ORIGINAL ARTICLE

A Comparative Study of Physical Fitness among Rural Farmers and Urban Sedentary Group of Gulbarga District

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Abstract: *Introduction:* Body mass index (BMI) is one of the factor that determines health of an individual being over fat or having a higher than desirable content of fat that has a negative effect on person's health. The impact of either excess or less body fat is detrimental to health. Modern life styles have reduced physical activity in urban population in comparison with rural population. Exercise stress test is a valuable tool for evaluating physical fitness of an individual. Hence, the current study was designed to evaluate the comparative physical fitness between rural farmers and their urban sedentary counterpart in Gulbarga district. *Materials & Methods:* The study included 30 apparently healthy male rural farmers and 30 urban sedentary subjects in the age group of 20 to 30 years belonging to Gulbarga district. Anthropometric measurements were recorded, body mass index (BMI) was calculated, pre and post exercise systolic blood pressure (SBP),diastolic blood pressure (DBP), pulse pressure (PP) and mean arterial pressure(MAP), heart rate (HR), peak exercise HR, post exercise HR were recorded and percent recovery heart rate(% RHR) in beats per minute (BPM) of both groups was calculated**.** *Results:* The BMI was significantly lower ($p<0.05$) in rural farmer group compared to urban sedentary group. We found a significant increase of pre SBP ($p<0.05$), pre MAP ($p<0.05$), post SBP ($p<0.001$), post DBP ($p<0.05$), post PP ($p<0.05$), and post MAP ($p<0.001$) in urban sedentary group compared to rural farmer group. Peak HR ($p<0.001$), 1 min Post HR ($p<0.001$) was significantly decreased in rural farmer group. But % RHR ($p<0.001$) and PFI Score ($p<0.001$) were found to be significantly increased in rural farmer group compared to urban sedentary group**.** We found a negative correlation between BMI and % recovery heart rate, BMI and PFI Score in rural farmer group compared to urban sedentary group. *Conclusion:* The rural farmer group had lower BMI and less increase in peak heart rate, faster heart rate recovery after exercise, increase in PFI Score and increase in % RHR as compared to urban sedentary group. Results show a greater cardiovascular efficiency of rural farmer group of Gulbarga District of Karnataka as compared to their urban sedentary counterpart.
Key Words: rural farmer, urban sedentary, recovery heart rate, Harvard step test

Introduction

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 leisure-time activities. It also helps to withstand stress and carry on, in circumstances where a physically unfit person could not continue.

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Aerobic fitness is a key factor in maintaining healthy body composition, cardio respiratory fitness and depends on individual body mass index (BMI). BMI in late adolescence is an important predicator of coronary heart disease and stroke among men before the age of 55yrs, independent of smoking, hypertension and early cardiovascular mortality [1]. Exercise stress test gives important data about the functioning of autonomic nervous system. It has been demonstrated that heart rate profile such as resting heart rate before exercise, maximum heart rate at peak exercise, increment during exercise and decrement after exercise (heart rate recovery) are important prognostic factors [2]. Hence, the current study was aimed to assess the comparative physical fitness between rural farmers and their urban sedentary counterpart of Gulbarga district.

Material and Methods

The study composed of 30 rural farmers and 30 urban sedentary male subjects of age group 20-30 years. Anthropometrical parameters recorded. BMI (kg/m^2) was calculated by Quetelet equation and Harvard Step test was employed for calculating physical fitness index (PFI).Resting / pre exercise and post exercise (3 min after exercise) SBP, DBP, were recorded by digital blood pressure monitor (Omron BP monitor HEM 7111). Pulse pressure and mean arterial pressure were calculated accordingly. Resting / Pre exercise, Peak and Post exercise (1 min after exercise) heart rate was recorded by (Omron Digital Heart Rate monitor watch) and % recovery Heart Rate was calculated in both the groups separately by using the formula.

Peak exercise heart rate ─ heart rate after 1 min of exercise = A

Peak exercise heart rate ─ Resting heart rate = B

Percent RHR = $\frac{A}{B} \times 100$

Subjects were screened for general physical health. All subjects gave written consent to participate in the study voluntarily. The study was approved by the Institutional Ethical Committee.

Statistical analysis: The results were expressed as mean ± standard deviation (SD). A p value of <0.05 was considered statistically significant. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS-16, Chicago, USA). An independent t test was used to compare mean values. Pearson correlation was applied to correlate between the parameters.

Results

Sl. No	Parameters	Urban sedentary group (Mean±SEM)	Rural group farmers (Mean±SEM)	P value
Table-1: Anthropometric Parameters				
1	Age (Yrs)	25.9±2.3	24.9±2.5	>0.05
2	Height (cm)	165±0.03	167±0.03	>0.05
3	Weight (kg)	62.1±2.9	61.±4.3	>0.05
4	BMI (kg/m^2)	22.5±1.36	21.8±1.01	<0.05
*P value < 0.05 is considered significant				

The anthropometric measurements between two groups did not show any significant change except for B.M.I (p < 0.05) (Table 1). Percent change difference was found to be 3.11% less in rural farmer group compared to urban sedentary group. Pre-exercise SBP and MAP showed significant change (p<0.05). No significant change seen in pre -exercise DBP, PP between two study groups. Percent change difference in pre-exercise SBP, DBP, MAP showed 2.83%, 12.65%, 2.24% respectively was less but PP was 22.13% more in rural group in comparison with urban group. (Table 2)

Sl. No	Parameters	Urban sedentary group (Mean±SEM)	Rural group farmers (Mean±SEM)	P value
8	Table-2: Physiological Parameters related to blood pressure.			
1	Pre exercise SBP (mmHg)	123.5±5.37	120.0±4.96	<0.05
2	Pre exercise DBP (mmHg)	80.66±5.65	70.4±2.19	>0.05
3	Pre exercise Pulse Pressure	40.66±4.11	49.6±4.61	>0.05
4	MAP(Pre exercise)	88.9±4.26	86.9±2.58	<0.05
5	Post exercise SBP(mmHg)	149.8±7.79	141.0±5.67	<0.001
6	Post exercise DBP(mmHg)	74.5±5.09	72.6±2.74	<0.05
7	Post exercisePulse pressure (mmHg)	75.2±7.92	68.4±5.46	<0.001
8	Post exercise MAP(mmHg)	99.6±4.86	95.4±3.02	<0.001
∗P value < 0.05 is considered significant				

We found a significant change (p<0.05) in post-exercise SBP, DBP, PP, MAP between two groups. The percent change difference in post-exercise SBP, DBP, PP and MAP showed 5.87%, 2.55%, 9.04% and 4.21% respectively was less in rural group in comparison with urban group (Table 2).

Pre-exercise heart rate was not statistically significant, but there was significant change in peak and post exercise heart rate (p<0.001) between two study groups. Percent change difference in pre-exercise Resting heart rate; peak heart rate and post-exercise heart rate (1min after exercise) showed 0.14%, 11.62%, and 17.44% respectively less in rural group in comparison with urban group. The percentage Recovery heart rate between two groups was highly significant statistically (<0.001) but percent change difference showed steep rise (98.91%) in rural farmer group compared to urban sedentary group (Table 3).

Sl. No	Parameters	Urban sedentary group (Mean±SEM)	Rural group farmers (Mean±SEM)	P value
Table-3: Physiological Parameters related to heart rate				
1	Pre exercise HR (bpm)	71.2±1.54	71.1±2.35	>0.05
2	Peak exercise HR(bpm)	154.8±10.10	136.8±6.92	<0.001
3	Post exercise HR 1min (bpm)	142.70±8.53	117.8±7.06	<0.001
4	% Recovery HR (bmp) (RHR)	14.73±2.10	29.3±4.38	<0.001
∗P value < 0.05 is considered significant				

The PFI score was also statistically significant ($p<0.001$) between two groups and percent change difference showed (23.31%) more in rural group compared to urban group (Table 4). A significant negative correlation was seen between BMI and Recovery heart rate in rural farmer group compared to urban sedentary population. (Fig 2&3). We found a significant negative correlation between BMI and physical fitness index in rural farmer group in comparison to urban sedentary group (Fig 1&4).

Table-4: Physical fitness index score				
Sl. No	Parameters	Urban sedentary group (Mean±SEM)	Rural group farmers (Mean±SEM)	P value
1	PFI (Score)	60.9±3.90	75.1±3.10	<0.001
*P value < 0.05 is considered significant				

Fig-1: Correlation between BMI and physical fitness index in rural farmer group.	Fig-2: Correlation between BMI and Recovery heart rate in rural farmer group.

Correlation between BMI and PFI in rural farmer group
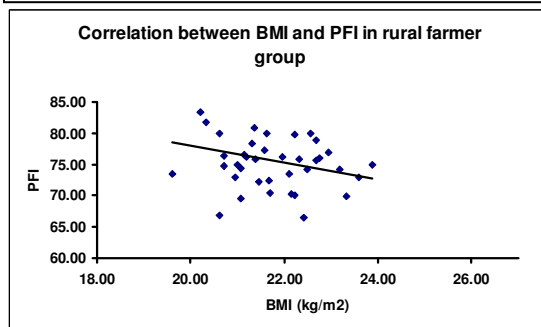

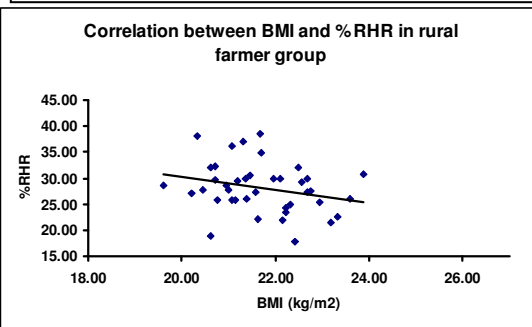Correlation between BMI and %RHR in rural farmer group

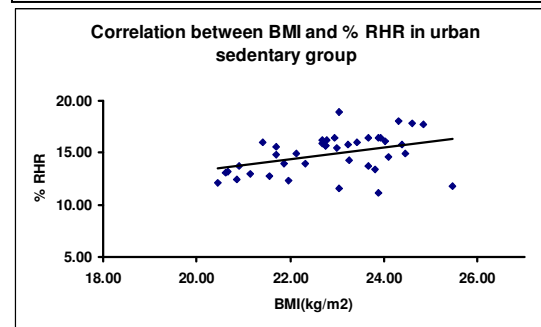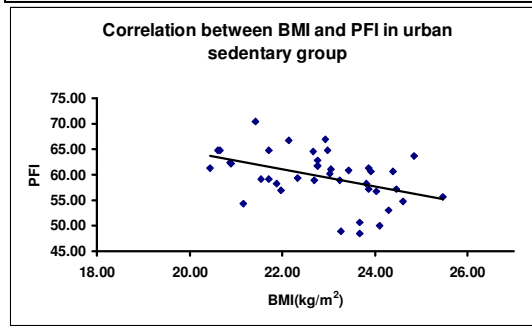| Fig-3: Correlation between BMI and Recovery heart rate in urban sedentary group.	Fig-4: Correlation between BMI and physical fitness index in urban sedentary group.

Correlation between BMI and % RHR in urban sedentary group

Correlation between BMI and PFI in urban sedentary group

Discussion

The results presented in this study demonstrates that compared to urban sedentary group, the rural farmer group had lower BMI; less increase in peak heart rate during exercise; a faster HR recovery after exercise.

These findings of exercise stress test showed increased cardio respiratory function and accelerated HR recovery after exercise. Heart rate recovery after exercise depends on several factors: like the intensity of exercise, the cardio respiratory fitness, hormonal changes and baroreflex sensitivity. In our study we observed, a much lesser BMI in rural farmer group compared to urban sedentary group, which indicates a healthy physiological status in rural population compared to urban population (Table 1). Higher the BMI signifies how overweight a person is and will guide to evaluate between overweight and under weight in an individual. Normal weight obesity, defined as the combination of normal BMI and high body fat content, is associated with a high prevalence of cardio metabolic dysregulation, metabolic syndrome, and CV risk factors [3].

Pre exercise SBP showed slight increase in urban sedentary group, which can be attributed to life style. Whereas pre exercise DBP, PP, MAP was not significant, but the post exercise SBP, DBP, MAP and PP of both rural and urban group showed significant change indicating a normal physiological and autonomic nervous system. The large increment of blood pressure during the exercise may be necessary to achieve greater work capacity. The change of blood pressure brings about reflex HR change by the arterial baroreceptors, which are important in attenuating the rapid change of blood pressure during daily perturbation [4]. Pre-exercise heart rate showed no significant change in both groups. But significant less rise of peak exercise HR with significant fall of post exercise HR has been observed in rural farmer group compared to urban sedentary group. A delayed decline of heart rate has been associated with increased risk of cardiovascular mortality, autonomic dysfunction, diabetes, endothelial dysfunction, and metabolic syndrome [5]. These results show a greater cardiovascular efficiency of rural farmer group which is further compared by less post exercise HR of rural group, the greater the fall of post exercise HR from peak exercise HR of a rural group (136.8-117.80) compared to urban sedentary group (152.6-137.40). Our result on RHR showed (12-18 bpm) fall from peak heart rate to 1 min post exercise heart rate which are similar to the previous reports, which showed that at the end of the exercise a decrease of (15-20 bpm) in the first minute of recovery has been shown to be typical for a healthy person [6].

Recovery heart rate is the heart rate measured at a fixed period after ceasing the activity; typically measured over a 1 minute period at the end of standard physical task. During the first few seconds of exercise, there is a rapid HR increase, exclusively mediated by vagal inhibition, regardless of exercise intensity. As the exercise continues, there is increasing sympathetic activity, proportional to the intensity of the exercise, which progressively accelerates the HR. Immediately after exercise, a final decreasing HR response is observed. This is as a result of vagal reactivation and a reduction in the sympathetic stimulation, with the latter contributing more effectively to the slow or late deceleration phase of post exercise HR [7]. A Similar trend was seen in our study but the rural farmer group showed a significantly faster decrease in HR from peak exercise heart rate to 1 min post exercise heart rate compared to urban sedentary group.

Since the two age-matched groups performed the exercise until exhaustion was reached, the relative intensity of exercise for the two groups may be expected to be identical. Obviously, other factors such as influences from long-term endurance life style are suggested to be responsible for the faster HR recovery after exercise in the rural farmer group. A more significant negative correlation between BMI and % RHR among rural group shows greater physiological status compared to urban group. This clearly proves that higher the BMI lowers the % RHR. Frequent and regular aerobic exercise has been shown to help prevent or treat serious and life-threatening chronic conditions such as high blood pressure, obesity, heart disease, Type 2 diabetes, insomnia, and depression [8]. The greater PFI score in rural group shows more favorable aerobic metabolism and endurance, lower resting and post exercise heart rates, which may be related to down regulation of cardiac beta adrenergic receptor. It also indicates a higher percentage of oxidative metabolisms involved in their skeletal muscle, which causes increase in number of capillaries in the muscles, resulting in better distribution of blood to muscle fiber. The net effect is complete utilization of oxygen and smaller rise in lactate production.

A highly significant negative correlation between BMI and PFI score among rural group compared to urban sedentary group indicates that BMI can be a predictor of PFI score among both groups.

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