SOCIODEMOGRAPHIC AND RISK FACTOR ASSOCIATED WITH *STAPHYLOCOCCUS AUREUS* ISOLATES FROM RESPIRATORY INFECTED COTTON INDUSTRIES LABOURS FROM SALEM DISTRICT, TAMIL NADU

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Abstract: *A total of 72 clinical samples were collected from patients of cotton industry. With the assistance of statistical package for social science (SPSS) for the analysis of the percentage of bacterial causes of respiratory tract infection. Among the bacterial isolates identified, Staphylococcus aureus (26; 27.95%) was found to be the predominant isolates. Since this study found that the most predominant bacterial isolates observed to be Staphylococcus aureus. Based on the bacterial culture results of the clinical samples the high prevalence of RTI observed at the age of 19-30, among male in the rural area, educational level at high school(5-10), marital status married, Monthly income Rs.5000-8000 and <2000, with the previous history of RTI, symptoms like Allergic rhinitis and eosinophilia. This study concludes that it is essential to control the respiratory infection by cotton dust exposure cessation with suitable antibiotics to get rid of scattering of respiratory infection and public health issues.*

Keywords: Respiratory tract infection, cotton labours, risk factors, health issues

I. INTRODUCTION

Respiratory tract infection is the most common infection reported of all human infections. Most of these infections are usually mild, transient and sometimes self-limited. However, respiratory infections are a common and important cause of morbidity and mortality abnormally throughout the world. Surveillance of RT infections, especially acute cases in defined populations are necessary to monitor existing pathogens while the determination, population groups at risk is an important for executing strategies (Papenburg *et al*., 2010; Savage *et al*., 2011).

Watson *et al*., 2006 have stated that the human URT is the reservoir of a diverse community of commensals and potential pathogens, including *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, and *Staphylococcus aureus*, which sometimes turn into pathogens causing infectious diseases. In the year of 2003 Wang *et al*., has revealed that Multivariate analysis showed a trend for higher increasing exposure to endotoxin in relation to a higher risk of byssinosis. *Staphylococcus aureus* is a common pathogen associated with serious community and hospital acquired diseases and has for long been considered as a major problem of Public health (Pesavento *et al*., 2007). The transfer of antimicrobial resistance *Staphylococci* from person- to- person, most notably occurs in hospitals and presents substantial infection control problems (Von *et al*., 2001). The overall mortality rate of respiratory infection was 56%, and the median survival time was 10 days. All of the deaths were attributed to *Staphylococcus aureus* infection and were secondary to refractory shock respiratory failure.

Chinese cotton textile workers (*n*=429; study group) and silk textile workers (*n*=449; control group) was followed prospectively from 1981 to 1996. Among cotton textile workers, the cumulative incidence of

byssinosis and chest tightness was 24% and 23%, respectively, and was significantly more common in smokers than in non-smokers. A high proportion of symptoms were found to be intermittent, rather than persistent. Silk workers, no typical byssinosis were identified; the frequency of chest tightness was 10%. Long term bronchitis, cough, and dyspnoea were more common and persistent in the cotton group than in the silk group. Significantly lesser odds ratios for symptoms were observed in cotton workers who left the cotton mills; risk was also related to years since last worked. Multivariate analysis indicated a trend for higher cumulative exposure to endotoxin in relation to a higher risk for byssinosis (Wang *et al*., 2003).

Work related dust exposure is a risk factor for short term and long term respiratory irritation and inflammation. Exposure to dust and cigarette smoke predisposes to exogenous bacterial and viral infections of the respiratory tract. Respiratory infection can also act as a risk factor in the improvement of atherosclerosis and coronary artery disease. Co-morbidity from cardiovascular and respiratory diseases range from 17% to 35%. In slightest 60% of the co-morbidity cases a respiratory disease preceded a cardiovascular disease. Chronic bronchitis, pneumonia, and upper respiratory tract infections predicted IHD in granite workers (rate ratio (RR) = 1.9; 95% CI 1.38 to 2.72), foundry workers (2.1; 1.48 to 2.93), and iron foundry workers (1.7; 1.16 to 2.35). Dust exposure was not a significant predictor of IHD and CVD in any group. Dust exposure was related to respiratory morbidity. Thus, some respiratory diseases appeared to act as intermediate variables in the association of dust exposure with IHD (Koskela *et al*., 2005).

2. Methods

2.1 Socio-Demography

A cross sectional study was performed at clinical wards of various hospitals in Salem, Tamil Nadu State, India. In the present study, a sum of 72 clinical samples was taken from patients of cotton industry who attended the various hospitals and clinical wards in Salem from January 2012 to December 2014. All patients had clinical evidence of respiratory tract infections, as determined by the treating physicians.

2.2 Data collection

All patients of cotton industry had clinical evidence of respiratory tract infections interviewed face to face by a trained physician and a medical caretaker utilizing a pretested survey with the clinical registry information. Socio-demographic and clinical variables of patients included were age, sex, residence, education status, marital status, monthly income, history of RTI, clinical symptoms and history of antibiotics used.

2.3 Specimen collection

The specimens were collected aseptically from 72 (nasal swabs 20, Sputum 27 and Throat swab 25 samples) patients. All patients were instructed on how to safely collect sputum samples aseptically. The sputum samples were collected into well-labeled sterile, wide mouthed glass sample container with screw cap lid. The inner surface of the infected throat sample was collected by swabbed sterile cotton gently. For a collection of throat specimens, tongue depressor was used to depress the tongue to examine the mouth for the presence of inflamed membrane, exudates or pus. Sterile cotton swabs were used to collect the nose sample and placed in swab transport container. Then specimen bottles containing sputum, throat swab and nasal swab were labeled with the unique sample number, date and time of collection, then immediately transported to the Microbiology Laboratory.

2.4 Data analysis

Socio demographic and clinical variable data of the RTI patients were first entered and cleaned using EpI data version 3 and exported to Statistical package for social science (SPSS, version 16) for further analysis. The ratio of bacterial causes of RTI was calculated by dividing the frequency of positive samples by the aggregate number of each sample examined. Chi-square Test and Bivariate (Linear Regression) analysis was performed to assess whether individual predictors of interest associated with RTI. Variables with p value less than 0.05 significantly.

2.5 Ethical consideration

The objectives of the study were well explained to the head of the hospital and each patient. Signed consent was also obtained from the all study participates. Information obtained during this study was kept

confidential, and only used for this study only. It is declared that no experiments were performed on humans or animals for this investigation.

3. Results:

3.1 Socio - demographic and clinical characteristics of the study patients

A sum of about 72 RTI patients of cotton industry attended different clinical wards and hospitals in and around Salem. Most of the participants, who are affected in the study were males (47; 65.27%) in the age group of 19-30 years and belong to a rural residence (54; 75%). 69% of the labors were married (50) and completing the high school education ((19; 26.38%).The family income is evaluated, 23 (31.94%) received between 5000-8000 per month. 72% of the labors had previous history of respiratory infection with clinical symptom of allergic rhinitis ((32; 44.4%) and 59 workers with 81.9% had reported a history of antibiotics previously used. **(Table 1)**.

3.2 Screening of RTI patients by bacterial culture positive

Among the 72 clinical samples included were nasal (20), throat swab (25) and sputum (27). The culture result of these 72 samples was revealed that 59 (81.94%) were positive. Of the 59 nasal swab samples 17 (85%) were culture positive. Of the 27 sputum samples 22 (81.4%) were culture positive and of the 25 throat samples 20 (85%) were culture positive. The study revealed that sputum samples yield more positive for RTI infection than nasal and throat swab clinical samples.

3.3 Risk factors associated with RTI

From these clinical samples, which have also been included for bacterial culture, it is clear that the RTI infection has a high prevalence among males in the 19- 30 age group compared to females living in rural areas. People here always seem to have only a high school education (5- 10), mostly everyone is married. These people have monthly income by 5000-8000 which is not less than 2000. These people have a previous history of RTI with symptoms like allergic rhinitis and eosinophilia, previous history of antibiotics used among the study participants. A statistically significant association between risk factors for respiratory infections in cotton industry laboratories, including clinical symptoms of Chi- square test (x2= 13.194; p=0.0401) and bivariate analysis (COR:1, CI: 1); allergic rhinitis (COR: 0.3939, CI: 0.0423 to 3.6685) eosinophilia (COR: 0.8182, CI: 0.0662 to 10.1178) **(Table 2)**.

Table 1: Socio-demographic and clinical variables of patients of cotton industry who attended the various Hospitals and clinical wards in Salem.

Characteristics		Total (n=72)	
		Frequency (No.)	Percentage (%)
Age	19-30	34	47.22
	31-40	23	31.94
	41-50	9	12.5
	51-70	6	8.33
Sex	Male	47	65.27
	Female	25	34.72
Residence	Rural	54	75
	Urban	18	25
Education status	Read and Write	18	25
	Primary (1-5)	14	19.44
	High school (5-10)	19	26.38
	Higher Secondary (11-12)	14	19.44

	Higher education (>12)	7	9.7
Marital status	Unmarried	14	19.44
	Widowed	6	8.33
	Married	50	69
	Divorced	2	2.77
Monthly income (Rs)	<2000	18	25
	2000-5000	16	22.22
	5000-8000	23	31.94
	8000-10000	11	15.27
	>10000	4	1.38
History of RTI	Yes	52	72.22
	No	20	27.77
Clinical symptoms	Chest pain	13	18.05
	Allergic Rhinitis	32	44.44
	Eosinophilia	20	27.77
	Asthma	8	11.11
History of antibiotics	Yes	59	81.94
	No	13	18.05

Table 2: Chi-Square and Bivariate (Linear Regression) analysis for assessment of factors associated with RTI patients of cotton industry attended the various hospitals and clinical wards in Salem.

Characteristics	**Bacterial culture**			**Chi-square Test**		**Bacterial culture**		**Bivariate analysis**	
	Nasal Swab (n=17/20)	Throat Swab (n=20/25)	Sputum (n=22/27)			Significant (No. %)	No Significant (No. %)	Crude Odds Ratio (COR)	95% Confidence Interval (CI)
	No. (%)	No. (%)	No. (%)	x^2	***p* - value (0.05)**				
Age: 19-30	9(52.94%)	12(60%)	8(36.36%)	4.003	0.6762	29	3	1	1
31-40	4(23.52%)	4(20%)	10(45.45%)			18	5	0.3724	0.0792 to 1.7502
41-50	2(11.76%)	2(10%)	2(9.09%)			6	3	0.2069	0.0333 to 1.2845
51-70	2(11.76%)	2(10%)	2(9.09%)			6	2	0.3103	0.0423 to 2.2783
Sex: Male	12(70.58%)	14(70%)	13(59.09%)	0.771	0.6891	39	8	1	1
Female	5(29.41%)	6(30%)	9(40.90%)			20	5	1.2188	0.3525 to 4.2141
Residence: Rural	12(70.58%)	16(80%)	17(77.27%)	0.469	0.7909	45	0	1	1
Urban	5(29.41 %)	4(20%)	5(22.72%)			14	13	84.7241	4.7372 to 1515.2630
Education status: Read and Write	3 (17.64%)	6(30%)	6 (27.27 %)	5	0.7576	15	3	0.8333	0.0717 to 9.6885
Primary (1-5)	1(5.88%)	4(20%)	3 (13.63%)			8	6	0.2222	0.0208 to 2.3699

High school (5-10)	7 (41.17%)	6(30%)	6(27.27 %)			19	0	9	0.3249 to 249.3140
Higher Secondary (11-12)	5 (29.41%)	2(10%)	4(18.18%)			11	3	0.6111	0.0516 to 7.2405
Higher education(>12)	1(5.88%)	2(10 %)	3(13.63%)			6	1	1	1
Marital status: Unmarried	3(17.64%)	3(15%)	5(22.72%)	0.997	0.9857	11	2	1	1
Widowed	1 (5.88%)	2(10%)	3(13.63%)			6	0	2.8261	0.1169 to 68.3062
Married	12(70.58%)	14(70%)	13(59.09%)			39	11	0.6446	0.1240 to 3.3518
Divorced	1 (5.88%)	1(5%)	1(4.54%)			3	0	1.5217	0.0582 to 39.7860
Monthly income (Rs) <2000	4(23.52%)	5(25%)	6(27.27%)	3.916	0.8646	15	3	1.6667	0.1262 to 22.0053
2000-5000	3(17.64%)	5(25 %)	5(22.72%)			13	3	1.4444	0.1086 to 19.2172
5000-8000	8(47.05%)	6(30 %)	5(22.72%)			19	4	1.5833	0.1291 to 19.4232
8000-10000	1(5.88 %)	3(15 %)	5(22.72%)			9	2	1.5	0.0975 to 23.0705
>10000	1(5.88%)	1(5%)	1(4.54 %)			3	1	1	1
History of RTI: Yes	12(70.58 %)	16(80%)	14(63.63%)	0.735	0.6924	42	10	0.7412	0.1813 to 3.0294
No	5(29.41%)	4(20 %)	8(36.36%)			17	3	1	1
Clinical symptoms: Chest pain	2(11.76%)	4(20%)	5(22.72 %)	13.194	0.0401	11	1	1	1
Allergic Rhinitis	10 (58.82%)	3(15%)	13(59.09%)			26	6	0.3939	0.0423 to 3.6685
Eosinophilia	4(23.52%)	11(55%)	3(13.63%)			18	2	0.8182	0.0662 to 10.1178
Asthma	1(5.88%)	2 (10%)	1(4.54%)			4	4	0.0909	0.0077 to 1.0771
History of antibiotics: Yes	15 (88.23 %)	16(80%)	20(90.90 %)	1.129	0.5685	51	8	3.9844	1.0400 to 15.2645
No	2(11.76%)	4(20%)	2(9.09 %)			8	5	1	1

4. Discussion

4.1 Socio demographic and frequency of respiratory tract infection

Whiteson *et al*., 2014 has revealed that always various sequences of microbial communities occupy a variety of points of the respiratory tract, with community composition controlled by the distance from sources and rates of colonization and extinction rates. Ecology and evolution hypothesis created in the circumstance of biogeography is related to clinical microbiology and could restructure the analysis of current studies comparing communities from lung explants samples, sputum samples and or pharyngeal swabs.

A total of 72 RTI patients of cotton industry attended the various hospitals and clinical wards in Salem were included in this study. The majority of the study participants were in the age range of 19-30 years (47.2%), in sex wise male (65.27%), by living status rural dwellers (75%), in educational status attended high school (26.38%), in the marital status married (69%), in monthly income Rs. 5000-8000 (31.94%), previous history of respiratory infection (72.2%), clinical symptoms of Allergic Rhinitis (44.4%) and history of antibiotics

previously used (81.9%) Of these Nasal (23.61%); Throat (27.77%); Sputum (30.55%) were found to be culture positive and this is also considered for respiratory tract infection positive from the study participants. This study revealed that sputum samples yielded more positive for RTI infection than nasal and throat swab clinical samples.

Staphylococcus aureus is the most well known type of *Staphylococcus* bacteria causing infections in human. *S. aureus* lives on the noses and throats or inhabitants on the surface of the skin. 20-30% of healthy people as *Staphylococcus* carriers. However, in even slightly injured skin or mucosa, *S. aureus* may cause blisters, abscess, folliculitis, furuncles, boils swimmer's ear, sinusitis, epiglottis, whitlow, mastitis, impetigo, cellulitis, scalded skin syndrome. Although *S. aureus* is a vital pathogen, colonize various parts of many healthy people may carry it as a part of the normal micro flora associated with the nose, throat, perineum or skin **(**Loir *et al*., 2003). The individuals who are asymptomatic nasal carriage of *S. aureus* are at risk of developing persistent nasal carriage and thus they can disperse the organisms into other human beings or the environment around them **(**Boyce, 1996**).**

4.2 Risk factors associated with RTI

Long term exposure to cotton dust is related to both work specific and non-specific respiratory symptoms. Byssinosis is more closely associated to endotoxin exposure than with dust. The Cessation of exposure may progress the respiratory health of cotton textile workers; the progress appears to increase with time since last exposure.

In this study, the high prevalence of RTI observed at the age of 19-30, among male in the rural area, educational level of high school (5-10), marital status married, Monthly income Rs.5000-8000 and <2000, with the previous history of RTI, symptoms like Allergic rhinitis and eosinophilia, previous history of antibiotics used among the study participants. However, statistically significant association found with clinical symptoms by Chi square test (x^2 =13.194; p=0.0401) and bivariate analysis [chest pain (COR:1, CI:1); allergic rhinitis (COR: 0.3939,CI:0.0423 to 3.6685) eosiophilia (COR: 0.8182, CI: 0.0662 to 10.1178) asthma (COR: 0.0909, CI: 0.0077 to 1.0771)].

Dust exposure was found to be one of the risk factors the cotton industries labours thereby they could develop other hitches besides respiratory infections. Therefore, there are more chances for the persons who are working in cotton industries to dust; cottons pieces and other contribute to the symptoms of allergy and upper respiratory tract infection. This study also concludes that more percentage of Labours in the cotton industry was suffering from upper respiratory infections. It requires an appropriate medical check-up and medication to eliminate respiratory illness.

Conclusion

This study concludes that respiratory infection associated with exposure to cotton dust may be reversible with a decreasing risk factor after exposure cessation with suitable antibiotics to get rid of scattering of respiratory infection and public health issues.

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