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Original Article

Physiotherapy Section

Normative Values of Physical Fitness Test in the Elderly: A Community Based Study in an Urban Population in Northeast India

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ABSTRACT

Introduction: Physical inactivity exposes elderly people to higher risk of diseases. Assessing their functional fitness using fitness assessment tools like Senior Fitness Test (SFT) is helpful in geriatric care. Determination of normative values of SFT increases its interpretability of interindividual and intergroup performances scores and usefulness.

Aim: To determine normative values of SFT in geriatric population in an urban community setting.

Materials and Methods: A communitybased prospective study in 400 elderly participants (284 men, 116 women), aged ≥65 years, selected by multistage random sampling from 60 municipal wards of Guwahati city in Northeast India. Descriptive statistics, percentiles, univariate Analysis of Variance (ANOVA) and Bonferroni correction methods were used. A p-value <0.05 was considered significant.

Results: Mean ages in males and females were 69.80±3.82 and 67.25±2.57 years. Mean height, weight and BMI in males and females respectively were 165.61±5.36 cm and 161.03±7.93 cm; 63.63±5.99 kg and 55.54±6.74 kg; 23.2±2.03 kg/m^2 and 21.5±3.42 kg/m^2. Males aged 65-69 years had highest BMI (23.4±2.11 kg/m^2) while those ≥80 had lowest (21.8±1.30 kg/m^2). Females aged 70-74 years had highest BMI (23.3±3.50 kg/m^2) while 65-69 years (21.3±3.39 kg/m^2) had lowest. 'Arm-curl' test showed maximum values in 70-79 year and 65-69 year age-groups in males and females respectively (11.4±3.89; 14.5±4.63). In 'chair-stand' test, maximum values were in 65-69 year for both sexes (males=15.2±4.64; females=13.6±4.26 respectively). In 'back-scratch' and 'chair-sit and reach' tests, maximum values were found in age-groups 70-74 and 65-69 in males and females respectively (10.5±9.11 and 13.4±8.91; 9.8±7.28 and -8.4±6.92). In '8-foot up-and-go' test, maximum time to perform in males and females were in ≥80 and 75-79 year groups respectively (13.9±4.11; 20.3±0). In both sexes, maximum values of '2-minute step up' test was found in 65-69 year age groups (male=67.4±21.9; female=62.7±16.9). In both sexes, changes of performance scores with age were observed in all tests, with maximum changes observed in 'back-scratch' test (male=131.4%, female= 157%).

Conclusion: The normative values obtained for SFT of each test score can be applied in aged population of similar settings to assess physical fitness.

Keywords: Functional fitness, Geriatric, Senior fitness test

INTRODUCTION

The proportion of elderly population in India has been documented to be 7% in 2009 which is projected to rise to 20% by 2050. This translates to approximately 88 million in 2009 with a projected rise to 315 million by 2050 [1]. This projected rise of the elderly population over the next few decades, mainly as a result of improved healthcare services, increased longevity and decreased fertility [2], although laudable, is a matter of concern and due attention should be paid to make the economic and social policies more friendly for the constantly increasing proportion of senior citizens of the country. Over the years, the focus of public healthcare services for the aging population has been to increase physical activity levels in order to maintain functional independence [3]. However, the major challenge in preventive geriatric care is that physical activity decreases with age and inactive older people are at high risk of diseases [4].

Level of physical fitness or 'functional fitness', defined as "having the physiologic capacity to perform normal everyday activities safely and independently without undue fatigue" can be determined by various test protocols [5]. However, most of these test protocols are designed for the younger population and are not appropriate for the older population. The Senior Fitness Test (SFT) developed by Rikli RE and Jones CJ is one of the simplest and best tools in assessing six important 'functional fitness' parameters for the elderly, comprising of body composition, lower and upper body strength, aerobic endurance, lower and upper body flexibility, and agility/dynamic balance [6]. Each test component of the SFT has been selected for its high reliability in a fitness facility or large community facility [6]. The normative data/values increases the usefulness of a test and the interpretability of test score by providing information about the range of performance that can be expected for elderly individuals of different ages as well as comparing the performance of one elderly individual or group with others of the same age [7]. Moreover, although such studies have been done in other parts of the world [7-9], there is limited published data from India. Therefore, this community based propective study was undertaken in an urban population from the northeast region of the country to determine the normative scores of SFT in the geriatric population in this geographical region.

MATERIALS AND METHODS

A community based prospective, non-experimental study was undertaken to assess normative values of physical fitness test in elderly subjects, aged ≥65 years during the period from January 2013 to August 2016. Assuming the prevalence rate of elderly of 50% at 95% confidence interval specified limits with a precision rate of 5%, the sample size calculated using the formula 4pq/l2 was found to be 400, where p=prevalence, q=1-p and l=standard error.

Participants were assessed for physical fitness from different wards/block of Guwahati Urban area, India. In the initial sampling process, selection of 60 different ward/blocks of Guwahati was done by lottery method of simple random sampling, from which 30% (18 wards) were selected. The names of the remaining 42 municipality wards, which were not included in the present study, were set aside for future use in case adequate numbers of participants were not obtained from the initial 18 wards. Taking into consideration of the elderly population of Guwahati urban as 44231 where total population of elders in the age group of 65-69 years (18151), 70-74 years (12350), 75-79 years (6704) and 80 years of above (7026), systematic random sampling was followed to identify their household. The sampling interval was 100947 households/400 (samples) = 252. Every K^{th} (252) household was visited as per household records available at the Office of the Director of Census Operations: Guwahati. In the first Ward, the first household was selected using simple random technique and afterward every 252^{th} household was visited. If the household was found locked during the visit or a geriatric participant was not available during the visit, the right hand thumb rule was followed. From one household only one participant, either male or female participant was tested for fitness.

The inclusion criteria in this study were functionally independent elder people over the age of 65 years, of either gender with no physical or cognitive limitation that would prohibit them to follow instructions or to participate safely. Those with acute illnesses, unstable musculoskeletal injury, elevated blood pressure, and vision problems hampering mobility or test performance were excluded from the study. The study was approved by the Institutional Ethical Committee of Gauhati Medical College, and written informed consent and screening with Physical Activity Readiness Questionnaire (PAR-Q) was obtained from all subjects before the enrolment in the study. Each test of the SFT was first demonstrated to the participants and if necessary, cues or gestures were provided. All participants performed the six physical tests (Senior Fitness Test) as described in [Table/Fig-1] in their own residences.

Assessment category	Test item	Test description
Lower body flexibility	Chair sit-and-reach test	From sitting position at front of chair, with leg extended and hands reaching toward toes, number of inches (+ or –) from extended fingers to tip of toe
Upper body flexibility	Back scratch test	With one hand reaching over shoulder and one up middle of back, number of inches between extended middle fingers (+ or –)
Lower body strength	30-second chair stand test	Number of full stands in 30 second with arms folded across chest
Upper body strength	30-second arm curl test	Number of bicep curls in 30 second holding hand weight (women 5 pound; men 8 pound)
Agility/dynamic balance	8-foot up-and-go test	Number of seconds required to get up from seated position, walk 8 foot, turn, and return to seated position on chair
Aerobic endurance	2-minute step test	Number of full steps completed in 2 minute, raising each knee to point midway between patella and iliac crest (score is number of times right knee reaches target)

[Table/Fig-1]: Methodology of senior fitness test [10].

Test protocol

The Senior Fitness Test (Rikli RE and Jones CJ, 1997) was administered.

STATISTICAL ANALYSIS

The Statistical Package for Social Studies (SPSS) was used for statistical analysis. The age groups used in the analysis were as follows: 65–69, 70–74, 75–79, and 80 and above. All analyses were conducted separately for men and women. The descriptive statistics are presented as means and standard deviations for continuous variables and as frequencies and percentages for categorical variables and age group percentiles used for all measures. To determine the differences between age groups, we used univariate Analysis Of Variance (ANOVA). We used Bonferroni correction to determine which of groups are statistically different. The statistical significance was set at $p < 0.05$.

Participant characteristics	No of participants (%)		
	Total	Male	Female
No of participants			
Overall	400 (100)	284	116
65-69	247(61.75)	147(36.75)	100(25)
70-74	131(32.75)	117(29.25)	14(3.5)
75-79	14(3.5)	12(3)	2(0.5)
≥80	8(2)	8(2)	-
Mean age (years)			
Overall		69.80±3.82	67.25±2.57
65-69		67.41±1.29	66.44±1.39
70-74		71.04±1.28	71.50±1.22
75-79		76.83±1.27	78.00±0
≥80		85.00±5.61	-
Mean height (cm)			
Overall		165.61±5.36	161.03±7.93
65-69		164.98±5.24	161.88±7.38
70-74		166.44±5.03	156.21±9.92
75-79		164.00±8.82	152.00±0
≥80		167.50±4.38	-
Mean weight (kg)			
Overall		63.63±5.99	55.54±6.74
65-69		63.90±5.88	55.50±7.15
70-74		63.65±5.46	56.21±3.38
75-79		61.75±11.41	53.00±0
≥80		61.38±4.60	-
Marital status			
Single	7(1.75)	5(1.25)	2(0.50)
Married	336(84)	242(60.50)	94(23.50)
Widowed/separated/ divorced	57(14.25)	37(9.25)	20(5)
Education			
Uneducated	29(7.25)	10(2.50)	19(4.75)
Primary school	51(12.75)	29(7.25)	22(5.50)
Secondary	124(31)	86(21.50)	38(9.50)
University	196(49)	159(39.75)	37(9.25)
Type of family			
Nuclear	91(22.75)	62(15.50)	29(7.25)
Joint	309(77.25)	222(55.50)	87(21.75)
Economic status			
Dependent	167(41.75)	74(18.50)	93(23.25)
Independent	233(58.25)	210(52.50)	23(5.75)

[Table/Fig-2]: Baseline characteristics of participants.

RESULTS

A total of 400 elderly participants comprising 284 men and 116 women with a mean age of 69.80±3.82 years and 67.25±2.57 years, respectively, were assessed for the physical fitness tests using the SFT. All the elderly were grouped in 4 age groups of 65-69 years, 70-74 years, 75-79 years and above 80 years of age. The maximum number of subjects was in the age group of 65–69 years. The baseline characteristics of the participants are shown in [Table/Fig-2].

The physical fitness test score was calculated with reference to the individual test maximum, minimum and mean score values for

Males	65-69 years (n=147)		70-74 years (n=117)		75-79 years (n=12)		80 years and above (n=8)	
Test (unit)	Mean ± Sd*	Range	Mean ± Sd*	Range	Mean ± Sd*	Range	Mean ± Sd*	Range
BMI	23.4±2.11	18.36–29.37	22.9±1.76	16.8 – 26.5	22.8±3.18	17.7 – 28.8	21.8±1.30	20.3 – 23.5
Arm curl test (number)	11.4±3.71	4–25	11.4±3.89	3 – 21	9.58±4.03	5 – 19	10.7±2.60	8 – 14
Chair stand test (number)	15.2±4.64	4–26	13.5±4.30	4 – 24	8.83±1.26	7 – 11	9.37±1.18	8–11
Back scratch test (cm)	-7.41±7.96	-36 – 3	10.5±9.11	-38 – 0	-8.75±7.68	-20 – 4	-20.2±14.6	-42 – 0
Chair sit and reach test (cm)	-13.7±7.22	-30 –0	13.4±8.91	-39 –17	9.83±7.09	-25 – -2	-18.6±5.37	-24 – -9
8 foot up and go test (second)	7.26±1.46	5 – 13.1	7.68±1.69	4.9 – 12	9.22±2.87	5.8 – 13.8	13.9±4.11	9.1 – 19.8
2 minute step test (number)	67.4±21.9	23 – 120	56.1±21.4	13–120	53.4±12.2	35– 80	47.2±14.0	20 – 60

[Table/Fig-3]: Mean and standard deviation of the test scores in elderly men.
*Sd= standard deviation.

Females	65-69 years (n=100)		70-74 years (n=14)		75-79 years (n=2)	
Test (unit)	Mean ± Sd*	Range	Mean ± Sd*	Range	Mean ± Sd*	Range
BMI	21.3±3.39	16.0–28.2	23.3±3.50	18.5 – 28.9	22.9±0	22.9 – 22.9
Arm curl test (number)	14.5±4.63	6 – 25	12.2±2.43	8 – 16	7.00± 0	7 – 7
Chair stand test (number)	13.6±4.26	6 – 24	9.9±2.01	8 – 14	5.00±0	5 – 5
Back scratch test (cm)	-9.8±7.28	-31 – 11	-13.2±8.88	-30 – -3	-34.0±0	-34 – -34
Chair sit and reach test (cm)	-8.4±6.92	-31 – 15	-16.5±11.2	-37 –0	-24.0±0	-24 – -24
8 foot up and go test (second)	8.0±2.03	3 – 13.3	11.6±5.20	5.1 – 21.9	20.3±0	20.3 – 20.3
2 minute step test (number)	62.7±16.9	10 – 99	51.7±10.5	33–64	37±0	37– 37

[Table/Fig-4]: Mean and standard deviation of the test scores in elderly women.
*Sd= standard deviation

Male	65-69 year (a)	70-74 year (b)	75-79 year (c)	>80 year (d)	Percentage of change in test Performance among age categories		
	147	117	12	8			
Variable	Mean	Mean	Mean	Mean	%(a and b)	%(b and c)	%(c and d)
BMI	23.49	22.97	22.83	21.86	-2.19	-0.60	-4.26
Arm curl test (number)	11.43	11.40	9.58	10.75	-0.29	-15.94	12.17
Chair stand test (number)	15.23	13.57	8.83	9.37	-10.92	-34.91	6.13
Back scratch test (cm)	-7.41	-10.57	-8.75	-20.25	42.58	-17.23	131.42
Chair sit and reach test (cm)	-13.78	-13.47	-9.83	-18.62	-2.25	-27.04	89.40
8 foot up and go test (second)	7.26	7.68	9.22	13.96	5.71	20.09	51.35
2 minute step test (number)	67.4898	56.17949	53.41667	47.25	-16.75	-4.91	-11.54

[Table/Fig-5]: Difference (percentage of change) in the physical fitness test parameters in elderly men.

Female	65-69 year (a)	70-74 year (b)	75-79 year (c)	>80 year(d)	
	100	14	2		
Variable	Mean	Mean	Mean	%(a and b)	%(b and c)
BMI	21.30	23.32	22.93	9.46	-1.65
Arm curl test (number)	14.52	12.28	7	-15.38	-43.02
Chair stand test (number)	13.65	9.92	5	-27.26	-49.64
Back scratch test (cm)	-9.8	-13.21	-34	34.83	157.29
Chair sit and reach test (cm)	-8.45	-16.5	-24	95.26	45.45
8 foot up and go test (second)	8.07	11.65	20.3	44.32	74.24
2 minute step test (number)	62.75	51.78	37	-17.47	-28.55

[Table/Fig-6]: Difference (percentage of change) in the physical fitness test parameters in elderly women.

different age groups in both males and females. For convenience of description, the results in males and females are being shown separately.

In elderly males, the highest BMI was recorded in men aged 65–69 years (23.4±2.11) and the lowest in the oldest subjects aged above 80 years (21.8±1.30). Results of the arm curl test showed highest values in the 70-74 years age group (11.4±3.89) while the lowest values were seen in the 75-79 year age group (9.58±4.03). In the chair stand test, the maximum values were recorded in the age group of 65-69 years (15.2±4.64) while the minimum values were in the age group of 75-79 years (8.83±1.26). In the back scratch and chair sit and reach test the highest values were in the age group of 70-74 years (10.5±9.11 and 13.4±8.91 respectively). Maximum time to perform the 8 foot up and go test was required in the age group above 80 years (13.9±4.11) while the minimum time was required in the age group of 65-69 years (7.26±1.46). Participants in the age group of 65-69 years performed maximum number of 2 minute step up test (67.4±21.9) while those in the age group above 80 years performed the least (47.2±14.0). The results of the test performance for elderly males are shown in [Table/Fig-3].

The physical fitness test scores for women were only for 65-69 years, 70-74 years and 75-79 age group. In elderly females, the BMI was maximum in the age group of 70-74 years (23.3±3.50) while it was minimum in the age group of 65-69 years (21.3±3.39). Results of the arm curl test showed highest values in the 65-69 years age group (14.5±4.63) while the lowest values were seen in the 75-79 years age group (7.00± 0). In the chair stand test, the maximum values were recorded in the age group of 65-69 years (13.6±4.26) while the minimum values were in the age group of 75-79 years (5.00±0). In the back scratch and chair sit and reach test, the highest values were in the age group of 65-69 years (-9.8±7.28 and -8.4±6.92 respectively). Maximum time to perform the 8 foot up and go test was required in the age group of 75-79 years (20.3±0) while the minimum time was required in the age group of 65-69 years (8.0±2.03). Participants in the age group of 65-69 years performed maximum number of 2 minute step up test (62.7±16.9)

Percentiles	65-69 years	70-74 years	75-79 years	80 years and above
	N=147	N=117	N=12	N=8
BMI				
10	20.74	20.94	18.49	20.32
25	22.32	22.01	20.46	20.54
50	23.63	23.18	22.35	21.54
75	24.60	24.14	25.62	23.36
90	26.18	24.85	28.32	23.50
99	29.37	26.55	28.88	23.50
Arm curl test				
10	7	7	5	8
25	9	9	7.25	8
50	11	11	9	11
75	13	13	11.25	13.5
90	17	17	17.8	14
99	22.6	21	19	14
Chair stand test				
10	9	9	7	8
25	11	10	8	8
50	15	13	9	10
75	19	17	10	10
90	22	19.2	10.7	11
99	25.52	24	11	11
Back scratch test				
10	-18.2	-21	-20	-42
25	-12	-14.5	-15	-36
50	-6	-10	-8.5	-18
75	0	-3	-2.5	-12
90	0	0	2.2	0
99	1.56	0	4	0
Chair sit and reach test				
10	-23	-24.2	-24.1	-24
25	-19	-20	-12	-23
50	-13	-12	-8	-20
75	-9	-8	-5	-14
90	-5	-3.8	-2.6	-9
99	0	15.02	-2	-9
8- foot up and go test				
10	6	6	5.86	9.1
25	6.1	6.45	7.2	10.55
50	7	7.2	8.3	13.2
75	8.2	8.95	12.02	18.55
90	9	10.14	13.8	19.8
99	12.62	12	13.8	19.8
2 minute step test				
10	39	30.8	35	20
25	51	41	48	39
50	67	54	53.5	50
75	82	70	60	60
90	99	87	75.2	60
99	120	116.58	80	60

[Table/Fig-7]: Age group percentiles of physical fitness test in elderly men.

Percentiles	Age group		
	65-69 years	70-74 years	75-79 years
	N=100	N=14	N=2
BMI			
10	17.48	19.02	22.93
25	18.16	19.57	22.93
50	20.31	23.23	22.93
75	24.22	25.93	22.93
90	26.31	28.93	22.93
99	28.22	28.93	22.93
Arm curl test			
10	8.1	8.5	7
25	11	10	7
50	14	12.5	7
75	18	14.25	7
90	21	15.5	7
99	24.99	16	7
Chair stand test			
10	9	8	5
25	10	8	5
50	12.5	9.5	5
75	17	11	5
90	20	14	5
99	23.99	14	5
Back scratch test			
10	-18	-27.5	-34
25	-14.75	-19.75	-34
50	-10	-12	-34
75	-4.25	-5	-34
90	0	-3.5	-34
99	10.89	-3	-34
Chair sit and reach test			
10	-19	-37	-24
25	-10	-21	-24
50	-7	-19.5	-24
75	-5	-5.75	-24
90	-3.1	-2.5	-24
99	14.95	0	-24
8- foot up and go test			
10	6	5.55	20.3
25	6.72	7.37	20.3
50	7.7	10.7	20.3
75	9	14.5	20.3
90	11.46	21.9	20.3
99	13.3	21.9	20.3
2 minute step test			
10	43	35	37
25	49.25	45.25	37
50	64	52	37
75	76.5	60.75	37
90	85	64	37
99	98.92	64	37

[Table/Fig-8]: Age group percentiles of physical fitness test in elderly women.

while those in the age group above 80 years performed the least (37±0). The results of the test performance for elderly females are shown in [Table/Fig-4].

Rate of age related changes among elderly male showed marked changes in percentage over arm curl test (-15.9%), chair stand test (-34.91%), chair sit and reach test (-27%) and 8 foot up and go test ((20%) in 70-74 vs. 75-79 years age group , whereas in flexibility testing (back scratch test) marked changes (131.4%) between 75-79 and 80 years above group indicating age related physical fitness decline occur faster after 70 years and above [Table/Fig-5].

In elderly females, more pronounced changes in body mass index of 9.46% between 65-69 vs. 70-74 age group was observed. The arm curl, chair stand, back scratch, 8-foot up and go, and 2 minute step test showed decrease in performance when compared over progressive age groups.

Also, age related changes of 157% were observed in upper back flexibility testing (Back scratch test) between 70-74 and 75-79 years age group [Table/Fig-6].

The 10th, 25th, 50th, 75th, 90th and 99th percentile score equivalent for men and women separately for all age group on each test item are shown in [Table/Fig-7,8]. A percentile represents the point in

a distribution of score below which that given percentage of score fall. Using this information, individual scores within a distribution are considered normal if they fall between 25th and 75th percentiles. Scores below the 25th percentiles are interpreted as below average, and score above the 75th percentile as above average. For example, upper body strength of a 68 years elderly male would be considered normal if he scored 12 on the arm curl test, whereas elderly male of the same age who scored 14 on the arm curl test would be considered as having above average upper body strength for his age group.

DISCUSSION

The published literature on clinical geriatric research in India primarily revolves around morbidity pattern of elderly population and there is paucity of literature related to physical fitness. Therefore, the main goal of this study was to evaluate the normative values and level of physical fitness of community dwelling elderly in the Northeastern region of India.

The most pronounced observation from this study is the relative consistent and progressive decline in performance on all test variables for both men and women. The mean BMI of all elderly men and women were 23.2±2.03 and 21.5±3.42 respectively. Although there are no clearcut body mass index standard for elderly, those with BMI of 20-25 are generally considered to be in the healthy range, whereas those with values either below or above these value may be at increased risk for disease or functional limitation [10].

In our study, we found that in the male population, those aged between 75-79 years showed a lower strength for both arm curl and chair stand test in comparison to those aged 80 years and above. In comparison to that in the female population, there was uniform decrease in muscle strength of upper and lower extremities with progressive increase in age. Decrease in muscle strength during the aging process is the result of significant loss and atrophy of muscle cells, which may cause the decrease in physical activity but also increase the risk of falls and injuries in older people [11]. Sarcopenia is a multifactorial process and one of the commonest age related changes in elderly people. A reduction in endocrine function, physical activity and inadequate nutrition, all play an important role in the reduction of muscle mass with normal aging. This involuntary loss of muscle mass, strength, and function is a fundamental cause of and contributor to disability in older people [12].

The result for flexibility testing among elderly men showed higher scores in the chair sit and reach test, a test used for assessing lower body flexibility, on comparison to back scratch test, which is a test for determining upper body flexibility. While interpreting the values of flexibility tests, lower the values obtained better the flexibility. This indicated that elderly men showed better scores in upper body flexibility test compared to lower body flexibility tests. In comparison to this in elderly women, upper limb flexibility was less than lower limb. Also in age group 70-74 and 75-79 years, upper and lower limb flexibility of elderly women were less against the elderly men counterpart. This variation may occur due to difference in sample size of men and women and lesser sample of elderly women. Overall elderly people (men and women) tend to be less flexible than their younger counterparts, and women tend to be in general less flexible than men of the same age group which is similar to findings in previous studies [11]. Metabolic alterations in the muscles and mitochondrial DNA deletion can contribute to the decline in overall fitness capacity of the elderly [13].

A linear decline in agility/dynamic balance and aerobic capacity was noted among the age group of elderly population in our study. The rate of decrease of maximal oxygen consumption is not constant throughout life, but has been shown to decrease with each decade of aging with loss of up to 10% with each decade of aging [14].

Age related changes with consideration to age group performance in elderly men and women showed that in elderly women flexibility, strength, agility/dynamic balance and aerobic capacity were less as compared to males, indicating age related changes occur faster among elderly women. This reflects that women form an area particular interest due to some gender differences accompanying aging, particularly as a result of menopause. Physiological decline, particularly a reduction in Bone Mineral Density (BMD), muscle mass, strength can possibly be attributed to oestrogen deficiency as a result of menopause [15].

In this study we estimated normative scores which reflect average scores across the general active community dwelling elderly of this region. 10th, 25th, 50th, 75th, 90th, 99th percentile score for men and women for all the age group of each test item represent the point distribution of scores below which that given percentage of score fall. For example, an arm curl test score of 11 for 65 to 69-year-old women falls at the 25th percentile point thus indicating that 25% of this age group had scores of 11 or below. The percentage of decline in fitness performance scores over two decades (65 years to 80 years and above group) exhibited by the elderly population in our studies is comparable to previously published data from United states, Taiwan and Spain [7-9]. However, it must be mentioned that this percentile scores may not be always appropriate for scoring of elderly of different racial, ethnic group, or of people from different countries and also from different regions in the same country. Therefore, these normative values obtained with this study may be generalized to similar groups of elderly population.

This study has been undertaken in elderly population who are functionally independent. Further, the study has been carried out in urban population from one region of the country. Therefore there is a need for future study for assessing health related fitness for both functionally dependent and independent elderly from both urban and rural communities from different regions of the country. These are the limitations of the study

CONCLUSION

This study concluded that with aging, physical fitness decreases in men and women. Moreover, it was determined that aging results in reduction of muscle strength causing lower levels of flexibility, agility, and endurance with progressive aging. Thus their work ability and physical fitness are many times reduced. The normative values and percentile of each test score can be applicable for cross-sectional and controlled interventional studies for elderly population of this region and the inferences of this study would be able to help in assessing the physical fitness of the elderly population in this region of Indian community.

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