Byssinosis in Hong Kong

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ABSTRACT After a report in 1980 of the first three diagnosed locally cases and a preliminary epidemiological investigation that found little evidence of the disease, a survey was aimed at determining the prevalence of byssinosis in Hong Kong. Some 1776 workers in six cotton mills were studied using the standard MRC questionnaire and portable spirometers. Only 48 (2.7%) of the mill workers had symptoms acceptable for a diagnosis of byssinosis. The pattern of relation to dust exposure levels was similar to findings in other countries: blowing and carding process operatives had twice the prevalence rate of the spinners. Another 178 workers (10%) had symptoms of chest tightness or breathlessness or both that were not related to the first exposure after a break and therefore did not fit the standard diagnosis. Some 257 workers (14.5%) had chronic obstructive airflow disease but only 12 (4.7%) had chronic bronchitis. Job mobility and self selection of sensitive cases out of cotton dust exposure seem the most likely explanations for the low prevalence. The significance of non-specific lung ailments needs further assessment to elucidate the possible connection with cotton dust exposure.

Byssinosis was diagnosed for the first time in Hong Kong in 1980 with a report of three cases.¹ This focused attention on the disease, and since cotton milling is an active local industry there was an obvious need to determine the effect of related dust exposure on the workforce. A preliminary investigation in 1981 of workers in the mills found no cases of byssinosis, but the prevalence was much lower than that experienced elsewhere in similar circumstances.² This set the scene for a wider survey of local mill workers to explore further the epidemiology of cotton dust related illness. The survey is described and discussed in this paper.

Survey population and method

Based on the dust levels found in an associated workplace monitoring exercise and the size of the workforce in Hong Kong, six mills were chosen as typical examples of the total of 22 establishments which were working with raw cotton at the beginning of 1983. The number of employees in each mill varied between 120 and 677, and the total of 2202 from the six mills represented about 35% of all such local workers. The aim was to screen all blowing, carding, and spinning process operators with the

inclusion of as many other staff such as cleaners, electricians, and storekeepers as time permitted. The mills were working a three shift system and each shift workforce was studied in the same 24 hour period. All workers were encouraged to participate but those who were unwilling were left out of the study as were absentees on survey day. Of the total workforce of 2202, 1776 (80.7%) subjects were examined, of whom 320 (18%) were carders or blowers, 1201 (68%) spinners, and 255 (14%) associated workers. These occupations were represented in roughly similar proportions in the group omitted from the survey. Table 1 shows the distribution of the survey population.

The Medical Research Council Questionnaire on Respiratory Symptoms (as modified for byssinosis 1960) was translated into colloquial Cantonese and used as the basis for determining the prevalence of symptoms of byssinosis. An extra question was added to the standard questionnaire in which the subject was asked to describe in his own words how he felt to make sure that symptoms were not missed because of limitations in the translation. The mills were visited within a week of the Chinese New Year holiday. This is the longest break from work for most local cotton workers, and the timing was intended to help recall of "Monday feeling" which should be particularly evident just before interview. The questionnaire was administered by experienced

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Table 1 *Distribution of survey population and mean age of workers, by mills*

Mill No	Total workforce	Subjects in survey		Work process			Mean age (years)
		No	% of total	Blower and carders	Spinners	Others	
1	120	116	96.7	23	63	30	38.6
2	245	205	83.7	28	140	37	40.5
3	294	205	69.7	43	139	23	38.3
4	341	287	84.2	58	180	49	44.5
5	525	524	99.8	104	345	75	35.8
6	677	439	64.8	64	334	41	42.1
Total	2202	1776	80.7	320	1201	255	39.4

Table 2 *Duration of exposure of workers with byssinosis and distribution and grading by work process*

Work process	No examined	Subject with symptom		Grading of byssinosis				Mean duration of exposure (years)
		No	% of process group	½	1	2	3	
Blowing and carding	320	18	5.6	1	3	10	4	10.05
Spinning	1201	25	2.1	6	5	12	2	10.71
Other mill work	255	5	2.0	0	2	1	2	10.51
Total	1776	48	2.7	7	10	23	8	10.57

Table 3 *Distribution of respiratory symptoms among those 178 subjects with chest tightness or breathlessness or both not related to first workday after a break, by work process*

Work process	Cough	Phlegm	Chest tightness	Breathlessness	Wheezing
Blowing and carding	11	14	19	8	3
Spinning	28	40	80	24	14
Other mill work	7	14	23	6	6
Total	46	68	122	38	23

Table 4 *Lung function results by work process*

Work process	Preshift FEV ₁ /FVC (n = 1776)		Postshift fall in FEV ₁ (n = 1024)	
	Over 75%	75% or less	10% or less	More than 10%
Blowing and carding	250 (78.1%)	70 (21.9%)	206 (86.9%)	31 (13.1%)
Spinning	1057 (88.0%)	144 (12.0%)	610 (89.3%)	73 (10.7%)
Other mill work	212 (83.1%)	43 (16.9%)	97 (93.3%)	7 (6.7%)
Total	1519 (85.5%)	257 (14.5%)	913 (89.2%)	111 (10.8%)

Table 5 *Prevalence of chronic bronchitis among subjects with chronic obstructive airflow disease, by work process*

Work process	Chronic obstructive airflow disease	
	Chronic bronchitis	Other respiratory causes
Blowing and carding	5	65
Spinning	4	140
Other mill work	3	40
Total	12 (4.7%)	245 (95.3%)

staff who had been adequately briefed on the procedure. On completion, the ventilatory function of each subject was assessed using a portable spirometer (Vitalograph) and a mini-Wright peak flow meter. The examination was completed within two hours of starting work; six hours later respiratory function was again assessed before the shift ended.

Findings

Of the 1776 subjects examined, 48 (2.7%) gave a history of chest tightness or breathlessness or both on the first working day after a break and were diagnosed as suffering from byssinosis in accordance with the usually accepted definition.³ The highest

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prevalence was found among carders and blowers with 18 subjects, amounting to 5.6% of the group affected. Symptoms were graded by the usual method⁴ and table 2 shows the distribution in relation to work process. Of the 48 cases of byssinosis, 40 were graded in the categories C1/2, 1, and 2, whereas the remaining eight were in grade C3 and had associated evidence of respiratory disability.

In addition to byssinosis, 10% of the workforce had chest tightness or breathlessness or both which, unlike typical byssinosis, were not related to the first workday after a break. Table 3 shows the associated respiratory symptoms in this group and their distribution.

The results of lung function measurements showed that 257 (14.5%) workers had a preshift obstructive airways pattern (table 4). The prevalence of postshift deterioration was higher among carders and blowers than other mill workers. Of the 257 cases with a chronic obstructive airways pattern, only 4.7% had a typical history of chronic bronchitis⁵ (table 5).

Discussion

Using the generally accepted criteria this survey found evidence for byssinosis in 2.7% of the local cotton workers with the highest prevalence of 5.6% among those engaged in the blowing and carding processes. These rates are considerably lower than those reported elsewhere. Seven per cent of spinners and 40% of carders were recorded as having byssinosis by Schilling,³ and 11% and 37% in the same processes by Molyneux and Tomblinson⁶; in America prevalences of 10% and 29% were reported by Schrag and Gullett.⁷ The low prevalence in the present study is consistent with the results of our preliminary survey,² in which a rate of 1.5% was found, however.

That the low prevalence of the disease might be related to safer working conditions is not confirmed by dust monitoring (table 6) from which it was evident that the dust levels and the duration of exposure of the workforce to cotton dust resembled those reported in the mills of other countries. Dust control

did not receive any special attention and conditions were unlikely to have been any better than elsewhere. A connection with the quality of cotton is also unlikely, since the local industry worked all grades from all the major sources, China, India, Egypt, America, and Russia.

Special attention was given to the classical symptoms of byssinosis when administering the questionnaire. Several phrases with similar meaning were noted as acceptable in diagnosis. Provision was also made for the subjects to use their own words to explain any symptoms not covered in the questionnaire. It is unlikely that symptoms were missed or that any case within the accepted diagnostic criteria of byssinosis was overlooked.

In reporting the first cases Morgan and Ong suggested that byssinosis had not been diagnosed previously because the local working pattern of a seven day week without the weekend break as found elsewhere cloaked the typical Monday feeling symptom.¹ This explanation is unlikely to apply in recent years when both legal requirements and declining business have played a part in making rest days more common. To facilitate the recall of Monday feeling the present survey was conducted within a short time of the Chinese New Year holiday when all the subjects had had a break from work of at least four days. If the typical symptom had been experienced it should have been fresh in their memory at the time of interview.

The possibility of racial resistance to the causative agent or agents of byssinosis arises, but this hypothesis is not supported by a recent report of high prevalence rates of 59% and 74.1% in two studies of carders in China.⁸ A high prevalence rate has also been found in the preliminary stages of an Indonesian study in which one of the authors (THL) is concerned.

Self selection could remove sensitive people from exposure to cotton dust at an early stage in the development of symptoms and explain a low prevalence of disease among the surviving population. Possibly subjects with chest disorders, including asthma, who begin working in a textile mill tend to select themselves out of either of the high dust areas

Table 6 *Dust levels and mean duration of the workforce exposed to dust, by mills*

Mill No	Dust level (mg/m ³)		Mean duration of exposure of workforce (years)
	Carding and blowing	Other spinning	
1	0.18-1.20	0.06-0.60	11.87
2	0.18-1.20	0.06-0.30	14.23
3	0.18-5.28	0.06-2.10	10.04
4	0.12-1.20	0.18-0.54	9.58
5	0.06-0.60	0.06-0.60	7.32
6	0.18-0.96	0.06-0.48	13.27

(the carding and blowing rooms) or even from the mill itself.⁹ The local pattern of general labour mobility facilitated by a wide range of employment opportunity in industry lends support to this explanation although, based on a large influx of skilled workers from Shanghai after the war, cotton milling has traditionally been among the more stable of workforces by local standards. Nevertheless, management confirmed that a few younger workers do seek other employment after short exposure in the mill.

Some or all of the non-specific signs and symptoms of respiratory disease found in the group may also have been related to exposure to cotton dust. Kamat *et al* suggested that symptoms such as work related cough should be included in the diagnosis as variants of byssinosis.¹⁰ This, however, is not within the accepted definition of the disease. In this survey workers with non-specific symptoms and those with obstructive ventilatory function comprised 19.9% of those examined. It would be interesting to know what proportion of these effects have resulted from long term exposure to cotton dust; comparison with a non-exposed community would be required to study this further. If mill workers are found to have an excess of non-specific respiratory disorders the problem will arise as to whether they should be included within a diagnosis of byssinosis. Compensation considerations and difficulties in distinguishing between "atypical byssinosis" and lung disease of non-occupational origin would add further complications.

Although the prevalence of byssinosis was low, the typical relation with dust levels was maintained, blowers and carders having more than twice the rate than spinners.

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