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Research Article

Comparative Study of Effect of Farming on Anthropological Parameters among Farmers and Non-farmers

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Abstract: In most countries, agriculture is recognized as one of the most hazardous industries. Investigating the health status of agricultural workers is a challenging goal. The aim of this study was to examine the impact of physical activity and exercise on both farmers' and non-farmers health status on farm production at selected villages in Bankura district, West Bengal. In this cross-sectional study, certain anthropological parameters were compared between farmers and non-farmers living in the same rural area. Farmers and non-farmers, matched per age and sex, were selected randomly in the agricultural areas of different parts of Bankura. According to personal statements, farmers suffered from several musculoskeletal disorders and joint pains such as waist region, low back pain. BMI, HR, BP were found to be lower among farmers. Whereas their PFI scores and recovery duration were higher than non-farmers. This study also shows though farmers have more musculoskeletal disorders than normal sedentary workers, farmers are comparatively more fit than non-farmers. According to personal statements, farmers suffered from hypertension, cardiovascular and orthopaedic problems in higher frequency.
Keywords: Farming**,** health status, anthropological, musculoskeletal disorder, hypertension

INTRODUCTION

Agriculture plays a pivotal role in the Indian economy. Although its contribution to gross domestic product (GDP) is now around one sixth, it provides employment to 56% of the Indian workforce. Majority of Indian population live in rural areas, mainly depending on agriculture for their livelihood, and carry out more physical activities when compared to urban population who are accustomed to sedentary life style. Healthy body is necessary for increasing the working capacity and maintaining physical fitness of any individual to perform his daily tasks vigorously and alertly, with left over energy to enjoy leisuretime activities. It also helps to withstand stress and carry on, in circumstances where a physically unfit person could not continue.

Agricultural work is one of the highly physically demanding occupations. Farmers handle different heavy workloads, often in awkward postures and experiencing some work related musculo-skeletal disorder [1]. Some researchers has developed a perspective which identifies that farmers experience high rates of low back, shoulder, and upper extremity disorders [2]. According to Gangopadhyay *et al*. states that preadolescent agricultural workers suffered discomfort feeling (pain) in different parts of the body especially low back, knee, shoulder, hand and neck region due to working in an awkward posture for prolonged periods of time in the agricultural field [3].

Farmers and agricultural workers are believed to be the healthier and have lower morbidity and mortality rates than non-farming rural and urban populations [4-8]. This fact has been reported possibly attributable to a healthier lifestyle, especially with respect to drinking and smoking habits, more intensive physical activity and a healthier diet followed by farmers compared to non-farming populations [4, 9, 10].

On the other hand, farming itself and farming related tasks entail significant hazards to the health and well-being of farmers. Although not well appreciated, farming is among the most hazardous of occupations [11]. Farmers work long hours in hazardous and physically demanding work environments [12]. Health impairments observed on farmers is a highly controversial issue and many studies have focused on agricultural work-related factors that may have a health impact [4, 11, 13-16]. Agricultural workers are exposed to a wide range of occupational hazards, such as ergonomic stress, sunlight, viruses, inorganic dust, pesticides and other chemicals [13]. All these exposures

have been investigated as possible risk factors for the reported adverse health effects in farmers including musculoskeletal disorders, respiratory diseases, injuries, cardiovascular diseases, pesticides poisoning and neurological dysfunction [12, 13, 17].

Moreover, stress in farm workers has been recently recognized as an important public health concern. Stressors inherent in farm work and lifestyle, such as uncertain and fluctuating economic prospects are associated with poor physical and mental health outcomes and result in deleterious effects on cognitive function, depression and high rates of suicides [13, 16, 18].

In India, about 20% of the labor force population is engaged in agriculture. While agriculture is one of the most promising sectors of the Indian economy, little interest has been demonstrated in studying health and safety of the farming population. Farmers in Greece are involved in all kind of agricultural tasks [19].

MATERIALS AND METHODS

Source of data

The present study was a cross-sectional study, conducted in the different villages of an agricultural area in Bankura district of West Bengal, where about 60% of the total population deals with various cultivations. It is worth noting that the majority of the farming population in this area is indigenous and non-immigrants. The study population was acquired from 36 rural communities of the prefecture.

Method of collection of data

Sample size

A statistically adequate sample of 45 male farmers and 45 non-farmers in the age group of 25-40 years who were performed their tasks according to their occupations was selected from a process organization.

Type of work

To participate in the study, the farmers had to be at least thirty years old, so as to satisfy the criterion of long term farming (at least 10-15 years of farming), given that farmers start dealing with intensive agricultural work at the age of 17-18 years old. Non-farmers had to live in the same communities, not to be occupationally involved in farming and to match the recruited farmers *per* sex and age category.

Anthropological parameters

Measurements of body weight and height and Body Mass Index were determined by using height and weight (Quetelet Index method). BMI was calculated from self regulated weight (converted from pounds to kilograms divided by height (converted from inches to meters) squared by Quetelet Index [20-22] and their level of obesity was determined as per WHO scores (Table-1).

Measurement of pulse rate

Pulse rate is measured in right radial artery, after all participants had rested for at least 10 mins before and after exercise. Pulse rate was measured by using three fingers and for a complete minute in supine, in sitting and standing positions. The results were recorded as pulse rate per minute and then analyzed.

Measurement of Blood pressure

Blood pressure was measured by the auscultatory method in the right arm in supine, sitting and standing position by using a mercury sphygmomanometer with a cuff of 12 cm. widths. All the subjects were made to rest for at least 10 mins before taking the readings. The manometer cuff was sungly tied around the arm with tubing on the medial and the lower side. Systolic blood pressure was recorded to the nearest 2 mm of Hg at appearance of first korotkoff sound, and diastolic blood pressure was recorded to the nearest 2 mm of Hg at the disappearance of korotkoff sound. Systolic and diastolic blood pressure was recorded first in the supine position and then standing position, with cuff tied to the arm. Reading was taken in all 3 positions and was analyzed [23].

Measurement of Physical Fitness Index (PFI)

PFI was measured by modified Harvard Step test method. PFI was calculated by measuring heart rate after performing the Harvard step test (HST) developed by Brouha *et al*. in the Harvard Fatigue Laboratories using long form PFI equation [24]. But, following modified HST under Indian condition, using stool of 51 cm high stepping up and down with a rate of 30 cycles/ min for 3 minutes or up to exhaustion. Exhaustion is defined as when the subject cannot maintain the stepping rate for 15 seconds [25, 26]. The recovery pulse was counted at 1 to 1.5, 2 to 2.5 and 3 to 3.5 minutes of recovery.

Statistical analysis

The questionnaires were filled through interviews with both of the groups. For data analysis, SPSS 18, t-test and Chi-Square were used; the meaningful level was lower than 0.05 in almost all the analyses.

RESULTS

In this study it was observed that differences in the educational status among farmers and non-farmers. Usually farmers showing extremely low percentages, especially regarding secondary or higher degrees. Furthermore, higher income levels were observed in farmers than non-farmers. The percentage of heavy smokers was higher in farmers than non-farmers.

Table 2 shows the mean age of farmer was 33 ± 7 years and mean age of non-farmers were 32 ± 5. Mean height, body mass and BMI shows that both farmers and non-farmers BMI score were in healthy level as per WHO scores, and their prevalence of obesity is very minimal for both. The anthropometric measurements between both farmers and non-farmers did not show any significant change.

Mean and standard deviation of heart rate and blood pressure were recorded and it was observed that diastolic blood pressure for non-farmers were more than farmers (Table 3) (Figure-1).

Physical fitness index and their recovery period duration were measured among both farmers and non-farmers. It was found that farmers are physically more fit than the non-farmers may be due to their activities which are related with farming (Table 4). The PFI score was also statistically significant ($p<0.001$).

Farmers reported that they have more musculoskeletal symptoms than non-farmers especially in the elbow, fingers, waist regions and also sometimes in finger joints (Table 5). The differences were significant for low back and hip symptoms. The farmers reported significantly more workload, more vibrations, more heavy lifting, more difficult working positions, longer work and sleep hours, less leisure-time physical activity than the non-farmers. They also had significantly higher total muscle strength and arm strength, and had a significantly higher physical work capacity.

Table 1: WHO Classification of BMI (Sources from WHO)

BMI	Category
<18.5	Underweight
18.5-24.9	Healthy
25-29.9	Overweight
30-39.9	Obese
>40	Morbid obese

Table 2: Comparison of BMI among Farmers and non-farmers (Mean and standard deviation (S.D.) of anthropometric parameter)

Parameters	Farmers	Non-Farmers
Sample Size	45	45
Age	33±7	32±5
Sex	Male	Male
Mean Height (cm)	160.6 ± 7.08	162.5 ± 8.55
Mean Weight (kg)	58.37 ± 8.89	60.6 ± 10.15
Mean BMI	22.61 ± 2.89	22.78 ± 3.0

*Values were in (Mean ± SEM)

Table 3: Comparison of cardiovascular parameters among Farmers and non-farmers (Mean and standard deviation (S.D.) of anthropometric parameter)

Parameters	Farmers (n=45) (Mean ± SEM)	Non-Farmers (n=45) (Mean ± SEM)	p Value
HR (Beats/ min)	82.22 ± 10.62	84.46 ±18.06	p<0.05
SBP (mm of Hg)	121.06 ± 6.86	124.04 ±14.92	p<0.05
DBP (mm of Hg)	78.62 ± 3.56	80.07 ± 6.83	p<0.07
PP (mm of Hg)	42.22 ± 5.42	43.73 ± 8.27	p<0.05

*P value < 0.05 is considered significant

Table 4: Comparison of physical fitness index among Farmers and non-farmers:

Parameters	Farmers (n=45) (Mean ± SEM)	Non-Farmers (n=45) (Mean ± SEM)	P Value
Basal HR (Beats/ min)	82.22 ± 10.62	84.46 ±18.06	P<0.005
PFI score	75.1±3.10	60.9±3.90	P<0.001
Recovery period (min)	6± 2	8± 4	P<0.005

*P value < 0.05 is considered significant

Table 5: Musculoskeletal symptoms among Farmers & Non-farmers

Parameters	Farmers (n=45)	Non-Farmers (n=45)
Elbow	Yes	No
Wrist	No	No
Fingers	Yes	No
Waist region	Yes	No
Knee-joint	No	Yes
Legs finger	No	No
Low back pain	Yes	No

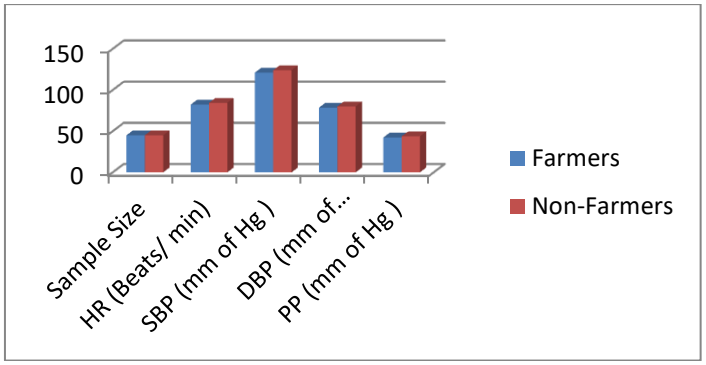

Fig-1: Graphical representation of mean cardiovascular parameters among farmers and non-farmers

DISCUSSION AND CONCLUSION

The present study gives evidence of several clinical and neurobehavioral alterations among farmers who have been involved in cultivation for a long time-period, indicating their susceptibility to certain impairments of their health status in comparison with non-farmers in the same area. Based on the participants' statements regarding their health problems, farmers mention more health issues than non-farmers at a statistically significant level ($p<0.005$). Hypertension and other cardiovascular disorders occur more frequently among farmers in comparison to non-farmers. It may due to their smoking habits (such as bidi, and alcohol consumption like haria).

Farmers and non-farmers both have several musculoskeletal disorders and joint pains such as waist region, low back pain. It may be due involvement such body parts most actively during farming. But farmers have some more pains which the non-farmers don't have. Such type of pains is elbow pain and pain in fingers.

This is a pilot study, makes an attempt to link the health & farm production in a framework of agricultural household model. The profit function approach has been adopted to analyze the issue econometrically. The analysis is, however, done both with the help of descriptive tables and econometric tools. Health status is found to be an important determinant of farm profit.

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