

Drudgery due to agriculture works among Sirumalai tribals

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ABSTRACT

A total of sixty families were surveyed from ten villages at Sirumalai hills of Tamilnadu. The primitive tribes of Sirumalai presents a kaleidoscopic mosaic of various socioeconomic status, drudgeries profile and health/nutrition scenario keeping in pace with improvement in their livelihood. The overall objective of the project was to reduce the drudgeries among the tribal. Continuous activities in the farm and home, without inadequate rest and use of improper agricultural tools led to increased incidence of musculoskeletal discomforts (MSDs) among them. Efforts have been taken to create awareness on use of drudgery reducing tools and use of low cost energy saving devices to improve their efficiency by reduced drudgeries. In the present study, conventional tools used for agricultural activities have been modified to reduce the discomforts and their ergonomic postures were altered by increasing the agriculture productivity.

Key Words : Drudgery, Agriculture works, Musculoskeletal discomforts

INTRODUCTION

In India, tribes have distinct health problems, mainly governed by multi-dimensional factors like their habitat, difficult terrain, ecologically variable niches, illiteracy, poverty, isolation, superstition and deforestation. Baseline survey of the tribal population revealed a low socio economic status with almost one half of the population with low level of education. Majority of the tribal people had low level of income and worked as farm laborers. Continuous activities in the farm and home without adequate rest and use of improper tools resulted in increased incidence of musculoskeletal discomforts among the tribal people. Efforts have been taken to create awareness on use of drudgery reducing tools and use of low cost energy and fuel saving devices to improve their efficiency. The conventional tools used for agricultural activities has been modified to reduce the discomforts and their by increase the productivity. Hence an integrated multidisciplinary approach has been adopted by the researchers to study the tribal health problems due to ergonomic issues.

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METHODOLOGY

Anthropometric measurements :

Anthropometric measurements are useful criteria for assessing the health and nutritional status of an individual. It is the single, universally applicable inexpensive and non-invasive method to assess the size, shape and composition of the body. Body fat percentage.

Body fat is of two basic types-storage and essential. Storage fat refers to the fat accumulated in the adipose tissue. Essential fat is stored in the lungs, heart, liver, bone marrow, kidney, muscles spleen and the central nervous system (Freedman *et al.*, 2005).

Resting metabolic rate :

Resting metabolic rate (RMR), the largest component of total daily energy expenditure, plays a significant role in the regulation of energy balance. Factors influencing RMR include age, nervous system activity ethnicity genetics. A low RMR is predictive of weight gain. RMR was assessed for the tribal people.

Blood pressure :

Hypertension is elevated blood pressure. WHO (2006) has estimated that high blood pressure causes one in every eight deaths worldwide making hypertension the third leading killer in the world. Hypertension is a condition in which systolic pressure exceeds 160 mm Hg and diastolic pressure exceeds 95 mm Hg.

Assessment of energy expenditure and heart rate of the tribals :

Heart rate monitors is a popular means to determine the degree of physical exertion. The constant fluctuations in heart rates occur due to changes in breathing rate, blood pressure, hormones, various actions of the sympathetic and parasympathetic nervous systems and emotional states, as well as working postures, environmental influences and health status, complicating the analysis of heart rate responses due to a specific activity alone.

Pulmonary function test :

Pulmonary function test was carried out for 50 farm workers at the worksite using ZAN 100 USB spirometer (Better Flow). American Thoracic Society (ATS) guidelines were followed for spirometry tests [American Thoracic Society, 1987]. The spirometry calibration (ZAN 100 USB spirometry) was carried out twice a day. Temperature, humidity and time of the day were recorded. Three tests to get flow/volume, Slow Vital Capacity (SVC) and Maximum Voluntary Ventilation (MVV) were conducted for each subject. Each subject underwent the test more than thrice, from which the best result was taken.

FEV₁ values were used to classify the severity of Chronic Obstructive Pulmonary Disease (COPD).

FEV₁ between 60 – 79% of prediction – Mild COPD.

FEV₁ between 40 -59% of prediction– Moderate COPD.

FEV₁ less than 40% of prediction– Severe COPD.

Assessment of postural discomfort :

Postural discomfort was one of the major problems of the tribals both at home and at farm level. This was assessed by using Corlett and Bishop method of body mapping, which indicates different body parts viz; upper body parts (eye, neck, shoulder joint, upper arm, elbows, wrist/hands) and lower body parts (lower arm, low back, upper leg/ thigh, knees, calf muscles, ankles, feet). The scorecard showing the value from 0-5 viz., 1-No discomfort, 2-mild, 3-moderate, 4- severe, 5- extremely severe discomfort was used to quantify the stress on the muscles. The discomfort mapping was carried out at five intervals during the day (ie.) before start of work, before tea break, before lunch, before mid afternoon tea break and before the end of work.

RESULTS AND DISCUSSION

The selected tribal population was in low socio economic status with almost one half of the population with low level of education. Majority of the tribal people had poor income and worked as farm laborers.

Anthropometric measurements of tribal :

There is a heavy burden of communicable, non-communicable and silent killer genetic diseases prevalent in tribal communities of Sirumalai. Many of the infectious and parasitic diseases can be prevented with timely intervention, health awareness, and information, education and communication (IEC) skilled activities. All the health parameters like BMI, Fat percentage, RMR, Heart rate and pulmonary function test were taken for 50 subjects who comprised of 25 tribal men and 25 tribal women.

Majority of the tribal people were with BMI of below 18.5 showing underweight which might be due to malnutrition. Only Twelve per cent were in normal weight category with BMI ranging from 18.5-22.9. Ten per cent were overweight and six per cent obese. Contrary to one side of the coin being under weight considerable per cent of twenty two per cent were secondary obese with BMI above 30. Mean fat percentage of the selected subjects was 19.49 ± 6.56 which shows that majority of the tribal had more fat percentage in their body and so falls under over weight category. The fat percentage ranged from 4.3 to 39.60 among the subjects. Though higher per cent group were underweight based on BMI, based on fat percentage recordings it is found that sixty five per cent falls under overweight category. This might be due to wrong dietary behaviours like saturated fat consumption, poor dietary fibre intake, alcohol consumption etc.

Resting metabolic rate :

RMR was 1246 ± 334 and majority of the subjects were in the normal range of Resting Metabolic rate. Thirty five per cent of the subjects had low range RMR showing that their BMR and RMR rate imposes them to have imbalanced energy expenditure inspite of heavy physical activity. This might be due to raw consumption of meat and excess alcoholic and narcotic addiction.

Blood pressure :

Mean blood pressure assessed in the tribal people was 127/96mmHg among the tribal subjects. Majority of the tribals were unaware that they had blood pressure and neglected the complications when being explained. Forty one per cent of them had a systolic pressure of 100-120 and thirty nine per cent had 80-90 diastolic pressure. Only four subjects were under medication for Blood pressure.

Sr. No	Particulars (n=50)	Minimum	Maximum	Mean	Std. Deviation
1.	Energy expenditure (kcal)	123	260	307.47	101.882
2.	Minimum heart rate (beats/min)	63	92	78.90	8.996
3.	Maximum heart rate (beats/min)	79	140	117.93	15.733
4.	Average heart rate	79	120	99.67	11.321
5.	Standard deviation	3.20	11.70	7.9300	2.10257

Heart rate of the farm workers :

Heart rate was assessed among the farm workers while at work.

Weeding is the activity invariably performed by tribal women in almost all crops. The tool used for weeding is very old and the activity is monotonous and drudgery prone. The traditional tool is kalavetti used by for hand weeding. Though better technologies have been developed they have not reached to the villages and particularly to farm women. The next drudgery agricultural prone activity performed by tribal people was fruit harvesting. Due to improper tools used by tribals like 'koduku' or 'thoratti', they had difficulties in harvesting fruits and kapok. The mean Energy Expenditure of the selected tribal subjects was 307.47±101.882. The mean Maximum Heart Rate was 117.93±15.73. The mean Average Heart Rate among the subjects was 99.67±11.321. It was found that heart rate was high among the farm workers while performing agricultural work.

Sr. No.	Body parts*	No discomfort		Mild discomfort		Moderate discomfort		Severe discomfort		Extremely severe discomfort	
		No.	%	No.	%	No.	%	No.	%	No.	%
1.	Head	-	-	-	-	-	-	-	-	159	100.0
2.	Neck	14	8.8	66	41.5	12	7.5	21	13.2	46	28.9
3.	Mid back	12	7.5	06	3.8	71	44.7	16	10.1	54	34.0
4.	Low back	46	28.9	30	18.9	21	13.2	04	2.5	58	36.5
5.	Arm	40	25.2	19	11.9	28	17.6	01	.6	71	44.7
6.	Palm	39	24.5	61	38.4	12	7.5	13	8.2	34	21.4
7.	Buttocks	34	21.4	29	18.2	47	29.6	13	8.2	36	22.6
8.	Thighs	06	3.8	18	11.3	31	19.5	31	19.5	73	45.9
9.	Knee	-	-	-	-	-	-	-	-	159	100.0
10.	Ankle	15	9.4	14	8.8	27	17.0	41	25.8	62	39.0
11.	Foot	45	28.3	15	9.4	13	8.2	03	1.9	83	52.2

(*Multiple response)

Pulmonary function test of the farm workers :

Mean FVC (actual) for men workers below 10 years was 2.36 ± 0.48 , while it was slightly decreased for workers with higher work experience 2.12 ± 1.01 . The mean FVC (actual) for women workers below 10 years work experience was 1.34 ± 0.50 liters and above 10 years of work experience was 1.21 ± 0.39 . The mean FEV₁ for men below 10 work experience was 2.36 ± 0.48 and above 10 years work experience was 2.06 ± 0.72 . The mean FEV₁ for women workers below 10 years and above 10 years were 1.24 ± 0.40 and 1.19 ± 0.40 , respectively. The result revealed that workers with higher work experience a decrease was observed in their FVC and FEV₁ values.

Thirty per cent of the respondents had recovery after complete cessation but not more than a week. Only very few of them went for medical consultation. Tribals reported that they always go for herbal treatments or just never care about the MSDs. Since they were not used to medical treatments and they have no accessibility even for deliveries and serious accidents they are least bothered for MSDs.

The details of MSDs, recovery pattern and health problems were collected using modified Nordic scale. Musculoskeletal problems are the predominant health hazards of the tribal people. This is mainly due to the household chores such as carrying water for long distances on hilly region as reported by all women and also the agricultural operations such as weeding, harvesting, carrying the harvested produces to the places poses several discomforts to the population. Many of the health problems were experienced by the tribal population and it is felt on all days at the end of the work.

Forty nine per cent had numbness in fingers, thirty nine per cent had stiff neck, fifty per cent had pain in palm, fifty one per cent had odemic fingers and upper arm pain for period of 1-7 days. Forty five per cent had blurred vision and thirty two per cent had lower arm pain for 8-30 days. Thirty nine per cent had dermatological problems, Thirty four per cent had shoulder pain and thirty five per cent had low back pain for more than 30 days but not every

Table 3 : Recovery pattern of the pain among the tribal workers

Sr. No.	Body parts*	Short break		Overnight rest		Complete cessation		Medical consult		Pills		Pain balm	
		No.	%	No.	%	No.	No.	No.	%	No.	%	No.	%
1.	Head	42	26.4	72	45.3	14	8.8	02	1.3	11	6.9	01	.6
2.	Neck	33	20.8	71	44.7	48	30.2	02	1.3	03	1.9	02	1.3
3.	Mid back	46	28.9	84	52.8	16	10.1	01	.6	10	6.3	02	1.3
4.	Low back	32	20.1	98	61.6	13	8.2	03	1.9	02	1.3	01	.6
5.	Arm	30	18.9	36	22.6	38	23.9	03	1.9	04	2.5	48	30.2
6.	Palm	37	23.3	77	48.4	36	22.6	03	1.9	01	0.6	05	3.1
7.	Buttocks	51	32.1	46	28.9	24	15.1	-	-	-	-	-	-
8.	Thighs	50	31.4	81	50.9	19	11.9	05	3.1	-	-	-	-
9.	Knee	21	13.2	40	25.2	31	19.5	01	.6	-	-	-	-
10.	Ankle	68	42.8	25	15.7	09	5.7	04	2.5	51	32.1	-	-
11.	Foot	79	49.7	62	39.0	15	9.4	-	-	-	-	-	-

*Multiple reason

day. Majority of sixty four per cent had pain in knee joints followed by thirty two per cent had pain in heel, ankle and foot more than 30 days but every day.

Tribal people frequently got involved in manual material handling tasks, associated with manuring, harvesting of crops, storage, transportation, etc. In tribal areas, loads weighing over minimum of ten to maximum of 50 kg might be carried several miles. Women and children had to fetch water and fuel wood from a long distance in unstructured path/roads and in slopes. The modes of load carrying include carrying on the head, on the hips, on the back and on the shoulder (yoke), with substantial risk of musculoskeletal strains, including spinal injuries. In general, the optimization of loads that may be lifted or carried would help in minimizing the potential risks. Comparing different modes of load carrying, Sen and Nag suggested that load carrying using transverse yoke was relatively less strenuous than the head pack and frontal yoke.

Since agricultural operations necessitate prolonged standing and bending posture, pain in the lower extremities was reported by the people. Low back pain was the next reported



Fig. 1 : Postures adopted in agricultural operations

discomfort followed by ankle and knee pain. All the tribal people reported frequent sprains in legs, neck, low back and even shoulders.

Drudgery reduction for agriculture work:

Fruits and Vegetables are the major crops at Sirumalai hills. All the tribal people were involved in agricultural activities like harvesting and weeding. Based on this to reduce the drudgeries caused by these agricultural operations a tool namely 'Ergonomic Fruit harvester' with height adjustable pole along with collector bag has been designed. The developed tool was designed in such a way that the farm workers will have reduced drudgeries. The developed tool was tested and evaluated by one of the units of CIAE situated at Coimbatore.

Conclusion :

Towards making the existing tribal livelihoods more productive, intensive efforts should be mounted to vitalize and expand the agricultural sector. Use of irrigation in agriculture with



Fig. 2 : Postures adopted in agricultural operations

a preference for organic farming, can be a major step. Training centres may be opened to impart skills for diverse occupations to the tribal. Efforts should be made to promote horticulture, animal husbandry, dairy farming, sericulture and cottage and small industry by extending the necessary technology and credit, marketing and entrepreneurial information, and training. State Govt. has to shoulder the task of marketing to ensure remunerative prices to tribal group. Education and skill formation are principal vehicles for improving the earning capacity. The various structural gaps which constrain the young people in the backward regions, rural areas and socially marginalized communities to receive quality education need to be removed without delay. This will positively impact on the economic growth by enlarging the pool of knowledge workers significantly.

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