ORIGINAL ARTICLE

Vigorous activity level and risk of sarcopenia: A study among the Wanchos of Arunachal Pradesh and Assam, India

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Abstract

Background: Sarcopenia is the progressive and generalized loss of muscle mass. Studies focusing on sarcopenia generally are limited to older adults, but recent developments have proven that the risk of sarcopenia arises from young adulthood itself. *Aim and Objectives:* This present study focuses on the risk of sarcopenia as an important health risk among the adult Wanchos of Arunachal Pradesh, a marginalised population of North-East India. *Material and Methods:* A total of 400 adult Wanchos (221 males and 179 females) ranging from 20 to 60 years of age were measured for height, weight, waist circumference, Basal Metabolic Rate (BMR), blood pressure and grip strength. Data collection on physical activity was done with the help of WHO Step-wise instrument version 3.2, 2004. *Results:* Overall, 45.25% females were found to be at risk of sarcopenia or having low muscle strength, which was significantly higher than found among the males, (4.07%). Vigorous to moderate physical activity level was found to be 1.495 times likely to increase the chances of having sarcopenia among the adult Wancho males. This was almost twice among the females. *Conclusion:* The dominant hand was found among males and females to be having low muscle strength in most of the cases, who performed mostly vigorous to moderate activity on most days in a week. Physical activity level was found to be the strongest predictor of risk of sarcopenia among the adult Wanchos, which started among the male after mid 30's and after mid 20's among the females.

Keywords: Physical Activity Level, Sarcopenia, Grip Strength, Wancho Ethnic

Introduction

Grip strength measurement is one of the important physiological measurements. Grip strength is a measure of muscular strength or maximum force/tension generated by one's forearm muscle. It can be used to assess upper body strength or whole body strength [1]. Grip strength is an indicator of the overall muscular strength, nutritional status, muscle mass and physical performance. It has also been used as the index of low muscle strength to diagnose sarcopenia as it is a better predictor of clinical outcome of low muscle mass [2].

Loss of muscle strength and physical performance is clinically termed as sarcopenia; which is a progressive and generalized loss of mass [3]. According to the European Working Party on Sarcopenia in Older People (EWGSOP) the diagnosis of sarcopenia requires low muscle mass and low muscle function (strength or physical performance). A wide range of tools were viewed for that by EWGSOP. Grip strength was the only technique recommended for assessment of the muscle strength [4]. The studies regarding sarcopenia in Asia are fewer and were conducted in Japan, China, Taiwan, Korea and Thailand. The prevalence of sarcopenia based on low muscle mass alone is greater than the current definition which required low muscle strength and poor

physical performance [3]. Asian people appear to have a higher prevalence of sarcopenia than other regions [5].

Although, loss of muscle mass generally occurs at the age of 40 years at a rate of 8% per decade and increases 15% per decade after 70 years [6], clinically the risk of sarcopenia can be seen from midlife [4]. However, since very few studies have been done in this regard, which can be considered a new development in the field of epidemiological studies, conclusive answers are still to be obtained for a consensual, age appropriate and more cross-culturally approved epidemiology of sarcopenia. This study especially focuses on the risk of sarcopenia as an important health risk among the adult Wancho, a marginalised hill tribe of Arunachal Pradesh, under the age of 60 years.

Wancho are a population living in the hills of Arunachal Pradesh and in some plain areas of Assam in India. Wancho are a completely nascent tribe and yet to be studied from their health perspective. No literature is therefore available regarding their health about this marginalised tribal group of North Eastern India. Wancho are one of the most important tribes of Arunachal Pradesh, in north eastern India. Formerly known for their headhunting practices, Wancho share cultural affinity with the Noctes of Arunachal Pradesh and Konyak of Nagaland, for what they are also known to be the part of the greater Naga tribe. The Wancho are one of the original inhabitants of Patkai hills of Longding district, Arunachal Pradesh. According to the 2011 Census of India, the population of Wancho is 56,866. They are the third largest tribe of Arunachal Pradesh. Wancho do not have their own scripts; however, they have a very strong oral tradition of their whereabouts and historical disposition. Before the arrival of Ahom, Wanchos are said to have frequent communication with the people inhabiting the plains of present day Assam. Wanchos are a very hard working population, largely dwelling on hilly terrain with average to high geographical obscurity. Living in the hills requires going uphill and downhill for every activity of their day to day life. Therefore, just walking to and from places can be considered as vigorous intensity activity for them, which involves constant upward and downward movements of the whole body. The hypothesis of this study is that being a highly physically active population Wanchos should be able to bring about some difference in their rate of loss of muscle mass.

Material and Methods

The Institutional Ethics Committee has approved the proposed doctoral work of the researcher vide reference no. GUIEC/2021/012. The present study has been conducted among the Wanchos of Arunachal Pradesh and Assam in two phases; May-June, 2018 and in January and November, 2019. The data collection was done in the two surrounding localities of Longding town; Niaunu and Zedua, RUSA village of Kanubari block, Nitong village of Tirap district, in Arunachal Pradesh and Deopani and Baregaon village of Charaideo district, in Assam.

Data collection was done with the help of purposive sampling. The sample size was calculated with the help of OpenEpi open-source software version 3.01, 2006 [7]. The sample size of the present study is a proportional representative of the total Wancho population of 56,866 (according to the 2011 Census of India). Four hundred Wancho adults, belonging to the age range from 20 to 60 years, of the present study fall under 95% confidence level

of the total population with anticipated frequency of 50% and design effect of 1.0.

A total of 400 adult Wanchos (221 males and 179 females) ranging from 20 to 60 years of age were measured for height, weight, waist circumference, Basal Metabolic Rate (BMR), blood pressure and grip strength. The data collection on physical activity was done with the help of WHO Step-wise instrument version 3.2, 2004 [8]. The questionnaire was custom devised as a survey schedule with appropriate activity related modifications. The sample was divided into 3 physical activity levels depending on their daily activity routine, i.e., vigorously active, moderately active and sedentary. This division was made with the help of the directions given by Global Physical Activity Questionnaire (GPAQ) which was specially designed by WHO for developing countries to measure physical activity.

Every subject was classified by their daily physical activities associated with work, travel, leisure time. Depending on the time invested in each of these categories, Metabolic Equivalent (MET) was calculated independently. The sum of the total MET value of the three categories was used to classify an individual in a physical activity level. Those with a MET score less than 600 in a week were considered as sedentary or physically inactive. Those who are both vigorously and moderately active throughout a week were further assessed on the basis of their independent MET for vigorous intensity and moderate intensity physical activity and put in the physical activity level according to whichever had a higher MET score. The daily household activities involving, cleaning, washing, cooking were considered as moderate intensity activity, whereas fetching water from stream, collecting firewood and daily foraging were reckoned as vigorous intensity activity. Resting time which is collected for each individual, following the guidelines of the GPAQ is exclusive of sleeping time.

Grip strength was measured with the help of a manual hand dynamometer in kilograms. A demonstration was given about the use of dynamometer to the subjects before use. Subjects were asked to stand straight with a grip on the dynamometer and fingers placed over the gripping position, dial facing upwards and the hand fully stretched out. The very first fresh attempt made by every individual was taken as the maximal capacity as after the first try, even after an interval of 10-15 minutes everyone was found to be unable to even reach the maximal capacity. Every subject was given three chances to put their grip strength on the scale. Later, the average of the three was taken as their grip strength for the respective hand. After every use the dynamometer was assessed whether it worked properly to the scale. Irrespective of the dominant hand being either right or left, subjects were found with a range of variations in grip strength. It was also noticed that dominant hand of most subjects was having considerably lesser muscle strength. Average of the both right and left hand grip strength was taken for using the Asian Working Group for Sarcopenia (AWGS) classification i.e. <26 kg for men and <18 kg for women indicates low muscle mass (at risk of sarcopenia) [6] .

Lean Body Mass (LBM) was calculated using the Boer's formula [9] given below:

Male = 0.407 * weight + 0.267 * height - 19.2

Female = 0.252 * weight + 0.473 * height - 48.3

BMR was recorded digitally with the help of Omron handheld body fat analyser. After putting the height, weight, age and sex of the subjects, they were asked to stand still and hold the device in front with both arms stretched out.

Blood pressure was measured using a digital blood pressure analyser in the early hours of the day. Individuals on medication were excluded from the study. Blood pressure levels were categorised using classification given by "The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure" (JNC 7) [10]. The sample was divided into four categories, normotensive, pre-hypertensive, hypertensive stage 1 and hypertensive stage 2. Those with <120 mmHg systolic BP and <80 mmHg diastolic BP were put in the normotensive category, those with 120-139 mmHg systolic BP and 80-89 mmHg diastolic BP were put in prehypertensive category, those with 140-159 mmHg systolic BP and 90-99 mmHg diastolic BP were put in hypertensive stage 1, and finally those with $\geqslant$ 160 mmHg systolic BP and $\geqslant$ 100 mmHg diastolic BP were put in the hypertensive stage 2 category.

Waist circumference was used for assessing the cardio-metabolic risk. A flexible circumference measuring tape was used to measure waist circumference; at a point midway between the iliac crest and the lowest rib in the standing position. Waist circumference is classified using WHO classification [11].

>94 cm (males)	Increased risk
>102 cm (males)	Substantially increased
>80 cm (females)	Increased risk
>88 cm (females)	Substantially increased

Data analysis were done with the help of MS Excel 2007 and SPSS 16.0 software. Descriptive statistics were used to calculate the frequency of basic measurements among the participants. Student's t test was applied to compare the sex wise means of the sample and Chi square test was done to see goodness of fit among the various categories in the behavioural data. Odds ratio was calculated to assess the impact of variables on low muscle mass and risk of sarcopenia.

Results

A total of 400 Wancho were assessed and analysed in Table 1 based on their basic anthropometric and physiological characters. Mean values of the anthropometric and physiological variables project higher values for males in stature, weight, waist circumference, BMR, LBM, systolic and diastolic blood pressure. Females have higher mean BMI and body fat percentage than males have. The sex wise variances for all the anthropometric and physiological variables except waist circumference, BMI and diastolic blood pressure are statistically significant. Both males and female show higher mean values for the left hand grip strength and muscle strength of both hands are significantly higher among the males than the females who are also found to be more vigorously active (69.23%) than females (31.18%). However, females are more moderately active (72.35%) than males (21.75%), similarly sedentary males (9.05%) are considerably higher than the females (1.76%). The variance across the three categories of physical activity between both the sexes is statistically significant.

The left hand in both males (70.59%) and females (78.21%) had considerably stronger muscle strength irrespective of the dominant hand being

Table 1: Descriptive statistics for anthropometric, physiological and behavioural data

Variables	Males (N 221)	Females (N 179)
Stature	160.95±5.62	150.2±5.19**
Weight	57.19±7.88	50.42±8.76**
Waist Circumference	73.65±8.26	68.69±7.15
BMI	22.09±2.92	22.39±3.69
BMR	1330.32±142.47	1135.45±154.6**
BFP	19.12±4.79	29.57±5.41**
LBM	47.41±4.62	34.33±3.63**
Systolic blood pressure	124.97±14.85	121.82±16.71*
Diastolic blood pressure	79.25±10.88	78.36±11.31
Grip strength right hand (kg)	48.33±15.91	17.12±8.69**
Grip strength left hand (kg)	54.77±15.26	23.51±9.92**
Mean grip strength	51.55±13.96	20.32±8.13
Physical activity level**		
Vigorous	153(69.23%)	53(31.18%)
Moderate	48(21.72%)	123(72.35%)
Sedentary	20(9.05%)	3(1.76%)
Stronger hand muscle strength (in kg)		
Right hand	56(25.34%)	31(17.32%)
Left hand	156(70.59%)	140(78.21%)
Equal for both hands	9(4.07%)	8(4.47%)
Low muscle strength**	9 (4.07%)	81 (45.25%)
Normal muscle strength	212 (95.93%)	98 (54.75%)
Risk of cardio-metabolic syndrome defined by WC **		
Normal	213 (96.38%)	143 (79.89%)
Increased risk	6 (2.71%)	27 (15.08%)
Substantially Increased risk	2 (0.9%)	9 (5.03%)

*Note. Here, * p<0.05, ** p<0.001 when compared to the mean values of male and female. P values were obtained by independent samples t test for anthropometric and physiological variables and chi square test for behavioural data. BMI=Body Mass Index, BMR= Basal Metabolic Rate, BFP=Body Fat Percent, LBM= Lean Body Mass*

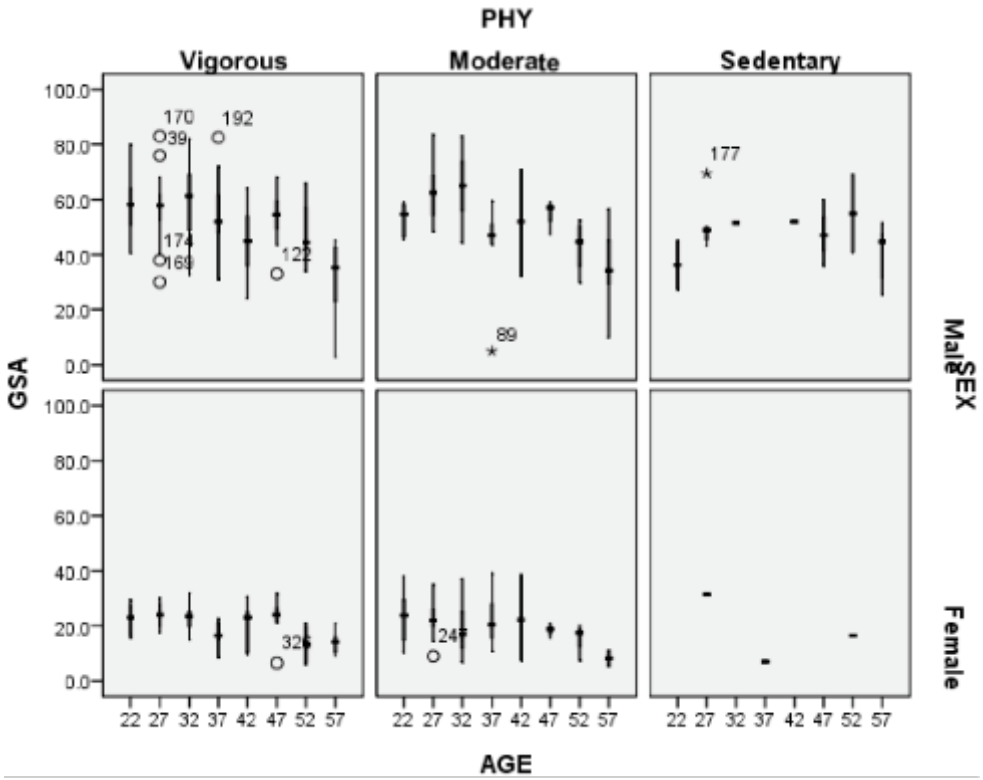

Figure 1: Age-wise distribution of adult Wancho according to grip strength and physical activity level

Note: here, GSA= grip strength average, PHY= physical activity level

either left or right. Risk of sarcopenia determined by low muscle strength has been found to be significantly higher among the females (45.25%) than the males (4.07%). Similarly, females are also significantly more at risk of cardio-metabolic syndrome than males (Increased risk; 2.71% M, 15.08% F, Substantially increased risk; 0.9% M, 5.03% F).

Figure 1 shows the age-wise distribution of adult Wanchos according to grip strength and physical activity level. The vigorously and moderately active males in their early 30's achieve the peak muscle strength which decreases afterwards. However, among the 9% sedentary males peak grip strength is achieved in 52 years (median) or in the age cohort 50-54 years. Among the females, the peak muscle strength is achieved in the early and late 20's among both moderately and vigorously active females, respectively. After which, an irregular decrease can be seen with advancing age.

Age-wise distribution of muscle strength for the adult Wanchos is shown in Table 2. The 55-60 age cohort shows the highest percentage of people having low muscle strength. The variance among the age cohorts for both the sexes is significant at .05 level. Figure 2 and Figure 3 show the age-wise trend in relationship of normal and low muscle strength among males and females with LBM and physical activity. Among the males those belonging to the median age of 57 or the age cohort 55-60 showed visible increment in LBM, having

Table 2: Age-and sex-wise distribution of adult Wancho according to muscle strength

Age group	N	Male (n=221)		N	Female (n=179)	
		Normal	Low muscle strength*		Normal	Low muscle strength*
20-24	20	20 (100%)	0	33	20 (60.61%)	13 (39.39%)
25-29	41	41 (100%)	0	36	29 (80.56%)	7 (19.44%)
30-34	34	34 (100%)	0	27	14 (51.85%)	13 (48.15%)
35-39	41	40 (97.56%)	1 (2.44%)	26	13 (50%)	13 (50%)
40-44	18	17 (94.4%)	1 (5.56%)	19	8 (42.12%)	11 (57.88%)
45-49	16	16 (100%)	0	15	8 (53.33%)	7 (46.67%)
50-54	23	23 (100%)	0	8	3 (37.5%)	5 (62.5%)
55-60	28	21 (75%)	7 (25%)	15	3 (20%)	12 (80%)

Note. Here, p<0.05, when the variability in the age cohorts in respect to normal and low muscle strength was compared.*

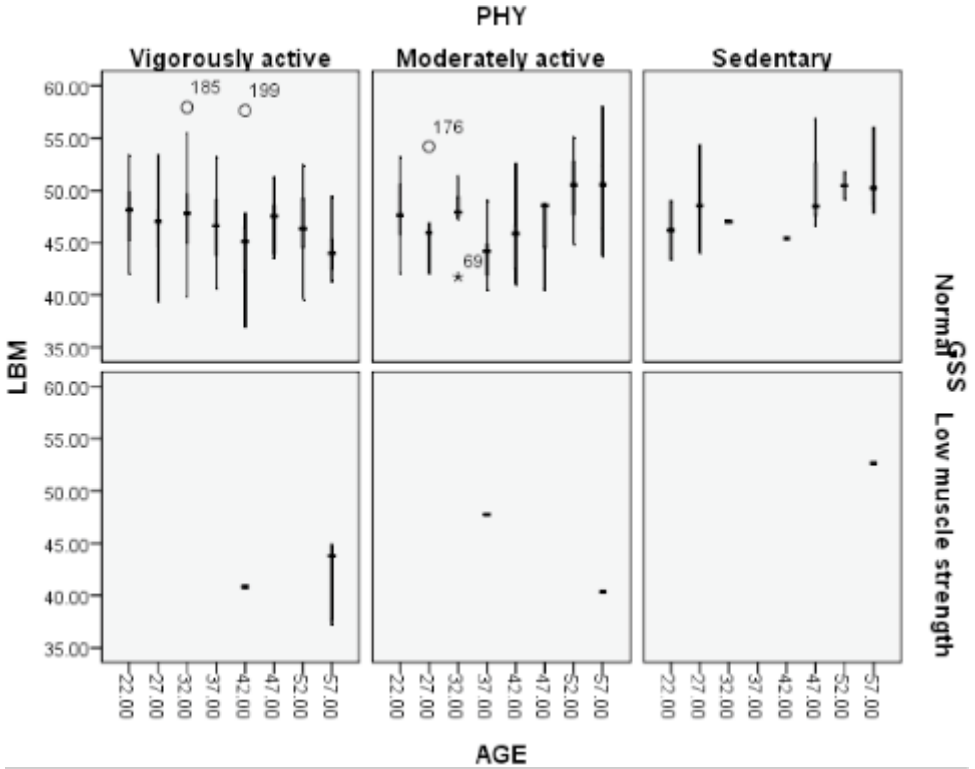

Figure 2: Age-wise distribution of adult Wancho males according to LBM, physical activity level and GSS

Note: here, LBM= lean body mass, GSS= grip strength status, PHY= physical activity level

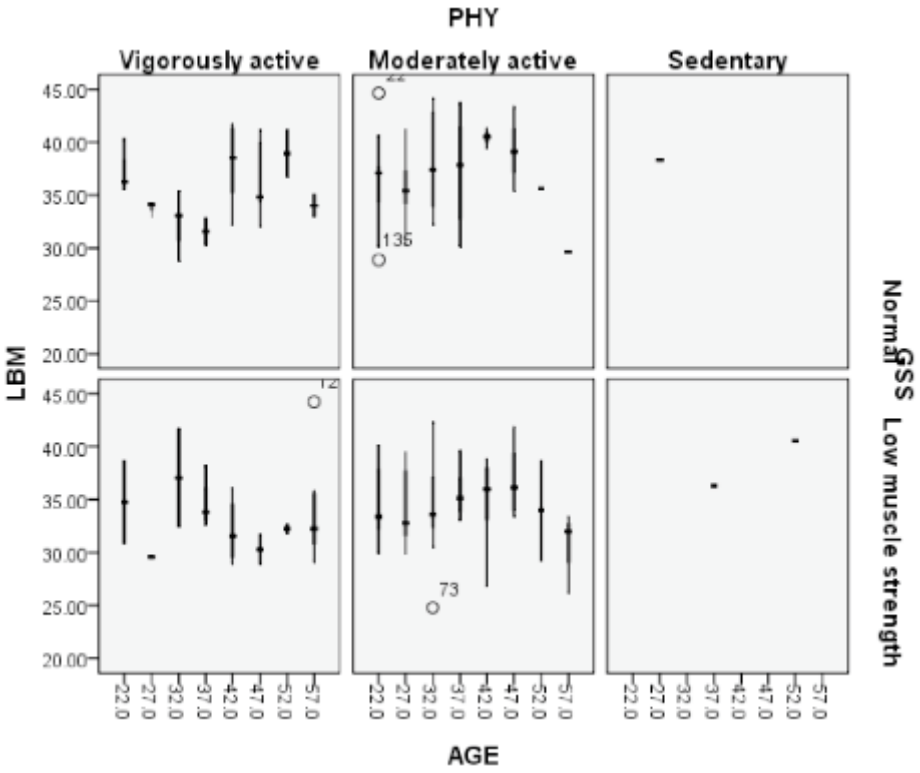

Figure 3: Age-wise distribution of adult Wancho females according to LBM, physical activity level and GSS

Note: here, LBM= lean body mass, GSS= grip strength status, PHY= physical activity level

low muscle strength and being vigorously active on most days in a week. Among the females, the LBM decreases from 30-34 till 45-49 age cohort among those with low muscle strength and also are mostly vigorously active in a week. However, among those who are mostly moderately active in a week showed gradual increment in LBM from the 25-29 to 45-49 age cohort with low muscle strength. Table 3 shows that 2.71% vigorously active males are at risk of sarcopenia, which is the highest proportion among the three physical activity levels. Among the females moderate

Table 3: Distribution of physical activity level as per muscle strength of the adult Wancho

Sex	Categories	Vigorous	Moderate	Sedentary	Total
Male (n=221)	**Normal**	147 (66.52%)	46 (20.81%)	19 (8.6%)	212 (95.93%)
	Low muscle strength	6 (2.71%)	2 (0.9%)	1 (0.45%)	9 (4.07%)
Female (n=179)	**Normal**	27 (15.08%)	70 (39.11%)	1 (0.56%)	98 (54.75%)
	Low muscle strength*	26 (14.53%)	53 (29.61%)	2 (1.12%)	81 (45.25%)

*Note. Here, * $p<0.05$, when the variability in the 3 physical activity level categories in respect to normal and low muscle strength was compared.*

activity level shows the highest percentage of females having low muscle strength (29.61%). The variance in the low muscle strength category among the physical activity levels for both the sexes is statistically significant.

The odds ratio of sarcopenia or low muscle strength shows that physical activity level is very much predictive of the low muscle strength among both males and females (Table 4, Figure 4). Physical activity level is the strongest predictor of the risk of sarcopenia among the adult Wanchos. Vigorous to moderate physical activity level is 1.495 times likely to increase the chances of having sarcopenia among the adult Wancho males. Among the female physical activity level is a stronger predictor of sarcopenia as vigorous to moderate physical activity level is almost twice (1.939) more likely to increase the chances of having sarcopenia. With increasing age the chances of having sarcopenia also increases. The odds of having sarcopenia with increasing age is 1.222 among the males and 1.037 among the females. Apart from this, waist circumference also has been found to increase the chances of having low muscle strength among the females (OR 1.076).

Table 4: Binary logistic regression analysis of sarcopenia among the adult Wancho

Sex	Variables	Exp. (ß)	Sig.	95% CI	
				Lower	Upper
Male	**Physical activity level**	1.495	0.697	0.198	11.284
	Total energy expenditure	1.000	0.907	0.999	1.001
	Basal Metabolic Rate	1.011	0.652	0.965	1.059
	Body Mass Index	0.829	0.713	0.305	2.251
	Waist Circumference	0.989	0.914	0.809	1.208
	Blood Pressure	0.967	0.947	0.356	2.623
	Lean Body Mass	0.549	0.258	0.194	1.553
	Age	1.222	0.064	0.989	1.511
Female	**Physical activity level**	1.939	0.219	0.675	5.565
	Total energy expenditure	1.000	0.772	1.000	1.001
	Basal Metabolic Rate	0.994	0.235	0.984	1.004
	Body Mass Index	0.932	0.616	0.706	1.229
	Waist Circumference	1.076	0.127	0.980	1.181
	Blood Pressure	0.888	0.585	0.580	1.360
	Lean Body Mass	0.986	0.891	0.803	1.210
	Age	1.037	0.215	0.979	1.099

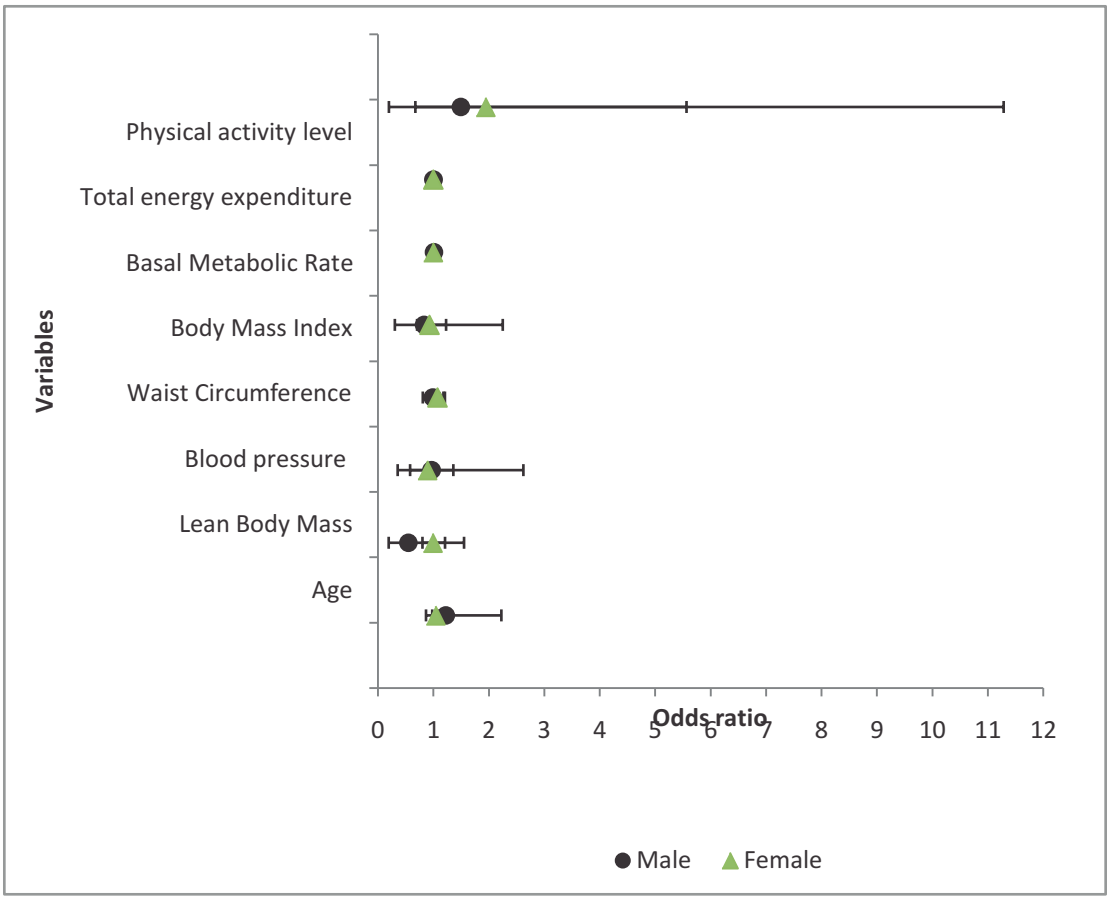

Figure 4: Probability of risk of sarcopenia among the adult Wancho

Discussion

The mean hand grip strengths in men and women are 51.55 kg and 20.32 kg respectively. The study showed that adult females (45.25%) have significantly higher risk of sarcopenia or low muscle strength than the adult males (4.07%). Yoo *et al.* (2017) [2] found similar results in their study of the Korean population, where the mean hand grip strength for males was 40.2 kg and the mean hand grip strength for females was found to be 24.2 kg. In the same study they found that the mean hand grip strength increased from 19 to 39 years of age and peaked at 34 to 39 years for both men and women. After 39 years, it was found to be in a decreasing trend. In the present study as well, a similar trend can be seen where with increasing age the percentage of those with low muscle strength also increases among the Wancho males. For both adult males and females significantly higher percentages of individuals with risk of sarcopenia are found in the age group 55-60. The odds of having sarcopenia increase more than 1 time for both the males and the females with increasing age.

The LBM among vigorously and moderately active females with low muscle strength decreases after early 30's and early 40's respectively, which is not exactly the case among the vigorously and moderately active females with normal muscle strength. This could be used as an indicator of muscle loss among the adult females. Among the males, however, slight increase in the LBM can be seen among the vigorously active males with low muscle strength from early 40's to 60's. That means among the females those who are more vigorous-moderately active in a week are also more at risk of sarcopenia, however, among the males no clear pattern is seen to attribute their activity level with low muscle mass. Similarly, among the females it was seen after the early to late 20's, the muscle strength has been decreasing in an irregular fashion in both vigorously and moderately active categories. Among the males, however, the decrease in muscle strength was seen a bit late. This is may be because of the early involvement of females in the household or cultivation related daily chores irrespective of being married or unmarried. Studies have found that the physical activity works in favour of reducing the risk of sarcopenia or muscle loss with advancing age [12-15], however, in the present study population only among the males it can be seen falling in consensus, as those with low muscle strength and vigorously active in most number of days are showing a slight increase in the LBM in the later age groups. On the other hand, among the females there is clear fall in the LBM after late 30's and early 40's among the low muscle strength category who are vigorously and moderately active in most number of days in a week, respectively. One thing that differentiates the present study with other works is that, all the published works have proved that physical activity helps in reducing the risk of sarcopenia with advancing age. They have also pointed out the intensity level and nature of the activity plays a significant role in it. All the researches says that leisure time light to vigorous physical activity works in favour of reducing the risk of sarcopenia, but nothing has been talked about moderate to vigorous physical activities which are unorganized and not directed for the attainment of a desired physique or an ideally sound and functioning health. The present study population is a kind of population that has seldom intentionally directed their daily bodily movements towards the attainment of specific goals, which aren't associated with occupational, household or basic routine activities. Most of their vigorous and moderate intensity works are unorganized in nature and rarely an adult male or female after his/her early 20's has reported intentionally engaging in leisure time physical activity. This could be a reason for present disconformity that has come up with the existing literature.

Interestingly enough, it was found among the Wancho that the left hand is much stronger than the right hand, irrespective of the dominant hand being right or left. Most of the existing literature on the other hand suggests that the dominant hand is mostly found to be stronger than the non-dominant hand [16-17]. Peterson *et al.* (1989)) [18] has discussed in their paper about the dominance of the non-dominant hand in case of both left handed and right handed groups of people. Although the prevalence of a non-

dominant hand showing greater or equal grip strength is very less in percentage, it was clearly observed that the percentage of people having stronger non-dominant hands was more among the left handed people. Most of these researches are on the sedentary population but in the present study the population is largely vigorously or moderately active in most number of days in a week. It can be articulated from this that maybe because of them being vigorous to moderately active on most days, their dominant hand (right hand in most people) which is continuously used for a variety of works, in turn has lesser muscle mass.

Cho *et al*. (2020) [19] in their study among a Korean population ⩾ 19 years, found that both energy intake/BMR and physical activity level are independently related to reduced risk of sarcopenia and showed addictive effects on reducing the risk of sarcopenia in young male and older groups. However, high physical activity was associated with an increased risk of sarcopenia in the young females with low energy intake. It has been suggested by Mijnarends *et al*. (2016) [20] that to delay the onset of sarcopenia and its potential adverse outcomes, attention should be paid to increasing physical activity levels in older adults. In the present study it has been observed that both males and females are mostly active (vigorously or moderately) most days in a week, however, among the females, 45.25% are having low muscle strength and are at the risk of sarcopenia. The present study clearly depicts that the odds of having sarcopenia among the adult females increases more than 1 time if there is an increase in the waist circumference. With every increase in the BMI as well, it is more than 1 time likely to be at the risk of sarcopenia among both males and females. Dominguez & Barbagallo (2007) [21] suggested in their study that the loss of muscle mass might also facilitate obesity and insulin resistance. If anything, we probably can articulate that among Wanchos central obesity might essentially translate into low muscle strength or sarcopenia. However, as the present population ranges from young adult to older adult, the most interesting fact that has come up among the Wanchos is that the probability of being at the risk of sarcopenia increases almost two times both in male and female with every increase in the physical activity level. The same is seen in the percentage of low muscle strength among both males and females as it is comparably higher among the vigorous and moderate intensity physical activity level than in the sedentary category. Even though the odds ratio of BMR is slightly less than 1 for both male and female, but it is a significant predictor of sarcopenia, which further proves the point that more energy expenditure (an outcome of them being more vigorous to moderately active in most of the times) equals to less muscle strength among the adult Wanchos.

Table 5: Comparison of the association of physical activity and muscle strength of the present study with published works (M= male, F= female)

Parameters	Present study	Geffken *et al*. 2001 [12]	Rolland *et al*. 2004 [22]	Moliner-Urdiales *et al*. 2010 [23]	Pollock *et al*. 1997 [15]	Cho *et al*. 2020 [19]	Mijnarends *et al*. 2016 [20]
Age cohort	20-60 yrs (M/F)	⩾ 65 yrs (M/F)	⩾ 70 yrs (F)	12-17 yrs (M/F)	M	⩾ 19 yrs (M/F)	66-93 yrs (M/F)
Sample size	400	5888	1454	363	27 (athletes)	16313	2309
Population	Wancho, India	U.S. Cardiovascular Health Studies, 1989-90 1992-93	French	Spanish	NA	Korean	Reykjavik, Iceland
Physical activity and muscle strength	Increasing levels of physical activity is associated with the low muscle strength	Increased physical activity is associated with reduced chronic inflammation among the older adults, which in turn also reduces the risk of sarcopenia.	For physically active women, lower limb strength increases with increasing BMI, due to the weight-bearing activities such as walking, gardening, etc.	Physical activity of high intensity is the only PA variable associated with greater muscular strength. The current PA recommendations does not ensure higher levels of muscular strength or fat free mass in adolescents.	The late onset of sarcopenia is observed among those older adults who exercise regularly than those healthy sedentary older adults.	High physical activity deceases the risk of Sarcopenia among the older adults and younger males. However, among the young females, high physical activity and low energy intake is associated with high risk of Sarcopenia.	Moderate to vigorous physical activity latens the onset of sarcopenia among the older adults

Conclusion

Physical activity level is the highest predictor of the risk of sarcopenia among the adult Wanchos. The prevalence of low muscle mass is significantly high among the Wancho females. For a female the chances of being at risk of sarcopenia increases almost two times depending on their physical activity level. In conclusion, occupational, household or basic routine activities comprises the majority (if not all) of the daily physical activity among the Wanchos which is associated with low muscle strength or risk of sarcopenia.

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