners, 42 (82 %) males and 83 (50 %) females had been working for than 20 years ($p = 0.0001$) while 29 (34 %) males and 127 (64 %) females did more than 9 hours of spinning per day ($p = 0.04$) (Table 1).

Overall, 491 (82 %) participants reported one or more symptoms of illness with higher proportion of females (44 %) reporting more than two symptoms compared to males (35 %) ($p = 0.03$). Musculo skeletal pain (43 %) was the most prevalent morbidity. Prevalence of backache and musculo skeletal pain was higher among female ($p < 0.05$) (Table 2).

The risk of backache, diminished visual acuity, COPD and musculo skeletal pain was estimated according to demographic (age, gender, caste, income, education) and occupational (looming, spinning) characteristics. Handloom weavers with backache were four times more likely to be aged more than 41 years (adjusted P.O.R. = 4.1, 95 % C.I = 2.3 – 7.3) and two and half times more likely to be involved in spinning (adjusted P.O.R. = 2.5, 95 % C.I = 1.2 – 4.9). Participants with diminished visual acuity were eleven times more likely to be older than 41 years of age (adjusted P.O.R. = 11.1, 95 % C.I = 4.5 – 23.4) and three times more likely to be involved in spinning (adjusted P.O.R. = 3.3, 95 % C.I = 1.7 – 6.5). Handloom weavers with musculo skeletal pain were about four times more likely to belong to the general caste category (adjusted P.O.R. = 3.7, 95 % C.I = 1.7 – 8.1) and two and half times more likely to have completed their primary education (adj. P.O.R. = 2.6, 95 % C.I = 1.4 - 5) (Table 3).

Increase in duration of looming from less than 10 years to more than 30 years was significantly associated with increased likelihood of backache (χ^2 trend = 10.96, $p = 0.0009$), diminished visual acuity (χ^2 trend = 24.27, $p = 0.00001$), COPD (χ^2 trend = 4.91, $p = 0.03$) and musculo skeletal pain (χ^2 trend = 10.96, $p = 0.0009$). The likelihood of backache and diminished visual acuity also increased with increase in duration of spinning. The likelihood of musculo skeletal pain increased with increase in hours of spinning per day (χ^2 trend = 9.14, $p = 0.003$). Other morbidities did not show any association with duration of spinning. Duration of looming per day was not associated with any of the selected

morbidities (Table 4). The risk of backache, diminished visual acuity, COPD and musculo skeletal pain among loomers and spinners did not differ in terms of age and gender (Table 4).

Discussion

Majority of the handloom weavers were more than 41 years old, primary educated, belonging to general caste and within the per capita income of Rs. 375 per month. Occupation wise, there was more involvement in looming by the males while females preferred spinning more. Males worked more, both in total duration (more than 20 years) and daily working (more than 9 hours). While most of the handloom weavers had at least one morbidity symptom, musculo skeletal pain was the most prevalent morbidity. Backache and diminished visual acuity were more among the aged population and among the spinners whereas the weavers with musculo skeletal pain were more likely to be primarily educated females.

The gender differences in the occupational characteristics could be explained by the nature of occupational as well as household job done by the females. Looming is the main money earning occupation which also involves more strain and is thus more commonly done by the male members. The females support them by spinning after completing their household chores. Further pregnancy and child rearing possibly make the females for work shorter duration. Household tradition led the weavers to take the occupation before completing their secondary level of education. Similar was the reason of general caste being the majority. Regarding majority being in the lower income group, two factors possibly were important like tendency of hiding the income to the survey team for more financial and other assistance and comparatively low earning potential from handloom work. Several sociological reports support this observation¹¹.

Backache was reported to be a common morbidity in a study from Andhra Pradesh^{3,7}.

Banerjee et al have discussed about ergonomic problems in the form of musculo skeletal pain⁶ in their study in the handloom weavers. Similar type of symptom was also noted in a model study analysis¹². COPD, though not found to have any significantly associated with weaving in this study has drawn the attention of the researchers in the textile industry.⁸

Higher prevalence of backache and diminished visual acuity in older age group and increased risk of backache in females may simply be physiological symptoms of aging of lumbo sacral

muscles as well as ligaments and ciliary muscle ageing. The physical demand of handloom work and poor ergonomics are reflected in high prevalence of musculo skeletal pain. The looming and spinning activities have different ergonomic characteristics that may explain the type of morbidities associated with them. In looming, the weavers sit just like motor driver with two hands dealing with the knitting frame and the spindle while the legs are used to lift the loom frame to different planes. The job entails continuous strain on the back. On the other hand spinning involves a sitting posture with visual strain involving fine threads with or without stretching the legs. The aged and females are thus more commonly involved in spinning that is not very labour intensive. The increase in backache and diminished visual acuity with increase in years worked suggested a cumulative effect of work load.

In the absence of a comparison group of non weavers in this study, we could not conclude whether the morbidities in the weavers were actually higher than the normal population. In conclusion, the study showed that, the handloom weavers were more likely to have increased musculo skeletal pains in the short time frame where as backache and diminished visual acuity in the long run.

In light of our findings we recommend for the handloom weavers to reduce their morbidity by taking rest in between the long hours of work , encouraging limb exercises through mass education, checking the visual acuity at the earliest opportunity, if not regularly. Further health awareness and periodic medical check up programs focused for the handloom weavers can be organized at local government health facilities.

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Table 1: Demographic and occupational characteristics of handloom weavers according to gender, Hooghly, W.B. India, 2008

Characteristics		Male (n = 377)		Female (n = 221)		Total (N = 598)		Chi ²	P value
		#	%	#	%	#	%		
Age group	18-29 yrs	48	12.7	35	15.8	83	13.9	7.7	0.053
	30-41 yrs	106	28.1	81	36.7	187	31.3		
	42-53 yrs	130	34.5	60	27.1	190	31.8		
	Above 53 yrs	93	24.7	45	20.4	138	23.1		
Education	Primary	308	81.7	205	92.8	513	85.8	14.8	0.002
	Secondary	64	17.0	16	7.2	80	13.4		
	Graduate	5	1.3	0	0.0	5	0.8		
Caste	General	329	87.3	211	95.5	540	90.3	11.9	0.003
	Schedule caste	8	2.1	0	0.0	8	1.3		
	Other backward caste	40	10.6	10	4.5	50	8.4		
Per capita income	Less than Rs. 376	192	50.9	112	50.7	304	50.8	0.04	0.98
	Rs 376 - Rs 750	165	43.8	98	44.3	263	44.0		
	Rs. 751 and above	20	5.3	11	5.0	31	5.2		
Looming duration (yrs)		Male (n = 364)		Female (n = 103)		Total (N = 467)		46.9	0.0001
	1 - 10 yrs	61	16.8	46	44.7	107	22.9		
	11 - 20 yrs	105	28.8	29	28.2	134	28.7		
	21 - 30 yrs	102	28.0	24	23.3	126	27.0		
	Above 30 yrs	96	26.4	4	3.9	100	21.4		
Daily looming hours								63.3	0.0001
	1 - 4 hrs	31	8.5	34	33.0	65	13.9		
	5 - 8 hrs	113	31.0	49	47.6	162	34.7		
	9 - 12 hrs	193	53.0	17	16.5	210	45.0		
	More than 12 hrs	27	7.4	3	2.9	30	6.4		
Spinning duration (yrs)		Male (n = 85)		Female (n = 199)		Total (N = 284)		43.4	0.0001
	1 - 10 yrs	17	20.0	58	29.1	75	26.4		
	11 - 20 yrs	26	30.6	58	29.1	84	29.6		
	21 - 30 yrs	23	27.1	49	24.6	72	25.4		
	Above 30 yrs	19	22.4	34	17.1	53	18.7		
Daily spinning hours								2.95	0.04
	1 - 4 hrs	31	36.5	16	8.0	47	16.5		
	5 - 8 hrs	25	29.4	56	28.1	81	28.5		
	9 - 12 hrs	18	21.2	46	23.1	64	22.5		
	More than 12 hrs	11	12.9	81	40.7	92	32.4		

Table 2: Frequency of different morbidities in handloom weavers, Hooghly, West Bengal, India, 2008

Symptoms	Female (n = 221)		Male (n = 377)		Total (598)		Chi ²	P value
	#	%	#	%	#	%		
With no morbidity symptoms	30	13.6	77	20.4	107	17.9	4.4	0.35
With one morbidity symptoms	57	25.8	118	31.3	175	29.3	2.04	0.15
With two morbidity symptoms	36	16.3	49	13.0	85	14.2	1.24	0.27
With more than two morbidity symptoms	98	44.3	133	35.3	231	38.6	4.82	0.03
Backache	36	16.3	38	10.1	74	12.4	4.92	0.03
Diminished visual acuity	36	16.3	26	6.9	62	10.4	0.73	0.39
Chronic obstructive pulmonary diseases	12	5.4	15	4.0	27	4.5	0.68	0.41
Musculo skeletal pain	124	56.1	133	35.3	257	43.0	24.63	0.0000004

Table 3: Demographic and occupational factors associated with selected morbidities in handloom weavers (N = 598), Hooghly district, West Bengal, India, 2008

Characteristics	Backache				Diminished visual acuity				COPD [‡]				Musculo skeletal pain			
	Yes (n = 74)	No (n = 524)	P.O.R. [§] (95%CI)	Adj. ^{**} O.R. (95%CI)	Yes (n = 62)	No (n = 536)	P.O.R. (95%CI)	Adj O.R. (95%CI)	Yes (n = 27)	No (n = 571)	P.O.R. (95%CI)	Adj O.R. (95%CI)	Yes (n = 257)	No (n = 341)	P.O.R. (95%CI)	Adj O.R. (95%CI)
Demographic																
> Median age	56	244	3.6 (2.0-6.2)	4.1 (2.3-7.3)	55	245	9.3 (4.2-20.9)	11.1 (4.9-25.1)	18	282	2.1 (0.9-4.9)	2.04 (0.9-4.6)	127	173	0.95 (0.7-1.3)	NA ^{††}
Female	36	185	1.7 (1.1-2.8)	1.1 (0.5-2.3)	26	195	1.3 (0.7-2.2)	NA	12	209	1.4 (0.6-3.1)	NA	124	97	2.3 (1.7-3.3)	1.6 (1-2.7)
General caste	64	476	0.7 (0.3-1.4)	NA	60	480	3.5 (1.0-21.8)	NA	25	515	1.4 (0.4-8.7)	NA	249	291	5.3 (2.6-2.3)	3.7 (1.7-8.1)
PC income > Rs 375	40	295	0.9 (0.6-1.5)	NA	34	301	0.95 (0.6-1.6)	0.79 (0.5-1.4)	15	320	0.98 (5-2.2)	NA	147	188	1.1 (0.8-1.5)	NA
Education > Primary	65	453	1.1 (0.6-2.5)	0.8 (0.4-1.8)	58	460	2.4 (0.9-8.0)	NA	27	491		Undefined	242	276	3.8(2.1- 7.03)	2.6 (1.4-5)
Occupational																
Looming	47	420	0.4 (0.3-0.7)	0.78 (0.4-1.6)	43	424	0.6 (0.4-1.1)	1.26 (0.6-2.6)	19	448	0.7 (0.3-1.6)	0.66 (0.3-0.6)	177	290	0.4 (0.3-0.6)	0.65 (0.4-1.1)
Spinning	50	234	2.6 (1.6-4.4)	2.5 (1.2-4.9)	41	243	2.4 (1.4-4.2)	3.3 (1.7-6.5)	13	271	1.04 (0.5-2.3)	NA	143	141	1.8 (1.3-2.5)	1.0 (0.6-1.7)

* Chronic obstructive pulmonary diseases

§ P.O.R.: Prevalence odds ratio

** Adj O.R.: Odds ratio adjusted with multiple logistic regression model

†† NA: Multiple logistic regression model not applied

Table 4: Duration of looming and spinning associated with selected morbidities in handloom weavers (N = 598), Hooghly, W.B, India, 2008

Occupational factors with duration	Backache				Dimness of vision				COPD				Musculo skeletal pain			
	Back ache+ (n=74)	Back ache - (n=524)	P.O.R (95%C.I)	Chi ² trend (P value)	Dim vision+ (n=62)	Dim vision - (n=536)	P.O.R (95%C.I)	Chi ² trend (P value)	COPD + (n=27)	COPD -(n = 571)	P.O.R (95% C.I.)	Chi ² trend (P value)	M S pain + (n = 257)	M S pain - (n = 341)	P.O.R (95% C.I.)	Chi ² trend (P value)
Duration of looming (yrs)																
1 - 10 yrs	5	102	Ref		3	104	Ref			4	103	Ref		33	74	Ref
			1.7				1.6 (0.3-8.4)					0.4 (0.05-2.54)				1.4 (0.8-2.5)
11 - 20 yrs	10	124	(0.5-5.7)		6	128	3.7 (0.9-16.8)			2	132	0.6 (0.11-3.4)		52	82	1.5 (0.9-2.7)
21 - 30 yrs	14	112	(0.8-8.4)		12	114	9.8 (2.7-42.7)	24.3 (0.00001)		3	123	2.9 (0.8-11.3)	4.91 (0.03)	51	75	1.6 (0.9-2.9)
> 30 yrs	18	82	4.5 (1.5-14.5)	10.96 (0.0009)	22	78			10	90			41	59		10.96 (0.0009)
Daily looming hours																
1 - 4 hrs	9	56	Ref		8	57	Ref			1	64	Ref		23	42	Ref
			0.7				0.8 (0.3-2.1)					4.7 (0.6-98.6)				1.2 (0.6-2.3)
5 - 8 hrs	17	145	(0.3-1.9)		16	146	0.6 (0.2-1.7)			11	151	1.9 (0.2-42.3)		64	98	1.1 (0.6-1.97)
9 - 12 hrs	19	191	(0.3-1.6)		17	193	0.5 (0.07-2.8)	1.35 (0.25)		6	204	2.2 (0.0-84.3)	0.15 (0.7)	77	133	1.4 (0.5-3.7)
> 12 hrs	2	28	(0.1-2.5)	1.59 (0.21)	2	28			1	29			13	17		0.07 (0.79)
Duration of spinning (yrs)																
1 - 10 yrs	6	69	Ref		4	71	Ref			3	72	Ref		37	38	Ref
			1.4				1.9 (0.5-7.8)					1.5 (0.3-8.4)				0.9 (0.4-1.7)
11 - 20 yrs	9	75	(0.4-4.6)		8	76	2.2 (0.6-9.3)			5	79	0.3 (0.01-3.8)		38	46	1.2 (0.6-2.4)
21 - 30 yrs	15	57	(1.0-9.4)		8	64	11.7 (3.4-44)	24.31 (0.00001)		1	71	1.96 (0.4-11.6)	0.12 (0.73)	39	33	1.2 (0.6-2.7)
> 30 yrs	20	33	7 (2.4-21.6)	20.35 (0.00001)	21	32			4	49			29	24		0.82 (0.79)
Daily spinning hours																
1 - 4 hrs	6	41	1 (ref)		8	39	Ref			3	44	Ref		17	30	Ref
			1.8 (0.6-5.7)				0.9 (0.3-2.7)					0.4 (0.04-2.9)				1.6 (0.7-3.5)
5 - 8 hrs	17	64	(0.4-4.3)		13	68	0.7 (0.2-2.2)			2	79	0.5 (0.05-3.7)		38	43	1.6 (0.7-3.7)
9 - 12 hrs	10	54	(0.5-4.8)		8	56	0.7 (0.3-2.2)	0.6 (0.47)		2	62	1.02 (0.2-5.5)	0.22 (0.64)	30	34	3.01 (1.4-6.7)
> 12 hrs	17	75		0.14 (0.71)	12	80			6	86			58	34		9.14 (0.003)

Table 5: Occupational factors associated with backache^{††}, stratified by age and gender in handloom weavers, Hooghly, W.B., India, 2008

Occupational factor	Strata	Backache			
		Yes	No	Prevalence O.R.	95 % Confidence interval
Spinning	Age				
Yes	Above 41 yrs ^{§§}	38	93	9.5	3.6 - 26
Yes	Below 41 yrs)	12	141	1.97	0.66 - 6.1
No	Above 41 yrs	18	151	2.8	1.0 - 8.03
No	Below 41 yrs	6	139	Reference	
Spinning	Gender				
Yes	Female	35	164	2.5	1.4 - 4.5
Yes	Male	15	70	2.5	1.2 - 5.3
No	Female	1	21	0.56	0.03 - 4.2
No	Male	23	269	Reference	
Looming	Age				
Yes	Above 41 yrs	36	196	1.5	0.6 - 3.8
Yes	Below 41 yrs	11	224	0.4	0.1 - 1.2
No	Above 41 yrs	20	48	3.3	1.2 - 9.6
No	Below 41 yrs	7	56	Reference	
Looming	Gender				
Yes	Female	12	91	0.4	0.1 - 2.4
Yes	Male	35	329	0.4	0.1 - 1.7
No	Female	24	95	0.9	0.2 - 4.3
No	Male	3	10	Reference	

The same analysis was done for diminished visual acuity, COPD and musculo skeletal pain also which did not any difference.

Review of literature

Review of literature:

Introduction:

Handloom industry in India is an age old cottage industry employing 6.5million weavers¹³, mainly distributed in north eastern states and some southern states like Andhra Pradesh, Karnataka, and Maharastra. Indian handloom weaving involves carpet industry, silk like fiber looming (shawl, pashmina etc) and allied products and yields 22 % of the cotton and indigenous cloth production of the country¹⁴. Government of India, therefore, adopted special measures in the form of training, designing, marketing, exhibitions etc. which led to an increase in the cloth production from 500 million sq. meters 7352 million sq. meters in 1999. The government of India allocated Rs. 3.6 billion as central share and the states Rs. 3.3 billion as state shares¹⁵ for uplifting of this industry.

Handloom weaving in West Bengal is a heritage rich cottage industry¹⁶ in which 6000 exclusive weaver families and thousands allied people earn their live hood¹⁷. Other states have several other types comprising of fly shuttle, throw shuttle and loin looms¹⁸ but in villages of West Bengal handlooms are the most popular because of low budget, simple and indigenous technology. General review reports about handloom weavers focused on the economic and sociological aspects mainly^{19, 20}.

Ergonomics of weaving:

The weaving operation consists of two major important components. In spinning, weavers purchase the raw threads from the market and after applying some stiffening agent process them through a house hold machine is called '*Charkha*'. Looming is pushing the shuttle (called spindle) containing the weft back and forth through the knitting frame²¹. Handloom is the machine in which all the systems are accommodated in such a way that the weaver can use two hands and legs simultaneously like a motor driver for synchronization of the knitting in different layers. Ergonomic studies of weaving²² revealed some work related strain grades. Ergonomic studies in simulation models also focused upper arm repetitive injuries²³ XXX found similar upper limb injuries in bank employees using computers in similar position and working hours²⁴. Banerjee et al in a study of repetitive upper arm injuries²⁵ used questionnaires of Kournica et al, 1987 including Borg scale assessment of pain. Studies conducted on the cumulative trauma in different unorganized sectors²⁶ including handloom sector

mentioned both static and motion factors in relation to the morbidities. Ergonomic considerations and job designs were studied in upper extremity disorders by the Industrial Hygiene Section, Ford Motor Company, Dearborn²⁷. Review of hand and arm injuries associated with repetitive manual work in industry in a literature with review of disorders, risk factors and preventive measures was done by Muggleton JM²⁸ et al. An integrated medical analysis on the ergonomics for the upper extremity was provided by Falkenburg et al for further ergonomic redesign concepts and within the ergonomic redesign discussion, general design guidelines and standards were presented to introduce ergonomic design changes.²⁹

Socio demographics:

The handloom weavers in West Bengal are either individual based or master based. In individual weaving, the individual weaves on his own resources and are usually rare. In master base, the master weavers invest in weaving and sell the weaving products.³⁰ In West Bengal different co operative societies also take part in co operative training and marketing of the handloom products but that caters only ten to thirty percent of the total handloom population as a whole^{31, 32}. In general, they are of low to medium income group with average working hours starting after the morning wake up session till noon and again in the afternoon till early night. Adult active males carry out the looming activities while the less labor intensive spinning is done by the females and old aged peoples. It is mainly a profession of Hindus in West Bengal. Child laborers are not available in this sector in West Bengal mainly because of expertise labour needs but reports are available on child labor problems in other areas³³. Handloom weavers in West Bengal usually belong to otherwise backward caste (OBC) but because of unemployment now general caste people also take this profession for their daily earnings. Reports are available on social health problems of handloom weavers³⁴.

Morbidities:

Published studies on morbidities of handloom weavers are lacking. There were some unpublished studies conducted by the post graduate trainees in community medicine among the handloom weavers near Varanasi. Matched case control study on handloom weavers conducted revealed significant association with respiratory morbidity in univariate analysis only³⁵. Tewari et al mentioned about reduction in peak expiratory flow rate³⁶ in the workers of textile industries. Reports on diminished visual acuity, COPD and backache are available in the grey literatures of different NGOs, websites of

state govt. handloom sectors. Poverty related tuberculosis have been reported in handloom weavers in Varanasi district of Uttar Pradesh, India³⁷. South Indian reports³⁸ focuses on illness among handloom weavers in Andhra Pradesh. Health insurance schemes in other countries³⁹ focus mainly on the general illness as well as respiratory morbidities. In general, in West Bengal the weavers suffer from the general illnesses like any other human beings and some occupational problems in the form of backache, diminished visual acuity, respiratory problems in the form of COPD and musculo skeletal pain after the daily working hours are over.

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¹⁶ Ministry of textile, Govt. of India Report 2001,

¹⁷ Ministry of small scale and cottage industries , Govt. of West Bengal Report, 2006

¹⁸ Health Insurance Scheme of DCHL Project I of Gov. of India, Report 5 January, 2005

¹⁹ Asian Human Rights Commission appeal: ua@ahrchk.org.

²⁰ Srinivasulu K, Anil Kumar V et al, Crisis in handloom sector in Andhra Pradesh: Ways forward, Sept, 2004.

²¹ [Http://www.cottontown.org/page.cfm?pageid=473&language=eng](http://www.cottontown.org/page.cfm?pageid=473&language=eng).

²² Gangopadhyay S, Das T, Ghosal G et al, Int J Industrial Ergonomics, Oct 2006, 36 (10), 912-920.

²³ T J Armstrong , P. Buckle, LJ Fine et al; Centre for ergonomics, University of Michigan: A conceptual model for work related neck and upper limb musculo skeletal disorders, Ann Arbor 48109-2117

²⁴ Elian M Lacerda , Luis C Nalkul et al; BMC public health, October 11, 2005: 10.1186/1471-2458-5-107

²⁵ Banerjee P; Gangopadhyay S: J Hum Ergol (Tokyo). 2003 Jun ;32 (1):17-22 15176126
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- ³² Report of the district cottage and small and medium scale industries, Hooghly, 2001
- ³³ The small hands of slavery”; Human right watch children rights project / human rights watch, Asia: page 9
- ³⁴ Shramashakti: report of the national commission, of weavers, page 146
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- ³⁷ www.foodjustice.net/ha/mainfile.php/ha2007/104
- ³⁸ www.hindu.com/2007/10/03/stories/2007100358060400.htm
- ³⁹ www.ilo.org/public/english/region/asro/bangkok/events/sis/download/paper10.pdf

Consent form for the investigation of the disease prevalence in the handloom weavers in the Hooghly district of West Bengal, India, 2008

Part A: Information sheet:

Respected Sir / Madam,

I am Dr. Bijay Prasad Mukhopadhyay, working with the department of health and family welfare, in Hooghly district. I and my colleagues who are the volunteers are here to look into factors that may put you at risk for different health problems due to handloom activities. We are also here to advise you for the prevention measures for them. We are doing this investigation as there was no such activities in Hooghly district earlier and there are approximate 2000 weaver families in Hooghly district. There are two large Co operative societies named Tantuja and Tantushree and the ministry of Small and cottage industry may use this information for hazard minimizing strategies

To find out the health hazards that are found in handloom weavers, we need to ask questions to persons who do loom between June and August, 2008 and to persons who do not. Thus, between June and August, 2008, we will be asking the same questions to all the persons with handloom activities. We would like to confidentially ask these few questions to you once. We will not disclose you having the disease or any information provided by you to anyone during the interview of your healthy neighbors or others. Answering these questions should take about 25 minutes of your time. In this survey, we will ask questions and make a few specialist visits or laboratory tests if required. However, those special activities would be a part of the regular medical care that you need and you will be treated at the nearby government hospitals free of cost for those hazards detected. Taking part in this survey is purely voluntary. No compensation will be

paid to you for participating in this study. You can choose not to participate. You can choose not to answer a specific question. You can also stop answering these questions at any time without having to provide a reason. This will not affect your rights to health care in the nearby government hospitals or any other rights. There is no specific benefit for you if you take part in the survey. However, taking part in the survey may be of benefit to the community, as it may help us to understand the problem, its public health burden and potential preventive strategies. When the results will have been analyzed, a report will be shared with all the participants and the local health officials concerned with public health, so that appropriate steps can be taken to minimize and control the health hazards in the handloom weavers of Hooghly district as well as all weaver families of West Bengal

The information we will collect in this survey will be completely confidential. We may ask questions about various specific behaviors or practices. This does not necessarily mean that we think that these behaviors or practices put you at risk for health hazards related to handloom activities. It does not necessarily mean either that we think that these behaviors or practices would protect you from health hazards related to handloom activities. We will not write your name on this form. We will only use a code instead. The key to this code will only be known only to the principal investigator of this survey. It will be kept under lock and key. It will be destroyed after the project.

If you wish to find out more about this survey before taking part, you can ask the volunteer all the questions you want. You can also contact me, Dr. Bijay Prasad Mukhopadhyay MAE-FETP Scholar (7th Cohort) and principal investigator of this survey attached to the National Institute of Epidemiology, Chennai, presently detailed at the office of the Chief Medical Officer of Health, Hooghly and I will be happy to give you more details. If you are OK to take part, we will go ahead now.

Part B: consent form:

I have read the above / the above has been read to me in the language I understand. I have had an opportunity to ask questions and the questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a subject in this study and understand that I have the right to withdraw from the study at any time without it in any way affecting my further medical care.

Name of the study participant or guardian (if minor)

Signature/thumb impression of the study participant or guardian

Name of the witness

Signature of the witness

Name of the interviewer

Signature of the interviewer

Data collection instrument form for the study of the disease prevalence in the handloom weavers in the Hooghly district of West Bengal, India, 2008

A. Cross sectional study No. Date of interview (dd/mm/yyyy)

B. Interviewer's

name..... ☐

C. Outcome variable: Id 1. Backache
acuity

Id 2. Diminished visual

Id 3. COPD
pains

☐

Id 4. Musculo skeletal

D. DEMOGRAPHIC INFORMATION

As you know, we are conducting a study to understand what health problems do the handloom weavers have due to their handloom activities. We would like to interview you. Do you have some time now?

If YES, Thank you. I will be asking you certain general questions. You do not have to respond to any questions that you do not wish to answer.

If NO, Would you be available at another time? 1) Yes 2) No

If YES, when and at what time? _____

If NO, Thank you very much for your time.

Id 5. What is your age? _____ (years)

Id 6. What is your sex? 1) Male 2) Female

Id 7. What is your religion? 1) Hinduism 2) Buddhism 3) Christianity 4) Islam 5) Others

Id 8. What is your caste? 1. General 2) Scheduled tribe 3) Scheduled caste 4) OBC

Id 9. Do you reside in an urban or rural area? 1) Urban (municipal area)
2) Rural (non-municipal or block area)

Id 10. In which block do you reside 1) Jangipara 2) Haripal 3) Dhaniakhali

Id 11. Could you tell me what your average monthly family income is?

1) Nil, 2) < Rs.2000, 3) Rs 2000 to Rs3999, 4) Rs 4000 to Rs 5999, 5) Rs 6000 to 7999
6) Rs. 8000 to 9999, 7) Rs.10000 to 11999, 8) > Rs. 12000

Id 12. How many members are there (i.e. family members in the same kitchen)?

1) One, 2) two, 3) three, 4) four, 5) five, 6) six, 7) seven, 8) eight or more

Id. 13 What class, do you read in now or did you complete when left?

.....

Now, we will perform some medical examinations to know what exactly happened to your health status. For that we will need your help for kind cooperation. It will involve some clinical tests which you most probably are not so familiar. But those are very simple and effective method of clinical examination and are done by the expert peoples like in the armed forces medical examination or quick public health screening for ophthalmology. **If you are OK, we shall go ahead.**

If NO, thank you for so patient cooperation till now.

E. CLINICAL INFORMATION (medical review):

(These will be obtained from the individuals' records through the primary investigator/ attending physician/s.)

Id 14 - Id. 17 Are any of the following symptoms/signs present?

Id 14 Backache ¹ :	1) Yes	2) No	☐
Id 15 Diminished visual acuity ²	1) Yes	2) No	☐
Id 16 COPD ³	1) Yes	2) No	☐
Id 17 Musculo skeletal pains ⁴	1) Yes	2) No	☐

Id 18- Id. 21 Additional symptoms if any:

Id 18.	1) Yes	2) No	☐
Id 19.	1) Yes	2) No	☐
Id 20.	1) Yes	2) No	☐
Id 21.	1) Yes	2) No	☐

Please note that, the main symptoms of backache, diminished visual acuity, COPD and musculo skeletal pains are recorded for analysis as well as treatment. The other symptoms are recorded for giving the individual benefit of the study by treating him or her for the additional ailments from the ethical point of view.

Please note the operational definitions as below:

- 1. Backache means pain in the back in an individual with straight leg rise test leg than 60⁰, and /or positive scober test.**
- 2. Diminished visual acuity means distant vision less than 6/18 and near vision less than N 18 as mentioned in current medical diagnosis and treatment, Edition 2001.**
- 3. COPD : breathlessness with chest expansion less than 3 centimeter and expiration and inspiration ratio more than 1.5 as mentioned in the current medical diagnosis and treatment, Edition 2001.**

¹ Backache would mean pain in back with straight le rise test less than 60⁰.

² Diminished visual acuity means distant vision less than 6/18

³ Obstructive lung diseases mean breathlessness with chest expansion less than 3 centimeter.

4. Limb pain mean pain in upper or limbs as per the scale used by P. Banerjee and S Gangopadhyay

4. Musculo skeletal pain means pain in upper or limbs as per the scale used by Banerjee P and Gangopadhyay S (Banerjee P, Gangopadhyay S, J. Hum. Ergol. (Tokyo), 2003, Jun;32(1):17-22 Pubmed 15176126 ,cited:1)

Now, we would like to ask you regarding certain factors which might be related to the handloom activities and your health problems, if any. If you are OK, we shall go ahead.

If NO, thank you for so patient cooperation till now.

F. EXPOSURE INFORMATION RELATED TO THE HANDLOOM ACTIVITIES

Id. 22. Do you engage yourself in looming? 1) Yes 2) No ☐

IF YES,

22 a. How many hours a day? ☐

22 b. Is it continuous or intermittent? 1) Yes 2) No ☐

Id 23. Do you engage yourself in spinning? 1) Yes 2) No ☐

IF YES,

23 a. How many hours a day? ☐

23 b. Is it continuous or intermittent? 1) Yes 2) No ☐

Id 24. Do you engage yourself in framing? 1) Yes 2) No ☐

IF YES,

24 a. How many hours a day? ☐

24 b. Is it continuous or intermittent? 1) Yes 2) No ☐

Id 25. Do you engage yourself in dyeing? 1) Yes 2) No ☐

IF YES,

25 a. How many hours a day? ☐

25 b. Is it continuous or intermittent? 1) Yes 2) No ☐

Now we will ask you some questions about the environment in which you work. We have no intension to intrude into your privacy but just to correlate with your health problems if any or are at risk for health problems. We will observe some of the environmental factors along with this. If you are OK, we shall go ahead.

If NO, thank you for so patient cooperation till now.

G. HANDLOOM RELATED ENVIRONMENTAL INFORMATIONS

Id. 26. How many living rooms do you have in your family? ☐

Id. 27 How many family members do you accommodate per room in an average?

Id. 28. Whether you have any other source of dust in the house? 1) Yes 2) No

IF YES,

28 a. What is the source of dust?

28 b. What was the duration of exposure?

28 c. What is it continuous or intermittent?

1) Yes 2) No

Id. 29. Whether you have any other source of dye in the house? 1) Yes 2) No

IF YES,

29 a. What is the source of dye?

29 b. What was the duration of exposure?

29 c. What is it continuous or intermittent?

1) Yes 2) No

Id. 30. Do you work in light less than day light or a long tube light at night in the house?

1) Yes 2) No

(If required, please explain in detail or demonstrate showing tube light or see yourself)

IF YES,

30 a. How many hours a day?

30 b. Was it in lantern or a 60 watt bulb? , If 60 watt bulb write 1, else 2

30 c. What is it continuous or intermittent?

1) Yes 2) No

Id. 31. Do you work in less ventilated room or area in the house? 1) Yes 2) No

(If required, please explain in detail or demonstrate showing picture or see yourself)

IF YES,

31 a. How many hours a day?

31 b. What is it continuous or intermittent?

1) Yes 2) No

List of random numbers used in simple random sampling method for selection of the handloom household of Hooghly district, West Bengal, 2008

First sheet for first 1000 handloom households⁹:

3	64	124	176	240	292	367	441	497	567	630	699	750	809	874	939
5	66	127	179	243	295	368	443	498	568	632	701	754	812	876	945
11	67	133	181	245	297	369	444	500	572	634	704	757	813	877	949
14	68	134	184	248	303	370	445	502	574	635	705	767	813	878	953
16	69	136	185	250	305	372	449	508	575	640	706	768	816	880	954
17	71	139	186	251	306	373	451	510	578	643	711	769	819	889	959
19	75	140	189	252	307	376	453	512	583	645	714	771	823	891	960
26	76	142	192	253	309	378	454	513	584	648	716	774	825	894	964
28	81	143	194	255	310	385	455	516	585	650	721	775	827	895	966
29	83	144	206	258	314	387	457	521	586	651	722	778	829	902	967
31	84	145	207	260	316	390	460	522	587	653	723	781	836	904	972
32	85	146	209	263	318	391	461	523	588	654	724	787	837	907	973
35	86	147	211	265	319	397	462	524	590	655	725	788	840	909	975
36	87	149	218	266	320	401	469	527	591	661	726	789	844	913	977
37	88	152	219	269	321	402	471	533	593	666	728	790	847	915	979
40	90	157	221	270	329	404	477	535	595	668	729	791	856	916	981
44	92	158	222	272	333	406	480	536	596	671	732	792	857	919	982
45	93	159	224	274	334	410	484	543	598	680	734	794	859	920	985
46	95	160	225	280	336	412	486	545	600	686	735	796	860	922	989
51	97	162	229	281	337	417	489	550	611	688	736	797	861	923	994
53	98	165	230	282	338	420	490	552	618	691	738	799	862	925	997
58	103	166	231	283	339	422	492	556	620	692	739	805	864	930	
59	114	168	232	285	342	427	493	557	621	696	740	806	867	933	
62	120	172	233	290	343	434	494	559	622	697	742	807	869	937	
63	121	175	234	291	361	439	495	563	628	698	744	808	872	938	

⁹ 698 handloom weavers were randomly selected from whole list. The repetitive numbers were skipped to next available number. One member from each household was selected by using numbered round balls and picking up one at random. The numbers were generated using random number option of a statistical calculator.

Second sheet for next 1000 handloom households:

2	75	163	243	311	362	427	482	536	583	637	704	782	845	905
5	77	164	245	313	363	430	483	537	584	638	706	786	846	907
13	79	165	249	314	367	431	484	538	586	639	709	787	849	910
14	84	167	251	320	368	432	485	541	590	640	711	790	853	913
16	86	169	258	321	371	434	487	542	597	644	713	791	859	915
18	88	179	259	322	372	435	489	543	599	645	719	794	861	918
22	92	187	262	323	375	437	490	545	600	650	723	795	862	920
25	96	188	272	326	376	438	491	546	601	651	729	796	864	921
27	98	190	274	328	377	445	492	547	608	654	730	798	865	928
29	101	192	275	330	381	446	494	550	611	655	732	799	866	930
32	109	193	279	331	387	447	498	551	612	656	741	800	867	932
33	112	200	284	332	389	449	499	553	613	659	743	801	868	933
35	115	201	289	334	391	450	504	554	616	660	745	803	873	939
39	122	205	292	335	394	457	509	556	617	661	752	806	875	943
44	126	206	293	336	396	460	510	557	618	663	753	809	876	947
46	128	208	294	338	397	461	512	561	620	664	755	813	878	961
47	130	210	295	342	398	462	515	562	623	668	756	814	885	963
59	132	215	300	343	399	465	517	564	625	677	762	815	886	976
60	134	216	301	344	409	466	520	567	627	679	763	817	890	981
61	139	219	302	345	410	467	521	569	628	683	764	820	894	987
62	140	222	303	346	416	473	523	572	629	691	765	826	895	988
64	145	223	305	348	417	475	526	573	632	693	769	829	896	990
68	150	227	306	349	418	476	529	579	633	698	774	831	898	996
72	157	232	309	354	423	478	530	581	634	700	775	837	900	999
73	158	234	310	358	426	480	535	582	635	702	777	844	903	