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Original Research Article

A STUDY ON RESPIRATORY MORBIDITY OF RAG PICKERS IN KOLKATA CITY

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ABSTRACT

This present study was initiated to explore morbidity status of rag pickers with special reference to respiratory health and to find the associated factors. Questionnaire survey was carried out for obtaining personal, occupational history and morbidity details followed by clinically examination. Pulmonary Function Test, haematological and immunological estimations were also done. Statistical analysis was done using Epi Info 3.01 software. Relevant mean values and proportions were calculated and appropriate significance test was applied. This study observed significant deterioration in pulmonary function values of rag-pickers with increasing job duration. PEFV values of rag-pickers (having job experience of more than 5 yrs) was significantly lower in comparison to control population. Obstructive pulmonary function abnormality was also significantly higher among rag-pickers. Symptom of cough and breathlessness was also more prevalent. Backache, joint pain also has been significantly higher. Increased IgE values (statistically significant) among rag-pickers and increased eosinophil in peripheral blood of higher proportion of rag-pickers signified allergic response. Findings point that the working conditions of rag-pickers might have contributed to their adverse respiratory health conditions. This study concluded that there is a need to take a comprehensive well-coordinated, structured action plan to alleviate the drudgeries of rag-pickers.

KEYWORDS: Rag Pickers, Respiratory Health, Pulmonary Function

India's booming urbanization brings the problem of waste management. Migration of more and more people towards cities is causing quick increase in waste and management of waste is becoming a critical problem. Class I cities of this country where 65.2% of the population resides, generate 23.86 million tonnes of the solid waste (National Solid Waste, 2003). As far as waste management of Indian cities is concerned, the role of Rag pickers is important, although silent. Among various informal activities seen in the urban centres, rag picking is one of the most neglected sectors. A considerable number of urban poor are involved in these activities and for them it is the major job activities for their livelihoods. They collect garbage in search of recyclable items (paper, plastic, tin etc.) that can be sold to scrap merchant. This activity requires no skill and is a source of income for a growing number of urban poor. Rag pickers are usually paid according to amount of the collection. Usually they receive a small income that is used for their daily survival. In many cases whole families are therefore occupied as rag pickers. Rag pickers can be of any age and any gender. Rag pickers are sometimes migrants who have come to the city for better life.

Two major categories of rag pickers are seen, the street rag pickers (collect garbage from street bins) and pickers working in dumping grounds. These two categories of rag pickers do not have the same living

conditions and characteristics. Street pickers, mostly boys and girls, share many characteristics with other street children: they are extremely mobile and it's therefore difficult to gain access to them. In majority of cases, the children at work get a small amount and middleman for whom they work obtains major share. The dumping ground pickers in comparison to street rag pickers often get better income and enjoy a relatively better living environment. They usually work in or around the dumping ground. Females are traditionally more involved in rag picking than males. Waste pickers are self-employed workers with no formal legal relationship with the municipality or the recyclable items' traders

Rag picking is probably one of the most dangerous and dehumanizing activities in any country. Rag pickers are working in filthy environments, under various weather conditions and may have to search through hazardous waste without gloves or shoes. They often eat the filthy food remnants they find in the garbage bins or in the dumping ground. The children use dumping ground as playing field and face the risk of needles, used condoms, soiled gloves etc, and other plastic and iron items. They suffer from a number of adverse health conditions such as respiratory problems, worm infestations, nutritional deficiency anaemia, injuries and animal bites. Studies have shown that such waste workers suffer from not only local injuries and infections

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but also systemic illnesses as well as addiction (Venkateswaran, 1994) (Sanson, 1986) (Bhide, 1990) (Ray *et al.*, 2004). Apart from respiratory and gastrointestinal ailments, they suffer from occupation related musculo-skeletal problems and vector borne ailments also as sometimes they carry heavy loads of materials over long distances and waste provides an ideal habitat for disease vectors around them. The rag pickers often live in unhealthy temporary settlements lacking sanitation and hygiene. The risks of children in the occupation are greater than the risk of adults (WHO, 1988). In Kolkata a considerable number of rag-pickers are involved in managing solid waste. The number of people involved in this work in Asian cities is increasing (Furedy, 1990). There is a need to intervene into the prevailing adverse public health conditions in order to promote healthful living of such workers. Urgent intervention is also required to protect them from occupation related morbidities. However, understanding the magnitude of the problem and its associated factors is the first necessary step in this direction. There have only been a small number of studies investigating the health risks involved in such work and their associated factors (Gunn and Soto's, 1992). In this backdrop this present study was initiated to explore morbidity status of rag pickers with special reference to respiratory health and to find the associated factors.

MATERIALS AND METHODS

This present cross sectional study encompassed the rag-pickers of Kolkata city. The sample size of this study was calculated on the principles of prevalence study. Assuming the total rag-pickers population of Kolkata city as 10,000, using prevalence 12% and allowable range (7-17%), the sample size was calculated as 196 with α error 5% and power of study 80%. The study was conducted around four principal dumping sites and subjects for this study was selected by systematic random sampling.

Detailed personal occupational history of the subjects as well as morbidity details was noted in the pre-designed, pre-tested proforma. The selected subjects were clinically examined also. Due care was also taken to note the acute symptoms during or just after work. We attempted to include 215 subjects considering 10% non-response rate. However, we could include 204 subjects for this study. We aimed to include control subjects with 2: 1 ratio of Rag-pickers: Control subjects. We selected control subjects with similar socio-economic background having different occupation. Rickshaw pullers and domestic helps mainly represented our control subjects. We could recruit 87 control subjects.

Pulmonary Function Test (PFT) was carried out on all male and female rag pickers and control subjects who were included in the study. Slow Vital capacity (VC) and Forced Vital Capacity (FVC) was recorded by Spirovit SP-10 (Schiller Health Care, Switzerland) and Peak Expiratory Flow by Wrights Peak Flow meter (Clement and Clarke, UK). Forced expiratory volume in one second (FEV₁), Forced expiratory volume in 1st sec as the percentage of FVC (FEV₁%), forced expiratory flow at 25 – 75% was calculated from the tracings. Before the recordings, all subjects were made well motivated thus ensuring recording at optimum levels as per standard procedures (Chattopadhyay and Alam, 1996). The measurements were made in a comfortable standing position. Height and body weight was measured with a standard scale without footwear. All measured lung volumes obtained was expressed in body temperature pressure saturated with water vapour (BTPS) (Chattopadhyay *et al.*, 1999). Body surface area (BSA) was calculated from the Du-Bois and Du-Bois formula (Du-Bois and Du-Bois, 1916). PFT values were predicted from the standard prediction equation of the Kolkata normal subjects (Chatterjee *et al.*, 1988). The criteria followed for categorization of restrictive and obstructive impairment was based upon the ratios, between predicted and observed values of FVC as well as FEV₁% values.

Haematological and Immunological estimations were made in order to examine eosinophil percentage and Immunoglobulin-E (IgE) values in a subset of rag-pickers and control subjects. Subjects for such examination were selected by systematic random sampling (1:3) against of the already selected subjects for epidemiological study. However, the subjects who did not give consent for such examination were spared.

RESULTS

Mean age of workers (rag-pickers) and control population was 38.25 ± 13.6 yrs and 35.26 ± 11.5 yrs respectively. About 95% of both rag-pickers and control subjects were married. Majority of workers (78.4%) and control population (85%) were illiterate. As far as personal habits are concerned, 85.06% of control subjects and 85.78% of rag-pickers were non-smokers, only 14.94% of control and 14.22% of rag-pickers were smokers. Tobacco chewing habit was present in 5.75% of control subjects and 4.9% of workers. Mean job experience was 13.05 ± 8.95 years for rag-pickers. About 34.31% of rag-pickers had job experience of 11 to 20 years and 16.19% had experience of more than 20 years (Table 1).

Table 1: Personal and Occupational characteristics of study subjects

Demographic Characteristics	Rag-pickers	Control subjects
Age group (in years)		
≤ 20	15 (7.35)	9 (10.34)
21-30	59 (28.92)	24 (27.59)
31-40	61 (29.90)	30 (34.48)
≥ 41	69 (33.83)	24 (27.59)
Mean Age (Years ± SD)	38.25 ± 13.60	35.26 ± 11.50
Gender		
Male	59 (28.92)	23 (26.44)
Female	145 (71.08)	64 (73.56)
Marital Status		
Unmarried	9 (4.41)	4 (4.60)
Married	195 (95.59)	83 (95.40)
Educational Status		
Illiterate	160 (78.43)	74 (85.06)
Primary level	16 (7.84)	4 (4.60)
Secondary level	27 (13.24)	6 (6.90)
Higher Secondary level	1 (0.49)	3 (3.44)
Smoking Habit		
Non-smoker	175 (85.78)	74 (85.06)
Smoker	29 (14.22)	13 (14.94)
Tobacco Status		
No-Chewing	194 (95.10)	82 (94.25)
Chewing	10 (4.90)	5 (5.75)
Job Duration		
Upto 5	52 (25.49)	21(24.14)
6 to 10	49 (24.01)	22(25.29)
11 to 20	70 (34.31)	28(32.18)
above 20	33 (16.19)	16(18.39)
Mean Job Duration (years ± SD)	13.05 ± 8.95	12.6 ± 7.6

* Figure within bracket shows percentage calculated on total number of control/rag-picker subjects.

Most common symptoms complained by study subjects was backache suffered more by female subjects. About 48 % of control and 59% of workers had backache (Table 2). Other complains were headache during work, joint pain, breathlessness and occasional chest pain during work. Some of the complaints were significantly higher in rag-picker population as compared to the control group.

Table 3 shows values of pulmonary function parameters in respect to rag-pickers and control subjects. Peak expiratory flow rate (PEFR) value was significantly lower in rag-pickers in comparison to control subjects. Table 4 shows the distribution of pulmonary function parameters according to age groups. Significant decline of values with increasing age was evident in both rag pickers and control subjects. On age-wise comparison of values between rag-pickers and control subjects, it was noted that PEFR values were significantly lower in rag-

pickers of age 21 years to 41 years in comparison to control subjects of similar age.

Table 5 shows distribution of pulmonary function parameters according to job experience. Significant deterioration of values with increasing job duration was found in case of rag-pickers. However, no such significant change was visible in case of control subjects. Job duration wise comparison of pulmonary function values between rag-pickers and control subjects was made, it was found that PEFR values were significantly lower in rag-pickers (having duration of job of more than 5 yrs) in comparison to control subjects having similar job duration. As far as abnormality of pulmonary function is concerned, 7.35% of rag-pickers had obstructive abnormality in comparison to 1.1% of control subjects. Obstructive abnormality was significantly higher among rag-pickers in comparison to the control subjects ($\chi^2 = 4.517$, $p=0.033$).

Table 6 shows the haematological and immunological findings. IgE values were significantly higher in rag-pickers in comparison to control subjects.

About 36% rag-pickers had more than 6% eosinophil in peripheral blood as observed in differential count in comparison to 18.75% control subjects.

Table 2: Distribution of morbidity among study subjects

Symptoms	Rag-pickers	Control subjects
Morning Cough	33* (16.18)	8 (9.2)
Cough for 3 months in a year	22 (10.78)	5 (5.75)
Breathlessness	57 (27.94)	20 (22.99)
Burning eyes	20 (9.8)	7 (8.05)
Watering eyes during work	35** (17.16)	6 (6.9)
Occasional chest pain during work	43*** (21.08)	6 (6.9)
Headache during work	129*** (63.24)	24 (27.59)
Dizziness during work	54*** (26.47)	3 (3.45)
Skin symptom	30** (14.71)	3 (3.45)
Backache	122* ((59.8)	42 (48.28)
Joint Pain	102** (50)	32 (36.78)

* Figure within bracket shows percentage calculated on total number of control/ rag-picker subjects.

Table 3: Distribution of pulmonary function parameters of rag-pickers and control subjects

		Rag-pickers	Control subjects
SVC (l)	Mean ± SD	2.93 ± 0.70	2.81 ± 0.77
FVC (l)	Mean ± SD	2.95 ± 0.73	2.82 ± 0.80
FEV₁%	Mean ± SD	83 ± 9.54	86 ± 7.08
FEF_{25-75%}	Mean ± SD	2.79 ± 1.14	3.08 ± 1.22
PEFR (l/min)	Mean ± SD	366 ± 90.80	392* ± 106.10

*P<0.05; SVC: Slow Vital Capacity, FVC: Forced Vital Capacity, FEV₁: Forced Expiratory Volume in one second, FEV₁%; Percentage of FVC, FEF-Forced Expiratory Flow at 25-75% ,PEFR-Peak Expiratory Flow Rate.

Table 4: Distribution of pulmonary function parameters of study subjects among age groups (Mean ± SD)

Age group (in years)	SVC (l)		FVC (l)		FEV ₁ %		FEF _{25-75%}		PEFR (l/min)	
	Rag - pickers	Control subjects	Rag - pickers	Control subjects	Rag - pickers	Control subjects	Rag- pickers	Control subjects	Rag- pickers	Control subjects
≤ 20	3.03 ± 0.66	2.81 ± 0.59	3.07 ± 0.62	2.81 ± 0.61	87.93 ± 4.96	87.78 ± 7.10	3.52 ± 1.13	3.14 ± 1.00	390 ± 74.07	379 ± 87.67
21-30	3.17 ± 0.72	3.02 ± 0.72	3.20 ± 0.72	3.05 ± 0.70	86.03 ± 8.22	89.74 ± 5.00	3.29 ± 1.22	3.79 ± 1.05	396 ± 91.54	429*** ± 73.70
31-40	2.93 ± 0.59	2.89 ± 0.79	2.95 ± 0.62	2.95 ± 0.81	81.90 ± 7.63	84.65 ± 6.98	2.73 ± 0.84	3.11 ± 1.29	368 ± 74.57	417*** ± 103.57
≥ 41	2.68 ± 0.71	2.46 ± 0.81	2.67 ± 0.76	2.39 ± 0.86	78.92 ± 11.53	81.24 ± 6.89	2.23 ± 1.04	2.22 ± 0.94	343 ± 94.03	332 ± 125.92
Anova	F=5.64 df=3 p=0.001	F=1.81 df=3 p=0.155	F=5.99 df=3 p=0.001	F=2.57 df=3 p=0.063	F=7.91 df=3 p=0.000	F=5.78 df=3 p= 0.002	F=12.83 df=3 p=0.000	F=6.12 df=3 p=0.001	F= 5.12 df=3 p=0.002	F=3.42 df=3 p=0.023

*P<0.05, **P<0.01, ***P<0.001 as compared between control subjects vs. rag-pickers. Anova shows comparison through age groups.

Table 5: Distribution of pulmonary function parameters of study subjects with duration of exposure (Mean ± SD)

Job Duration (in years)	SVC (l)		FVC (l)		FEV ₁ %		FEF ₂₅₋₇₅ %		PEFR (l/min)	
	Rag-pickers	Control subjects	Rag-pickers	Control subjects	Rag-pickers	Control subjects	Rag-pickers	Control subjects	Rag-pickers	Control subjects
Upto 5	2.97 ± 0.71	2.77 ± 0.69	3.00 ± 0.73	2.82 ± 0.71	84.31 ± 8.65	86 ± 6.65	2.96 ± 1.09	3.06 ± 1.19	369 ± 89.37	374 ± 91.60
6 to 10	3.03 ± 0.71	2.85 ± 0.85	3.00 ± 0.82	2.80 ± 0.87	84.39 ± 11.55	88 ± 7.99	3.24 ± 1.36	3.48 ± 1.32	401 ± 80.56	436*** ± 90.85
11 to 20	2.97 ± 0.70	2.94 ± 0.85	2.98 ± 0.69	2.93 ± 0.91	81.64 ± 8.35	84 ± 6.86	2.61 ± 0.90	3.11 ± 1.22	370 ± 84.76	409** ± 126.67
above 20	2.63 ± 0.61	2.28 ± 0.85	2.69 ± 0.63	2.13 ± 0.92	79.42 ± 9.62	78 ± 5.51	2.28 ± 1.07	2.01 ± 1.20	323 ± 88.37	360* ± 173.49
Anova	F=2.52 df=3 p=0.059	F=0.69 df=3 p=0.56	F=1.60 df=3 p=0.19	F=0.87 df=3 p=0.46	F=2.41 df=3 p=0.068	F=2.35 df=3 p=0.82	F=5.83 df=3 p=0.001	F=1.09 df=3 p=0.36	F=4.97 df=3 p=0.002	F=1.08 df=3 p=0.37

*P<0.05, **P<0.01, ***P<0.001 as compared between control subjects vs. rag-pickers. Anova shows comparison through job duration groups.

Table 6: Distribution of haematological/immunological findings

Study Subjects	IgE values (Mean ± SD)	Eosinophil percentage (Mean ± SD)
Rag-pickers	412.51 ± 274.51***	6.41 ± 2.74
Control	251.63 ± 171.25	6.56 ± 4.09
Statistics	t=5.06, P=0.000	NS
IgE values (IU/ml)		
	>150	≤ 150
Rag-pickers	42 (75%)	14 (25%)
Control	10 (62.5%)	6 (37.5%)
Statistics	$\chi^2=0.9692, p= 0.325$	
Eosinophil percentage		
	>6	≤ 6
Rag-pickers	20 (35.7%)	36 (64.3%)
Control	3 (18.75%)	13 (81.25%)
Statistics	$\chi^2=1.647 p= 0.199$	

* Figure within bracket shows percentage calculated on total number of control/rag-picker subjects.

DISCUSSION

Rag pickers live and work in filthy environment and also face health hazards during work. During this study, it was found that no one uses even minimum protective device or precautionary measures. They have very little idea of self-protection during work. Even if they have knowledge about potential risk, they are unable to buy suitable precautionary measures. The problems faced by rag pickers are multiple. Many times they commit illegal or unpermitted entry to places in course of their job and consequently face harassment.

This study observed that significant deterioration had occurred in pulmonary function values of rag-pickers

with increasing job duration. Such deterioration of values was not observed in control population. PEFR values of rag-pickers (21 to 40 yrs of age) were significantly lower in comparison to control population of similar age. PEFR values of rag-pickers (having job experience of more than 5 yrs) also was significantly lower in comparison to control population having similar job experience. Obstructive pulmonary function abnormality was also significantly higher among rag-pickers in comparison to control subjects. Symptom of cough and breathlessness was also more prevalent among rag-pickers. Such findings point to the fact that the working conditions of rag-pickers might have contributed to their adverse respiratory health conditions. Apart from respiratory

health morbidity, backache, joint pain and other work related morbidities (headache/dizziness) have been significantly higher. Increased IgE values (statistically significant) among rag-pickers in comparison to control subjects as well as increased eosinophil in peripheral blood of higher proportion of rag-pickers signify that prevailing work conditions of rag-pickers might have inflicted allergic response among them.

The findings of this present study are in many ways similar to some earlier studies which have also highlighted the adversities of rag-pickers. Unhealthy working conditions, tedious work that affect health have been reported (Godara and Rani, 2018). Suffering of rag-pickers from a multitude of health problems related to their occupation is also highlighted (Ray *et al.*, 2004). The social stigma and associated ill treatment apart from health hazards has also been explored (Naaz, 2019). Need of extensive awareness generation as well as social support activities have been stressed (Agarwalla *et al.*, 2017).

This present study has explored adverse respiratory health conditions and other morbidities of rag-pickers that may be attributed to the exposures that take place during their job activities. This study concluded that there is a need to take a comprehensive well-coordinated, structured action plan to alleviate the drudgeries of rag-pickers.

The rag-pickers are exposed to e-waste, medical waste and harmful gases and other substances. They go barefoot and work without gloves or other protective clothing. Unfortunately, sufficient concerted attempts have not been made to create awareness on this issue. The reason that leads these rag pickers work at unhealthy environment even at early age is the fact that their earnings are needed to support themselves and their family. Rag pickers come across difficult situations of discrimination and suffer lack of proper accommodation, lack of sleep, lack of nutrition and a feeling of shame, embarrassment and guilt as they are exposed to the harsh realities of life. There is a need to take initiative at all levels. Adoption of improved methods of waste disposal by municipal authorities can restrict unhealthy exposures to which such workers are frequently exposed. Widespread awareness generation activity, inculcating safe work practices, providing alternate scope of work wherever necessary and different poverty alleviation programmes together can be able to provide better life to these scavengers of modern society.

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