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A Comparative Study to Evaluate the Cardiorespiratory Profile of Rheumatoid Arthritis Patients Versus Normal Healthy Volunteers in a Tertiary Care Hospital in WB

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KEYWORDS

Cardiovascular Disease, Rheumatoid Arthritis, and Cardiovascular-Respiratory Fitness.

ABSTRACT:

Introduction: Rheumatoid arthritis (RA) is a common chronic systemic rheumatic disease affecting joints, tendons, bursae and internal organs including the cardiovascular and respiratory systems. Patients with RA often show more unfortunate cardiovascular risk profiles, with higher frequencies of the metabolic syndrome and smoking history compared with the general population.

Aim and Objective: To evaluate and compare the cardiorespiratory profile of rheumatoid arthritis patients versus normal healthy volunteers in a tertiary care Hospital in WB.

Material and Method: This observational cross sectional case control study was conducted in a time span of 1 year after taking institutional ethical clearance and Informed consent of the participants. The study participants include two groups. One group is control group and other group is case group Written informed consent was obtained from all participants.

Result: In this instance, the average DBP Changes after IHT in Pre-Intervantion patients (mean±sd) was 88.4000±3.1082. The control group's mean DBP Changes Following IHT in Pre-Intervantion patients were 78.8250±3.3481 (mean±sd.) A statistically significant distribution of mean DBP Changes following IHT in the preintervention group was observed ($p \leq 0.0001$).

Conclusion: We find that, in comparison to the general population, patients with rheumatoid arthritis (RA) had an increased risk of cardiorespiratory profile and mortality. Consequently, cardiorespiratory risk factor management must be a keystone of RA treatment. Out of 160 persons in our study, the Control group's mean 6MWD (Male) and 6MWD (Female) were substantially greater than those of the C group. Although there was a modest difference in mean SBP between the Case and Control groups, the difference was not statistically significant.

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Introduction

Common chronic systemic rheumatic disease rheumatoid arthritis (RA) affects the joints, tendons, bursae, and internal organs such as the pulmonary and circulatory systems. Worldwide, rheumatoid arthritis is a disorder that affects humans. The estimated prevalence in India is 0.75 percent. Globally, the prevalence of RA is relatively stable at 0.5%–1%.

Compared to the general population, patients with RA frequently have more unfavorable cardiovascular risk profiles, including greater rates of metabolic syndrome and smoking history. Furthermore, persistent inflammation in RA is thought to have a significant role in accelerated atherosclerosis, which raises the risk of cardiovascular disease (CVD), which in turn raises the possibility of premature death in RA.

Low cardiorespiratory fitness (CRF) is a greater predictor of poor cardiovascular outcomes than established risk variables, and there is compelling evidence that CRF level influences cardiovascular health. Currently accepted as a clinical vital sign, cardiorespiratory fitness (CRF) is determined by a person's maximum oxygen uptake (VO2max). Exercise training produces an increase in cardiorespiratory fitness, especially at high intensities (CRF). Thus, by increasing appropriate physical activity (PA), improved cardiorespiratory fitness (CRF) is a significant modifiable risk factor.

Determinants of and correlates with CRF include sex, age, body composition, resting heart rate, physical activity (PA) habits, education, smoking habits, alcohol consumption, and genetics [1] Although the response to exercise may be influenced by individual factors, performing aerobic exercise is essential to improve and maintain CRF. Interventions involving regular aerobic exercise are associated with improved aerobic capacity, improved functional ability, reduced pain, and improved CVD risk profile in persons with RA [2]

The EULAR emphasizes that PA and exercise should be an integrated part of standard care for persons with RA [3] Consistent with the aerobic PA recommendations for the general population, EULAR recommends performing ≥150 minutes of PA at moderate intensity, or ≥75 minutes at vigorous intensity, or a combination of these, per week [3] Psychological, physical, social, and environmental factors may affect PA behaviour and in turn CRF. RA patients have more joint symptoms and increased prevalence of depression compared to healthy individuals Furthermore, RA patients tend to experience more work stress and interpersonal stressors than the general population, and the presence of RA can also be considered a stressor [4] These factors may explain some aspects of the lower CRF estimates among RA patients compared to controls. For example, as psychological stress has been associated with a reduction in PA and exercise in longitudinal settings, it is possible that higher levels of stress over time also lead to a reduction in fitness [5]

Material and method:

This observational cross sectional case control study was conducted in a time span of 1 year after taking institutional ethical clearance and informed consent of the participants.

Research design: Observational Cross Sectional case control. The study participants include two groups.

One group is control group and other group is case group. Written informed consent was obtained from all participants.

Case group: Diagnosed RA patients.

Diagnostic criteria:

Joint Involvement

1 Large joint 0

2-10 Large joints 1

1-3 Small joints, +/-Large joints 3

>10 Joints (at least 1 small joint) 5

Serology (need at least 1)

Negative RF, Negative Anti CCP ab 0

Low positive RF or Low positive Anti CCP ab 2

High positive RF or High positive Anti CCP ab 3

Acute Phase Reactants (need at least 1)

Normal CRP and Normal ESR 0

Abnormal CRP or Abnormal ESR 1

Duration of symptoms

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< 6 weeks 0

>6 weeks 1

≥ 6/10 Definite RA

Control group: Normal healthy volunteers.

Study area: Burdwan Medical College and Hospital (BMCH)

Inclusion Criteria:

1. Diagnosed case of RA in the age between 25 to 45 years.
2. Healthy Volunteers having same age and both sex without any prior alcohol and smoking history.

Exclusion Criteria:

1. Patients having co-morbidities other than cardiovascular and respiratory system.
2. Immunocompromised patients and patients suffered from malignancy.
3. Patients having history of previous COVID-19 infection.
4. Healthy Volunteers having previous history of Rheumatoid Arthritis or any other major diseases.

Result

Table: Distribution of mean with all parameters: Group

		Number	Mean	SD	Minimum	Maximum	Median	p-value	T Statistic
BMI	Case	80	21.95	1.9803	18	25	22	0.0086	2.662
	Control	80	21.0625	2.2295	18	25	21		
Waist-Hip Ratio	Case	80	50.075	12.7396	24	84	54	0.4562	0.7469
	Control	80	51.5875	12.874	25	87	54		
6MWD (Male)	Case	80	362.625	44.9118	300	430	380	<0.0001	28.0601
	Control	80	548	38.3983	500	610	545		
6MWD (Female)	Case	80	379.0625	40.0719	320	440	380	<0.0001	27.5126
	Control	80	581.75	52.3081	520	700	600		
Orthostatic SBP (Lying)	Case	80	138.75	6.2834	130	147	141	<0.0001	7.0705
	Control	80	129.725	9.5321	113	147	130		
Orthostatic SBP (Standing)	Case	80	119.7	4.7797	111	127	120	0.7201	0.359
	Control	80	120.025	6.5352	110	132	120		
Orthostatic DBP (Lying)	Case	80	87.8875	2.2501	85	93	88	<0.0001	7.4746
	Control	80	83.0375	5.3497	75	93	85		
Orthostatic DBP (Standing)	Case	80	76.65	2.9899	72	80	76	0.8062	0.2457
	Control	80	76.7875	4.0148	71	85	76		
SBP	Case	80	131.025	7.6174	120	141	134	0.9342	0.0827
	Control	80	131.125	7.6842	120	141	134		
HR	Case	80	85.4125	14.5739	60	100	92.5	0.2403	1.1788
	Control	80	82.7	14.5327	60	100	85		
RR	Case	80	17.975	1.3592	16	20	18	0.2123	1.2523

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	Control	80	17.7	1.4178	16	20	17.5		
DBP Changes Following IHT in Pre Intervantion	Case	80	88.4	3.1082	84	94	88	<0.0001	18.7465
	Control	80	78.825	3.3481	73	85	79		
DBP Changes Following IHT in Post Intervantion	Case	80	87.875	3.3161	83	93	88	<0.0001	20.4135
	Control	80	76.6375	3.6396	71	83	77		

In Case, the mean BMI (mean± sd.) of patients was 21.9500 ± 1.9803.In Control, the mean BMI (mean± sd.) of patients was 21.0625 ± 2.2295.Distribution of mean BMI with Group was statistically significant (p=0.0086).In Case, the mean Waist-Hip Ratio (mean± sd.) of patients was 50.0750 ± 12.7396.In Control, the mean Waist-Hip Ratio (mean± sd.) of patients was 51.5875 ± 12.8740.Distribution of mean Waist-Hip Ratio with Group was not statistically significant (p=0.4562).In Case, the mean 6MWD (Male) (mean± sd.) of patients was 362.6250 ± 44.9118.In Control, the mean 6MWD (Male) (mean± sd.) of patients was 548.0000 ± 38.3983. Distribution of mean 6MWD (Male) with Group was statistically significant (p<0.0001). In Case, the mean 6MWD (Female) (mean± sd.) of patients was 379.0625 ± 40.0719.In Control, the mean 6MWD (Female) (mean± sd.) of patients was 581.7500 ± 52.3081.Distribution of mean 6MWD (Female) with Group was statistically significant (p<0.0001). In Case, the mean Orthostatic SBP (Lying) (mean± sd.) of patients was 138.7500 ± 6.2834. In Control, the mean Orthostatic SBP (Lying) (mean± sd.) of patients was 129.7250 ± 9.5321.Distribution of mean Orthostatic SBP (Lying) with Group was statistically significant (p<0.0001). In Case, the mean Orthostatic SBP (Standing) (mean± sd.) of patients was 119.7000 ± 4.7797. In Control, the mean Orthostatic SBP (Standing) (mean± sd.) of patients was 120.0250 ± 6.5352.Distribution of mean Orthostatic SBP (Standing) with Group was not statistically significant (p<0.7201).

In Case, the mean Orthostatic DBP (Lying) (mean± sd.) of patients was 87.8875 ± 2.2501.In Control, the mean Orthostatic DBP (Lying) (mean± sd.) of patients was 83.0375 ± 5.3497.Distribution of mean Orthostatic DBP (Lying) with Group was statistically significant (p=<0.0001).In Case, the mean Orthostatic DBP (Standing) (mean± sd.) of patients was 76.6500 ± 2.9899.In Control, the mean Orthostatic DBP (Standing) (mean± sd.) of patients was 76.7875 ± 4.0148.Distribution of mean Orthostatic DBP (Standing) with Group was not statistically significant (p=0.8062).In Case, the mean SBP (mean± sd.) of patients was 131.0250 ± 7.6174.In Control, the mean SBP (mean± sd.) of patients was 131.1250 ± 7.6842.Distribution of mean SBP with Group was not statistically significant (p=0.9342).In Case, the mean DBP (mean± sd.) of patients was 99.9375 ± 8.0604.In Control, the mean DBP (mean± sd.) of patients was 99.7125 ± 7.7217.Distribution of mean DBP with Group was not statistically significant (p=0.8572). In Case, the mean HR (mean± sd.) of patients was 85.4125 ± 14.5739.In Control, the mean HR (mean± sd.) of patients was 82.7000 ± 14.5327.Distribution of mean HR with Group was not statistically significant (p=0.2403).In Case, the mean RR (mean± sd.) of patients was 17.9750 ± 1.3592. In Control, the mean RR (mean± sd.) of patients was 17.7000 ± 1.4178.Distribution of mean RR with Group was not statistically significant (p=0.2123).In Case, the mean DBP Changes Following IHT in Pre Intervantion (mean± sd.) of patients was 88.4000 ± 3.1082.In Control, the mean DBP Changes Following IHT in Pre

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Intervantion (mean± sd.) of patients was 78.8250 ± 3.3481.Distribution of mean DBP Changes Following IHT in Pre Intervantion with Group was statistically significant (p=<0.0001).In Case, the mean DBP Changes Following IHT in Post Intervantion (mean± sd.) of patients was 87.8750 ± 3.3161.In Control, the mean DBP Changes Following IHT in Post Intervantion (mean± sd.) of patients was 76.6375 ± 3.6396.Distribution of mean DBP Changes Following IHT in Post Intervantion with Group was not statistically significant (p≤0.0001).

Discussion

The present study was observational cross sectional case control study. This Study was conducted 1 year at department of pathology; Burdwan Medical College. Total 160 patients were included in this study.

Group-I-80 patients in Case

Group-II- 80 patients with Control

Stavropoulos-Kalinoglou A et al [6](2013) examined that low cardiorespiratory fitness (CRF) is a significant predictor of cardiovascular disease (CVD), and interventions aiming at increasing CRF are known to reduce CVD risk. 40 age, gender, body mass index (BMI) and disease duration matched RA patients were allocated to either an exercise (receiving 6 months individualised aerobic and resistance high intensity exercise intervention, three times per week), or control (receiving advice on exercise benefits and lifestyle changes) arm and **Banerjee S et al [7] (2020)** found that patients with rheumatoid arthritis (RA) have higher incidence of cardiovascular diseases (CVDs) compared with age- and sex-matched controls.

In our study, out of 160 patients most of the patients were 21-30 years old [93(58.1%)] Age was not statistically significant (p=0.7246). We observed that, mean Age was higher in Case group [29.6000 ± 6.8503] compared to Control group [28.4875 ± 6.6523] but this was not statistically significant (p=0.2990).

Liao KP et al [8] (2017) found that the risk of cardiovascular disease (CVD) in patients with rheumatoid arthritis (RA) is 1.5–2-fold higher than age- and sex-matched individuals from the general population.

We found that, male population was higher [126 (78.8%)] than the female population [34(21.3%)]. Male: Female ratio was 3.8:1 it was not statistically significant (p=1.0000).

Stavropoulos - Kalinoglou A et al [9] (2013) examined that low cardiorespiratory fitness (CRF) is a significant predictor of cardiovascular disease (CVD), and interventions aiming at increasing CRF are known to reduce CVD risk. 40 age, gender, body mass index (BMI) and disease duration matched RA patients were allocated to either an exercise (receiving 6 months individualised aerobic and resistance high intensity exercise intervention, three times per week), or control (receiving advice on exercise benefits and lifestyle changes) arm.

Our study showed that, mean BMI was significantly higher in Case group [21.9500 ± 1.9803] compared to Control group [21.0625 ± 2.2295] (p= p=0.0086).

Cooney JK et al [10](2019) found that rheumatoid arthritis (RA) is associated with an increased risk of cardiovascular disease (CVD). Regular exercise significantly improved CRF ($p = 0.021$), lower body strength ($p < 0.001$), agility ($p < 0.001$), systolic blood pressure ($p = 0.021$), body fat ($p = 0.018$), waist circumference ($p = 0.035$), hip circumference ($p = 0.016$), disease activity ($p = 0.002$), disability ($p = 0.007$) and QoL ($p = 0.004$).

We observed that, mean Waist-Hip Ratio was lower in Case group [50.0750 ± 12.7396] compared to Control group [51.5875 ± 12.8740] which was not statistically significant (p=0.4562).

In our study, mean 6MWD (Male) was significantly higher in Control group [548.0000 ± 38.3983] compared to Case group [362.6250 ± 44.9118] (p<0.0001).

Our study showed that, mean 6MWD (Female) was significantly higher in Control group [581.7500 ± 52.3081] compared to Case group [379.0625 ± 40.0719] (p<0.0001).

We found that, mean Orthostatic SBP (Lying) was significantly higher in Case group [138.7500 ± 6.2834] compared to Control group [129.7250 ± 9.5321] (p<0.0001).

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In our study, mean Orthostatic SBP (Standing) was lower in Case group [119.7000 ± 4.7797] compared to Control group [120.0250 ± 6.5352.] through it was not statistically significant (p=0.7201).

In our study, mean Orthostatic DBP (Lying) was significantly higher in Case group [87.8875 ± 2.2501] compared to Control group [83.0375 ± 5.3497] (p<0.0001).

Our study showed that, mean Orthostatic DBP (Standing) was slightly higher in Control group [76.7875 ± 4.0148.] compared to Case group [76.6500 ± 2.9899] but this was not statistically significant (p=0.8062).

We found that, mean SBP was slightly lower in Case group [131.0250 ± 7.6174] compared to Control group [131.1250 ± 7.6842] but this was not statistically significant (p=0.9342).

We observed that, mean DBP was slightly higher in Case group [99.9375 ± 8.0604] compared to Control group [99.7125 ± 7.7217] but this was not statistically significant (p=0.8572).

Myasoedova E et al [11](2021) found that to assess trends in incidence of cardiovascular disease (CVD) and mortality following incident CVD events in patients with rheumatoid arthritis (RA) onset in 1980–2009 vs. non-RA subjects The HR for any incident CVD in the 2000s vs. 1980s was 0.53 (95% CI 0.31–0.93). The strength of association attenuated after adjustment for anti-rheumatic medication use (HR 0.64, 95% CI 0.34–1.22). Patients with RA in the 2000s had no excess in CVD over non-RA subjects (HR 0.71, 95% CI 0.42–1.19).

In our study, mean HR was higher in Case group [85.4125 ± 14.5739] compared to Control group [82.7000 ± 14.5327] but this was not statistically significant (p=0.2403).

We showed that, mean RR was slightly higher in Case group [17.9750 ± 1.3592] compared to Control group [17.7000 ± 1.4178] through it was not statistically significant (p=0.2123).

In our study, mean DBP Changes Following IHT in Pre Intervantion was significantly higher in Case group [88.4000 ± 3.1082] compared to Control group [78.8250 ± 3.3481] (p<0.0001).

Our study showed that, mean DBP Changes Following IHT in Post Intervantion was significantly higher in Case group [87.8750 ± 3.3161] compared to Control group [76.6375 ± 3.6396] (p<0.0001).

Conclusion

We find that, in comparison to the general population, patients with rheumatoid arthritis (RA) had an increased risk of cardiorespiratory profile and mortality. Consequently, cardiorespiratory risk factor management must be a keystone of RA treatment. Out of 160 persons in our study, the control group's mean 6MWD (Male) and 6MWD (Female) were substantially greater than those of the Control group. Although there was a modest difference in mean SBP between the Case and Control groups, the difference was not statistically significant. The mean DBP in the Case group was somewhat higher than in the Control group, but this difference was not statistically significant. In our investigation, the mean HR between the Case and Control groups was greater, although the difference was not statistically significant. We demonstrated that, while not statistically significant, the mean RR in the Case group was marginally greater than in the Control group. In our investigation, the Case groups mean DBP Changes Following IHT in Pre Intervention was considerably higher than that of the Control group. The findings of our study indicate that there was a significant difference between the Case and Control groups' mean DBP Changes Following IHT in Post Intervention.

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