

BYSSINOSIS IN COTTON GINNERIES IN GREECE*

BY

X. G. KONDAKIS and N. POURNARAS

From the Department of Hygiene and Epidemiology, Athens University

(RECEIVED FOR PUBLICATION APRIL 10, 1965)

The prevalence of byssinosis in a sample of cotton ginnery workers in Greece was investigated. The respiratory symptoms, F.E.V._{1.0}, and V.C. of 70 male ginnery workers were recorded. No case of clinical byssinosis was found, but a statistically significant relationship exists between years of exposure to cotton dust and impairment of lung function. On the contrary no significant relationship exists between smoking and lung function, or between sputum production and lung function. The findings suggest the hypothesis that the cotton dust may exert, in the case of a prolonged exposure, a chronic deleterious action without producing the typical symptoms of clinical byssinosis.

The exact prevalence of byssinosis in Greece is still unknown although the textile industry occupies about 10% of the total labour force of the country (Survey of Industrial and Commercial Enterprises, November 1958). The disease occurs in many other countries of the world, *e.g.*, in England (Roach and Schilling, 1960), Belgium (Tuypens, 1961), and Egypt (Batawi, 1962), with various air pollution and climatic patterns, and it would be surprising if the disease did not exist in Greece. In fact a few clinical cases have already been described (Dimoiliopoulos, 1963), but no epidemiological study has so far been undertaken on any large scale.

The present study represents an attempt to add some knowledge on the prevalence of the disease among workers in cotton ginneries in Greece, which is both a cotton producing and a cotton processing country. In this respect, its textile industry is similar to that of Egypt.

Method

The study was made in the town of Levadia (pop. 12,000) situated about 130 miles north-west of Athens. The mean monthly temperatures of the region vary between 8°C. and 28°C., the coolest months being those of January and February. The relative humidity varies between 50% and 80% and mean rainfall amounts to 35.4 inches per annum.

The driest period occurs during the summer, mainly during July and August.

The region is agricultural with a few small ginneries and textile spinning plants in the town of Levadia. There are no chemical or other industrial plants and traffic circulation is rather light. It may therefore be assumed that whatever air pollution exists in the area may stem from these textile plants.

One hundred and forty-three workers, all men, are engaged in the ginnery and, with three exceptions, they are all members of the same trade union. In this study a 50% strictly random sample of the trade union members was taken. A questionnaire similar to that developed by the Medical Research Council (Fairbairn, Wood, and Fletcher, 1959) for chronic non-specific respiratory disease was used. All questioning was done by one observer (physician). A second physician was recording the vital capacity (V.C.) and forced expiratory volume in 1 second (F.E.V._{1.0}) of each subject by means of a 9-litre Collins spirometer, from which both valves and soda lime cannister had been removed. Four attempts were recorded, the final assessment being the mean of the last three. If there were large fluctuations between the attempts, a fifth one was also recorded, and again, the mean of the last three was calculated. All the subjects were examined on Sunday morning, the working days being from Monday to Saturday.

The performances were compared to the European Standards published by C.E.C.A. (1961) and were classified as normal (more than mean minus one standard deviation), subnormal (more than mean

*Thanks are due to the Royal Institute of Research (Greece) for financial assistance towards part of the cost of this survey.

minus two standard deviations but less than mean minus one standard deviation), and abnormal (less than mean minus two standard deviations). In addition the results of the F.E.V._{1.0} were also expressed in percent of the normal, according to age and standing height.

Detailed questions were asked about symptoms of cough and complaints of chest tightness and breathlessness on Monday and other days of the week, and the clinical history was used to estimate the prevalence of byssinosis.

Chronic bronchitis was defined as cough and sputum occurring in the morning or during the day for at least six months per year.

In the Greek ginnery the work may be divided into the following three principal tasks: (a) storage room, where the worker feeds with cotton the openings of the suction system transporting the material to the cleaning machines. This task may be considered as fairly dusty; (b) lint section, where the main tasks are inspection, cleaning of the machines, and removal of the lint rolls (150 kg. each). This work is very dusty; (c) cotton cleaning and pressing machines, where the tasks are inspection, cleaning, and transport of heavy bales weighing 250 kg. each. The mean production of the last section is 5 to 6 metric tons per eight-hour shift. The work is very heavy but only moderately dusty.

Finally, it must be pointed out that the ginning work is only seasonal, lasting from September to May each year.

Smoking was expressed by multiplying the number of cigarettes smoked per day by the number of years. The total index thus calculated has been used in the following classification: light smoker, 1 to 200; moderate smoker, 201 to 500; heavy smoker, 501 and more.

Results

Table 1 summarizes the composition of the sample as well as its main characteristics with the

TABLE 2
RESULTS OF LUNG FUNCTION TESTS

	Normal		Subnormal		Abnormal		Total
	No.	%	No.	%	No.	%	
V.C.	31	44.3	14	20.0	25	35.7	70
F.E.V. _{1.0}	29	42.0	22	31.9	18	26.1	69*

*One subject was unable to perform the forced expirogram.

mean F.E.V._{1.0} (volume and percent of normal). Table 2 concerns the results of the lung function tests. Of the 70 subjects, 14, *i.e.*, 20%, are severely affected (both V.C. and F.E.V._{1.0} are abnormal) but none of these subjects reveals the characteristic history of byssinosis. In fact no case of classic byssinosis fulfilling the clinical criteria has been encountered. As indicated in Table 1, the mean F.E.V._{1.0} is 2.89 l. and therefore the predicted mean F.E.V._{0.75} is 2.59 l. (McKerrow, McDermott, and Gilson, 1960) since the mean indirect maximum breathing capacity is 103.6 l.

No statistically significant association was found between job and lung function (Table 1), or between smoking and lung function (Table 3). On the contrary, a significant association was observed between years of exposure and F.E.V._{1.0} although there was no age difference between the groups (Table 3). Finally, there is no significant association between sputum production and lung function (Table 3).

Table 4 summarizes the prevalence of respiratory symptoms. It must be pointed out also that 13 subjects (*i.e.*, 18.6%) are considered, according to the above criteria, to be suffering from chronic bronchitis.

Discussion

The absence of byssinosis in our group strongly contrasts with the observations of Batawi in Egypt where about 38% of the ginning workers present typical symptoms of byssinosis. The cause of this

TABLE 1
JOB AND MAIN CHARACTERISTICS OF THE SAMPLE

Job	No.	Mean Exposure (years)	Mean Age (years)	Mean Standing Height (cm.)	Mean F.E.V. _{1.0} (ml.)	Mean F.E.V. _{1.0} ± S.D. (% normal)
Cotton feeders	17 (24.3%)	5	50.0	165.2	2,753	83.9* ± 21.19
Lint section workers	11 (15.7%)	8	48.8	164.2	2,649	83.4* ± 16.87
Pressing-machine operators	36 (51.4%)	8	47.2	166.8	3,000	89.0* ± 13.45
Others (sweepers, sampling section, etc.)	6 (8.6%)	6	52.0	164.3	3,326†	100.4†
Total	70		48.6	165.8	2,893	87.6

*Differences not significant at the 0.05 level.

†Five subjects; one was unable to perform the forced expirogram.

TABLE 3
YEARS OF EXPOSURE TO GINNERY DUST, SMOKING, SPUTUM, AND F.E.V._{1.0} (PERCENT OF NORMAL)

	No.	Mean F.E.V. _{1.0} (% normal)	Mean Squares	Mean Age (range)
Exposure (years)				
0-3	13 (18.6%)	96.4	155.17	46.7 (28-58)
4-8	30 (42.9%)	87.4	367.25	48.0 (30-64)
9 and more * 29 subjects	27 (38.5%)	84.1 F = 4.91	88.35 P ≈ 0.025	50.0 (29-65)
Smoking				
None	24 (34.3%)	91.0	297.92	
Light	24 (34.3%)	85.0	282.34	
Moderate	10 (13.3%)	89.5	118.22 (9 subjects)	
Heavy	12 (17.1%)	84.6 F = 0.728	205.62 P > 0.25	
Sputum				
None	19 (27.2%)	90.8*	154.61	
On rising in winter	15	91.2*	262.68	
On rising, winter and summer	5 (28.6%)			
All day in winter	17 (24.2%)	82.1*	384.40 (16 subjects)	
All day, winter and summer	14 (20.0%)	84.8*	191.85	

*Differences not significant at the 0.05 level.

TABLE 4
PREVALENCE OF RESPIRATORY SYMPTOMS

	No.	%
Cough		
None	13	18.5
On rising all year	17	24.3
All day, winter	16	22.9
All day, all year	24	34.3
Sputum		
None	19	27.2
On rising, winter	15	21.4
On rising, all year	5	7.1
All day, winter	17	24.2
All day, all year	14	20.0
Dyspnoea		
None	36	51.4
On uphill walking	22	31.4
On normal walking	12	17.1
Other grades	0	—
Wheezing		
None	9	12.9
Occasional	26	37.1
Frequent	35	50.0
Lung disease (last three years)	9	12.9

significant difference is not clear. The air pollution and climatic conditions may differ in Egypt and in Greece, but certainly not to such an extent as to be the main cause of the above discrepancy. Perhaps the only important difference between the two countries concerns the absence of the farfara process in Greece, where the cotton is mixed mechanically and not by hand. Since the original survey of Batawi (1962) does not distinguish between various working places and since a second survey (Batawi, Schilling, Valić and Walford, 1964) includes too small a number of ginnery workers, we can draw no conclusion concerning the influence of the farfara process on the prevalence of byssinosis.

Nevertheless, in this study the following important facts have been noted.

First, the presence of a significant association between years of exposure and lung function indicates that the deleterious action of the cotton dust may still exist, even in the absence of typical byssinotic symptoms. This finding is similar to that of Batawi, who has observed that the incidence of advanced stages of the disease increases with the length of the period of exposure. It seems to us therefore that, in the ginneries studied, the pharmacological action of the cotton dust is continuous but subclinical, and in cases of long exposure definite signs of lung impairment appear without the characteristic history of byssinosis.

The second interesting finding is that no correlation exists between chronic bronchitis and the F.E.V._{1.0} in ginneries. If in fact we consider that the F.E.V. decrease is a sign of the above chronic action of the cotton dust, then this finding confirms the observation of other investigators (Batawi, 1962; Gilson, Stott, Hopwood, Roach, McKerrow, and Schilling, 1962) who have clearly noticed the absence of any association between chronic bronchitis and byssinosis. The prevalence of respiratory symptoms is, however, very high (Table 4), approaching the figures for agricultural workers in Britain quoted by Olsen and Gilson (1960), despite the climatic differences between Greece and Great Britain.

It is thus very probable that the ginning workers examined here are exposed to small concentrations of cotton dust, as was the case with the workers examined by Gilson *et al.* (1962) in Uganda, where no byssinosis was encountered in moderately dusty ginneries. In this case the absence of typical byssinosis may be due to the moderate potency of the

ginny dust compared with that in the cardrooms (Batawi *et al.*, 1964). Nevertheless its chronic action, at a subclinical level, very probably persists. Evidently more studies, including dust measurements, are needed in order to confirm or disprove the above hypothesis.

Conclusions

No case of typical byssinosis has been observed in 70 Greek ginning workers. This finding is similar to that of Gilson *et al.* (1962) in Uganda but quite different from the findings in surveys in Egypt. A negative correlation has been observed between the F.E.V._{1.0} and years of exposure to ginnery dust.

This supports the hypothesis of a chronic, subclinical action of the cotton dust after prolonged exposure.

REFERENCES

- Batawi, M. A. El (1962). *Brit. J. industr. Med.*, **19**, 126.
 —, Schilling, R. S. F., Valié, F., and Walford, J. (1964). *Ibid.*, **21**, 13.
 Communauté Européenne de Charbon et d'Acier (1961). *Collection d'Hygiène et de Médecine du Travail, Etudes de la Physiologie et de la Pathologie du Travail*, pp. 100-102. Luxembourg.
 Dimoitiopoulos, I. (1963). M.D. Thesis, University of Athens.
 Fairbairn, A. S., Wood, C. H., and Fletcher, C. M. (1959). *Brit. J. prev. soc. Med.*, **13**, 175.
 Gilson, J. C., Stott, H., Hopwood, B. E. C., Roach, S. A., McKerrow, C. B., and Schilling, R. S. F. (1962). *Brit. J. industr. Med.*, **19**, 9.
 McKerrow, C. B., McDermott, M., and Gilson, J. C. (1960). *Lancet*, **1**, 149.
 Olsen, H. C., and Gilson, J. C. (1960). *Brit. med. J.*, **1**, 450.
 Roach, S. A., and Schilling, R. S. F. (1960). *Brit. J. industr. Med.*, **17**, 1.
 Survey of Industrial and Commercial Enterprises, 1958. National Statistical Service of Greece.
 Tuypens, E. (1961). *Brit. J. industr. Med.*, **18**, 117.