Pulmonary Function Tests In The Normal Pakistan Population

Pages with reference to book, From 9 To 13

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Abstract

Pulmonary function was assessed in apparently healthy Pakistani, subjects according to age, sex, height, weight and body surface area. The observed values were less than those predicted for healthy Americans (Baldwin, et al. 1948). (JPMA 32:-.1982).

Introduction

Normal physiological parameters are available in U.S.A. and in Eastern European countries countries (Bucherl 1955; Comroe et al. 1963; David et al. 1971) but no such studies are available in Pakistan. Minor abnormalities in pulmonary functions in patients with cardiorespiratory diseases cannot be detected in the absence of comparable data in healthy subjects.
In the present study, pulmonary function tests were done in healthy Pakistani individuals and compared with those reported by Baldwin et al. (1948) in healthy Americans.

Material and Methods

A hundred subjects (50 males and 50 females) of different age groups were selected according to their socio-economic status, occupation and place of origin.
The subjects were examined thoroughly to exclude cardiopulmonary disorders. The respiratory manoeuvrcs were explained to them and tests were performed at room temperature and in sitting positin.
13.5 liter C'lline respirometer (closed circuit spirometery) was filled with oxygen. The subject Pakistani Population was asked to breath normally for I to 2 minutes, and then resume quiet breathing after a maximal inspiration and expiration. From this tracing, respiratory rate, tidal volume, minute ventilation (Respiratory rate X Tidal Volume) inspiratory capacity, expiratory reserve volume and vital capacity were calculated (Fig. 1) To calcuate the percentage of forced expiratory volume in one second and maximum breathing capacity subject was asked to breathe normally for a minute then inhale maximally and then exhale rapidly arid deeply followed by resumption of quiet breathing (Fig. I) For both these pulmonary functions kymograph was set at a fast speed (1920 mm/min).The subject was asked to breathe as rapidly and as deeply as possible for 10-15 seconds and the readings were converted to one minute (Fig. I).

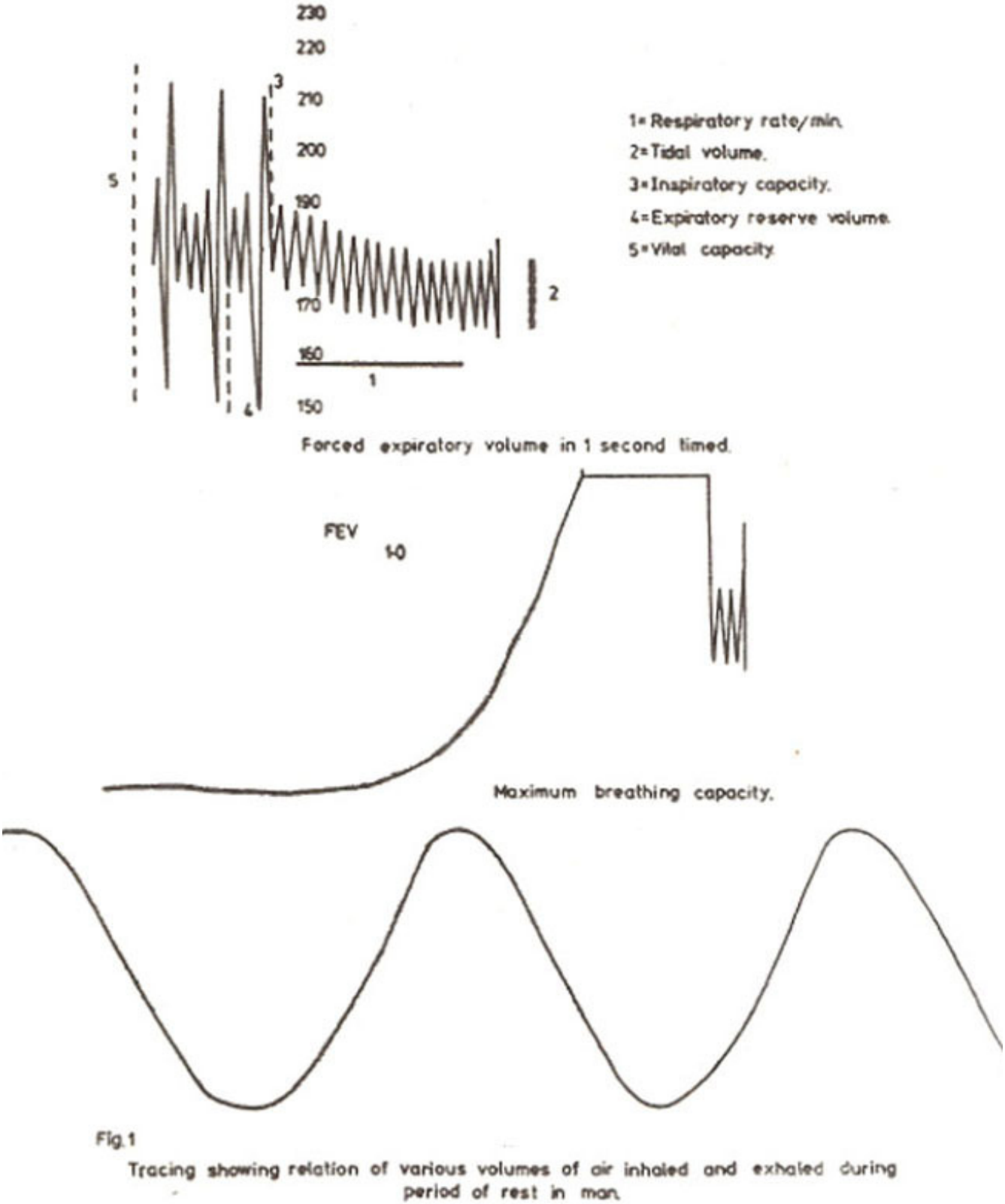

Fig. 1

Tracing showing relation of various volumes of air inhaled and exhaled during period of rest in man.

The gas volume recorded by the respirometer was corrected by a factor (BTPS) because the subject exhales the gas at 37C while the volume recorded on the spirograme was at room temperature. Factor for any given room temperature for correction of the measured volume to body temperature embient pressure and saturated with water vapour is called BTPS.

Results

In both sexcs different parameters like age, height, weight, body surface area and respiratory rate are compared with average values of the different parameters of lung volume (with their standard error values). All results are summarized in Table I to VI.

Table I

Relationship between Age Groups and *Average Value of Respiratory Rate Tidal Volume, Minute Ventilation* and *Inspiratory Capacity* in Males and Females

Sex	*Age groups (years)*	*Respiratory Rate (Breaths/min)*	*Tidal Volume (ml)*	*Minute Ventilation (Liter/min)*	*Inspiratory Capacity (ml)*
Males	16—20	20± .42	83?± 56.8	16±1.17	215?± 91.0
	21—25	19± .70	865± 43.6	16±0.65	2368± 91.5
	26—30	16±1.61	1017±136.0	15±0.91	2446± 83.0
	31—35	19±1.0	903±100.0	14±1.20	2421±109.6
	41—45	15±1.24	911± 92.9	13±1.05	2321± 57.9
Femaler	16—20	20± .75	803± 34.2	15±0.79	1659±113.1
	21—25	19± .73	763± 51.7	14±1.08	1719± 92.0
	26—30	19±1.45	672± 77.8	12±1.46	1746± 80.6
	31—35	18±1.75	611± 65.2	10±0.47	1891± 52.7

Table II

Relationship between Age Groups and Average Values of Expiratory Reserve Volume, Vital Capacity, Forced Expiratory Volume and Maximum Breathing Capacity in Males and Females.

Sex	*Age group (years)*	*Expiratory reserve volume (ml)*	*Vital capacity (ml)*	*Forced expiratory volume (%)*	*Maximum breathing capacity (Liters/min)*
Males	16—20	1325±95.0	3477±112.5	89±3.9	92±7.2
	21—25	1383±49.6	3751±104.5	87±2.4	90±4.0
	26—30	1432±89.1	3853±120.0	89±3.1	87±6.3
	31—35	1354±99.0	3797± 92.3	77±3.3	86±5.7
	41—45	1349±48.1	3670± 68.1	82±3.2	85±3.4
Females	16—20	855±27.6	2556±117.6	85±1.4	78±2.2
	21—25	989±45.0	2574± 97.6	88±2.6	81±3.2
	26—30	909±59.3	2653=125.0	89±2.8	78±3.6
	31—35	922±56.9	2813±106.3	94±3.4	81±2.3

Table III

Relationship between Height and *Average Values* of *Inspiratory Capacity*, *Expiratory Reserve Volume*, *Vital Capacity*, *Forced Expiratory* Volume and Maximum *Breathing Capacity* in Males and Females

Sex	*Height group (cm')*	*Inspiratory capacity (ml)*	*Expiratory reserve volume (ml)*	*Vital capacity (ml)*	*Forced expiratory volume (%)*	*Maximum breathing capacity (lit/min)*
Males	156—160	2226± 89.6	1213± 50.6	3439±100.8	80±3.4	85± 2.6
	161—165	2258± 69.8	1387± 98.0	3645± 86.7	83±4.2	86± 3.8
	166—170	2348± 78.6	1393± 29.0	3735± 78.9	86±1.9	87± 3.2
	171—175	2481±125.0	1437±104.9	3917±114.7	89±3.5	95± 6.6
	176—180	2528±179.1	1481± 68.9	4009±201.5	92±4.3	104±11.9
Females	151—155	1632± 58.5	832± 28.0	2464± 61.3	87±1.8	76± 1.4
	156—160	1728± 96.3	916± 40.5	2643±102.9	88±3.0	81± 2.5
	161—165	1742± 95.6	948± 49.4	2691±129.9	89±2.3	82± 5.8
	166—170	2182±146.7	954± 48.0	3136±100.0	90±2.0	85± 2.0

Table IV

Relationship of Vital Capacity with Weight and Vital Capacity with Respiratory Rate, in Males and Females

Sex	*Weight (Kg)*	*Average vital capacity (ml)*	*Respiratory rate (Breaths/min.)*	*Average vital capacity (ml)*
Males	41—45	3352±127.9	11—15	3798± 85.5
	46—50	3694±105.3	16—20	3726± 86.6
	51—55	3678±143.5	21—22	3633± 93.8
	56—60	3702± 93.9		
	61—65	3715±120.5		
	66—70	3934±147.2		
Females	41—45	2502± 82.0	11—15	2903±118.6
	46—50	2528±116.8	16—20	2572± 73.6
	51—55	2740±155.0	21—22	2572±106.5
	56—60	2620±133.3		
	61—65	2967±182.3		

Table V

Relationship of Maximum Breathing Capacity with Body Surface Area and Maximum Breathing Capacity with Respiratory Rate in Males and Females

Sex	*Body surface area (Sq. meter)*	*Average Breathing capacity (Lit/min.)*	*Respiratory rate (Breaths/min.)*	*Average Maximum Breathing Capacity (Liters/min.)*
Male	1.41—1.45	86± 2.4	11—15	93±3.6
	1.46—1.50	90± 3.9	16—20	91±3.8
	1.51—1.55	91± 6.9	21—22	83±3.2
	1.56—1.60	83± 7.2		
	1.61—1.65	88± 5.0		
	1.66—1.70	92± 7.1		
	1.71—1.75	88± 4.3		
	1.76—1.80	100± 7.4		
	1.86—1.90	95±14.8		
Females	1.31—1.35	78± 2.7	11—15	80±5.2
	1.36—1.40	78± 2.2	16—20	79±1.5
	1.41—1.45	73± 3.1	21—22	79±3.2
	1.51—1.55	82± 4.0		
	1.56—1.60	81± 3.4		
	1.61—1.65	84± 4.0		

Table VI

Comparison of Pulmonary Capacities in Pakistani and American Population

Age (years)	Height (Cms.) Male	Female	Vital capacity of Pakistani population (ml) Male	Female	Predicted Vital Capacity of U.S.A. Population (ml) Male	Female
16—25	156—180	151—168	3092—4803	2025—3328	3883—4535	2980—3330
26—35	160—177	112—168	3348—4158	2238—3090	3810—4360	2765—3190
36—45	158—180	—	3437—4015	—	3585—4085	—

Age (years)	Body Surface area (sq. meter) Male	Female	Maximum Breathing Capacity of Pakistani population (Liter/min) Male	Female	Predicted maximum breathing (liter/min) of U.S.A. population Male	Female
16—25	1.41—1.90	1.31—1.78	70—139	65—98	105—143	87—110
26—35	1.55—1.90	1.35—1.62	73—114	68—89	106—134	84—93
36—45	1.55—1.90	—	71—110	—	99—121	—

It was observed that values of pulmonary functions decreased with age and increased with height, weight, and body surface. No relationship was observed between time vital capacity (FEV1) and age.

Discussion

The higher correlation depends on size, area of lungs, expansibility of the chest, strength of muscles, excercise, hormonal effect, and life patterns. House wives and sedentary people show less value due to less physical exertion and working capacity. Predicted values for American population (Table VI) are higher than those of Pakistani population reported here which may be because Of environmental, conditious, economic, occupational and nutritional effects as well as geographical variations and psycho-social problems. Variations and errors in the present results may be due to the fact that the subject either fails to cooperate fully because of nonrespiratory factors like seif-conciousness, communication barriers, or anxiety because of suffocation due to the mouth piece used by the subject.

References

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