Original Article

Assessment of Cardiorespiratory Dysfunctions of Health Professionals above the Age of 40 years by means of Electrocardiography and Spirometry

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Abstract

Background: The increasing prevalence of chronic respiratory diseases, particularly chronic bronchitis and emphysema (COPD), is reflected as a growing concern regarding its diagnosis and control. Moreover medical personnel working in different medical set up are at greater risk of stress and disease related susceptibility.

Materials and Methods: Descriptive observational study based on 'convenience sampling done on Health professional viz. Doctors, Nurses and Technicians attached with Medical College, Kolkata and Ruby General Hospital, Kolkata between Feb 2015 to May 2016. Overall 50 doctors, 25 nurses and 25 technicians were taken from Medical College, Kolkata. Pulmonary function tests were done by Spirotech ©, a software after rest for 10-15 min and briefing about to the technique of FVC (maximum inhalation followed by maximum exhalation) and MVV (voluntary hyperventilation for 15 seconds) tests were carried out. Spirometric parameters recorded for analysis were FVC, FEV^1, FEV^1/FVC, PEFR, $FEF^{25\%-75\%}$ and MVV. The controls were selected from relatives of Out Patient Department (OPD) of Medical College who were non-health professionals. They followed the same procedure as the cases.

Results: It shows among cases of Medical College, 8 people are hypertensive and 42 people are normotensive, whereas in control group 5 people are hypertensive and 44 people are normotensive and 1 person had hypotension, which is not statistically significant (P Value 0.419). It shows among Medical college cases Mean FEV1 / FVC ratio is 114.50 (SD 12.63) whereas that of control is 103.90 (SD 15.94), which is statistically significant (P Value 0.000).

Conclusion: Medical personnel are more obese particularly in corporate hospital. Medical personnel have similar blood pressure level as in general population. RBBB pattern is the most predominant QRS abnormality which is not uncommon. Medical personnel have lower mean FEV^1%, FEV^1/ FVC and PEFR % than general population. Predominant spirometry abnormality in our study is restrictive pattern.

Keywords: Cardiorespiratory system, spirometry, electro-cardiography (ECG), cardiorespiratory dysfunctions, Health care professionals.

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Introduction

Abnormalities of the cardiorespiratory system above the age of 40 years in some form may not be very uncommon. This is especially true for health care professionals like doctors, nurses & technicians who discharge their day to day duties under good deal of stress at work places, under the threat of contagious diseases and unfavourable environment, though they might be otherwise nutritionally protected and conscious about their health.

The increasing prevalence of chronic respiratory diseases, particularly chronic bronchitis and emphysema (COPD), is reflected as a growing concern regarding its diagnosis and control. It rank behind Arteriosclerotic Heart Disease and Arthritis as a cause of early disability payment under social security administration.[1] India is experiencing a rapid health transition with a rising burden of non-communicable diseases (NCDs) like cardiovascular and respiratory diseases etc. It is causing significant morbidity and mortality, both in urban and rural population with considerable loss in potentially productive years (35 to 64 years) of life. NCDS are estimated to account for about 53% of all deaths.[2]

Health awareness is the foremost precondition to have disease free and good quality of life. There are some modifiable risk factors for cardio-respiratory diseases like smoking, hypertension, dyslipidemia, diabetes mellitus, obesity, sedentary habits and stress.[2] So, proper clinical evaluation and some basic medical test like ECG and PFT can quantify the cardio-respiratory functional burden in affected individual. People above 40 years of age irrespective of sex are quite susceptible to have ill-effect of hypertension, diabetes, dyslipidemia, COPD, coronary artery disease, stroke etc and the related physical disabilities. Moreover medical personnel working in different medical set up are at greater risk of stress and disease related susceptibility. But their awareness of diseases and their preventive aspects are supposed to be better than the same for the general non-medical population. Our endeavor was to find out the fact in respect of doctors, nurses and technician attached to the Medical College Kolkata compared with the non-health care providers from the respective premises.

Materials & Methods

Descriptive Observational Study based on 'convenience sampling done on Health professional viz. Doctors, Nurses and Technicians attached with Medical College, Kolkata and Ruby General Hospital, Kolkata between Feb 2015 to May 2016. Overall 50 doctors, 25 nurses and 25 technicians were taken from Medical College, Kolkata. Similar controls not belonging to Health care delivery system were also considered for comparison. Health Professionals above the age of 40 years with the aforementioned criteria who gave consent were assessed. Exclusion Criteria were any cardio respiratory emergency; any surgical cause relating to cardio respiratory system; heart failure; stroke and acute exacerbation of bronchial asthma or chronic bronchitis.

Study proposal (synopsis) including the questionnaire approved by the Institutional Ethics Committee of Medical College, Kolkata Memo No. MC/KOL/IEC/NON–SPON/377/11-2014 dated 6.11.2014. The height of the subject was measured by a wall mounted measuring scale.

The weight was measured by a bathroom weighing scale. Mercury sphygmomanometer was used to record blood pressure. Thorough examination of the subject's of respiratory system as well as cardiovascular system was done. A Stethoscope was used for auscultation. The detailed history along with assessment of pulse rate, blood pressure recording, ECG and PFT findings were noted down in data sheet. Subjects came early in the morning after proper night rest. Then a short history was taken and clinical examination was done. The subjects were enquired for any acute respiratory problem or cardiac problem, and subjected to anthropometry at the point of entry using the standard procedure and instruments.

Pulmonary function tests were done by Spirotech©, a software installed in a desktop computer in the Department of Physiology, Medical College, Kolkata. After rest for 10-15 min and briefing about to the technique of FVC (maximum inhalation followed by maximum exhalation) and MVV (Voluntary hyperventilation for 15 seconds) tests were carried out in a private and quiet room, in a sitting position with the nose clip held in position on the nose. All pulmonary function tests

were expressed as percentage of Predicted for that particular age, sex, height and weight. Spirometric parameters recorded for analysis were forced vital capacity (FVC), forced expiratory volume in 1st second (FEV^1), FEV^1/FVC, peak expiratory flow rate (PEFR), forced expiratory flow 25%-75% ($FEF^{25\%-75\%}$) and maximum voluntary ventilation (MVV). A multi channel ECG machine (semi automatic type) of clarity brand supplied to our department was used to perform electro-cardiography. The controls were selected from relatives of Out Patient Department (OPD) of Medical College who were non-health professionals. They followed the same procedure as the cases.

In the present study the statistical methods were used as follows:

(a) Nominal data was analyzed by "Chi-square Test"

(b) Parametric data was analyzed by "Unpaired Students T-Test". A value of p "<0.05" was to be taken as significant.

Results

In cases Medical College mean age is 48.20 years (SD 6.06 yrs) whereas that of control is 49.34 years (SD 7.64 yrs). In cases of Medical college 14 people have history of treatment (diabetes, hypertension, asthma and other disease), whereas in control of medical college 16 people have treatment history, which is statistically significant (P Value 0.000) in both cases and control.

Table 1: History of disease, addiction, awareness, treatment among study participants

		Case	Control
Family History	Hypertension only	9	5
	T2-DM only	4	5
	Heart Disease only	2	0
	CVA only	0	0
	Tuberculosis only	0	1
	Cancer only	1	4
	None	18	22
	More Than One	16	13

Continue table 1....

Addiction History	Smoking only	11	12
	Alcohol only	2	3
	Both	4	3
	None	33	32
Awareness	Absent	0	17
	Present	50	33
Treatment History	Asthma	2	1
	T2-DM	3	7
	HTN	3	5
	More Than One	3	2
	Others	3	1
	None	36	34

Table 1 shows among cases of Medical College 17 people are addicted to either alcohol or smoking or both, whereas in case of control 18 people are addicted which is statistically significant (P Value 0.000). Table 2 shows among cases of Medical College all, people have life style awareness and in control group 33 people have life style awareness which is statistically significant (P Value 0.000).

Table 2: Clinical characteristics among health care professionals

		Cases	Controls
Pulse	Normal	47	48
	Tachycardia	2	0
	Bradycardia	1	2
Rhythm	Irregular	0	3
	Regular	50	47
BP	Hypertension	8	5
	Hypotension	0	1
	Normal	42	44
Edema	Absent	43	44
	Present	7	6
Murmur	Absent	49	49
	Present	1	1
Breath Sound	Abnormal	0	1
	Normal	50	49

Table 2 shows mean BMI of cases of Medical college is 24.20 (SD 2.92) whereas that of control is 23.06 (SD 3.57) which is not statistically significant (P Value 0.084). It shows among cases of Medical College, 8 people are hypertensive and 42 people are normotensive, whereas in control group 5 people are hypertensive and 44 people are normotensive and

1 person had hypotension, which is not statistically significant (P Value 0.419).

Table 3: E.C.G. findings among

		Cases	Controls
Axis	Normal	48	42
	Right	0	8
	Left	2	0
P-Wave	Abnormal	0	0
	Normal	50	50
PR-Interval	Abnormal	0	0
	Normal	50	50
QRS-Complex	Abnormal	9	5
	Normal	41	45
ST-Segment	Abnormal	0	0
	Normal	50	50
T-Wave	Abnormal	1	0
	Normal	49	50
QT-Interval	Abnormal	0	1
	Normal	50	49

Table 3 shows among cases of Medical college 41 people have normal QRS and 9 people have abnormal QRS, whereas in case of control of Medical College 45 people have normal QRS and 5 people have abnormal QRS, which is not statistically significant (P Value 0.249). It shows among cases of Medical College 50 people have normal QTc and none have prolonged QTc whereas 49 people have normal QTc and 1 people has prolonged QTc which is not statistically significant (P Value 0.466).

Table 4: Pulmonary function test findings among healthcare professionals

PFT Parameters (Predicted %)		Case	Control
FEV1	Abnormal	14	25
	Normal	36	25
FEV1/FVC	Obstructive	1	4
	Normal	35	29
	Restrictive	14	17
FVC	Abnormal	22	30
	Normal	28	20

Table 4 shows among cases of Medical college mean FEV 1 is 91.92 (SD 32.50) whereas that of control is 75.98 (SD 28.65) which is statistically significant (P Value 0.011). It shows among Medical college cases Mean FEV1 / FVC ratio is 114.50 (SD 12.63) whereas that of control is 103.90 (SD 15.94), which is statistically significant (P Value 0.000). Study shows among Medical college case mean PEFR is 63.46 (SD 26.339) and that of control is 50.39 (SD 22.430) which is statistically significant (P Value 0.009).

Table 5: Analytical statistics of health care professionals (cases) versus controls Unpaired T-Test

Variable		Mean	Standard Deviation	Standard Error Mean	p-Value
Age	Cases	48.20	6.061	0.857	0.411
	Control	49.34	7.644	1.081	
BMI	Cases	24.20	2.921	0.413	0.084
	Control	23.06	3.571	0.505	
FEV1	Cases	91.92	32.505	4.597	0.011
	Control	75.98	28.650	4.093	
FEV1/FVC	Cases	114.50	12.630	1.786	0.000
	Control	103.90	15.944	2.301	
PEFR	Cases	63.46	26.339	3.725	0.009
	Control	50.39	22.430	3.204	

P<0.05 is considered as statistically significant.

Table 5 shows FEVI[1], FEV[1]/FVC and PEFR are significantly increased / higher in cases compared to controls.

Discussion

Cardio-respiratory fitness (CRF) is not only an objective measure of habitual physical activity

but also a useful diagnostic and prognostic health indicator for patients in clinical settings. Although compelling evidence has shown that CRF is a strong and independent predictor of all–cause and cardiovascular disease mortality, the importance of CRF is often over looked from a clinical perspective compared with other risk factors such as hypertension, diabetes, smoking or obesity.[3]

Generalized obesity is defined as BMI ≥ 25 kg per m^2 for both genders (based on the world health organization Asia Pacific guidelines) with or without abdominal obesity.[4] Rajendra Pradeepa et al published a study in Indian journal of Medical Research in 2015 regarding prevalence of generalized and abdominal obesity in urban and rural India.[4] They observed incidence of obesity increased significantly with income. An increasing trend in obesity was observed with increasing educational status. Table 5 shows there is significant difference between BMI, addiction & awareness. In a study published in Nigerian Journal of Clinical Practice in 2013 B Ordinioha found prevalence of hyper tension among lecturers of Medical school was lower than that of general population in urban centers.[5] But in a similar study published by Kurtul S et al[6] found that despite a tendency to have lower prevalence of hypertension among physicians, the difference found with the rest of the population did not reach statistical significance.

Abhishek Ghosh et al[7] published study in International Journal of Medical Science and Public Health in 2016. They have found that the prevalence of pre-hypertension and hypertension in doctors is not at all less than general Indian population. Rather the risk factors such as raised BMI and smoking are very common among doctors. But result of our study need not show such trend. In our study we assessed the knowledge of life style awareness about cardio vascular disease during history taking.

In our study also we have found that doctors, sisters and technician of Medical College (cases) have better knowledge of lifestyle awareness than general population (Control). In another study published in Central Asian Journal of Global Heath in 2015 by Nidhi Goel et al[8] conducted a Multicentric Cross-Sectional study among Medical students of 8 Medical colleges across India. They observed prevalence of alcohol consumption in undergraduate and post graduate student was 16.6% and 31.5% respectively. Tobaco usage for undergraduate and post graduate was found to be 8% and 14.5 % respectively. In our study we have found that addiction of alcohol and smoking is statistically significant among doctors and technicians and similar in control group of Medical College and Hospital. Result of our study is similar to earlier studies.[7, 8]

Barbara E. Bussink et al[9] published a study in European Heart Journal in 2012. They have found prevalence of RBBB was twice as high in men compared to women. Prevalence of RBBB is associated with higher blood pressure but not consistently with other cardio vascular risk factors. Similarly FLEG JL et al[10] published a study in Journal of American College of Cardiology in 1983. They have found RBBB in asymptomatic men is a manifestation of a primary abnormality of cardiac conduction system but has no demonstrable adverse effect on long term cardiac morbidity and mortality. In our study majority of QRS abnormality is of RBBB pattern. Though there is no statistical significant QRS abnormality among cases or control, 13% of our study population have RBBB pattern (complete and incomplete) which is a bit higher than earlier study.

Basavarajaiah S et al[11] published a study in European Heart Journal in 2007 on prevalence and significance of long QT interval in elite athlete. Incidence of QTc prolongation among athletes was 0.4%. In our study we have found incidence of asymptomatic prolonged QTc is 1% which is much higher than earlier studies. But no obvious cause was found in our study.

During our study we have measured 4 parameters in PFT viz., FEV^1 %, FEV^1/ FVC%, FVC% and PEFR %.V.K. Vijayan and K.V. Kuppurao et al[12] published a study in Thorax 1990 on pulmonary functions in healthy young adult in Madras. They have found mean FEV^1% in South Indian men and women are 85.87 (SD 7.05) and 87.53 (SD 6.17) respectively. S.R. Kamat and Tyagi NK[13] have done a study of lung function in Indian adult subject and published in Lung India in 1982. They found that there is a distinct relationship between FVC, FEV1% and socio-economic status, the values being lower ($P<0.005$) in the males of lower socioeconomic strata. There was no clear relationship

with daily physical activity, the values being lower in those doing strenuous exercise. In contrast to above mentioned studies we have found opposite result. S.K. Chhabra & R.Kumar[14] published a study in 2014 on PFT among adult population of northern India. They have found mean FEV 1 / FVC is 80.37 in case of male and 84.27 in case of Female. In our study we have found much higher mean FEV1/ FVC in medical personnel and control group of Medical College. Jung Yeon Lee et al[15] published a study on prevalence of spirometrically defined restrictive ventilatory defect in Korea in 2015. They have found prevalence of restrictive ventilatory defect among the nationwide population in Korea was 11.3%.

Laura Kurth and Eva Hnizdo in a study[16] among US population found that over all age-standarized prevalence of restrictive pattern decreased significantly from 7.2% (1988-1994) to 5.4% (2007-2010). Factors positively associated with restrictive pattern on Spirometry include age, female sex, white race, lower education, former and current smoking and comorbidities like cardiovascular disease, Diabetes and Abdominal Obesity. Ravi B. Solanki et al[17] in a study among petrol filling workers in India found that prevalence of restrictive pattern abnormalities was 14% and obstructive pattern was 1%. In our study, we have found predominant spirometry abnormality was restrictive pattern which was 45%, much higher than earlier study. But obstructive pattern was found in 4.5% among study population. High prevalence of restrictive pattern in our study may be due to poor effort or confounding factor like obesity/ overweight which needs further study.

Conclusion

Doctor, nurses and technicians are more health conscious than general population. Medical personnel are more obese particularly in corporate hospital. Doctors and technician are addicted to smoking and alcohol similar to general population. Medical personnel have similar blood pressure level as in general population. RBBB pattern is the most predominant QRS abnormality which is not uncommon. QTc prolongation is rare. Medical personnel have lower mean FEV^1%, FEV^1/ FVC and PEFR % than general population. Predominant spirometry abnormality in our study is restrictive pattern.

Conflict of Interest: None

Ethical clearance: Approved by Institutional Ethics Committee, Medical College & Hospital, Kolkata

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