

**RELATIONSHIP OF ANTHROPOMETRIC MEASURES TO
VO₂MAX AND HEART RATE RECOVERY IN RECREATIONAL
ATHLETES - A CROSS SECTIONAL OBSERVATION STUDY**

by

MRUNAL RAJENDRA BHOSALE

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In

SPORTS PHYSIOTHERAPY

Under the guidance of

DR. JOSEPH OLIVER RAJ

DEAN



ABHINAV BINDRA SPORTS MEDICINE & RESEARCH INSTITUTE

Bhubaneswar, Odisha

2022-2024



DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled **“RELATIONSHIP OF ANTHROPOMETRIC MEASURES TO VO₂MAX AND HEART RATE RECOVERY IN RECREATIONAL ATHLETES - A CROSS SECTIONAL OBSERVATION STUDY”** is a bonafide and genuine research work carried out by me under the guidance of Dr. Joseph Oliver Raj, Dean, Abhinav Bindra Sports Medicine and Research Institute, Odisha.

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Place: Odisha

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Date:

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Signature of Guide:

DR. JOSEPH OLIVER RAJ

DEAN

ABSMARI



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Date:

Place: ODISHA

Signature of Co-Guide:

DR. ARPITA PANDA

ASSOCIATE PROFESSOR

ABSMARI



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Date:

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Place: ODISHA

Dr. Chinmaya Kumar Patra



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Date:

Signature

Place: Odisha

Name: Mrunal Bhosale

TABLE OF CONTENTS

SL. NO	CONTENTS	PAGE NO.
1.	Introduction	1
2.	Need of the study	5
3.	Aim and Objectives	6
4.	Hypotheses	7
5.	Review of literature	8
6.	Methodology	10
7.	Procedure	13
8.	Sample size estimation	18
9.	Results	19
10.	Discussion	23
11.	Conclusion and Limitations	26
12.	Limitations and future scope of the study	27
13.	Summary	28
14.	References	29
15.	Annexures	34

LIST OF ABBREVIATIONS

1. **ABSI:** Body shape index
2. **ANS:** autonomic nervous system
3. **BMI:** Body mass index
4. **HRR:** heart rate recovery
5. **Min:** minute
6. **PNS:** peripheral nervous system
7. **QCT:** queen's college step test
8. **Sec:** seconds
9. **VO₂MAX:** maximal oxygen uptake
10. **WC:** waist circumference
11. **WHO:** world health organization

LIST OF TABLES

SL. NO	TABLE	PAGE NO.
Table 1.	Descriptive statistics	19
Table 2.	correlation statistics	22

LIST OF FIGURES

SL. NO	FIGURE	PAGE NO.
Figure 1.	Queens college step test procedure	3
Figure 2.	Queen's college step test performed by subject.	15
Figure 3.	stopwatch, Polar heart rate monitor along with chest strap and measuring tape.	16
Figure 4.	Pie chart of Gender	20
Figure 5.	Frequency histogram of BMI	21
Figure 6.	Frequency histogram of ABSI	21

ABSTRACT

TITLE: Relationship of anthropometric measures to VO₂max and heart rate recovery in recreational athletes- a cross sectional observational study

BACKGROUND: Obesity, which is a global health crisis, increases the risk of chronic diseases like diabetes and cardiovascular disorders. Cardiovascular abnormalities can pose a threat to the health and life of not only general population but also in athletes. It can be measured by BMI and ABSI, with ABSI offering a more accurate assessment of health risks than BMI alone. Aerobic capacity plays an important role in cardiorespiratory fitness. Key indicators such as VO₂max and heart rate recovery (HRR) help assess cardiovascular health, with faster HRR after exercise linked to reduced cardiovascular risk. Asian Indians face obesity-related health risks at lower BMI levels, emphasizing the need for early assessment of cardiovascular morbidity and mortality.

METHODS: 110 recreational athletes were taken for this study. Height and weight measurements were used to calculate BMI. Waist circumference and BMI were then used to calculate the Body Shape Index (ABSI). The Queen's College Step Test was then performed and heart rate recovery was recorded after 30 seconds, 1 minute and 2 minutes.

RESULTS: There is negative correlation of BMI with Heart rate recovery at 1 minute and 2 minutes.

CONCLUSION: There is significant negative correlation between Heart rate recovery and BMI as per this study suggesting heart rate recovery can be used for screening of cardiovascular disorders in recreational athletes.

KEYWORDS- BMI, VO2 max, heart rate recovery, body shape index, cardiovascular fitness, aerobic fitness, QCT

RELATIONSHIP OF ANTHROPOMETRIC MEASURES TO VO₂MAX AND HEART RATE RECOVERY IN RECREATIONAL ATHLETES - A CROSS SECTIONAL OBSERVATION STUDY

INTRODUCTION

Obesity has reached epidemic levels worldwide in recent decades and has become a huge global health burden, contributing directly to the development of some of the most common chronic diseases, including diabetes, hypertension, hyperlipidaemia and other cardiovascular disease, being overweight or obese is one of the risk factors for cardiovascular disorders not only in general population but also in athletes.[1]

Obesity can be measured in several ways, such as BMI and ABSI. Adolphe Quetele, a Belgian polymath, created the body mass index (BMI), which is typically used to identify people who are most likely to be overweight or obese. A higher value signifies excess body fat and is usually associated with higher mortality and health risks. [2]

An increased risk of cardiovascular morbidity and mortality is also linked with BMI and A body shape index (ABSI). [3,4]

An anthropometric parameter called (ABSI) is obtained by dividing waist circumference by an allometric regression estimate of weight and height. ABSI is independent of BMI and weight in determining cardiometabolic diseases risk

and is believed to be a superior measure of relationship between body composition and all-cause mortality than using either WC or BMI alone. [3,4,5,6]

When used in conjunction with BMI rather than in place of it, the ABSI can be a useful index for assessing the relative contribution of central obesity to clinical outcomes and combining them would prevent assessing the risks associated with general and abdominal obesity separately.[4]

The prevalence of cardiovascular disease has increased over the last decade and is one of the primary causes of death worldwide. Cardiovascular disorders can be stated as a group of diseases related to the blood vessels and heart. These include cerebrovascular disease, rheumatic heart disease, coronary artery disease and coronary heart disease, which can lead to heart attack and stroke and A third of these deaths occur prematurely in adults.[7]

Regular aerobic exercise not only improves well-being, but above all reduces the risk of coronary heart disease or myocardial infarction. Because of which many countries are implementing measures to promote physical activity, among the population. Cardiovascular abnormalities can pose a threat to the health and life of athletes, not only professional athletes but also recreational athletes.[8]

Athletes' aerobic capacity plays a major role in their ability to succeed in sports. Its assessment gives information on the players' health and aids in assessing the results of training and early athlete selection. So, assessing and maintaining a high level of cardiorespiratory fitness can play a role in preventing the health from declining. [9,10]

Maximal oxygen capacity (VO_{2max}), a key physiological indicator in the healthy adult population, is a strong determinant of health and fitness which can be estimated using the Queen's College Step Test (QCT), a submaximal exercise test which evaluates cardiorespiratory fitness. [10,11,12,13,14,15]

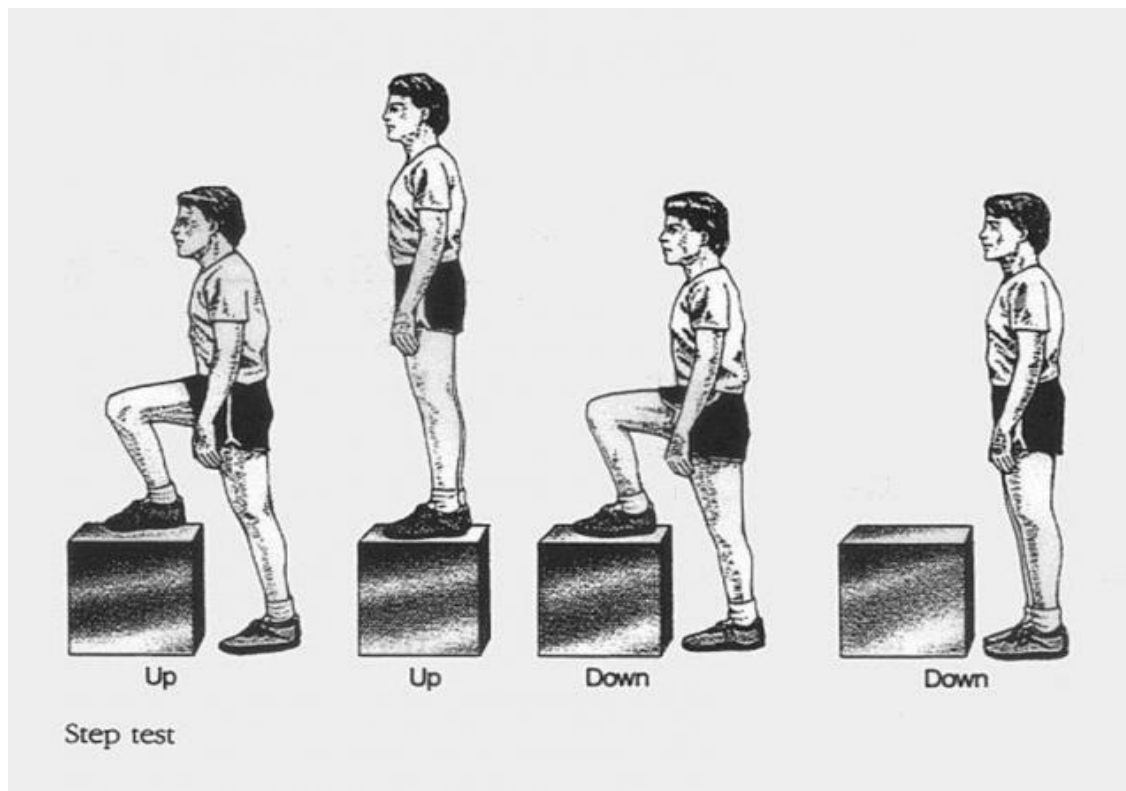


Fig1. Queens college step test procedure

Heart rate recovery (HRR) is frequently used by professionals to modify and prescribe training. It is a significant predictor of overall mortality including death from coronary artery disease. [13,16,17]

The autonomic nervous system (ANS) mediates HRR, with parasympathetic reactivation in the early phase and sympathetic activity withdrawal in the later phase controlling the rate. [9,10,17]

In general, a heart rate recovery of 12 to 22 beats or more after the first minute of stopping an exercise session is regarded as normal, however a heart rate recovery of 2 minutes or more after rest is seen as a powerful predictor of cardiovascular system-related morbidity and mortality. [18,19,20]

Ordinarily, a very quick heart rate recovery after exercise is linked to a lower risk of cardiovascular diseases, regardless of other exercise parameters. also, it has long been understood that the PNS's reactivation, which has its greatest impact in the first 30 seconds after exercise terminates, is the primary cause of interindividual HRR variations. [18,20]

NEED OF THE STUDY

- In younger populations, the prevalence of cardiovascular events has significantly increased during the past few decades and more so in the recent past especially after the Covid pandemic. So, it is necessary to assess the risk factors irrespective of age.
- Asian Indians are at risk of developing obesity related comorbidities at lower levels of body mass index when compared to international levels.[21]
- To find out overall and specifically cardiovascular morbidity and mortality risk earlier in adulthood.

AIM OF THE STUDY

To Correlate anthropometric measures like BMI and ABSI to $VO_2\text{max}$ and heart rate recovery in recreational athletes.

OBJECTIVES OF THE STUDY

- To measure BMI and ABSI.
- To calculate $VO_2\text{max}$ using the Queen's College step test.
- To calculate heart rate recovery after QCT
- To determine if $VO_2\text{max}$ and HRR are correlated with BMI and ABSI

HYPOTHESES:

Null hypotheses:

- H01: BMI and ABSI have no significant relationships with VO2max.
- H02: BMI and ABSI have no significant relationship with HRR.

Alternate hypotheses:

- H11: BMI and ABSI have significant relationships with VO2max.
- H12: BMI and ABSI have a significant relationship with HRR.

REVIEW OF LITERATURE

1. **Arifuddin MK et al.**, in 2020 studied Effect of BMI on VO₂max assessed by Queen's college step test in healthy adult males found that having an excessive amount of body fat places an unfavourable burden on heart function and the consumption of oxygen by exercising muscles. In this study, there is a substantial inverse relationship between BMI and VO₂max.
2. **S Chatterjee, P Chatterjee et al.**, in 2004 did research on validity of Queen's College step test for use with young Indian men in which he found highly significant correlation ($r = 20.96$, $p, 0.001$) existed between the recovery heart rate in QCT and VO₂max. From which he suggested that the Queen's College step test is recommended as a valid method to evaluate cardiorespiratory fitness in terms of VO₂max for large numbers in India.
3. **Fang Li, et al.**, in 2022 studied contribution of body mass index stratification for the prediction of maximal oxygen uptake. In which he advised to utilize BMI stratified models for VO₂max prediction since BMI can be used as the basis for the stratification.
4. **Yordi J. van de Vegte et al.** in 2018' study 'Heart Rate Recovery 10 Seconds After Cessation of Exercise Predicts Death'. Concluded that HRR

assessed soon (10 seconds) following the end of submaximal exercise is a good predictor of outcome than HRR recorded one minute later.

5. **Nir Y. Krakauer, et al.**, in 2017's study 'Association of body shape index (ABSI) with cardio-metabolic risk factors: A cross sectional study of 6081 Caucasian adults. Which suggests that in contrast to waist circumference, ABSI can be a helpful measure for assessing the relative contribution of central obesity to clinical outcomes in addition to, not instead of BMI.

6. **Redzal Abu Hanifah et al.**, in 2013 study 'The Correlates of Body Composition with Heart rate recovery after step test: An Exploratory Study of Malaysian adolescents' has shown that body composition measures are inversely associated with heart rate recovery in healthy Malaysian adolescent with waist circumference as the strongest predictor for boys and body fat percentage for girls respectively.

7. **Rohallah Arabmokhtari et al.**, in 2018 study 'Relationship between Body Composition and Cardiorespiratory Fitness in Students at Postgraduate Level' concluded that postgraduate students are in relatively ideal conditions of body composition, but they are in relatively weak cardiorespiratory fitness. These conditions are more in women who require notification and afterthought.

METHODOLOGY

- Study Design: Observational Study
- Sampling Technique: Purposive Sampling
- Study Population: Recreational Athletes
- Sampling Size: 110
- Study Setting: ABSMARI In Bhubaneshwar
- Study Duration: 1 year

INCLUSION CRITERIA: -

- Gender: Male and Female
- Age: 18-35 years

Recreational athletes who fall within Tegner's activity score 5 and 6.

EXCLUSION CRITERIA: -

- Subjects with history of cardiac disease, lung disease, Smoking history, neurological illness or any other chronic illness.
- Subjects with known metabolic diseases like diabetes mellitus, hypertension.

- Those on regular medications affecting cardiovascular and respiratory system.
- Subjects with any recent lower limb injury or joint pain in the past 3 months.
- Trained athletes.
- Type II and III obesity.

STUDY MATERIALS: -

- Consent form
- Information sheet
- Data collection sheet
- Measuring tape
- Metronome
- Stadiometer
- Wooden box for step test
- Measuring tape
- Weighing machine
- Heart rate monitor
- Stopwatch

OUTCOME MEASURES: -

- BMI
- ABSI (body shape index)
- Queen's college step test
- Heart rate recovery

PROCEDURE:

Ethical clearance was obtained from the ethical committee. Sample selection was based on selection criteria. Recruitment of the participants was carried out from reputed Badminton academies from Bhubaneswar in India by purposive sampling method. Voluntary participation was ensured, and written consent was obtained from the participants. Each subject's age, weight, height, and BMI was recorded, among other demographic details. Every step of the testing process was explained to the participants prior to the final data collection. The strength, endurance and balance, agility for both upper and lower extremity and core stability tests were conducted in this order throughout the entire series. To avoid tiredness, each exam was administered three times, with a 4–5-minute break in between. The following testing process were administered to the subjects:

1. BMI

To calculate BMI, height and weight was measured as per WHO protocol. Before measuring weight, subjects were asked to remove footwear, socks, any waist belts, mobile and other accessories. Weight was measured nearest to 0.1 kg using an electronic weighing machine with minimal clothing. After which height was measured using a stadiometer nearest to 0.1 cm. Then the BMI was calculated using formula: $\text{weight}/(\text{height})^2$. ICC value for height is 0.943 and that of weight is 0.977. sensitivity and specificity of BMI was found to be 80% and 92% respectively.[23]

2. ABSI

To calculate ABSI, above mentioned BMI values were taken into consideration along with waist circumference. Waist circumference was calculated without any clothing at the midpoint between lower margin of the last palpable rib and top of the iliac crest. Then ABSI was calculated using the formula: $\text{Waist circumference} \div (\text{BMI}^{2/3} \times \text{Height}^{1/2})$. [24]

3. Queen's college step test

The subject was instructed to sit for five minutes prior to the test's initiation. During that time, their pulse rate (PR) was recorded for one minute. The subject was also explained the test and given practice using metronome beats to become accustomed to the rhythm. Following a 3-minute rest period, the actual test was performed with metronome beats by alternating between stepping up and down on a 16.25-inch step bench at a rate of 24 steps per minute for men and 22 steps per minute for women for three minutes. After which, from the fifth to the twentieth seconds, their radial pulse was recorded while they were seated. High correlation $r = 0.95$, ($p < 0.00$) in males and $r = -0.83$, ($P < 0.001$) as found between the VO_2 max (ml/kg/min) and the 5th–20th second recovery heart rate post queen's college step test. Also test-retest reliability was found to be $r = 0.95$. [25].

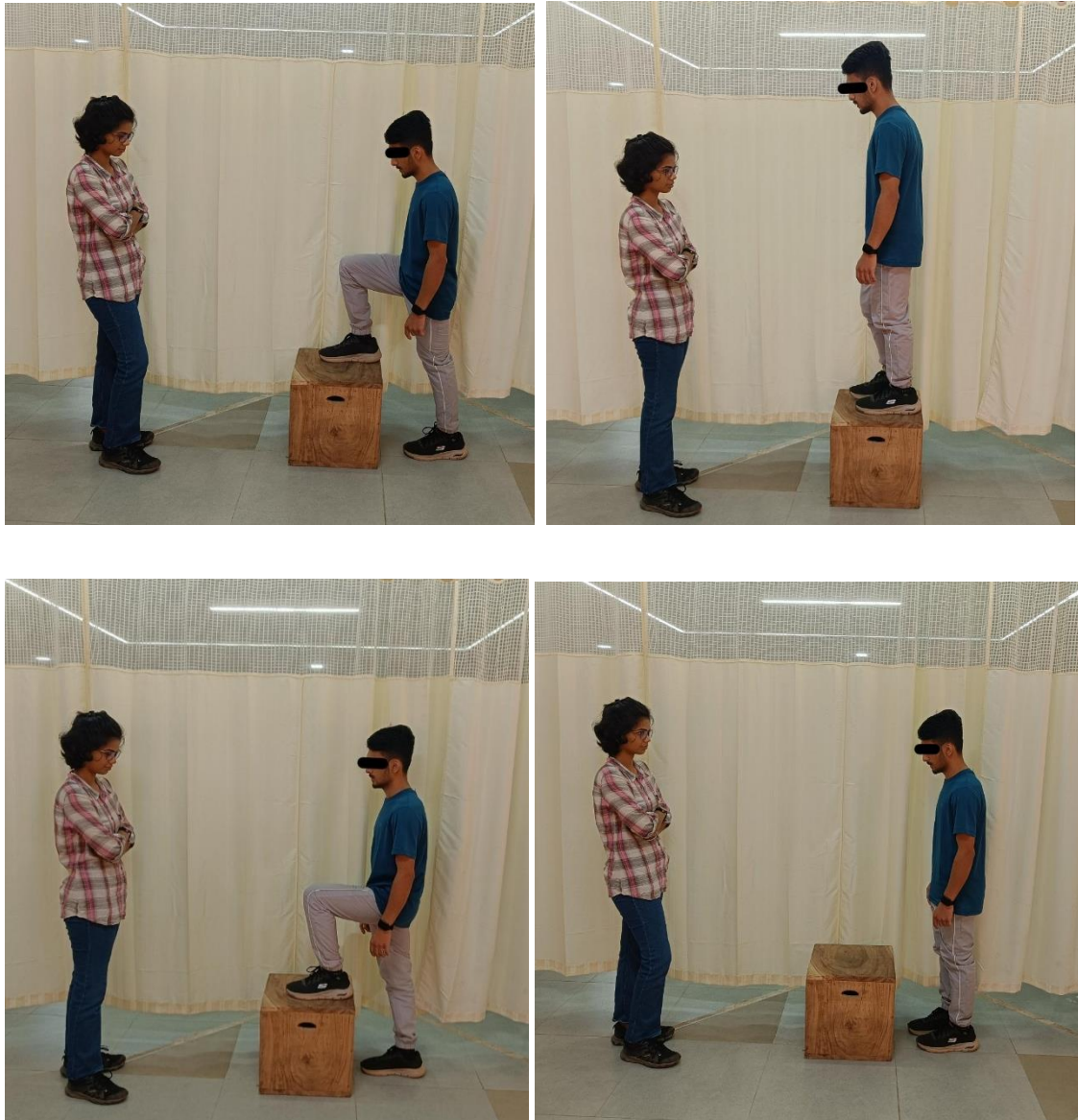


Fig2. Subject performing QCT under observation.

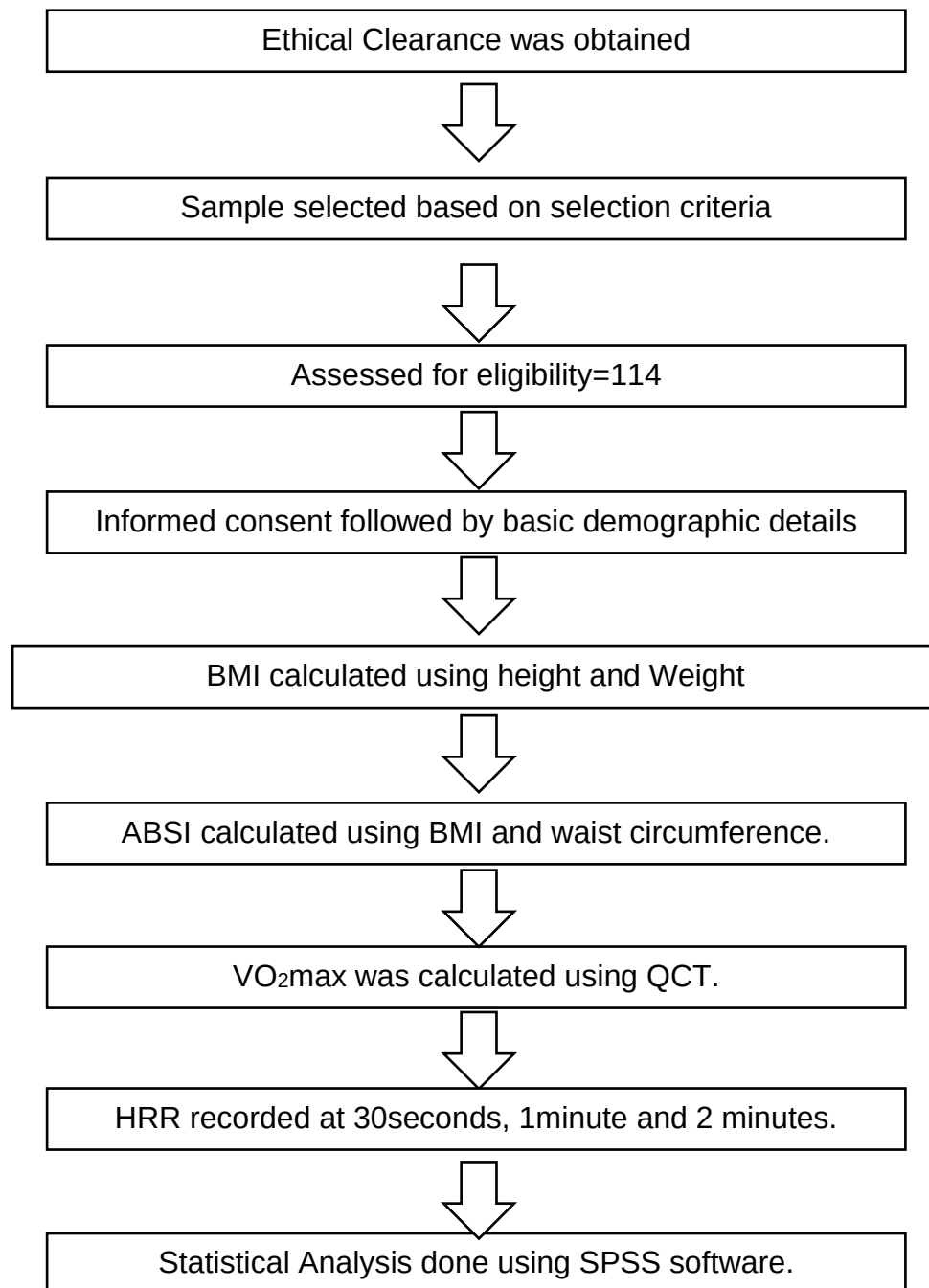
4. Heart rate recovery:

Heart rate recovery was recorded using polar heart rate monitor post Queen's college step test at the interval of 30 seconds, 1 minute and 2 minutes. Heart rate recovery was recorded at the intervals of 30 seconds, 1 minute and 2 minutes using a polar heart rate monitor while the subject is in a sitting position. Post exercise Heart rate recovery ($p < 0.001$) validity was found to be $r > 0.9$. and that of reliability ICC: 0.95.[26].



Fig3. Stopwatch, polar heart rate monitor along with the chest strap and measuring tape.

Methodology flow chart



SAMPLE SIZE ESTIMATION

A sample size of 110 subjects was estimated using a medium effect size of 0.5, a power of 0.95, and a level of significance set at 0.05. 40 participants were included in the study to account for any dropout rate.

RESULTS

The data collected in fragmented form was presented in an orderly manner and tabulated form in Excel. Data was analysed using SPSS22 software. Normality was taken out using Kolmogorov Smirnov test represented in Table 1 as p value. Descriptive statistics summarize or describe the characteristics of data set in Table 1. In inferential statistics, Spearman correlation coefficient was used to measure the linear correlation between two variables shown in Table 2.

TABLE 1

	P value	mean	std. deviation
Age		23.0273	2.60014
Height	0.022	1.6601	0.09583
Weight	0.007	66.0432	14.24240
BMI*	0.200	23.42	4.76
WC	0.000	1.6173	8.79339
MHR	0.007	79.0273	7.16446
HRR 30 sec	0.002	22.4909	6.6204
HRR 1min	0.012	39.6727	6.9929
HRR 2 min*	0.200	60	12
VO2max	0.00	41.9727	13.03101
ABSI	0.00	0.073116	0.0075264

‘*’ mark denotes data which is not following normal distribution ($P > 0.05$) and is expressed in terms of median and Inter quartile range instead of mean and standard deviation respectively.

The data for BMI and HRR2 does not follow normal distribution. The data for HRR30sec, HRR1min, VO2max, ABSI follows normal distribution. Therefore, as the data is not normally distributed, Spearman Test will be used for correlation statistics.

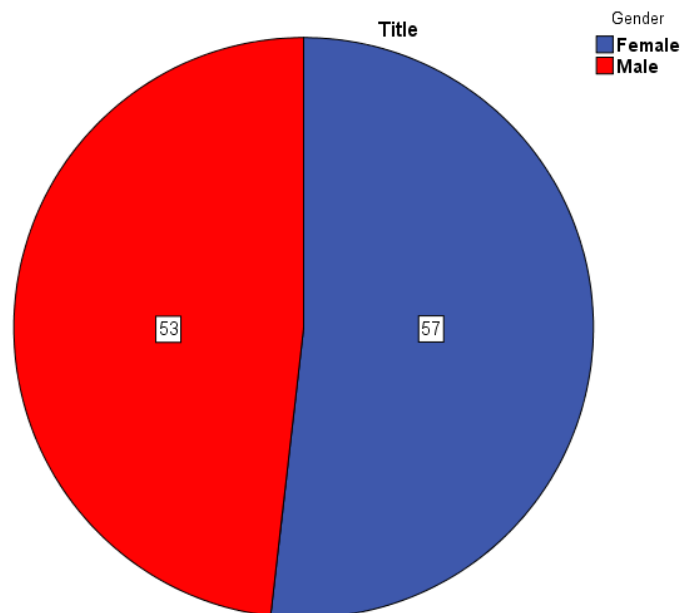


Fig4. Pie chart for gender

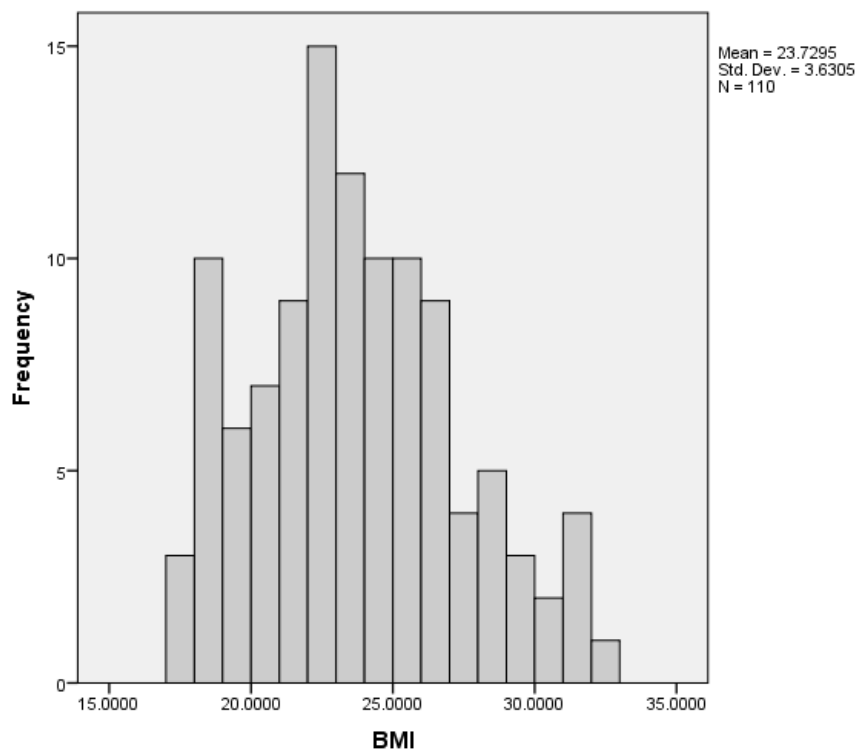


Fig5. Frequency Histogram for BMI

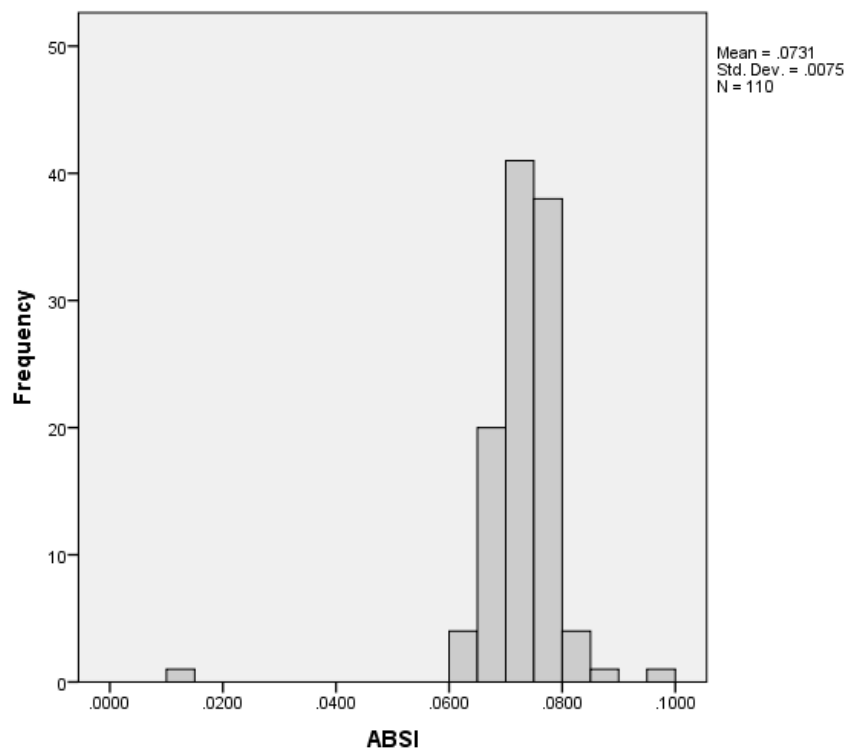


Fig6. Frequency Histogram for ABSI

TABLE 2

Correlation between Core Stability and Upper Extremity Performance

dependent variable	independent variable	r value	p value
HRR30	BMI	0.031	0.373
	ABSI	-0.097	0.156
HRR1	BMI	-1.58	0.049
	ABSI	-0.027	0.388
HRR2	BMI	-0.208	0.015
	ABSI	-0.057	0.277
VO2max	BMI	-0.057	0.277
	ABSI	-0.008	0.465

- We've found that HRR 1 min has mild negative significant correlation with BMI ($P < 0.05$, r : -1.58).
- Also HRR 2 min has mild negative significant correlation with BMI ($P < 0.05$, r : -0.208)
- However, the correlation of HRR 30 sec with BMI and of ABSI with HRR 30 sec, HRR 1Min, HRR 2min is not significant ($P > 0.05$)

DISCUSSION

Sport and physical activity at any level are having health benefits in preventing cardiovascular diseases.[26] But cardiovascular diseases can affect anyone, including young and active athletes.[27]

Till now the majority of research is mostly done on professional athletes, elite athletes or athletes in a particular club. So, there is a need to do more research on recreational athletes.[27]

A recreational athlete is someone who engages in physical activity or sport three times a week for at least 20 minutes without following a professionally designed training program.[11]

In routine clinical practice, the body composition indices that were used in this study are easily accessible and takes lesser time and perfection to assess the parameters and the chances of error in calculation are less as compared to other methods.

To find out maximal oxygen uptake, we've used Queen's college step test. The queen's college test is a valid method to calculate cardiovascular fitness in terms of VO₂max.

This study assesses correlation between body composition, heart rate recovery and VO₂ max. So, to determine whether there is correlation, we have measured post queen's college step test VO₂max.

this study also investigated the Heart rate recovery at 30 seconds (HRR 30), 1 min (HRR 1 min) and two minutes (HRR2) after performing Queens' college step test in recreational athletes.

Heart rate is mediated by autonomic nervous system, Heart rate increases during prolonged exercise as a result of sympathetic activation; following exercise, Heart rate recovers as a result of rapid parasympathetic reactivation in early phase and later, withdrawal of sympathetic activity. [9,10,11,28]

Several studies with varying conclusions have highlighted altered heart rate recovery. In this study we have found weak correlation of BMI with heart rate recovery in recreational athletes which suggest limited relationship which is in accordance with study done by **Susana Povas et al.**, 2023 in recreational football players.[29].

In 2022 study done by **Azam et al.**, found a significant negative correlation between HRR 2min and body composition variables like BMI, which is in accordance with our study.[30]

According to **Andrew M. Watson et al.**, 2017 there are contradictory findings about heart rate recovery in elite athletes. which suggests that a heart rate recovery at 10 seconds, but not exceeding 30 seconds, can be used as a measure of aerobic fitness in intermittent athletes.[31] this contradiction of results can be due to the difference in population as well as difference in activity levels of athletes. As elite athletes have better aerobic fitness level than recreational athletes due to their different goals.

ABSI is a anthropometric measure calculated using BMI and waist circumference which has a negative correlation with fat-free mass and a positive correlation with fat mass. It also predicts the occurrence of cardiovascular disease. A study done in 2017 by **Simona Bertoli et al.**, concluded that in

contrast to WC, ABSI may be a useful index for assessing the relative contribution of central adiposity to clinical outcomes.[3] It should be used in conjunction with BMI and not as a replacement.

This study uses ABSI in addition to BMI to determine how anthropometric indices relate to HRR and VO₂max. Using a step test, this study may be the first to demonstrate the relationship between ABSI and HRR. According to the findings the body shape index and HRR did not significantly correlate. These findings are in contradicting previous researches. This conflict of result might be due to single setting location and lack of randomization in sampling.

In this study there is no significant relationship between VO₂max and that of ABSI with BMI. These results can be because of shorter sample size from a single location, so further research which will include larger sample size should be done so that the results can be generalized.

Moderately significant negative correlation between BMI and VO₂max showed by **Dr. Arifuddin MK et al.**, which is not consistent with our result as we could not find a significant relationship between BMI and VO₂max, which can be due to small sample size.[14].

This study indicates a correlation between HRR and BMI. Furthermore, heart rate is a simple and convenient tool for measuring cardiovascular risk in athletes as well as for screening athletes prior to competition.

CONCLUSION

In conclusion, this study shows a negative correlation between heart rate recovery and BMI. suggesting that it may be used as a screening tool for cardiovascular disease in recreational athletes and can avoid further progression of these diseases.

LIMITATIONS

As this is a cross-sectional design of observational study, it lacks a follow-up component. However, follow-up data is crucial for identifying latent patterns and enhancing the overall impact/effectiveness of the research. Although this study provides valuable insights regarding recreational athletes, the findings may not be generalizable to other populations. Further research is needed to confirm the results across multiple settings.

Given that the sample size of the study is small, it is advisable to conduct the research with a larger sample in order to enhance the reliability and applicability of the findings. This study lacks a comparison between male and female genders.

FUTURE SCOPE OF THE STUDY

Future research can evaluate the impact of exercise-induced heart rate recovery and VO₂max by including a control group. Physiologically male and female individuals exhibit distinct body compositions, which may affect study results. Therefore, it is essential to conduct separate studies for male and female populations. Additional research may also assess the heart rate recovery of athletes involved in sports like rugby, football, and hockey etc.

SUMMARY

Obesity increases risk of diabetes and cardiovascular diseases; Cardiovascular abnormalities can pose a threat to the health and life of not only general population but also in athletes which can be measured by BMI and ABSI. Athletes' aerobic capacity plays a major role in their ability to succeed in sports, which reflects health and training progress. Key indicators like VO₂max and heart rate recovery (HRR) are valid methods for assessing cardiovascular fitness, with faster HRR linked to lower cardiovascular risk.

This study's aim was to evaluate the relationship of anthropometric measures like BMI and ABSI to VO₂max and heart rate recovery in recreational athletes.

This study found the negative correlation between heart rate recovery and BMI which suggests that it can be used as a screening tool for cardiovascular disease in recreational athletes.

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ANNEXURE: 1

CONSENT FORM

I confirm that I have understood about Relationship of anthropometric measures to VO₂max and Heart Rate Recovery in recreational athletes as explained by Miss Mrunal Bhosale and is as mentioned in her study which is taking place under the guidance of Prof. Joseph Oliver Raj, Dean, Abhinav Bindra Sports Medicine and Research Institute (ABSMARI) and co-guidance of Dr Arpita Panda, Ass. Professor, ABSMARI. I understand that my participation is voluntary and I'm free to withdraw at any time, without giving any reason. I understand that confidentiality will be maintained. I voluntarily agree to and give my consent to be a part of the above-mentioned study.

(Signature)

(Date)

INFORMATION SHEET

Study Title: **Relationship of Anthropometric measures to VO₂max and Heart Rate Recovery in recreational athletes - A cross sectional observation study.**

You are being invited to take part in the research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please read the information carefully.

1) Purpose of the study:

The purpose of the study is to find out the: Relationship of Anthropometric measures to VO₂max and Heart Rate Recovery in recreational athletes.

2) Information about the conduct of the study is given here:

The following parameters will be recorded and analyzed-Demographic details, Assessment date, BMI, waist circumference, ABSI, VO₂max using queen's college step test.

All the information taken from you will be kept strictly confidential and the data generated in the course of the research may be secured in paper form and electronic form for the duration of the research project.

It is up to you to decide whether or not to take part in the research study. If you decide to take part, you will be asked to sign a consent form.

Ask us if there is anything that is not clear or if you would like any more information.

Thanking you,

Name of research project: Relationship of Anthropometric measures to VO₂max and Heart Rate Recovery in recreational athletes - A cross sectional observation study

Participant's signature:

Researcher's signature:

Mrunal Bhosale

ANNEXURE: 2

ETHICAL COMMITTEE CLEARANCE CERTIFICATE



ABSMARI ETHICS COMMITTEE

ABHINAV BINDRA SPORTS MEDICINE AND RESEARCH INSTITUTE,
BHUBANESWAR, ODISHA

Prof. (Dr.) E. Venkata Rao
Chairperson

Mr. Chinmaya Kumar Patra
Member Secretary

ABSMARI/IEC/2023/060

02/09/2023

Ref. No. _____

APPROVAL LETTER
APPENDIX- VIII

Date: _____

To,

Mrunal Rajendra Bhosale

ABSMARI
273, PAHAL, BHUBANEWAR-752101

Protocol Title: Relationship of Anthropometric measures to VO₂max and Heart Rate Recovery in Recreational Athletes - A cross sectional observation study

Protocol ID.: ABS-IEC-2023-PHY-019

Subject: Approval for the conduct of the above referenced study

Dear Mr./Ms./Dr **Mrunal Rajendra Bhosale**

With reference to your Submission letter dated 12/08/2023 the ABSMARI IEC has of the Ethics reviewed and discussed your application for conduct of clinical trial on dated 02/09/2023 (Sat Day).

The following documents were reviewed and discussed

S.N.	Documents	Document (Version/Date)
1	IEC Application Form	08-08-2023
2	Informed Consent Form	08-08-2023
3	Undertaking form PI	08-08-2023
4	CRF	08-08-2023
5	COI from the Investigators	08-08-2023

The following members were present at meeting held on 02-09-2023

S.N.	Name of the Member	Designation & Qualification	Representation as per NDCT 2019	Gender (M/F)	Affiliation with the Institution (Y/N)
1	Prof. Dr. E. Venkata Rao	Professor (MBBS, MD, Dept. of Community Med.) IMS & Sum Hospital, BBSR	Chair Person	M	N
2	Dr. Satyajit Mohanty	Director-Medcare Hospital, BBSR	Basic Medical Scientist	M	N
3	Dr. Ashok Singh Chouhan	PhD. Pharmacology, Assoc. Prof. Dept. of Pharmacology, Hi-Tech Medical College & Hospital, BBSR	Basic Medical Scientist	M	N

MEMBERS
Dr. Smaraki Mohanty, Clinician
Dr. Satyajit Mohanty, Basic Medical Scientist
Dr. Ashok Singh Chouhan Basic Medical Scientist
Mr. Shib Shankar Mohanty Legal Expert
Ms. Annie Hans, Social Scientist
Ms. Subhashree Samal, Lay Person
Mr. Deepak Ku. Pradhan, Scientific Member
IEC-SECRETARIAT
Mr. Gouranga Ku. Padhy Mr. Susant Ku. Raychudamani



1

Utkal Signature, Plot No.-273,
Ground Floor, Pahal, Bhubaneswar-752101

+91-63707-03654

iec@absmari.com



ABSMARI ETHICS COMMITTEE

ABHINAV BINDRA SPORTS MEDICINE AND RESEARCH INSTITUTE,
BHUBANESWAR, ODISHA

Prof. (Dr.) E. Venkata Rao
Chairperson

Mr. Chinmaya Kumar Patra
Member Secretary

Ref. No. ABSMARI/IEC/2023/060

Date 02/09/2023

MEMBERS

Dr. Smaraki Mohanty,
Clinician

Dr. Satyajit Mohanty,
Basic Medical Scientist

Dr. Ashok Singh Chouhan
Basic Medical Scientist

Mr. Shib Shankar Mohanty
Legal Expert

Ms. Annie Hans,
Social Scientist

Ms. Subhashree Samal,
Lay Person

Mr. Deepak Ku. Pradhan,
Scientific Member

IEC-SECRETARIAT

Mr. Gouranga Ku. Padhy
Mr. Susant Ku. Raychudamani

S.N.	Name of the Member	Designation & Qualification	Representation as per NDCT 2019	Gender (M/F)	Affiliation with the Institution (Y/N)
4	Dr. Smaraki Mohanty	Asst. Prof-IMS & Sum Hospital/MBBS, MD (Community Med)	Clinician	F	N
5	Mr. Chinmaya Kumar Patra	Principal-ABSMARI, MPT	Member Secretary	M	Y
6	Mr. Shiba Sankar Mohanty	Junior Counsel-Lt. Ramachandra Sarangi's Chamber / BA LLB	Legal Expert	M	N
7	Ms. Annie Hans	Disability Inclusive Development Co-Ordinator in Humanity and Inclusion (India/Nepal/Srilanka). /MA in Social Work	Social Scientist	F	N
8	Ms. Subhashree Samal	Ref. Reader-Pol Sc.	Lay Person	F	N
9	Mr. Deepak Kumar Pradhan	Asst. Prof-ABSMARI, MPT	Scientific Member	M	Y

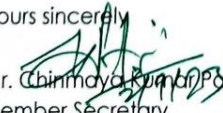
This is to confirm that only members who are independent of the Investigator and the Sponsor of the trial have voted/ provided opinion on the trial.

This Committee approves the documents and the conduct for the trial in the presented form with necessary recommendation.

The ABSMARI IEC must be informed about the progress of the study, any SAE occurring in the course of the study, any changes in the protocol and patient information/informed consent and requests to be provided a copy of the final report.

The ABSMARI IEC follows procedures that are in compliance with the requirements of ICH (International Conference on Harmonization) guidance related to GCP (Good Clinical Practice) and applicable Indian regulations.

Yours sincerely,


Mr. Chinmaya Kumar Patra
Member Secretary

ABSMARI Ethics Committee

Pahal, Bhubaneswar
Member Secretary

ABSMARI ETHICS COMMITTEE



ANNEXURE: 3

PROFORMA FORMAT

Name:

Gender:

Age:

Height:

Weight:

Waist circumference:

BMI:

ABSI:

RHR:

1. BMI: $\text{weight}/(\text{height})^2$

2. ABSI: $\text{WC} \div (\text{BMI}^{2/3} \times \text{Height}^{1/2})$

3. Queen's college step test

MHR	HRR 30sec	HRR 1min	HRR 2 min	VO ₂ max

MASTERCHART

Gender	Age	Height	Weight	WC	BMI	ABSI	VO2 max	RHR	MHR	HRR 30 sec	HRR 1 min	HRR 2 min
F	22	1.59	63	0.8	17.06	0.09572	32.38	85	192	17	34	53
F	19	1.54	63.18	0.77	26.64	0.06956	32.75	90	192	17	35	59
F	19	1.54	57.4	0.75	24.20	0.07223	35.52	94	176	16	26	49
F	18	1.53	43.1	0.64	18.41	0.07421	32.75	88	192	17	31	61
F	18	1.64	64.32	0.74	23.91	0.06962	31.27	77	200	20	40	71
F	18	1.565	58.1	0.78	23.72	0.07552	31.83	99	194	13	40	62
F	23	1.63	55.75	0.7	18.37	0.07876	34.60	72	180	15	57	72
F	26	1.54	67.35	0.8	28.40	0.06926	36.07	92	196	20	40	64
F	24	1.615	69.5	0.86	26.65	0.07586	34.97	87	188	28	52	66
F	24	1.62	65.65	0.78	25.02	0.07165	34.78	96	184	24	41	73
F	24	1.555	61.51	0.8	25.44	0.07417	33.67	82	188	18	28	68
F	25	1.645	68.2	0.83	25.20	0.07528	32.38	77	192	17	37	54
F	25	1.73	78.1	0.82	26.10	0.01337	39.21	74	166	26	45	76
F	25	1.58	80.65	0.81	32.31	0.06353	36.26	83	168	13	28	48
F	24	1.52	50	0.66	21.64	0.06893	41.80	64	156	34	53	69
F	25	1.59	54.45	0.67	21.54	0.06864	35.70	82	188	30	42	73
F	24	1.66	63.05	0.7	22.88	0.06741	35.52	84	176	15	36	54
F	26	1.66	74.9	93	27.18	0.07985	32.19	101	196	19	34	56
F	25	1.63	58.35	0.65	21.96	0.06492	35.70	62	176	16	27	47
F	24	1.6	51.8	0.68	20.23	0.07240	37.92	74	180	38	51	61
F	23	1.63	66.4	0.77	24.99	0.07056	35.33	82	184	25	57	79
F	24	1.56	48.12	0.68	19.77	0.07446	38.29	77	172	28	41	48
F	24	1.58	58.5	0.72	23.43	0.06995	32.01	77	192	14	36	67
F	26	1.6	47.12	0.63	18.41	0.07144	33.86	73	188	20	43	67
F	25	1.53	45.65	0.63	19.50	0.07030	34.97	75	184	24	39	66
F	24	1.62	56.74	0.7	21.62	0.07087	32.56	83	192	20	39	76
F	25	1.71	70.74	0.76	24.19	0.06948	34.23	83	184	20	36	62
F	24	1.59	70.95	0.77	28.06	0.06612	33.49	76	188	24	28	49
F	25	1.62	62.61	0.83	23.86	0.07869	35.70	78	184	26	44	64
F	27	1.68	60.21	0.69	21.33	0.06921	38.11	75	168	24	43	58
F	25	1.67	68.37	0.81	24.52	0.07427	31.83	84	192	13	34	54
F	22	1.52	43.12	0.66	18.66	0.07608	35.15	81	178	18	30	48
F	23	1.62	64.17	0.76	24.45	0.07088	34.78	78	188	27	39	66
F	18	1.62	49.56	0.72	18.88	0.07977	35.89	73	178	22	41	59
F	21	1.59	66.91	0.8	26.47	0.07144	32.19	84	192	14	32	51
F	21	1.52	50.47	0.72	21.84	0.07473	33.86	75	184	16	40	66
F	20	1.5	52.12	0.77	23.16	0.07737	33.49	79	188	19	40	68
F	22	1.51	60.17	0.79	26.39	0.07253	34.60	87	184	21	43	54
F	28	1.56	46.92	0.67	19.28	0.07461	35.70	71	172	16	41	53
F	21	1.66	82.22	0.83	29.84	0.06697	31.64	84	192	14	31	49
F	19	1.58	48.18	0.68	22.36	0.06815	35.70	74	172	14	31	44
F	20	1.52	52.78	0.82	22.84	0.08261	34.78	75	176	13	29	60
F	25	1.64	59.45	0.79	22.10	0.07832	32.93	85	192	20	39	62
F	24	1.62	64.18	0.81	24.46	0.07553	32.56	83	192	19	38	60
F	26	1.6	58.61	0.75	22.89	0.07354	33.30	79	188	16	36	65
F	25	1.66	56.61	0.72	20.54	0.07450	42.17	74	156	36	52	66
F	26	1.6	44.34	0.63	17.32	0.07440	35.15	76	180	21	45	59
F	22	1.62	49.67	0.69	18.93	0.07633	37.55	72	168	20	39	50
F	20	1.52	52.17	0.79	22.58	0.08021	32.38	75	192	17	34	60
F	20	1.61	74.43	0.86	28.71	0.07228	31.83	85	192	12	32	45
F	19	1.64	49.04	0.68	18.23	0.07665	35.89	72	172	15	41	54
F	25	1.67	64.32	0.84	23.06	0.08023	32.01	79	192	15	37	52
F	25	1.64	69.61	0.84	25.88	0.07497	34.23	74	188	24	55	69
F	19	1.6	49.81	0.69	19.46	0.07541	34.41	71	184	18	44	63
F	20	1.61	58.99	0.75	22.76	0.07360	34.97	67	180	18	30	49
F	20	1.53	56.41	0.73	23.72	0.07148	33.86	83	188	20	35	59
F	24	1.54	52.01	0.75	21.93	0.07714	33.49	75	192	21	34	57

M	26	1.68	86.9	0.97	30.79	0.07618	43.29	76	176	21	36	56
M	25	1.6	57.25	0.71	22.36	0.07071	54.21	85	164	38	47	63
M	18	1.74	73.45	0.79	24.03	0.07191	48.75	86	168	27	38	60
M	19	1.62	67.7	0.86	25.80	0.07739	50.43	78	172	34	46	62
M	19	1.71	88	0.95	24.26	0.08669	44.13	99	179	23	39	56
M	19	1.72	61.9	0.75	20.92	0.07531	61.77	63	140	30	50	62
M	24	1.78	86.41	0.92	27.27	0.07611	50.43	86	160	30	37	48
M	24	1.66	64.78	0.78	23.51	0.07377	44.13	83	180	35	41	62
M	24	1.95	119.25	1.08	31.36	0.07777	49.17	75	156	16	32	47
M	25	1.82	86.3	0.94	26.05	0.07928	37.83	82	188	19	38	56
M	26	1.73	58.55	0.74	24.92	0.06594	47.07	71	176	32	41	57
M	24	1.59	57.41	0.69	22.71	0.06824	56.73	74	144	19	32	48
M	21	1.64	52.27	0.64	19.43	0.06914	51.27	80	156	18	27	36
M	25	1.73	72.15	0.72	24.11	0.06560	52.11	74	164	18	45	69
M	25	1.79	85.34	0.93	26.63	0.07794	45.81	86	180	40	54	74
M	25	1.74	64.25	0.76	21.22	0.07517	56.31	70	152	26	43	59
M	24	1.77	70.18	0.8	22.40	0.07567	44.55	77	172	19	34	53
M	24	1.74	84.2	0.96	27.81	0.07928	52.95	73	172	22	40	59
M	23	1.72	65.5	0.8	22.14	0.07736	49.59	72	160	17	39	63
M	25	1.75	81.41	0.82	25.80	0.07100	50.85	76	160	22	36	55
M	24	1.83	91	0.86	27.17	0.07034	42.45	88	184	29	44	57
M	24	1.73	60.72	0.76	20.29	0.07768	52.11	77	168	31	46	71
M	24	1.71	65.15	0.77	22.28	0.07437	49.59	90	168	26	40	61
M	25	1.76	98.22	0.84	31.71	0.06320	48.33	88	172	24	43	55
M	27	1.66	50.46	0.66	18.31	0.07373	51.69	77	158	22	40	63
M	25	1.82	62.02	0.68	18.72	0.07148	48.33	78	168	24	42	69
M	28	1.73	74.6	0.89	26.56	0.07600	47.49	83	160	15	33	49
M	25	1.77	71	0.73	22.66	0.06852	45.81	77	184	36	57	86
M	20	1.68	56.33	0.72	19.96	0.07550	47.49	73	168	21	40	66
M	23	1.61	67.08	0.79	25.88	0.07116	47.07	80	176	36	49	67
M	19	1.7	88.41	0.93	30.59	0.07292	46.23	82	170	26	37	53
M	23	1.78	74.17	0.74	23.41	0.06778	52.11	73	166	30	44	67
M	22	1.71	64.75	0.74	22.14	0.07176	50.01	79	164	24	40	62
M	19	1.5	57.11	0.78	25.38	0.07374	34.89	85	192	22	39	58
M	19	1.7	60	0.76	20.76	0.07716	50.43	79	160	22	42	59
M	20	1.78	66.23	0.78	20.90	0.07704	52.11	73	156	21	42	58
M	20	1.95	110.16	1.02	28.97	0.07744	42.87	87	172	13	30	43
M	27	1.68	80.1	0.89	28.38	0.07380	46.23	72	172	26	45	61
M	25	1.67	71.23	0.83	25.54	0.07406	39.09	77	188	20	36	60
M	24	1.67	64.41	0.69	23.10	0.06584	53.37	70	164	33	47	71
M	25	1.6	65.13	0.77	25.44	0.07037	50.43	73	168	29	42	60
M	22	1.81	75.45	0.89	23.03	0.08172	52.53	76	164	32	34	47
M	21	1.79	101.65	0.94	31.72	0.07011	40.77	77	184	25	40	53
M	20	1.8	87.18	0.91	26.91	0.07554	53.37	73	156	26	37	60
M	23	1.62	47.89	0.69	18.25	0.07821	44.13	79	188	16	35	60
M	24	1.8	71.41	0.75	22.04	0.07111	46.65	78	164	17	36	56
M	23	1.77	65.33	0.76	20.85	0.07540	52.11	70	164	28	40	66
M	22	1.69	83	0.85	29.06	0.06917	44.97	75	176	25	46	55
M	26	1.68	82.4	0.96	29.20	0.07812	39.93	82	188	27	41	60
M	26	1.82	78.08	0.84	23.57	0.07574	43.71	79	180	27	39	56
M	24	1.74	65.44	0.76	21.61	0.07425	46.65	73	168	19	34	48
M	19	1.64	86.05	0.82	31.99	0.06354	39.51	84	188	25	37	56
M	25	1.865	59.35	0.72	17.06	0.07955	151	83	180	34	58	88