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## Physical fitness of women worker involved in cashew nut factory in Meghalaya

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### Abstract

Physical fitness and health have a symbiotic relationship and health of the working population denotes productivity of the nation and therefore knowledge of physical fitness and its application is of paramount importance. Selecting a representative sample of 40 women labour of cashew nut factory, and their physical fitness was assessed by employing physical characteristics and physical fitness tests. The mean Lean Body Mass, fat weight, VO<sub>2</sub> max and BMI of women workers are 33.62 Kg, 11.58 Kg, 23.22 ml/kg x min and 19.46 respectively and 92.5 percent women worker belong to mesomorphic group. Physical fitness of 75% women fell in the low average category followed by 25% in the high average in case of both step test score and VO<sub>2</sub> max. Average grip strength is 23.23 Kg. and average back strength is 39.95Kg.

**Keywords:** Physical fitness, BMI, Hand grip strength, Back strength.

### Introduction

Physical fitness is the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies (Shephard, 1986)<sup>[14]</sup>. It provides adequate energy to perform greater amount of work and also helps to recover from fatigue much faster. Individual and populations show differences in physical fitness as well as in its components, such as physical characteristics like BMI, Body composition, strength, muscular endurance, cardio-respiratory endurance, flexibility etc. It is primarily dependent on the functioning of the cardio – respiratory system and the capacity of utilization of oxygen by an individual at maximal level of physical ability and is determined by the maximum oxygen intake or maximum aerobic power or aerobic capacity (VO<sub>2</sub> max), which is regarded as a direct measure of physical fitness. Physical Fitness Index indicates the individual's status of health whereas aerobic capacity suggests the amount of oxygen that one can consume maximum while exerting the highest level of physical effort.

Meghalaya is one of the states of North East India where cashew nut (*Anacardium occidentale* L.) cultivation and processing is an important new area in case of agro-industrial development. There are many cashew nut industries set up in these areas to process raw cashew nut. The raw cashew has a very acid content (caustic oil) which can burn the skin and produce noxious fumes when heated and therefore it required to undergo an elaborate process of sun drying, roasting, breaking (shelling), heating and peeling to become suitable for consumption. The labour intensive processes are breaking (shelling) and peeling of brown skin where women are the majority of workers. Studies by different professional groups revealed that women were exploited without any consideration of workload demands, physical fitness and nutritional status as they performed dual role of bread earner and home maker. As a result, the aggregate workload placed on them is so high that it becomes incompatible with their physical fitness, leading to fatigue and thereby lowering efficiency and impairing health in long run (Bhatt E, 1988)<sup>[6]</sup>.

Women are the main working force in cashew nut factory. Therefore there should be job demand and physical fitness compatibility to improve the health status of women worker so that they can perform their activities more efficiently which will increase more productivity. Physical Fitness Index indicates the individual's status on health and it provides healthy impact on cardio-respiratory system. It can be defined as the ability of an individual to perform a given task in a specified time without any undue stress and fatigue.

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Physical fitness has three main aspects. These are static fitness (absence of diseases), dynamic fitness (ability to perform strenuous work) and motor skill fitness. Of these three, the dynamic fitness is very important for factory worker, which can be measured by Harvard Step Test. Keeping all these points in mind this study was designed to know physical characteristics and physical fitness of women worker involved in cashew nut factory.

**2. Materials and methods**

Forty healthy adult women working in cashew nut factory belonging to age group 20 to 50 years were selected as subject for the experiment. Physical characteristics was assessed by taking measurement of height, weight, body composition, body mass index (BMI) etc. by using anthropometric kit along with Herpendine skinfold caliper and physical fitness was interpreted by physical fitness index (Harvard Step Test) and by assessing VO<sub>2</sub> max. Hand grip strength was assessed by using Hand Grip Dynamometer and back strength was assessed by using Back Dynamometer, respectively. Body mass index or Quetlets index is the index used to find out the physical fitness of the Workers. It can be calculated by: (Deurenberg *et al.*, 1991)<sup>19</sup>

$$BMI = \frac{\text{Body weight (in kg)}}{\text{Height}^2 \text{ (square meter)}}$$

For assessing body composition multiple skin fold anthropometry was used. Measurements of skin fold thickness, the most commonly used technique that determines subcutaneous fat in the body was done at the triceps, biceps, subscapular and supraclavicular skin folds. These measurements were taken to derive body density, per cent body fat, fat weight and lean body mass.

Physical fitness of the subjects was recorded with the help of four methods:

1. With the use of Wooden Stool Ergometer
2. By assessing the VO<sub>2</sub> max of the subjects
3. By assessing the hand grip strength
4. By assessing the strength of back

For determining the physical fitness of selected subjects, Wooden Stool Ergometer was used which dimension was LxBxH: 45x30x24 cm. Duration of stepping activity was for 5 minutes and stepping rate was 30 steps/minute.

The transmitter of heart rate monitor was tied on the chest of the subject in a way that it was neither too tight nor too loose and the receiver of the heart rate was tied on the wrist. The subject was given enough rest and then her resting heart rate was measured. After complete rest, the subject was asked to perform the stepping activity on the wooden stool. During the stepping activity, heart rate of the subject was recorded for the entire stepping period with an interval of 1 min. each.

After 5 min. of stepping activity, the subject was asked to sit on the resting chair and their recovery pulse for 5 min. at an interval of 1 min. each was again recorded in the same way as that of stepping activity. The physical fitness score was calculated by using the following formula:

**Physical fitness Index**

$$= \frac{\text{Duration of steppings (sec.)}}{\text{Sum of I, II \& III min recovery pulse count}} \times 100$$

Scores of step stool were interpreted as below:

- Upto 80: Poor physical fitness
- 81-100: Low average
- 101-115: High average
- 116-135: Good
- 136-150: Very good
- Beyond 150: Excellent

Physical fitness on the basis of VO<sub>2</sub> max: VO<sub>2</sub> max of the selected subjects was calculated from the following linear equation (Chauhan and Saha, 1999):

$$VO_2 \text{ max (ml/kg x min)} = 0.377 \times \text{Step stool score (PFI)} - 12.767$$

The use of step test scores as a measure of physical fitness was strongly supported by many scientists in view of strong positive correlation being observed between physical fitness index (Harvard step-test score) and VO<sub>2</sub> max (Astrand and Rhyning 1954, Astrand and Rodehl 1970, Banerjee and Saha 1970)<sup>13, 4, 5</sup>. Based on VO<sub>2</sub> max, the level of physical fitness of the subjects was classified as follows:

VO2 max(l/min)	Level of physical fitness
Upto 15.0	Poor
16.0-25.0	Low average
26.0-30.0	High average
31.0-40.0	Good
41.0-45.0	Very good
Beyond 45.0	Excellent

Back Dynamometer was used to measure the strength of the back. It was measured by making the subject stand on the platform with their feet about 15 cm part from each other. Then they were made to hold the handles with both hands and adjust the length of chain so that their straightened back tilts at a forward angle of 30 degrees. The handle is then made to pull by gradually raising their upper body taking care that their legs were not bent at the knee. The results were compared to “Standard Values of Physical Strength of the Japanese 2000” by the Standard Physical Strength Survey Team, Tokyo Metropolitan University.

**3. Results and discussions**

**3.1 Physical characteristics:** Physical characteristics of the women worker involved in cashew nut factory are presented in the Table 1 and it reveals that the mean age of all the women workers was 34.55 years, mean weight was 45.53 kg with 153.08 cm height. The mean of the Lean Body Mass of women workers was 33.62 kg and fat weight was 11.58 kg., VO<sub>2</sub> max of the respondents was 23.22 and the Body Mass Index (BMI) was 19.46 which can be considered as normal category (Table 1). Borah *et.al*, 2001 also found BMI of rural women of Assam involved in the activity of sun drying of grain was 19.8 which was also in normal category.

**Table 1:** Physical characteristics of women worker involved in cashew nut industry

Parameter	Age Group		
	20-35 yrs n=20	36-50 yrs n=20	Total (20-50 yrs) N=40
Age (yrs)	29.20	39.90	34.55
Weight (kg)	44.75	46.30	45.53
Height (cm)	152.90	153.25	153.08
Lean body mass (kg)	33.20	34.04	33.62
Fat weight (kg)	11.45	11.70	11.58
Vo2 max (ml/kg x min)	23.26	23.17	23.22
BMI	19.21	19.71	19.46

**3.2 BMI and bodt type:** Further analysis of data on BMI (Table 2) revealed that the 2.5percent of women worker belonged to Chronic Energy Deficiency Grade II (Moderate), 20 percent of them belonged to Chronic Energy Deficiency Grade I (Mild) and 77.5 percent of women worker belonged to weight normal category. After analysis of Table 3, it is observed that majority of the respondents belonged to Mesomorphic group (92.5%) with well-developed muscular skeletal system and only 7.5% of women labour belongs to

Endomorphic group (body with high fat content). Vibha & V. Sangwan (2007) [15] reported that majority of female worker of Haryana are also having mesomorphic body type. Kishtwaria & Aruna (2007) also found that hill farm women of Himachal Pradesh had normal BMI (22.85±3.91) and maximum women had well-built body i.e. mesomorph body (63.33%), 33.33% had ectomorph body and very few i.e. 3percent women had obese body (endomorph).

**Table 2:** Body Mass Index of women worker involved in the Cashew Nut Industry (in percentage).

BMI class	Presumptive diagnosis	Age group		
		20 – 35 yrs n=20	36 - 50 yrs n=20	Total (20 – 50 yrs) N=40
16.0	* CED Gr. III (Severe)	-	-	-
16.0 – 17.0	* CED Gr. II (Moderate)	5	-	2.5
17.0 – 18.5	* CED Gr. I (Mild)	20	20	20
18.5 – 25.0	Weight normal	75	80	75.5
25.0 – 30.0	Obese (Grade I)	-	-	-
Above 30.0	Obese (Grade II)	-	-	-

(\*CED stands for chronic energy deficiency)

**Table 3:** Body Type of the respondents involved in Cashew Nut Industry

Age Group	Score	Body Type	Percentage (%)
20-35 yrs n=20	< 21.50	Ectomorphic	0
	21.50 – 25.00	Mesomorphic	95.00
	>25.00	Endomorphic	5.00
36-50 yrs n=20	< 21.50	Ectomorphic	0
	21.50 – 25.00	Mesomorphic	90.00
	>25.00	Endomorphic	10.00
Total (20-50 yrs) N=40	<21.50	Ectomorphic	0
	21.50 – 25.00	Mesomorphic	92.50
	> 25.00	Endomorphic	07.50

**3.3 Physical fitness:** Physical fitness of the subjects involved in cashew nut factory was determined and is presented in the Table 4. It was observed that physical fitness of 75% women fell in the low average category, which is followed by 25% in the high average in case of both step test score and VO<sub>2</sub> max. Ranjwan S. R. and Zend J.P (2007) [13] also informed that physical fitness and BMI of the majority of women subjects was below average in unorganized and self-employed sector. When both the age groups were compared, it was found that the older women (36-50 yrs) were more physically fit than the younger women. It was also indicated that none of the women in any age groups were found in good, very good and excellent fitness categories.

**Table 4:** Physical fitness of selected women involved in the Cashew Nut factory

PFI-Step Test (%)	Age Group		Total (20-50yrs) N=40
	(20-35 yrs) N=20	(36-50 yrs) N=20	
Low average	70	80	75
High average	30	20	25
PFI-VO <sub>2</sub> max (%)			
Low average	70	80	75
High average	30	20	25

**3.4 Grip strength:** Many daily functions require high activity levels of the flexor musculature of the forearms and hands often overlooked or taken for granted, the strength of one’s grip plays a key role in injury prevention and overall strength development. Physical fitness of women worker involved in shelling activity of cashew nut factory was also assessed by taking the grip strength and presented in Table 5. After analysis of the table it can be said that average grip strength of women worker of cashew nut factory is 23.23 kg., which is 7.5

kg. Less than the average standard value given by SPSST. Therefore hand grip strength as well as overall strength of women worker in cashew nut factory is not satisfactory. Hand grip strength has been correlated to nutritional status. Kenjle *et al* (2005) [10] found grip strength to be a strong predictor of an individual nutritional status. Ones nutritional status will lead to specific levels of body mass, which in turn has been found to correlate directly to grip strength.

**Table 5:** Hand grip strength of women involved in cashew nut industry

Age Group	Average hand grip strength (kg)	SD	Average standard value by SPSST (kg)	Difference (kg)
20-35 yrs n=20	24.25	2.039	31.66	- 7.41
36-50 yrs n=20	22.21	2.045	29.80	- 7.59
Total (20-36 yrs) N=40	23.23	2.042	30.73	- 7.50

**3.5 Back strength:** Back Dynamometer was used to measure the strength of the back of women involved in the selected activities of cashew nut industry. The results were compared

with “Standard Values of Physical Strength of the Japanese 2000” by the Standard Physical Strength Survey Team (SPSST), Tokyo Metropolitan University.

Results of strength of back were compiled and analyzed and are presented in the Table 6. From the Table it is revealed that on an average strength of back (kg) of women involved in Cashew nut factory was 39.95 kg which is 45.41kg less than

the standard strength of back of women of that age group. The standard value by SPSST is 85.36 kg. Therefore, the strength of back is almost half than the standard value.

**Table 6:** Average strength of back of women involved in shelling activity with average standard value by SPSST (kg)

Age Group	Average strength of back (kg)	SD	Average standard value by SPSST (kg)	Difference (kg)
20-35 yrs n=20	35.28	2.174	86.18	- 50.90
36-50 yrs n=20	44.62	2.156	84.55	- 39.93
Total (20-36 yrs) N=40	39.95	2.165	85.36	- 45.41

SPSST= Standard Physical Strength Survey Team

**5. Conclusion**

After assessing the physical fitness of the women worker involved in selected activity of cashew nut factory can be said that the physical level of the women labour was of low average. In 1990, Ahonen *et al* also observed that the VO<sub>2</sub> max on the aerobic capacity of the female farmers of Finland involved in dairy farming was below average. But Oberoi *et al* (1999) [12] observed that physical fitness of rural women of Punjab, involved in fetching water and collecting and bringing fodder was average or good. It may be due to women’s good food habit and good body structure as well as regular exercise in their field.

From the above discussion, conclusion can be drawn as the physical fitness of women involved in cashew nut factory are not very satisfactory may be due to poor nutritional status, heavy workload, less resting allowance etc and which can be improved by providing ergonomically designed tools, work layout and by organizing campaigns like nutritional awareness, family resource management etc among these factory workers. There should also be physical fitness and job demand compatibility and proper rest allowance to improve the physical fitness of women labour involved in cashew nut factory.

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