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Risk of COVID19 in Textile Workers: A Case Control Study

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ABSTRACT :Background: India is among the worst hit nations due to COVID – 19. The infection mainly affects the respiratory system; textile workers being exposed to cotton dust everyday have risk of developing respiratory diseases so impact of exposure to cotton dust in risk of developing COVID-19 was studied.

Objective: To check severity of COVID 19 infection and to find its association with exposure to cotton dust among the cotton textile workers using case-control study.

Methods: We carried out an observational Case Control study based on pre validated semi structured questionnaire survey assessing a sample of sub urban population of Morane village of District Dhule, Maharashtra, India.

Results: We conducted the study among 120 participants. Out of which 98(81.67%) were male and 12(18.33%) were female. The mean age of the participants were 43.40 years (SD=13.699). 60 random cases were taken for the study and equal numbers of controls were taken. The numbers of textile workers were 36 out of which 10[(27.77%) (N=36)]) were COVID positive of which 4[(40%) (n=10)]) were hospitalized and 2 [(20%)(n=10)] were ICU admissions with requirement of ventilator whereas non- textile workers were 84 out of which 50[(59.52%) (N=84)])were COVID positive of which 14[(28%)(N=50)] were hospitalized.

Conclusion: This is the study where association between exposure to cotton dust and COVID-19 infection among textile workers was investigated. The finding of lower odds of infection among them trends toward a lower risk due to cotton dust.

Key words: COVID-19, Cotton dust, textile workers, Case control, Semi urban, Morane Village

I. INTRODUCTION

The global corona virus disease 2019 (COVID-19) pandemic continues to have profound and devastating effects world-wide [1] with India being amongst the worst hit nation. Corona virus disease 2019 (COVID-19) is a new type of corona virus pneumonia, which is caused by infection of a novel corona virus, SARS-CoV-2. The virus infects lung cells by binding angiotensin-converting enzyme 2 (ACE2) of cell surface, which leads to leukocyte infiltration, increased permeability of blood vessels and alveolar walls, and decreased surfactant in the lung, causing respiratory symptoms. [2] A few studies have examined the prevalence of respiratory symptoms and lung function among cotton textile workers in view of exposure to cotton dust. [3-6] But impact of exposure to cotton dust in risk of developing COVID 19 among textile workers is unknown.

As India is the largest producer of cotton amongst all the nations, [7] exposure to cotton dust is very common in cotton textile industries. The studies suggest that exposure to cotton dust has larger impact on lungs causing Byssinosis also pneumoconiosis, chronic bronchitis, Bronchial asthma, COPD, cystic fibrosis. [8] Similarly the COVID -19 infection also has tremendous ill effects on the respiratory system [2]. Therefore to find out the association between the two aspects, the following study was carried out.

The cotton textile mill has a daily eight hourly shift system which operates continuously for the whole week, intermittently providing a "day off" for each worker to rest.[8] In textile industry there would be a greater possibility of workers being in close contact with people from various regions when commuting to and from work or mingle around the areas. Workers at these industrial factories may come home after a shift, increasing the possibility of being in contact with

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an infected person or chances of them infect other people. [9]

Many of industrial workers were at high risk of suffering occupation related health diseases. Industrial workers thus can be considered a vulnerable population, at higher risk of suffering more severe COVID-19 conditions should they get infected, as reports found the disease likely to develop complications on people with respiratory health problems. [8] Risk factors for severe illness in COVID-19 infection are not yet completely clear, although male gender, older persons, and those with a higher number of co morbid medical conditions appear to be at high risk for developing severe illness. [10-12] However, the impact of chronic respiratory diseases (CRDs) due to exposure to external agents on the risk and mortality of patients with COVID-19 remains controversial. [13]

II. MATERIAL AND METHODS

Objectives:

i. To assess the risk, symptomatology and prognosis of COVID19 in the textile factory workers.
ii. To find association between COVID19 and exposure to cotton dust by comparison between textile workers and normal population.

Methodology:

An **observational case-control study** was done based on a pre-validated semi structured questionnaire survey, assessing a representative sample of the semi-urban adult population. The inclusion criteria were the willing and cooperative participants and exclusion criteria were those not willing to participate in the study. Informed consent was taken from all the participants. Both cases and controls were selected by simple randomization to avoid selection bias.

Sample Size Calculation:-

FORMULA :$[(Z1 + Z2)^2 \times P (1-P)]/ (P1 - P2)^2$

Where,

Z1 = Z value associated with confidence (1.95)
Z2 = Z value associated with Power (0.84)
P1 = Probability of exposure in cases (0.02)
P2 = Probability of exposure in controls (0.17)

We have done a pilot study and the values of P1 and P2 were taken from our pilot study.

P= Arithmetic average of P1 and P2 (0.095)

According to the formula our sample size is 29.99 = 30.

So, we have taken the sample size as 60 in each group and total participants were 120.

Definitions:

1. **Cases or SARS-COV-2-Infected Subjects** were defined as RT-PCR Positive(confirmed) or patients with clinical symptoms highly suggestive of COVID-19 (fever, sore throat, headache, dry cough, tiredness, ache and pains, diarrhea, loss of taste and smell, dyspnea, conjunctivitis, tinnitus) (suspected).[14]
2. **Controls or NON-COVID19 Participants** had no clinical signs and were RT-PCR Negative.[14]

This study was conducted at a village named 'Morane' situated near a textile factory in the month of October 2021 and people residing at the village (permanent residence being a criterion) were interviewed. During the period of late of year 2020 to mid of year 2021, significant number of COVID-19 positive (RT-PCR positive) were found in the village as covid-19 pandemic proceeded forward in whole country of INDIA. All the data obtained during this period was recorded in Morane Sub- Health Centre. Among all the recorded cases at Sub-Health Centre, 60 cases were selected using **random table sampling** and as per the definition stated above. Plus points going in favor of research are that due to availability of medical records, memory bias or recall bias was removed automatically and selection bias was removed by randomization and no knowledge about which subject selected as case being a factory worker and non-factory worker. Also equal numbers of controls were selected for the study as per definition stated above so that there was one control per case. Mean, standard deviation, Odd's ratio, Pearson chi-square test, Fisher's exact test were the test applied to the data collected. Google Forms app version 6.6, Microsoft Excel 2007 and Trial version of IBM SSPS Software 28.0.0.0 were the apps used in aid to the research.

Statistics:

The questions of this survey were such that responders were able to answer as many options as they found fitting to their understanding, and the analysis of the data was done with the help of Excel sheets and trial version of SPSS software. Hence, the assessment and interpretation were based on collected data and the calculated percentage.

This study was approved by Institutional Ethical Committee (IEC).

III. RESULTS

The pre-validated questionnaire survey was done. 120 people had willingly participated in

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the same out of which 98(81.67%) were male and 22(18.33%) were female. The mean age of the participants was 43.40 years (SD=13.699) (youngest participant was 20 years old and the oldest participant was 79 years old).

Figure no.1 The flowchart shows pathways and distribution of COVID-19 diagnoses.

Table no.1 is a cross tabulation form of actual no. of SARS-COV-2 among textile workers as well as Non-Textile Workers. **Odds ratio** is 0.2615 (95 % CI: 0.1118 to 0.6116) (z statistic3.094) (Significance level P =0.0020).
The chi-square statistic is 10.1587. The p-value is .001436. Significant at p < .05.The chi-square statistic with Yates correction is 8.9286.The p-value is .002807.Significant at p < .05.

Out of 36 textile workers, 16[(44.44%)(N=36)] worked in Ring frame sector and 6[(37.4%)(n=16)] tested positive for COVID-19 among those while 12[(33.33%)(N=36)] worked in weaving sector and 4[(33.33%)(n=12)] tested positive for COVID-19 also there were 6[(16.66%)(N=36)] workers working at carding sector and 2[(5.55%)(N=36)] was working at simplex but none among these both sectors tested positive for COVID-19. But allotted sectors were temporary and used to change. All participant textile workers had **at least 5 years of experience** of working at the factory it was assumed that all factory workers had same exposure to cotton dust.

Table no.2 is record of symptoms occurred among 60 cases selected who were RT-PCR Positive and assessment of severity of infection in Textile Workers and Non-Textile Workers. Thus Fever, Sore throat, Loss of taste and smell were most common symptoms seen in both Textile and Non-textile workers. While Dyspnea was more common in textile workers, Ache and pains also dry cough were common among Non-textile workers. (Percentage calculated is approx.)

All 60 controls were also asked about symptoms suggestive of COVID-19 and only 2 participants (Non-textile worker) had fever despite being RT-PCR Negative while others were asymptomatic. Tiredness, Conjunctivitis and tinnitus were absent in both groups.

Table no. 3 showing that among 60 cases, Out of which 50 were Non-Textile Workers and 10 were Textile workers, thereby comparing the need of hospitalization.(Odds ratio 1.7143)(95 % CI: 0.4195 to 7.0059)(The Fisher's exact test statistic value is 0.468)

Table no.4 shows various addictions among the Textile and Non-textile Workers. Thus approx. 83% of textile workers were non-addictive compared to Non-textile workers where 52% were non-addictive. Out of these smoking was considered as confounding factor but with only 2 textile workers (Control) being a smoker, impact on study was ruled out. Out of 60 cases, only 14 were smokers while 46 were non-smokers and among controls 10 were smokers while 50 were non-smokers(Odds ratio1.5217) (95%CI: 0.6156 to 3.7614)(z statistic 0.909) (Significance level P = 0.3632).No statistical association was seen between smoking and COVID-19 infection. None tested positive for COVID-19 among alcohol consumers while 10 out of 22 tested positive for COVID-19 among tobacco chewers. 8 Non-textile (out of which 2 came positive for COVID-19) and 4 textile worker were addicted to both smoking and tobacco chewing. No statistical association between addiction and being infected by COVID-19 was found (Chi-square test and fisher's exact test were used).

Table no.5 provides information about vaccination status of textile and non-textile workers. Shockingly out of those who were not vaccinated among textile workers as well as non-textile workers tested positive for COVID-19 and those who tested positive had at least taken one dose of Covaxin or Covishield vaccine. Among 10 [(27.77%) (N=60)]) Textile workers who tested positive, 8 [(80%) (N=10)]) were completely vaccinated with two doses while 2[(20%)(n=10)]) was partially vaccinated with one dose. Now, among 50[(83.33%) (N=30)]) Non-textile workers who tested positive 36[(72%) (N=50)]) were completely vaccinated with two doses while 14 [(28%)(N=50)]) were partially vaccinated with one dose. Vaccination was provided by Govt. of INDIA at vaccination sites for free of cost.

IV. DISCUSSION

The present study was conducted as an effort to understand the prevalence and prognosis of COVID-19 Disease among the textile workers.

In a study by Nicolas paleiron et al on impact of tobacco smoking on risk of COVID-19 showed that among the 1688 crew member 87% were men[14] also a previous study by Maxime Taquet et.al on Bidirectional associations between COVID-19 and psychiatric disorder retrospective cohort studies of 62 354 COVID-19 cases in the

USA, it was found that 45.1% were males and mean age was 49.3 year with SD- 19.7[15] whereas in our study 81.67% are males and mean age 43.4 year with SD-13.699..

In previous study done by M Woldeyohannes on respiratory problems mainly byssinosis among cotton textile workers in Ethiopia, it was found that prevalence of byssinosis 43.2% among blowers and 37.5% in carders. The research was conducted at Ethiopia about respiratory problem among cotton textile worker blowing and carding had higher incidence of byssinosis, chronic bronchitis and Bronchial asthma as concentration of airborne cotton dust was high in blowing carding process. While carrying out the study we came across the fact that amongst those who were COVID positive among cotton textile workers, 60% were of ring frame sector followed by 40% of weaving sector were more susceptible to COVID-19 infection.[8]

Previous study of patient characteristics, knowledge of the COVID-19 disease, risk behavior and mental state in patients visiting an emergency room with COVID-19 symptoms in the Netherlands showed that mean age of all the patient 50.42 and out of total 159 patients, 33 (21%) tested positive, 85 (53%) negative and 41 (26%) were COVID-19 not suspected.[16] In our study mean age of participants was 43.40(SD-13.699) and our study considered COVID-19 as outcome and went in search for factor which was exposure to cotton dust (Textile Worker)(50% COVID-19 positive.

In previous study by Joshua Elliott et.al on Predictive symptoms for COVID-19 in the community, it was found that 11.1% participants were symptomatic 88.9% Non symptomatic.[17] In our study 83.33 participants were symptomatic and 16.66% participants were asymptomatic.

In previous study by Nicolas Paleiron et.al on Impact of Tobacco Smoking on the Risk of COVID-19 , active smokers were found less susceptible to COVID 19 infection(OR 0.59) (CI 0.45–0.78)(p value <0.001)[18] , while in our study no significant association was found between smoking and COVID 19 infection(Odds ratio1.5217) (95%CI: 0.6156 to 3.7614)(z statistic 0.909) (Significance level P = 0.3632).

V. CONCLUSION

1. The results of this study support that textile industry workers are less susceptible to risk of developing COVID19.
2. However severe symptoms like dyspnea were more common in textile workers (40%)than non-textile workers , at the same time majority remained asymptomatic (60%) while only 8% non-textile workers reported no symptoms.
3. Also 27.77 % (N=36) of textile workers developed Covid-19 followed by 4 hospitalizations (40%,n=10) while 2 ICU admissions (20%,n=10) among infected were seen, Thus the risk of severe infection is greater among those infected.

VI. RECOMMENDATION

1. The finding of lower odds of infection among textile workers and the trend towards a lower risk due to cotton dust, although moderately significant, encourages further research on physiologic pathway.
2. Further studies also have to be conducted to specify mechanisms that could underlie this relationship, particularly work place habits and their lifestyles, which could affect Inter-human SARS-CoV-2 transmission.
3. Moreover, the “protective” effect of cotton dust has to be put in context with burden of its exposure worldwide.
4. Use of mask, Hand washing ,Sanitization, Vaccination and Social distancing are rationale approaches in control of COVID-19 infection

CONFLICT OF INTEREST: None
FUNDING: Self

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Figure no.1 Flowchart shows pathways and distribution of COVID-19 diagnoses.

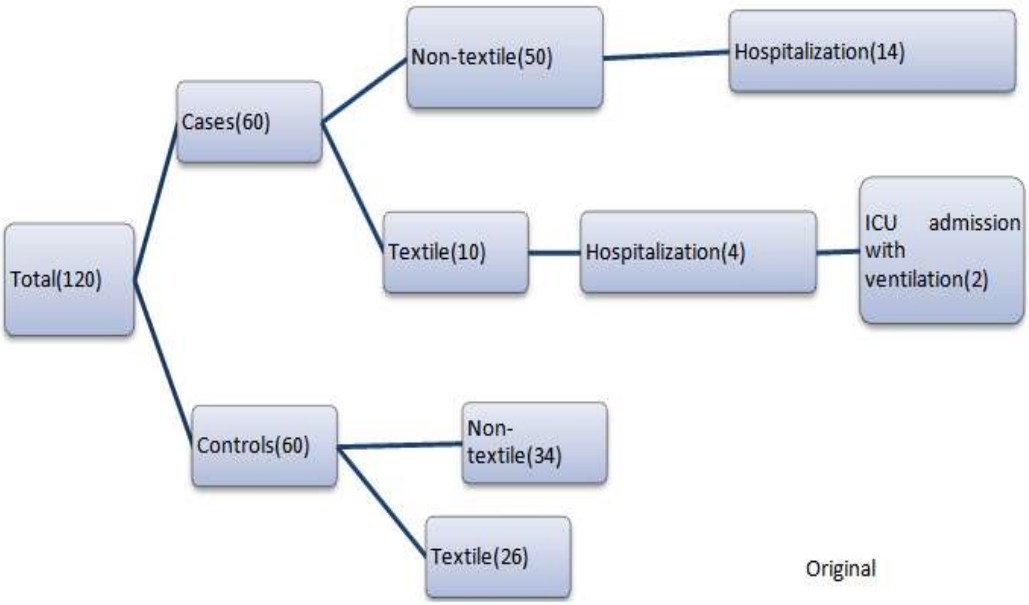

Table no.1 COVID19 Infection among textile and Non-Textile workers

		SARS-COV-2-Infected		
		No	Yes	Total
Textile worker	No	34 (28.33%)	50 (41.6%)	84
	Yes	26 (21.66%)	10 (8.3%)	36
Total		60	60	120

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Table no.2 Symptoms			
	Textile Worker		
	No(n=50)	Yes(n=10)	Total(N=30)
Fever	40(80%)	4(40%)	44(73%)
Sore throat	36(72%)	4(40%)	40(66%)
Headache	8(16%)	0	8(13%)
Dry Cough	18(36%)	0	18(30%)
Ache and pains	22(44%)	0	22(36%)
Diarrhea	16(32%)	2(20%)	18(30%)
Loss of taste and smell	36(72%)	4(40%)	40(66%)
Dyspnea	12(24%)	4(40%)	16(26%)
No symptoms	4(8%)	6(60%)	(16%)

Table no.3 Hospitalization occurred Among Cases				
		Hospitalization		
		No(n=42)	Yes(n=18)	Total(N=60)
Textile Worker	No	36 (60%)	14 (23.33%)	50 (83.33%)
	Yes	6 (10%)	4 (6.66%)	10 (16.66%)

Table no. 4 Addictions In Textile Workers			
		Textile Worker	
		No(n=84)	Yes(n=36)
Addiction	Alcohol	6(7%)	4(11%)
	Alcohol and Smoking	2(2%)	0
	Tobacco Chewing	12(14%)	10(28%)
	Smoking	22(26%)	2(6%)
	Tobacco Chewing and Smoking	4(5%)	2(6%)
	None	50(60%)	22(61%)

Table no.5 Vaccination Status Of Participants				
		Textile Worker		Total (N=120)
		No	Yes	
Vaccination	Covaxin - Partially Vaccinated	2(1.6%)	0	2(1.6%)
	Covaxin - Complete Vaccinated	0	0	0
	Covishield- Complete Vaccinated	56(46.66%)	22(18.33 %)	78(65%)
	Covishield- Partially Vaccinated	12(10%)	2(1.6%)	14(11.16%)
	Not Vaccinated	14(11.16%)	12(10%)	26(21.66%)
Total		84(70%)	36(30%)	120(100%)