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The Normative Data For Trunk Extensor Strength In Elder Population: A Pilot Study

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ABSTRACT

INTRODUCTION: Trunk strength is important for performing everyday activities. Functionally the trunk is a kinetic link between upper and lower extremities.Trunk extensor strength helps to maintain the spine stable during walking;vital in elderly individuals.Hence the objective quantification of trunk extensor strength is must and Modified Sphygmomanometer Test (MST) is suitable alternative in the clinical setting for use. So, this study is aimed to determine the normative reference values for trunk extensor strength in elder population thus establishing clinical norms for the elderly aged 60 and above.

MATERIALS AND METHOD :

In this observational pilot study, 60 individuals where divided into two groups comprising of 30 individuals in each group. Normative data for trunk extensor strength will be developed based on 6 different sub groups in each group of men and women.Modified Sphygmomanometer Test (MST) will be used to measure the trunk extensor strength,respectively.

RESULTS :

There was a significant age dependent decrease in trunk extensor strength in both men and women. The mean of trunk extensor strength by Sphygmomanometer test(MST) in age group of 60-69,70-79 and 80-89 are 33.28,29.5 and 21.5 in men and 34.28,25,18.75 in women respectively.

CONCLUSION :

This study adds to the normative data of Trunk extensor strength in men and women also that trunk extensor strength is age specific more in men than in female.

KEYWORDS : trunk extensor strength, elderly,isometric contraction, normative data

INTRODUCTION

Ageing is a natural process characterized by diminishing ability to function and growing susceptibility to diseases, disability, and death.Aging associated with declines in physical function results in the development of physical impairment and disability[1]. This is driven by a lifetime accumulation of molecular and cellular imbalances. By 2050, there will be approximately 25 percent more persons over the age of 65 in the world than there are currently (8.5%)[2]. Among others decreased muscle strength and deficits impact on the physical functioning in elderly population.

Trunk strength is important for performing everyday activities. Functionally the trunk is a kinetic link that transfers the torques and angular momenta between the upper and lower limbs during the execution of bodily movements as part of activities of daily living, fitness,occupational skills,travelling activities.Kasukawa et al.in 2010 found significantly lower levels of maximal back extensor strength in elderly fallers as compared to non-fallers with an age range of 60–92 years. Reduced trunk extensor strength can cause functional limitations and disability in subjects and increases the risk of onset and recurrences of low back pain[3]. Granacher et al in 2013 found a moderately significant level of correlation between the trunk muscle strength and balance in older people. They also stated a theory that a strong and stable trunk will allow more efficient use of lower extremities thus improving balance.Hence, restoring trunk muscle strength using active trunk or lumbar strengthening and stabilization exercises can reduce pain and disability,improve function and recurrences of low back pain treated with rehabilitation or spine surgery. Hence, measuring trunk extensor strength will help quantify deficits in trunk strength,individualize rehabilitation treatment based on these deficits, and record improvement with treatment[4,5].

Given the need for an objective assessment of muscular strength within clinical settings and the limitations of commonly used methods to measure this outcome, such as the manual muscle testing (MMT) and the portable dynamometer. Modified Sphygmomanometer Test (MST) is an alternative method for the clinical measurement for strength of trunk muscles.This test is different from most commonly used manual muscle test,which is subjective,descriptive and less sensitive and from the portable dynamometer which is more expensive which hinders the clinical studies. The MST provides an objective measure with the use of low cost instrument, is portable and easily accessible;so the Aneroid sphygmonamometer is commonly acquired by health professionals[6.7].

The MST has the potential to be used within clinical contexts because it uses portable and low cost equipment that is easily accessible to healthcare professionals and provides objective measurements of strength. Therefore, the establishment of this method is required.

PROCEDURE

After receiving ethics clearance from the Institutional Ethical Committee, the pilot study was conducted on patients with chronic non-specific neck pain. Participants were included according to inclusion criteria and exclusion criteria.The purpose of the study was explained, and written informed consent was obtained from all the participants.They were then segregated into two groups of men and women.

Recruitment of samples: 60 Participants were recruited from Opd setting of tertiary care hospital. This study's purpose and test method were fully explained to potential subjects, and those who volunteered to participate were included. Samples were recruited according to inclusion and exclusion criteria. They were again sub divided according to age into 3 sub groups of age criteria of 60-69,70-79 and 80-89 equally in both groups of men and women;

OUTCOME MEASURES:

Modified Sphygmomanometer Test (MST)

It is an alternative method for the clinical measurement for strength of trunk muscles.This test is different from most commonly used manual muscle test,which is subjective and from the portable dynamometer which is more expensive. MST provides an objective measure with the use of low cost instrument, is portable and easily accessible so the Aneroid sphygmonamometer is commonly acquired by health professionals. It has reliability of 0.79-0.97.

An Aneroid sphygmonamometer. which is adapted by bag method,is employed for strength measurement in mmHG as shown in figure no 1.The bag method was used in this study;the outer velcro was removed and the inflatable bladder folded and,was placed into a sewn bag. To perform a MST, the sphygmomanometer was inflated to 100mmHg,keeping the valve closed to reduce wrinkles,and then inflation was reduced to the baseline of 20mmHg thus providing a measurement interval between 20-304mmHg[6,7].

Test position for measurement of trunk extensor strength : The participant to sit on a chair without armrest and feet must be touching the ground. The therapist will inflate the aneroid sphygmomanometer mentioned above. Ask the patient to slightly flex the neck and then palpate the T1 vertebra and place the central portion of the bag of the aneroid sphygmomanometer on spinous process of T1 vertebra without applying the press on the bag then ask them to neck to previous position as shown in figure no 2. During testing the therapist provides the verbal encouragement and subjects is instructed to perform a maximum isometric contraction for 5 sec and peak force value will be noted.

Figure no. 1 : The bag of the aneroid Sphygmomanometer (unit of MST)

Figure no. 2: Therapist measuring MST on the participant

RESULT ANALYSIS :

Statistical analysis was done by using GraphPad Instat Version 3.06. A descriptive statistics test was used to compare the participants' general characteristics. The mean and standard deviation was calculated for the data according to the age group and gender. Table 1, 2 and 3 shows the normative trunk extensor strength in age group of 60-69, 70-79 and 80-89 in men. Table 4,5 and 6 shows the normative trunk extensor strength in age group of 60-69, 70-79 and 80-89 in women.

Table 1 : Trunk extensor strength in age group of 60-69 in men

60-69					
	Age	Height	Weight	BMI	MST
mean	64.28	155.28	59.42	24.42	33.28
SD	3.59	7.86	13.62	4.1	7.11

Table 2 : Trunk extensor strength in age group of 70-79 in men

70-79					
	Age	Height	Weight	BMI	MST
mean	74	151.5	64.25	27.52	29.5
SD	2.7	3.87	9.17	2.4	4.2

Table 3 : Trunk extensor strength in age group of 80-89 in men

80-89					
	Age	Height	Weight	BMI	MST
mean	82.25	152.75	55	23.55	21.25
SD	2	4.34	3.46	1.2	4.78

Table 4 : Trunk extensor strength in age group of 60-69 in women

60-69					
	Age	Height	Weight	BMI	MST
mean	62.28	152.57	57	24.5	34.28
SD	1.79	6.2	7.76	2.11	6.18

Table 5 : Trunk extensor strength in age group of 70-79 in women

70-79					
	Age	Height	Weight	BMI	MST
mean	74	149.75	56	24.9	25
SD	2.44	2.6	5.4	2..4	4.08

Table 6 : Trunk extensor strength in age group of 80-89 in women

80-89					
	Age	Height	Weight	BMI	MST
mean	82.25	152	57.5	25.1	18.75
SD	1.7	1.7	5.5	1.5	4.78

DISCUSSION :

The current study established normative reference values for mean trunk Extensor strength in elderly population between 60-90 years of age.Men and women were divided into 3 sub groups.The observed

reductions in trunk extensor strength are consistent with research demonstrating that aging is associated with sarcopenia, the progressive loss of muscle mass and strength. According to a systematic review by sarcopenia leads to reduced muscle function, which is critical for maintaining independence in older adults . The decline in trunk strength, as our results indicate, could severely impair balance and increase the risk of falls, a prevalent concern in the elderly population [8].

The significance of trunk extensor strength in functional tasks, such as walking and transitioning from sitting to standing, is well-documented. Granacher et al. (2013) emphasized that strong trunk muscles contribute to overall stability and mobility, essential for performing activities of daily living. Therefore, addressing trunk strength through targeted interventions could mitigate the functional decline commonly associated with aging[4].The variations in trunk extensor strength between genders observed in our study warrant further investigation. While women exhibited higher strength levels in the younger age group (60-69),shown in table 4; this trend reversed in older age groups. This pattern may be attributed to differences in muscle composition, physical activity levels, and health behaviors between men and women as they age. Studies suggest that hormonal differences and lifestyle factors contribute to these discrepancies in muscle strength [9,10,11].

Understanding these gender dynamics can inform tailored rehabilitation strategies, ensuring that both male and female patients receive appropriate interventions that cater to their unique needs.The implications of our findings for rehabilitation and fall prevention are substantial. Strengthening trunk extensor muscles through specific exercises may enhance stability and reduce the risk of falls, as highlighted by Suri et al. (2009), who found a significant correlation between trunk strength and balance performance in older adults. Rehabilitation programs that incorporate trunk stabilization exercises can be vital for improving balance and reducing fall risk, which is critical for maintaining independence in the elderly[5].

Furthermore, the Modified Sphygmomanometer Test (MST) offers a practical and objective means to assess trunk extensor strength in clinical settings.,This measure is accessible and reliable assessment tools are essential for effective clinical evaluation and intervention planning. The MST's cost-effectiveness and portability make it a valuable asset for healthcare professionals working with older populations[6].

Limitations and Future Research : Notwithstanding this study's importance, several drawbacks must be noted. Although sufficient for a pilot research, the sample size could restrict how far our results can be applied.Longitudinal research may also shed important light on how trunk extensor strength varies over time and how well rehabilitation techniques work. Furthermore, this study ignored other aspects of physical fitness such general muscular strength, flexibility, and cardiovascular health in favour of concentrating only on trunk extensor strength. A more thorough knowledge of older individuals' physical function may result from a more holistic approach that incorporates these components.

CONCLUSION :

This pilot study establishes a foundational understanding of trunk extensor strength in the elderly population. The normative data underscore the importance of monitoring trunk strength as a critical component of geriatric assessments. As the older adult population continues to expand, implementing strategies to enhance trunk strength will be essential for promoting functional independence and improving quality of life. Future research should build upon these findings to further elucidate the relationship between trunk strength, physical function, and successful aging.

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CONFLICT OF INTEREST : The authors asserted no conflict of interest.

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