



## ASSESSMENT OF PULMONARY FUNCTION IN POULTRY CONFINEMENT WORKERS IN KHORDHA DISTRICT

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### ABSTRACT

**Background:** Individuals engaged in poultry production are exposed to varying concentrations of airborne contaminants including organic dust, gases, endotoxins, fungi, bacteria, and bacterial constituents. Long-term exposure to this environment may put the poultry workers at risk for developing respiratory dysfunction. A periodic measurement of pulmonary functions can be a guiding factor to detect pulmonary abnormalities in early stages.

**Aim And Objects:** This present study was designed to evaluate the recording and comparing the pulmonary function parameters in poultry farm workers and healthy controls.

**Results:** We found that all pneumonic capacity boundaries in particular FVC, FEV0.5, FEV1, and FEV3 were measurably fundamentally lower ( $P < 0.01$ ) in poultry ranch laborers when analyzed to controls though FEV1/FVC was ordinary showing the restrictive sort of ventilatory changes in poultry laborers.

**Conclusion:** The findings suggest that, the poultry ranch laborers are in danger for lung work debilitation. Mindfulness ought to be spread to poultry laborers about the wellbeing chances due to introduction to poultry dust in poultry laborers.

**KEYWORDS :** Poultry Production; Spirometry; Pulmonary Function Parameters & Respiratory Dysfunction

### INTRODUCTION:

Today, poultry industry is developing at a quick rate in India with current complete poultry populace being 729.21 million. Poultry meat and egg creation is 3.26 tons and 82.93 billion, respectively.[1] The laborers in poultry ranch occupationally meet with huge degrees of poultry dust which is made out of rural residue particles [11.53 mg/m<sup>3</sup>], harmful gases, endotoxins,[2] parasitic spores, microorganisms and bacterial constituents, fecal material, plumes, dander, parasites, unadulterated wood residue, and dry feeds.[3] The essential work of poultry ranch laborers is to set down sheet material/litter, populate poultry houses, deal with and assess the feathered creatures, immunize them, regularly perfect the poultry houses during the developing and creation time, eliminate litter and excrement, clean, disinfect, what's more, disinfect the poultry sheds. All these works give ascend to residue to which these laborers are exposed. Poultry incorporates chickens, turkeys, ducks, quails, birds, geese, ostriches, quail, pigeons, and peafowls whether they are alive or dressed.[4] The ecological residue in poultry farmhouses has been viewed as a substance unsafe to wellbeing by Control of Substances Hazardous to Health Regulations 2002.

Subsequently, the poultry dust ascribes to expanded likelihood of respiratory issues. The odorants, for example, smelling salts and hydrogen sulfide transmitted from CAFOs have unsafe impact in these uncovered poultry workers.[5] Endotoxins exist all through in poultry creation units. They are segments of natural residue which have unfavorable impacts on specialists in poultry buildings. In an examination led on poultry and pig repression laborers, the endotoxin fixation (pig: normal 0.12 micrograms/m<sup>3</sup>, poultry: normal 0.31 micrograms/m<sup>3</sup>) was close enough for causing critical unfriendly wellbeing impacts. Grouping of microorganisms was discovered to be higher in these units. The detailed microorganisms' fixation in the settled residue at poultry ranch for microbes and growths was  $3.2 \times 10^8$  cfu/g and  $1.2 \times 10^6$  cfu/g, respectively. [6]

Acute indications concerned with introduction to endotoxin included hack, snugness of chest, windedness, and adjustments in lung work described by a crumbling in constrained expiratory volume (FEV1).[7] Exposure to wood dust is related with skin issues, rhinitis, and word related asthma. The detailed decrease in FEV1 going from 0.07 to 0.19 L.[8] The decline in normal FEV1 had likewise been accounted for by Martin et al. in poultry incubation facility workers.[9] An examination led in poultry restriction laborers

in Western Canada revealed lower mean values for [FEF25-75%] and FEV1/FVC.[10] Morris et al. likewise detailed decrements in FVC and FEV1 values in chicken catchers.[11] Pneumonic capacity tests or lung work tests gauge how proficiently the lungs take in and discharge air. It measures the working of the lungs. [12] A standard calculation of respiratory capacities can guide the clinicians to discover the lung irregularities at the underlying phases of its turn of events. Spirometry is basic, non-obtrusive, and the most regular test done in clinical medicine and furthermore in clinical exploration for distinguishing lung work disorders.[13] In obstructive disorder, the trademark is diminished in expiratory flow rates. With completely settled sickness, the proportion FEV1/FVC is diminished as is FEF25-75%.[14] It is found in asthma, ongoing obstructive pneumonic sickness, bronchiectasis, and bronchiolitis.[15] In restrictive disorder, the trademark is decline in lung volumes yet FEV1/FVC is typical or increased. It is seen in parenchymal illnesses (sarcoidosis, desquamative interstitial pneumonitis, idiopathic aspiratory fibrosis, and asbestosis), neuromuscular illnesses, anomalies of chest disorder, and pleura. The poultry business being a work escalated area gives employment to around 5 million individuals having a place with the more fragile areas of the society.[16] This puts huge populace at a danger of introduction to hurtful poultry dust. The breathed in poultry dust particles get saved in lung and these are taken out from the lung at a moderate rate. These particles apply their impact on lung even after the introduction is halted. Because of absence of assets and mindfulness at poultry ranch, the preventive measures against inward breath of residue particles are commonly poor. Hence, the present study carried out in this area would be find out the possible respiratory risk in poultry farm workers who are exposed to poultry dust within poultry houses in khordha district. Hence, this present study was designed to evaluate the recording and comparing the pulmonary function parameters in poultry farm workers and healthy controls.

### SUBJECTS AND METHODS:

This present study was conducted in the department of physiology, Hi-Tech Medical College and Hospital Bhubaneswar. The study was approved by the Institutional Ethics Committee for Medical Research in Hi-Tech Medical College and Hospital, during the period from 2015, July to 2018, July. Total of 64 Subjects in the age group 18-55 years. Out of which, 32 each belonged to Groups A and B. Group A included healthy volunteers from the general population as a controls. They were matched for age and sex. Group B

included poultry farm workers from khordha district as cases. All were male poultry farm workers. There was no personal protection equipment used by the poultry farm workers.

#### Inclusion Criteria:

Inclusion criteria were age group between 18 and 55 years and either gender.

#### Exclusion Criteria:

Exclusion criteria were smokers, subjects on medication (beta blockers, sedatives), suffering from acute or chronic cardiopulmonary disease, (abdominal and thoracic surgery), and subjects participating in any other study.

#### METHODS:

Volunteers were enlisted as subjects to take part in the study. Subjects who fulfilled the inclusion criteria were included in the study. All the subjects participating in the study signed a written informed consent form. After examination and recording of vitals, subjects were made completely familiar with the device followed by clarification of the moves to play out the tests as indicated by the rules of the American thoracic culture/European respiratory society task power guidelines.[17] Proper preliminaries were given to guarantee that subjects comprehend and get sure about the entirety system. At that point, the subjects were assessed for different respiratory work tests and anthropometric boundaries. Assessment Body stature was noted by standiometer in centimeters. Subjects were made to remain without shoes in upstanding position with the head in the Frankfort flat plane, arms at their sides, heels together, toes separated and back of the head, shoulder bones, rear end, and heels connecting with the backboard. Body weight was estimated in kilograms by standard gauging machine.

Various pulmonary function parameters were recorded using spirometry with the help of a computerized portable autospirometer (Helios-401). The autospirometer has a flow sensor which converts the airflow signals to digital signals. It has an inbuilt printer which gives printouts containing subject's information and calculates values of all parameters. The handset is designed in such a way that it is easy to be used by persons of all ages. Subjects were asked to inspire maximally from end-expiratory position and then place mouthpiece firmly in their mouth and were asked to expire as hard, deep, rapid, and as completely as possible into the mouthpiece.

#### Following Parameters Were Recorded And Calculated By Autospirometer:

FVC (liters), FEVs over fixed time intervals (in seconds) expressed in liters (FEV0.5, FEV1, FEV3), maximum mid expiratory flow rate (liters/second) (FEF25–75%), forced expiratory flow rate between 0.2 and 1.2 L of volume change (liters/second) (FEF0.2–1.2), forced expiratory flow after 25%, 50%, and 75% of the FVC has been expired (liters/second) (FEF25%, FEF50%, and FEF75%), FEV (timed) to FVC ratio expressed in percentage (FEV0.5/FVC, FEV1.0/FVC, and FEV3.0/FVC). After rest of 5 min, subjects were asked to breathe as rapidly and deeply as possible from the mouthpiece for 15 s. This provided the measurement of maximum voluntary ventilation (MVV) in liters/minute.

The data collected were statistically analyzed by SPSS Statistics Version 22. Mean and standard deviation were computed. *t*-test was applied to compare the means of control and study groups. The *P* < 0.05 was considered statistically significant.

#### RESULTS AND DISCUSSION:

The anthropometric data for poultry workers (Group B) and their matched controls (Group A) are shown in Table-1. Age

and height in both exposed and unexposed group were comparable. There was statistically significant (*P* < 0.01) reduction in weight in poultry farm workers (Group- B). Comparison of pulmonary function parameters between Groups A and B has been shown in Table 2. In the current examination, it was seen that a large portion of the lung work boundaries were discovered to be essentially lower in poultry ranch laborers. FVC, FEV0.5, FEV1, FEV3 FEF25%, FEF50%, FEF25–75%, FEF0.2–1.2, and MVV were essentially diminished in poultry laborers.

**Table-1: Anthropometric Variables:**

Parameters	Group-A	Group-B	P-value
Age in years	29.51 ± 10.21	36.01 ± 11.27	0.01
Height(mts)	168.02 ± 29.24	167.54 ± 29.2	0.72*
Weight(kgs)	67.02 ± 8.36	77.21 ± 8.41	0.01
BMI(kg/m2)	26.3 ± 8.36	24.08 ± 5.52	0.01

[Statistically Significant At *P* Value <0.01; \*NS: Statistically Not Significant]

**Table-2: Shows The Pulmonary Function Variables Between Cases And Controls Group:**

Pulmonary function variables	Group-A (Mean ± S.D.)	Group-B (Mean ± S.D.)	P-value
FVC(L)	3.38±0.7	2.64±0.8	0.01
FEV <sub>0.5</sub> (L)	2.62±0.6	1.3±0.5	0.01
FEV <sub>1</sub> (L)	3.20±0.5	2.46±0.6	0.01
FEV <sub>3</sub> (L)	3.34±0.7	2.62±0.6	0.01
FEF <sub>25-75%</sub> (L/S)	5.01±1.37	4.06±1.2	0.01
FEF <sub>0.2-1.2</sub> (L/S)	7.21±1.7	4.87±1.6	0.01
FEF <sub>25%</sub> (L/S)	7.39±1.51	5.4±1.8	0.01
FEF <sub>50%</sub> (L/S)	5.46±1.7	4.38±1.5	0.01
FEF <sub>75%</sub> (L/S)	3.14±1.29	2.87±1.12	0.14*
FEV <sub>0.5</sub> /FVC%	76.32±14.1	74.6±13.71	0.32*
FEV <sub>1</sub> /FVC%	92.85±16.02	93.57±16.4	0.71*
FEV <sub>3</sub> /FVC%	98.76±18.02	98.65±18.01	0.16*
MVV(L/min)	126.4±24.9	99.21±18.3	0.01

[ Statistically Significant At *P* Value <0.01; \*NS: Statistically Not Significant]

We found that all pneumonic capacity boundaries in particular FVC, FEV0.5, FEV1, and FEV3 were measurably fundamentally lower (*P* < 0.01) in poultry ranch laborers when analyzed to controls though FEV1/FVC was ordinary showing the restrictive sort of ventilatory changes in poultry laborers. My outcomes was like the outcomes gotten by Alencar M do CB de et al., who detailed essentially lower estimations of FEV1 and FVC than anticipated also, normal FEV1/FVC in specialists of poultry house.[14] The FEV1 estimations of the uncovered workers in poultry were diminished essentially when contrasted with the typical values.[18,19] Decrease in FEV1 might be because of the impact of endotoxins, mycotoxins, beta glucans and ammonia[19] present in the poultry dust. In my study, there was measurably critical reduction (*P* < 0.01) in FEF25% and FEF50% showing obstructive changes. Zuskin et al. seen that there was a critical decrease in FVC, FEV1, and FEF25% in poultry ranch workers.[20] There was factually huge diminishing (*P* < 0.01) in FEF25–75% showing early little airway route impediment. Lessening in FEF25–75% can be just anomaly in early little airway route obstacle with typical FEV1/FVC.[14] Lower mean estimations of FEV1, FEF25–75%, and FEV1/FVC had additionally been accounted for in various studies on poultry workers.[10] The poultry laborers in the current investigation demonstrated measurably critical reduction in FEF0.2–1.2 (*P* < 0.01) demonstrating enormous airway route deterrent as announced by Balmes and Speizer.[21] There was measurably huge decline (*P* < 0.01) in MVV in poultry ranch laborers in my study when contrasted with controls. A lower

estimation of MVV is more knowledgeable about prohibitive lung sickness, be that as it may, it tends to be gotten in obstructive condition as well.[22] Moreover, it is vague, as it is influenced by other factors, for example, muscle strength and perseverance, inspiration.[23]

### CONCLUSION:

In conclusion, the current investigation presumed that poultry ranch laborers are in danger for lung work debilitation. Mindfulness ought to be spread to poultry laborers about the wellbeing chances due to introduction to poultry dust in poultry laborers. The utilization of individual defensive hardware during work should be executed lawfully alongside standard well being tests.

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