RESULTS

Environmental measurement :

Table (1) :

Shows that the bale breaking area has the highest concentration of cotton dust while the carding area has the lowest cotton dust concentration .

Table (1) :

Concentration of cotton dust in different locations of the plant in mg / m^3 .

Location	Dust concentration in mg / m^3 .
Bale breaking	1.12
Opening and scutching	0.82
Mixing	0.71
Carding	0.69
Area of managment	0.12

General characters :

Table (2) :

Clearly illustrates that most of studied workers were over the age of 40 years, also there is no statistically significant difference between both exposed and control group workers as regards age .

Table (3) :

Shows that there is no statistically significant difference between the studied exposed groups of workers compared with each other as regards age .

Table (4) :

Illustrates that there is no statistically significant difference between the exposed and control group workers as regards smoking habit .

Tables (5 , 6) :

Show that there is no statistically significant difference between the smokers of both exposed and control groups .

Table (7) :

Clearly illustrates that there is no statistically significant difference between the studied exposed group workers compared with each other as regards smoking index except mixing versus opening and scutching groups .

Table (2) :

Frequency distribution of the studied workers according to their age .

Age group	Exposed workers	Control group
20 _	5	5
30 _	25	20
40 _	53	35
50 - 60	42	21
Total	125	81
$\bar{X}$	46.076	43.864
SD	8 .416	8 .065
t value = 1.89	P > 0.05	

Table (3) :

Means and standard deviations of age of exposed workers in different departments versus each other .

Studied group	No	$\bar{X}$	± S D	t value	P
(1)Bale breaking	39	46.03	6.98	(1)versus (2) = 0.368	>0.05
(2)Opening & scutching	20	45.17	9.19	(1)versus (3) = 0.479	>0.05
				(1)versus (4) = 0.658	>0.05
(3)Mixing	10	44.8	7.3	(2)versus (3) = 0.12	>0.05
				(2)versus (4) = 0.814	>0.05
(4)Carding	56	47.1	8.85	(3)versus (4) = 0.887	>0.05

Table : (4)

Number and percent of exposed and control group workers according to **smoking habit** .

Smoking habit	Exposed group		Control group		Total	
	No	%	No	%	No	%
Smokers	58	46.4	39	48.1	97	47.09
Non smokers	67	53.6	42	51.9	109	52.91
Total	125	100	81	100	206	100

$X^2 = 0.059$ $P > 0.05$

Table (5) :

Smoking index* among the exposed workers and the control group .

Smoking index	exposed gp.	control gp.	t value	P
$\bar{X}$	7.05	7.69	0.372	>0.05
SD	± 11.55	± 12.51		

* Smoking index = $\frac{\text{No of cigarettes / day X duration of smoking}}{20}$

Table (6) :

Smoking index of exposed workers in different departments versus control group .

	Bale breaking n = 39	Opening & scutching n = 20	Mixing n = 10	carding n = 56	control n = 81
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Smoking index	7.97 11.40	6.7 6.76	10.25 7.43	8.43 12.58	7.69 12.51
t value	0.119	0.696	0.936	0.34	
P	> 0.05	> 0.05	> 0.05	> 0.05	

Table (7) :

Smoking index among exposed workers in different departments versus each other

Studied group	No	$\bar{X}$ ± SD	t value	P
(1)Bale breaking	39	7.97 11.40	(1)versus (2)=1.46	> 0.05
(2)Opening & scutching	20	4.7 5.76	(1)versus (3)=0.767	> 0.05
			(1)versus (4)=0.185	> 0.05
(3)mixing	10	10.25 7.43	(2)vesus (3)=2.07	< 0.05
			(2)versus (4)=1.76	> 0.05
(4)Carding	56	8.43 12.58	(3)versus (4)=0.629	> 0.05

Symptoms of chest disease among the examined workers :

Table (8) :

From this table , it is evident that the number of workers with chest symptoms among exposed workers are more frequent than control group workers .

Table (9) :

Illustrates that the prevalence of chest symptoms are more frequent among the workers in the area with higher dust concentration than the lower one .

Table (10) :

From this table , it is evident that the prevalence of chest symptoms among workers exposed to cotton dust < 10 years are more frequent than those exposed > 10 years .On the other hand the prevalence of chest symptoms among workers exposed to cotton dust < 30 years are less than those exposed for 20 - 30 years .

Table (8) :

Number and percent of exposed and control group workers according to the presence of chest symptoms .

Chest symptoms	Exposed group n = 125		control group n = 81	
	No	%	No	%
Chest tightness	59	47.2	2	2.47
Breathlessness	41	32.8	5	6.17
Chest tightness and breathlessness	41	32.8	1	1.24
Cough and expectoration	60	48	18	22.22

Table (9) :

Number and percent of exposed workers according to the presence of chest symptoms in different processing of cotton industry .

Chest symptoms	Bale breaking n = 39		Opening and scutching n = 20		Mixing n = 10		Carding n = 56		Total 125
	No	%	No	%	No	%	No	%	
Chest tightness	24	61.54	9	45	4	40	22	39.29	59
Breathlessness	17	43.59	7	35	3	3	15	26.79	41
Chest tightness and breathlessness	18	46.15	7	35	3	30	14	25	41
Cough and expectoration	22	56.41	10	50	5	50	23	41.07	60

Table (10) :

Prevalence of chest symptoms among workers exposed to cotton dust according to the duration of exposure .

Duration of exposure in years	Chest tightness n = 59		Breathlessness n = 41		Chest tightness & breathlessness n = 41		Cough and expectoration n = 60	
	No	%	No	%	No	%	No	%
< 10	2	3.39	2	4.88	1	2.44	11	18.33
10 -	12	20.34	8	19.51	9	19.51	18	30
20 -	26	44.07	18	43.9	17	41.46	19	31.67
30-40	19	32.2	13	31.71	14	34.15	12	20

Pulmonary ventilatory measurements :

Table (11) :

Clearly illustrates that FEV_1, FEV_1/ FVC % and FEV_1 % of predicted values are statistically significantly lower among the exposed workers than those among the controls . Both groups don't statistically significantly differ as regards FVC and FVC % of predicted values .

Table (12) :

Illustrates that FEV_1, FEV_1 / FVC % and FEV_1 % of predicted values are statistically significantly lower among the workers of bale breaking , mixing , opening & scutching and carding than those among the control group . As regards FVC and FVC % of predicted values the control group don't statistically significantly differ from all studied exposed groups .

Table (11) :

Means and standard deviations of pulmonary ventilatory measurements among the exposed and control group workers .

Pulmonary ventilatory measurements	Exposed group n = 125		Control group n = 81		t value	P
	$\bar{X}$	± SD	$\bar{X}$	± SD		
FEV_1 (litre)	2.86	0.76	3.34	0.60	5.084	< 0.05
FVC (litre)	3.90	0.96	4.03	0.67	1.11	> 0.05
FEV_1/ FVC %	76.64	7.37	83.42	5.53	7.526	< 0.05
FEV_1 % of the predicted value	81.24	14.12	88.28	12.8	3.701	< 0.05
FVC % of the predicted value	91.96	11.20	92.69	10.48	0.472	> 0.05

Table (12) :

Means and standard deviations of pulmonary ventilatory measurements among the exposed and control group workers in the different processing of cotton industry.

Pulmon. ventil. measur.	Bale breaking n = 39	opening & scutching n = 20	Mixing n = 10	carding n = 56	control group n = 81
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
FEV_1 (litre)	2.41 0.81	2.69 0.65	2.77 0.40	3.00 0.54	3.34 0.60
	**	**	**	**	
t value	7.42	4.1	4.046	3.49	
FVC (litre)	3.85 0.98	4.2 0.77	3.61 0.75	3.93 0.62	4.03 0.67
	*	*	*	*	
t value	1.03	1.84	1.18	0.91	
FEV_1/ FVC%	72.08 10.24	73.5 9.91	76.23 6.72	79.47 8.84	83.42 5.53
	**	**	**	**	
t value	6.477	4.312	3.255	2.957	
FEV_1% of predi-ted	76.82 13.7	78.5 8.9	79.12 10.5	84.21 9.1	88.28 12.8
	**	**	**	**	**
t value	4.383	3.998	2.536	2.536	2.175
FVC% of predi-ted	87.44 16.4	91.51 2.8	83.18 15.3	94.7 3.0	92.69 10.48
	*	*	*	*	
t value	1.83	1.92	0.893	1.63	

** Means statistically significant difference .

* Means statistically insignificant difference .

Impact of the work shift on the pulmonary ventilatory measurements :

Table (13) :

Shows that the post shift measurements of FEV_1 and FEV_1 /FVC % are statistically significantly lower than those of the pre shift measurements among the workers of bale breaking , mixing , opening & scutching and carding operations . There is no statistically significant difference between the pre and post shift measurements of FVC among workers of all studied groups .

Table (14) :

Shows that the post shift index of FEV_1 amd FEV_1 / FVC % for the bale breaking workers are statistically significantly higher than those for opening and scutching ,mixing and carding workers. Also , the post shift index of FEV_1 and FEV_1 / FVC % for the opening and scutching workers are statistically significantly higher than those for the carding workers .

On the other hand , opening & scutching workers compared with mixing workers reveals no statistical significant difference as regards the post shift index of FEV_1 and FEV_1 / FVC % . There is no statistical significant difference between all studied groups as regards the post shift index of FVC .

Table (13) :

means and standard deviations of pre shift and post shift measurements of FEV_1, FVC and FEV_1 / FVC % among exposed workers in different departments .

Pulmon. ventil. measur.	Bale breaking n = 39		Opening & scutching n = 20		Mixing n = 10		Carding n = 56	
	pre	post	pre	post	pre	post	pre	post
FEV_1 (litre)								
$\bar{X}$	2.41	2.05	2.69	2.12	2.77	2.11	3.00	2.78
$\pm$ SD	0.81	0.77	0.65	0.58	0.40	0.62	0.54	0.53
		**		**		**		**
t	2.021		2.963		2.835		2.219	
FVC (litre)								
$\bar{X}$	3.85	3.43	4.23	4.06	3.61	3.54	3.93	3.81
$\pm$ SD	0.98	0.92	0.77	0.71	0.75	0.75	0.62	0.62
		*		*		*		*
t	1.942		0.749		0.209		1.007	
FEV_1 / FVC%								
$\bar{X}$	72.08	67.92	73.5	67.81	76.23	69.17	79.47	74.78
$\pm$ SD	10.24	9.84	9.91	5.72	6.23	8.14	8.88	7.65
		**		**		**		**
t	2.204		2.223		2.177		2.993	

** Means statistically significant difference .

* Means statistically insignificant difference .

Table (14) :

Post shift index of FVC , FEV_1 and FEV_1 / FVC % among exposed workers in different department (dust concentration) .

post shift index of	(1)Bale breaking n = 39	(2)opening & scutching n = 20	(3)Mixing n =10	(4)Carding n = 56	t value	P
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$		
FVC	-4.99 2.20	-3.64 2.91	-3.71 3.1	-4.62 2.71	(1)versus (2) = 1.818 (1)versus (3) = 1.224 (1)versus (4) = 0.724 (2)versus (3) = 0.06 (2)versus (4) = 1.314 (3)versus (4) = 0.869	>0.05 >0.05 >0.05 >0.05 >0.05 >0.05
FEV_1	-12.10 5.12	-10.72 5.68	-8.23 4.21	-5.07 2.02	(1)versus (2) = 3.114 (1)versus (3) = 2.416 (1)versus (4) = 8.141 (1)versus (3) = 1.304 (2)versus (4) = 4.353 (3)versus (3) = 2.394	<0.05 <0.05 <0.05 >0.05 <0.05 <0.05
FEV_1/ FVC%	-8.58 3.10	-6.27 3.26	-5.15 2.61	-2.97 1.71	(1)versus (2) = 2.619 (1)versus (3) = 3.456 (1)versus (4) = 10.254 (2)versus (3) = 0.992 (2)versus (4) = 4.324 (3)versus (4) = 2.461	<0.05 <0.05 <0.05 >0.05 <0.05 <0.05

Relation of pulmonary ventilatory changes to duration of exposure to cotton dust , smoking habit and chest symptoms :

Table (15) :

Clearly illusrates that the post shift index of FEV_1 and FEV_1 / FVC % are significantly increased with the increasing duration of exposure to cotton dust except for longer duration more than 30 years .

On the other hand , there is no statistical significant difference in the post shift index of FVC as regards the duration of exposure to cotton dust .

Table (16) :

Shows that the post shift index of FVC , FEV_1 and FEV_1 / FVC % didn't significantly differ among smokers and non smokers .

Table (17) :

Clearly illustrates that the post shift index of FEV_1 and FEV_1 / FVC % among workers with chest symptoms was significantly higher than those free from chest symptoms . But the two groups didn't significantly differ as regards post shift index of FVC .

Table (15) :

Post shift index of FVC , FEV_1 and FEV_1 / FVC among exposed workers according to duration of exposure to cotton dust .

Post shift index of	(1) > 10Y. n = 17	(2) 10 - 10 Y. n = 36	(3) 20 - 29 Y. n = 26	(4) 30 Y. or more n = 26	t value	P
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$		
FVC	-4.06 2.30	-3.65 3.11	-3.84 3.67	-3.10 2.82	(1)versus (2) = 0.54 (1)versus (3) = 0.287 (1)versus (4) = 1.233 (2)versus (3) = 0.247 (2)versus (4) = 0.735 (3)versus (4) = 0.963	>0.05 >0.05 >0.05 >0.05 >0.05 >0.05
FEV_1	-6.16 3.04	-8.15 3.14	-10.16 5.25	-11.00 5.46	(1)versus (2) = 2.199 (1)versus (3) = 3.743 (1)versus (4) = 3.723 (2)versus (3) = 2.156 (2)versus (4) = 2.395 (3)versus (4) = 0.637	<0.05 <0.05 <0.05 <0.05 <0.05 >0.05
FEV_1/ FVC%	-3.97 1.51	-5.35 2.35	-7.27 4.66	-7.99 3.24	(1)versus (2) = 2.25 (1)versus (3) = 4.232 (1)versus (4) = 5.48 (2)versus (3) = 2.265 (2)versus (4) = 3.282 (3)versus (4) = 0.772	<0.05 <0.05 <0.05 <0.05 <0.05 >0.05

Table (16) :

Post shift index of ventilatory measurements among smokers and non smokers .

Smoking habit	Post shift index of FVC $\bar{X} \pm SD$	Post shift index of FEV_1 $\bar{X} \pm SD$	Post shift index of FEV_1/ FVC % $\bar{X} \pm SD$
Smokers n = 58	-4.32 3.07	-10.10 4.55	-6.31 3.24
Non smokers n = 67	-3.51 2.30	-8.71 3.62	-5.43 2.71
t value	1.652	1.726	1.636
P	> 0.05	> 0.05	> 0.05

Immunological findings and its relation to chest symptoms :

Table (18) :

Shows that the mean serum total IgE concentration is higher among exposed group workers than those of the control group . But the difference is statistically insignificant .

Table (19) :

Illustrates that there is no statistically significant difference between the control group and the workers of bale breaking , mixing , opening & scutching and carding as regards serum total IgE .

Table (20) :

Shows that the eosinophil count among the exposed group workers is higher than those of the control group . But the difference is not statistically significant .

Table (21) :

From this table , it appears that there is statistically insignificant difference between the studied exposed groups of workers and the control group as regards eosinophil count .

Table (22) :

Shows that the mean skin test results (using cotton antigen) among the exposed workers do not statistically significant differ from those among the control group .

Table (23) :

Illustrates that there is no statistically significant difference between the control group and the workers of bale

breaking , mixing , opening & scutching and carding as regards the skin test results .

Table (24) :

Shows that 9 (7.2 %) of 125 exposed workers have positive skin test to cotton antigen and 116 (92.8 %) have negative skin test , while from the control group 5 (6.17 %) have positive skin test to cotton antigen and 76 (93.83 %) have negative skin test . The differnce between these groups are statistically insignificant .

Table (25) :

Clearly illlustrates that from 72 workers complaining of chest symptoms , 4 (5.56 %) had skin test (+ve) and 68 (94.44 %) have negative skin test . While 53 workers not complaining of chest symptoms showed 5(9.43 %) with positive skin test and 48 (90.57%) with negative skin test . The difference between these groups are not statistically significant .

Table (26) :

Shows that the mean serum specific IgE (against cotton antigen) concentration in the serum of exposed workrers is not statistically significantly different from those in the serum of the control group workers .

Table (27) :

Illustrates that there is no statistically significant difference between the control group and the workers of bale breaking , mixing , opening & scutching and carding as regards

serm specific IgE concentration against caotton antigen .

Table (28) :

Shows that 9 (7.2 %) of 125 exposed workers have positive IgE specific test (using cotton antigen) and 116 (92.8 %) have negative test , while from the control group 5 (9.3 %) have positive IgE specific test (using cotton antigen) and 49 (90.7%) are negative . The difference between these groups are statistically insignificant .

Table (29) :

Clearly illustrates that from 72 workers complaining of chest symptoms ,4 (5.56 %) have positive specific IgE test and 68 (94.44 %) have negative specific IgE test . While 53 workers not complaining of chest symptoms showing that 5 (9.43 %) have positive specific IgE and 48 (90.57 %) have negative specific IgE test . The difference between these groups are not staistically significant .

Table (18) :

Means and standard deviations of total IgE concentration in the serum of exposed workers and conrol group .

Studied gp.	Total serum IgE concentration (KU/1)		
	$\bar{X}$	±	SD
Exposed gp .	55.593		24.709
n = 125	(rang 18 - 130)		
Control gp .	52.928		24.113
n = 81	(rang 12 - 120)		
t value		o.767	
P		> 0.05	

Table (19) :

Means and standard deviations of total IgE concentration in the serum of exposed and control group workers in different processings of cotton industry .

	Bale breaking n = 39	opening & scutching n = 20	mixing n = 10	carding n = 56	control n = 81
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Total IgE concen. (KU/1.)	57.74 28.05	54.9 23.12	60.6 26.18	53.57 20.28	52.93 24.11
t value	0.921	0.339	0.882	0.167	
P	> 0.05	> 0.05	> 0.05	> 0.05	

Table (20) :

Means and standard deviations of eosinophil count among exposed and control group workers .

Studied group	Eosinophil count (%)		
	$\bar{X}$	$\pm$	SD
Exposed group (N = 125)	2.208 (1 - 6)		1.51
Control group (N = 81)	2 (1 - 5)		1.396
t value		1.01	
P		> 0.05	

Table (21) :

Means and standard deviations of eosinophil count among exposed and control group workers in different departments.

	Bale breaking n = 39	Opening and scutching n = 20	Mixing n = 10	carding n = 56	control gp. n = 81
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Eopsinophil count (%)	1.08 1.42	2.05 1.36	2.6 1.51	2.25 1.67	2 1.406
t value	0.28	0.14	1.27	0.95	
P	> 0.05	> 0.05	> 0.05	> 0.05	

Table (22) :

Means and standard deviations of skin test results (using cotton antigen) among exposed and control group workers .

Studied group	Skin test result (cm^2)		
	$\bar{X}$	$\pm$	SD
Exposed group n = 125	0.503		0.322
Control group n = 81	0.507		0.296
t value	0.108		
P	> 0.05		

Table (23) :

Means and standard dviations of skin test results among exposed and control group workers in different departments.

	Bale breaking n = 39	Opening & scutching n = 10	Mixing n = 10	carding n = 56	control n = 81
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Skin test result (cm^2)	0.6 0.39	0.47 0.27	0.51 0.26	0.44 0.29	0.51 0.30
t value	1.45	0.52	0.03	1.27	
P	> 0.05	> 0.05	> 0.05	> 0.05	

Table (24) :

Number and percent of cases with positive skin test using cotton antigen among exposed workers and control group .

Results of skin test	Exposed group		Control group		Total	
	No	%	No	%	No	%
(+ve) skin test (2 cm or more)	9	7.2	5	6.17	14	6.8
(-ve) skin test (2 < 1cm)	116	92.8	76	93.83	192	93.2
Total	125	100	81	100	206	100

$X^2 = 0.076$ $P > 0.05$

Table (25) :

The relationship between the skin test results and chest symptoms among exposed workers .

	workers with chest symptoms		workers with no chest symptoms		Total	
	No	%	NO	%	NO	%
+ve skin test	4	5.56	5	9.43	9	7.2
- ve skin test	68	94.44	48	90.57	116	92.8
Total	72	100	53	100	125	100

$X^2 = 0.687$ P > 0.05

Table (26) :

Means and standard deviations of specific IgE (against cotton antigen) concentration in the serum of exposed and control group workers .

Studied group	Specific IgE concentration (PRU / 1.)		
	$\bar{X}$	±	SD
Exposed group n = 125	0.176		0.125
Control group n = 54	0.18		0.128
t value		0.193	
P		>0.05	

Table (27) :

means and standard deviations of specific IgE cocentration (against cotton antigen) in the serum of exposed and control group workers in different departments .

	Bale breaking n = 39	Opening & scutching n = 10	Mixing n = 56	carding n = 56	control n = 54
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Specific IgE concentr (PRU/1.)	0.17 0.12	0.16 0.12	0.22 0.13	0.18 0.13	0.18 0.13
t value	0.45	0.52	0.8	0.04	
P	> 0.05	> 0.05	> 0.05	> 0.05	

TAble (28) :

Number and percent of cases with positive IgE specific to cotton antigen among exposed workers and control group .

Result of specific IgE	Exposed group		control group		Total	
	No	%	No	%	No	%
(+ve) test (0.35 PRU / 1. or more)	9	7.2	5	9.3	14	7.82
(-ve) test (> 0.35 PRU/1.)	119	92.8	49	90.7	165	92.18
Total	125	100	54	100	179	100
X^2 = 0.09			P > 0.05			

Table (29) :

The relationship between specific IgE concentration and chest symptoms among exposed workers .

	Workers with Chest symptoms		Workers chest symptoms free		Total	
	No	%	No	%	No	%
+ve IgE specific test	4	5.56	5	9.43	9	7.2
-ve IgE specific test	68	94.44	48	90.57	116	92.8
Total	72	100	53	100	125	100
	X^2 = 0.687		P > 0.05			

Using multiple regression analysis including age , smoking , dust concentration , duration of exposure to cotton dust , chest symptoms , pulmonary ventilatory measurements , eosinophil count, total IgE , specific IgE and skin test , the age was the only variable significantly related to FVC decrease :

$R = 0.23$	$R^2 = 0.054$
$F = 7.09$	$P < 0.01$

This relationship could be represented by the linear equation FVC decrease = age X 0.0036 - 0.283 The slope and constant in this equation were significantly different from zero $P < 0.01$ and 0.0001 respectively .

Also , duration of exposure and smoking were significantly related with FEV_1 decrease :

	Duration of exposure	Smoking
R	0.24	0.31
R^2	0.06	0.09
F	7.76	6.68
P	< 0.01	< 0.01

This relationship could be represented by the linear equation FEV_1 decrease = duration of exposure X 0.0055 - 0.066 smoking - 0.315 . The slope and constant in this equation were significantly different from zero $P < 0.01$ and 0.0001 respectively .

Also , dyspnoea was the only variable significantly related to FEV_1 / FVC % decrease :

$R = 0.32$	$F = 13.596$

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$R^2 = 0.10$ $P < 0.0001$

This relationship could be represented by the linear equation FEV_1 / FVC % decrease = dyspnoea X 3.634 - 2.853 . The slope and constant in this equation were significantly different from zero $P < 0.001$ and < 0.0001 respectively .