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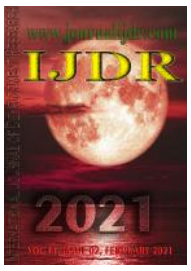

RESEARCH ARTICLE **OPEN ACCESS**

PULMONARY FUNCTION OF ADULT SABAR TRIBAL OF JHARGRAM DISTRICT,WEST BENGAL, INDIA

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ABSTRACT

Background: Assessment of Pulmonary Function has been used as a clinical tool in diagnosis, management, and follow-up of different respiratory disorders. Ethnic-specific standard norms in the form of regression Equations are necessary for a good interpretation of these parameters. But equations for a tribal population mainly Sabar tribal population is not available till now. **Method:** 55 males and 48 females sabar tribal adults were taken randomly from Sabar villages of Jhargram District of West Bengal. The standard procedure was followed for the measurement of the physical and Pulmonary function parameters. Prevalence ofrespiratory abnormalities, smoking habits, socio-demographic pattern, the occupation was recorded by a standard questionnaire. **Results:** All the Physical and Pulmonary function parameters of female sabartribes are significantly ($p<0.01$) lower than male sabar tribes .3.7% male and 3.5% femalesabar showed CED II level nutritional status and 7.5% male and 14% female sabar focused CED I level nutritional deficiency. Percentage prevalence of respiratory abnormalities reported that 8% female and 16% male (mostly smoker)have restrictive lung disease.6% of male and 4% of female sabar tribes have obstructive lung diseases. Comparison of FVC and FEV_1 values of a male and female tribal adult with people of different regions of India revealed that sabar tribal adults are significantly lower than people of other parts of India except for values of female adults of North Eastern region. A similar result has been found in PEFR when values for the tribal population are compared with national and international.But a comparison of the FEV_1 value of sabar tribal adult when made with international standard, a similar result has been found except Filipino and Malaysian male adult where lower values were found. **Conclusion:** From this study, it can be concluded that people from different ethnic backgrounds and different parts of a country with different socio-economic conditions need separate prediction equations for lung function parameters. Thus prediction equations for adult male and female sabar tribal population will be helpful in the diagnosis of respiratory disorder and monitoring the condition of the lung.

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INTRODUCTION

Tribes are a social group associated with a specific geographic territory and having their own socio-cultural and economic, biological, and political milieu independent of or having little contact with, the dominant national society of the country (Kapoor *et al*, 2009). The Sabars are one of the scheduled tribes in India live mainly in Jharkhand, Chattisgarh, Madhya Pradesh,Odisha, and West Bengal. According to the 2001 census, the total Sabar population in West Bengal was 43,599.Sabars are the 10thlargest group in West Bengal comprising 1% of the total ST population (Ghosh *et al*., 2019). The basic problem of the tribal population is poverty associated with illiteracy, low employment status, poor sanitation, low housing facilities, etc. which are reflected as the poor health status of this population.

At present most of the male members work as 100 days laborers and females keep themselves busy in cutting firewood and grasses, carry these items for miles, and selling these in the nearest markets as well as use for cooking. The present study was carried out among the sabar tribal population of the Lalgarh district of Jhargram. The name of the village was Punnapani and its surrounding locality.The area was surrounded by forest.This Sabar tribe is socially and economically the most underprivileged tribal community of Midnapore District, Jhargram. Pulmonary function is known to vary with age, sex, race, ethnicity, and geographical location of the subject (Sickle *et al*, 2011). Besides, Pulmonary function varies between region and race.Studies involving different tribes of India revealed the existence of ethnic differences among the tribal of the country in terms of their nutritional and other health parameters (Agarwal *et al*, 2007). No such study particularly on respiratory status in the

adolescent sabar tribal population of West Bengal has been made. Therefore the purpose of the present study is to evaluate the respiratory status of adult male and female sabar tribal of Jhargram district of West Bengal.

METHODOLOGY

This cross-sectional study was conducted in a tribal village of PunnaPani, block Binpur, near Lalgarhof PurbaMidnapore District, West Bengal. The camp was organized by an NGO and invited us to participate. The students of Serampore College and teachers of Raja Peary Mohan College along with some NGO members arranged this health camp. Permission from Panchayat and district headquarters were taken. Adult males and females between the age of 18 to 60 years of Sabar tribes were taken for this study.

Inclusion criteria

1. Adult males and females above 60 years were not included.
2. Disabled adults were also not included in this study.

Sampling and data collection: The subjects (55 male and 48 female) were randomly selected from the village population and the desired adults were taken by simple random sampling method. The research study was done through questionnaires, interviews, and experimental work.

Study questionnaire

- Age
- Education level
- Number of children
- Total family members
- Occupation, if any
  - Type of work
  - Total time spent to do this work
  - Income
- Health problems
  - Gynecological problems
  - Respiratory problems(asthma, emphysema, chronic Bronchitis)
  - Orthopedic problems
  - Gastrointestinal problems
  - Neurological problems
- Psychological problems, if any

Questionnaire related to infrastructural facilities in the village community:

1. Drinking water
2. Road and communication with nearest district town
3. Hospital/Health center
4. Job opportunity

Ethical consideration: The ethical approval was obtained from the Human Ethical Committee of Serampore College and Raja Peary Mohan College. Besides, consent from Panchayat was taken before the conduction of the study.

Physical Parameters

Stature: The stature of the participants was measured by an anthropometric rod. Stature is the perpendicular distance between the transverse planes of the vertex and the inferior aspect of the feet. Stature is measured in centimeters (cm).

Body Mass: The body mass of the participants was measured to the nearest 0.5kg by a standard weighing pan with bare feet. Body mass is measured in kilograms (kg).

***Body Mass Index (BMI)*:** BMI is a measure of body composition. BMI is calculated by taking a person's body mass and dividing by their square of height and is universally expressed in units of kg/m^2.

R**espiratory parameters:** The pulmonary function tests (PFT) were performed in their workplace by using an automatic spirometer (Spirovit SP 1 model) according to the guideline-recommended by the American thoracic society. The testing procedures are quite simple and non-invasive and harmless to the participants. The spirometer was calibrated each day before use and a new filter was introduced. The relevant data age, sex, body weight was recorded. The subject was connected to the mouthpiece and was asked to breathe in & out to familiarize himself with the equipment. During the tests the subjects were adequately encouraged to perform their optimum level and also a nose clip was applied. The test was repeated 3 times &the best results were considered for analysis.

Pulmonary function parameters studied

1 Forced vital capacity (FVC)
2 Forced expiratory volume in 1 sec (FEV1)
3 Slow vital capacity (SVC)
4 Expiratory reserve volume (ERV)
5 Inspiratory reserve volume (IRV)
6 Tidal volume (TV)
7 FEV_1/SVC
8 $FEF(Forced\ Expiratory\ Flow)_{25\%-75\%-}$
9 Maximum voluntary ventilation (MVV) –
10 $FEF_{0.2-1.2\%}$
11 $FEF_{75\%-85\%}$
12. PeakExpiratoryFlowRate (PEFR)

It is measured by wright's peak flow meter. The subject was instructed to take a deep breath and place the mouthpiece in his/her mouth, between the teeth and with the lips placed tightly around it, and then to blow into the instrument a short, sharp blow. Reading was recorded. It is expressed by lit/min. All the tests were performed between 2 PM to 4 PM to exclude the bias of circadian rhythm. All the gas volumes were corrected to BTPS (Body temperature, ambient pressure, and saturated with water vapor) automatically by the instrument.

Statistical analysis: Mean, Standard deviation, correlation, Regression has been made.

RESULTS

Table 1 represents the mean and Standard deviation values of different physical and Pulmonary function parameters of Sabar adult males and femalesof Jhargram district,West Bengal.All the Physical and Pulmonary function parameters of female sabar tribes are significantly($P<0.001$) lower than male sabar tribes of the Jhargram district.

Table 1. Mean ±SD values of Physical and Pulmonary function parameters of adult Sabar of Jhargram District, West Bengal

Parameters	Females N=48	Males N=55	Significance level
Age (years)	34.06 ± 12.96	33.12 ± 12.86	Not significant
Height(cm)	148.77 ± 5.22	160.03 ± 7.29	Significant, p<0.001
Weight(kg)	42.79 ± 5.22	57 ± 14.97	Significant, p<0.001
Bmi	19.47 ± 2.28	21.63 ± 2.44	Significant, p<0.001
Fvc	2.35 ± 0.48	2.99 ± 0.65	Significant, p<0.001
Fev1	2.09 ± 0.40	2.68 ± 0.59	Significant, p<0.001
Fev1%	89.86 ± 9.49	90.27 ± 12.36	Significant, p<0.001
Fef 0.2-1.2	3.81 ± 1.04	5.15 ± 1.59	Significant, p<0.001
Fef (25-75)%	2.81 ± 0.88	3.50 ± 1.31	Significant, p<0.001
Fef (75-85)%	1.21 ± 0.48	5.21 ± 25.94	Significant, p<0.001
Pefr (l/min)	255.41± 50.90	318.72 ± 73.12	Significant, p<0.001

Table 2A and B represent the correlation between different physical parameters (age, body height, body weight, and BMI) with Pulmonary function parameters in male and female tribal adults.

of the percentage prevalence of respiratory abnormalities among male and female sabar tribal adults. In the present study 8%female and 16% of males have restrictive lung disease and 6% of males and 4% of females have obstructive lung diseases78% of males and 88% of

Table 2A. Correlation between Physique and Pulmonary Function parameters of adult Sabar male

N = 55	FVC	FEV1	FEV1%	FEF 0.2-1.2	FEF (25-75)%	FEF (75-85)%	PEFR
AGE	0.01	-0.28*	-0.4**	-0.17	-0.41**	-0.07	-0.22
HEIGHT	0.13	0.16	0.04	-0.08	0.06	-0.12	0.23
WEIGHT	0.08	0.09	0.001	0.25	0.08	0.06	0.18
BMI	0.05	0.11	0.07	0.13	0.17	-0.08	0.09

* P<0.05,**P<0.01

Table 2B. Correlation between Physique and Pulmonary Function parameters of adult Sabar Female

N = 48	FVC	FEV1	FEV1%	FEF 0.2-1.2	FEF (25-75)%	FEF (75-85)%	PEFR
AGE	-0.03	-0.32*	-0.4**	-0.35**	-0.36**	-0.39**	-0.37**
HEIGHT	0.2	0.25	0.016	0.17	0.14	0.16	0.17
WEIGHT	-0.005	0.08	0.12	0.15	0.14	-0.007	0.11
BMI	-0.14	-0.07	0.13	0.05	0.07	-0.08	-0.003

*P<0.05,**P<0.01

Table 3. Percentage Distribution of subjects (Sabar tribal) according to their nutritional status base on BMI

Nutritional Status	BMI Reference Value	Frequency			Percentage		
		Children (N=59)	Adult Male (N=53)	Adult Female (N=57)	Children	Adult Male	Adult Female
CED Grade III	>16.0	29	0	2	49.1%	0%	3.5%
CED Grade II	16 - 16.9	13	2	6	22%	3.7%	10.5%
CED Grade I	17 - 18.4	7	4	8	11.8%	7.5%	14%
Normal	18.5 - 24.9	10	43	39	16.9%	81.1%	68.4%
Overweight	≥ 25	0	4	2	0%	7.5%	3.5%

Table 4. Simple Regression Equations for Prediction of Pulmonary Function parameters on the basis of age in the studied population

Lung Parameters	Male Adult Sabar			Female Adult Sabar		
	R	R^2	Standard Error of Estimate (SEE)	R	R^2	Standard Error of Estimate (SEE)
FVC	0.105	0.083	0.381	0.271	0.046	0.332
FEV1	0.286	0.203	0.370	0.578	0.321	0.259
FEV1%	0.289	0.121	7.675	0.696	0.565	3.647
FEF 25-75%	0.507	0.348	0.851	0.511	0.463	0.573
FEF 75-85%	0.451	0.310	0.429	0.464	0.357	0.410
FEF 0.2-1.2	0.391	0.136	1.32	0.548	0.238	0.821
PEFR	0.542	0.457	40.26	0.387	0.185	45.18

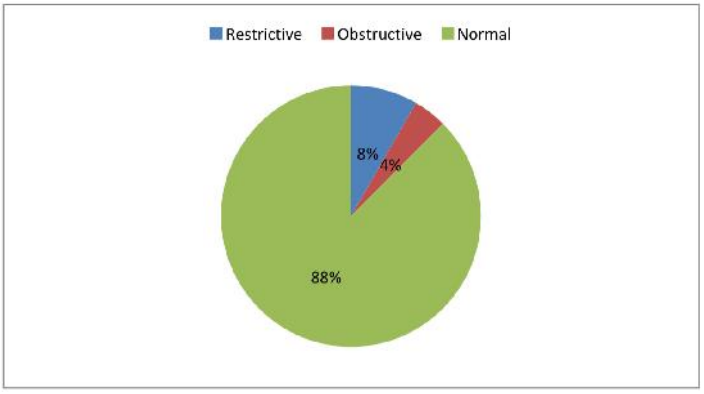

Fig 1(A). Percentage prevalence of respiratory abnormalities among female sabar of present study

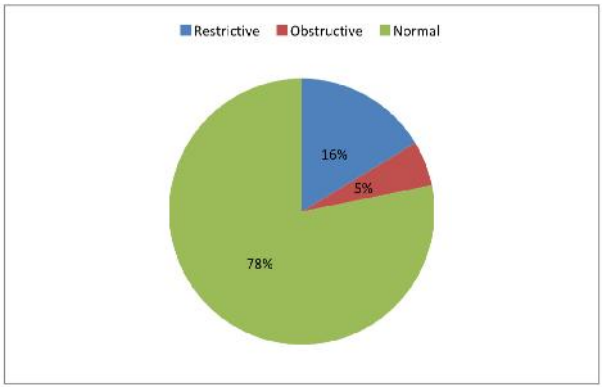

Fig 1(B). Percentage prevalence of respiratory abnormalities among male sabar of present study

Age is significantly (P<0.05- 0.01) correlated with Pulmonary function parameters in both males and females. Table 3 represents the distribution of subjects according to BMI status. Among young adult male Sabar,3.7% showed CED II and 7.5% CED I,whereas 81% were of normal weight. Likewise, 10.5% of female adult sabar showed CEDII and 14% CED I.Besides, 3.5% of females were CEDIII. And 68.4% were of normal weight.Conversely, 7.5% of adult males and 3.5% of adult female sabar were overweight. Table 4 represents simple regression equations for the prediction of different lung function parameters based on age for both male and female adult sabar population with SEE. Fig 1A and B represent the pie diagram

females showed normal respiratory functions. Fig 2-6 showsthe relationship between Pulmonary function parameters based on age. Fig 7 and 8 represent the comparison of FVC and FEV_1values of adult male and female population of different regions of India and sabar tribal population of India. It has been observed that the FVC and FEV_1value of male and female sabar tribe is lower than standard values of FVC and $FEV_1$of other regions of India except for FVC and FEV_1value of female of North Eastern region. Fig 9 represents a comparison of PEFR values of male and femaleadult national and International standard with the tribal population of the Jhargram area of West Bengal,it has been observed that PEFR values of the male

and female sabar tribal population are lower than other national and international population. Fig 10 represents a comparison of the FEV_1valuesof the male and female sabar population with other countries of the world.

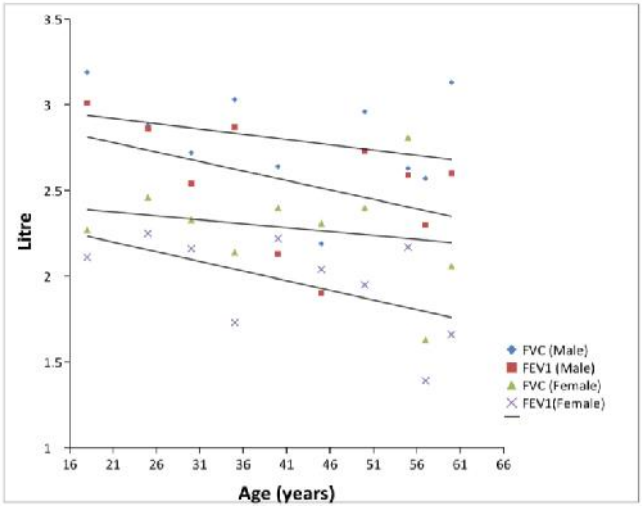

Fig. 2. Scatter plot of Lung Function traits and Age (Years) of Sabar Tribal of Jhargram District

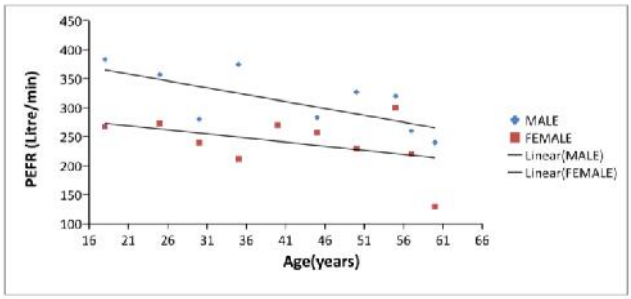

Fig. 3. Scatter plot of Lung Function traits and Age (Years) of Sabar Tribal of Jhargram District

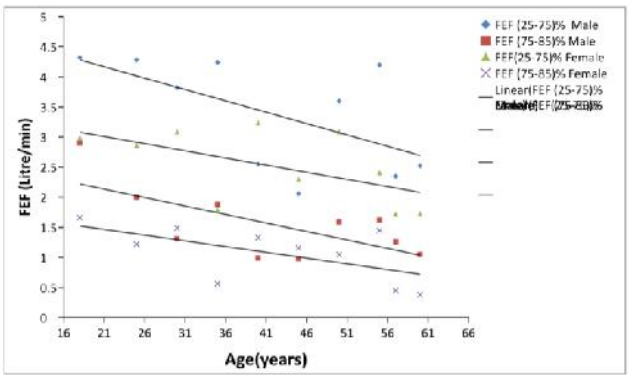

Fig. 4. Scatter plot of Lung Function traits and Age (Years) of Sabar Tribal of Jhargram District

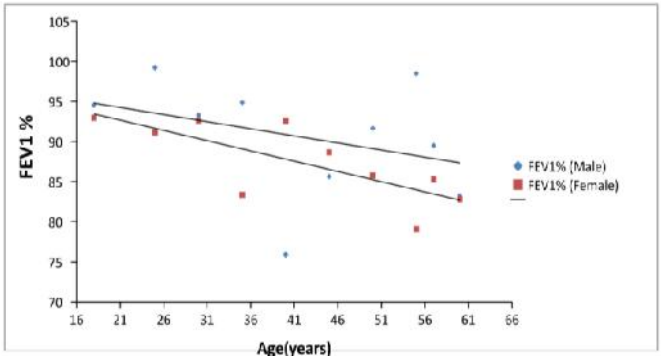

Fig. 5. Scatter plot of Lung Function traits and Age (Years) of Sabar Tribal of Jhargram District

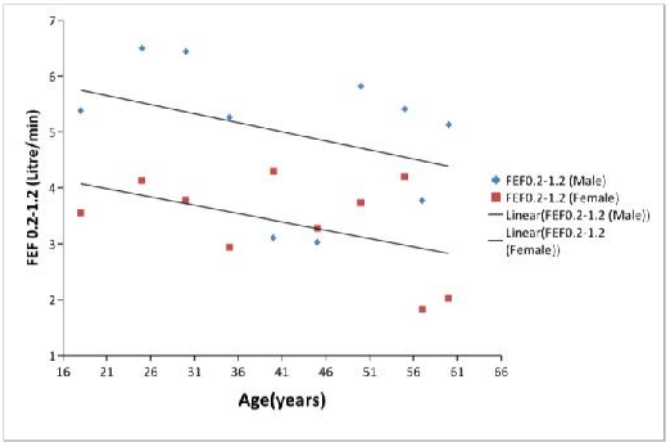

Fig. 6. Scatter plot of Lung Function traits and Age (Years) of Sabar Tribal of Jhargram District

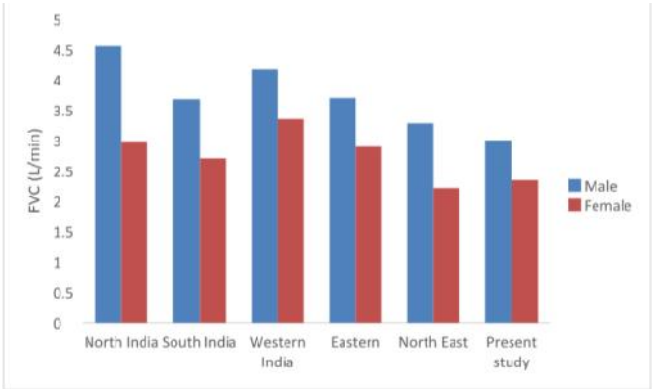

Fig. 7: Comparison of FVC values of adult male and females of different regions of India and Sabar Tribal of Present study.

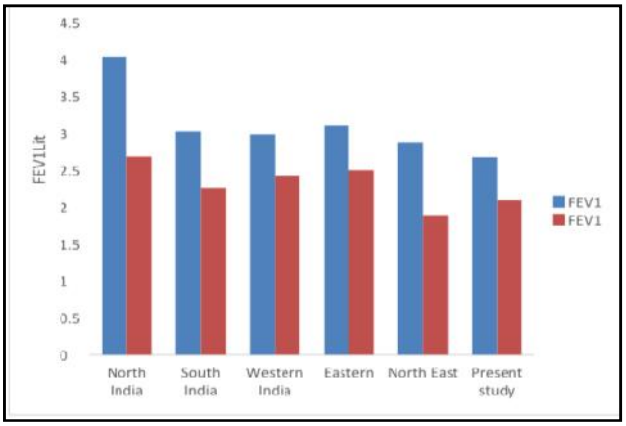

Fig. 8. Comparison of FEV1 values of adult male and females of different regions of India and Sabar Tribal of Present study

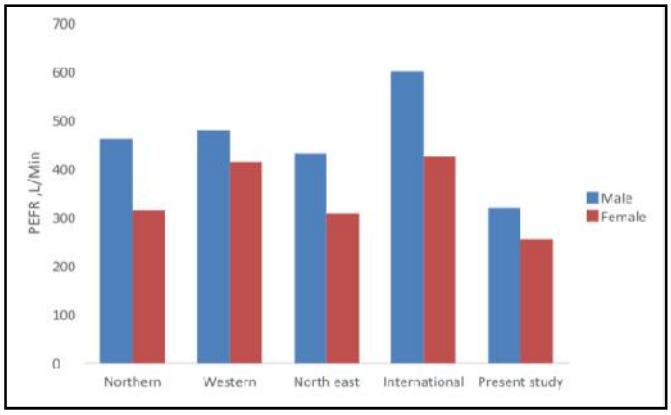

Fig. 9. Comparison of PEFR values among National and International standard with Sabar tribal Population

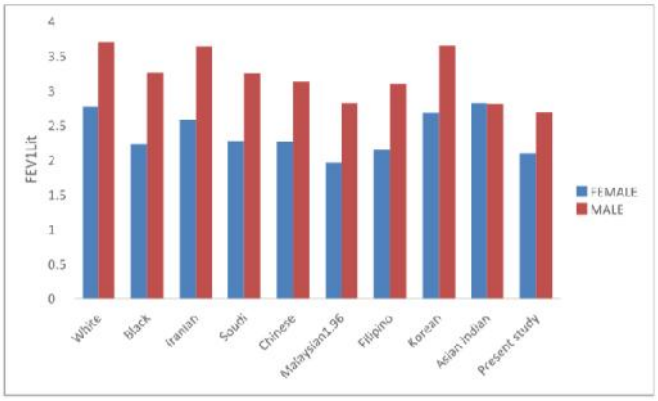

Fig. 10. Comparison of FEV1 values of male and female adult population of different countries and Sabar tribes of present study

It reveals that the FEV_1value of adult males is significantly lower than other populations throughout the world.Similar result has been found in the case of the adult female sabar population except for Filipino and Malaysian female adults where lower FEV_1valueswere found in comparison to the female sabar population.

DISCUSSION

The linear prediction equations of different Pulmonary function parameters of the Sabar tribal population are developed for both adult males and females of the eastern region (Jhargramdistrict) of India.All the Spirometric parameters are significantly higher in males comparedto female Sabar tribes.It has been observed that age has a significant negative relationship but height, weight, and BMI show insignificant positive relation with Pulmonary function parameters.Similar result has been reported by Chhabra *et al* (2014, Dasgupta et al (2015), Biswas *et al* (2018). Comparison of Spirometric values of the tribal population with other nontribal populations of different parts of India reveal that tribal adult males and females of Jhargram district of eastern India are lower in FVC, FEV1, and PEFR value than Northern,Western,Southern as well as Northeastern region of India. This difference might be due to racial or ethnic variation between populations (Nayak *et al*, 2015). Besides, Chhabra *et al* (2009) also observed that vital capacity and other Spirometric parameters were higher in adult males in North and East than South and West in India because of regional variation probably due to ethnicity and altitude.

Sex differences in male and female adult tribal Sabar population could be due to differences in body height, hormone profile,stronger respiratory muscles,greater activity, and bigger lung size and airway. Airways of women have 17% smaller diameters than airways of mature men(Vijayan *et al*,1990).They also pointed out that boys tend to have larger lungs per unit of stature than girls though no. of alveoli per unit volume and area was identical, the total number of alveoli was more in boys than in girls resulting in higher lung function(Vijayan *et al*,1990) . Card and Zeldin (2009) and Agadir *et al* (2012)in their study expressed that among various anatomical and Physiological contributing factors along with sex hormone,sex hormone receptor or intracellular signaling pathway might be responsible for the difference in Pulmonary function parameters among the male and female population. In the present study, the BMI of adult sabar males and females is mostly (81% male and 68.4% female) within the normal range (18.5- 24.9 Kg/m^2).Only3.5% of adult female had CED grade III(BMI<16.0 Kg/m^2)Adult female shows insignificant negative relation with Pulmonary function parameters but in case of male correlation values are insignificantly positive in most cases. But Fulambarker *et al* (2004) stated that BMI and weight gain are associated with more rapid loss of lung function.Similar result has been established by Ochs-Balcom *et al* (2002). Again Choudhuri and Choudhuri (2014) found a positive relationship between lung function parameters and BMI in tribal adolescents of both sexes of the Northeastern region of India. The SEE values and R^2 of prediction equations are significantly lower except $FEV_{1\%}$indicatesthe reliability of the equations developed for this population.Similar result has been reported by Nayak *et al* (2015) and Biswas *et al* (2018). Absence of prediction equations based on the current standardization of procedures and equipment produces errors in the interpretation of the data (Chhabra,2009) leading to errors in diagnosis. PEFR values of the male and female tribal population with National and International standard,it is reflected that male Sabar tribes are close to norms for Northern and Northeastern of India, but female sabar tribes showed significantly lower values when compared with national,International standard and maleshave significantly higher PEFR value than the female of the present study.This might be due to their socio-economic condition, environmental factors including lifestyle,exposure to fumes,tobacco as well as anthropometric variation of different population (Malakar and Roy, 2016). Comparison of FEV1 values tribal adults of the present study with other ethnic groups, show reduced values of the above parameters.In the present study, subjects were taken from low socio-economic and underprivilegedbackward in comparison to a nontribal well privileged healthy population of different ethnic backgrounds. Besides different types of instrumentsused have slightly contributed to variations (Sooriyakanthan *et al*, 2019). Again male tribal adults are mostly smokers or they use tobacco in other forms,this might be the reason for their lower PEFR and FEV_1 values.Tribal females mostly suffer from chronic energy deficiency due to lack of nutrition,heavy workload, and some cases use of tobacco in the form of Gutkha. These factors might be the reason for their restrictive (8% for female and 16% for male) and obstructive (4% for female and 6% for male) lung diseases. Thus the result of the present study indicates that people from different ethnic backgrounds and different parts of the country with different socio-economic, environmental conditions, and anthropometric variation, highlight the establishment of the importance of separate prediction equations for lung function parameters. In this context prediction equations for the adult male and female sabar tribal population of Jhargram district will be useful in the diagnosis of respiratory diseases and monitoring the condition of the lung.Thus these local reference norms with a large sample size will be more biologically appropriate for the interpretation of spirometry.

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