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Effects of Aerobic Exercises on the Prostate Bio-markers of Adult Low Back Pain Patients. A Systematic Review of Randomized Controlled Trials Protocol

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ADMINISTRATIVE INFORMATION

Support - No support.

Review Stage at time of this submission - Piloting of the study selection process.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202690120

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 September 2026 and was last updated on 28 September 2026.

INTRODUCTION

Review question / Objective Review Objectives

1.To establish the effects of aerobic exercise on the prostate bio-markers of adult low back pain patients.

2.To ascertain the safety profile of supervised high-MET aerobic exercise in adult male low back pain patients with cardiovascular morbidity.

3.To identify which aerobic exercise mode is highly reported to yield decreased pain levels in adult male patients with recurrent low back pain.

4.To understand how systemic inflammatory markers that modulate PSA levels are impacted by aerobic exercise.

5. To improve adult male low back pain patients' understanding of the significance of aerobic exercise programme.

Research Questions
1. What are the effects of aerobic exercise on the prostate bio-markers of adult low back pain patients?

2.Are there increased risks of occurrence of cardiovascular events during supervised high-MET aerobic training in adult male low back pain patients with cardiovascular morbidity?

3.Which aerobic exercise mode is highly reported to yield decreased pain levels in adult male patients with recurrent low back pain?

4.How are systemic inflammatory markers that modulate PSA levels impacted by aerobic exercise?

5. What is significance of performing aerobic exercise in the management of low back pain among adult male patients?

Rationale Recent studies on percentage of Adult low back pain patients with Prostate Bio-markers

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are understudied perhaps there are no concurrent means to represent this demographic in developing countries.

This scarce evidence of the association between the severity of Non-Specific Low Back Pain and the magnitude of changes in the systemic inflammatory profile (Pinto et al., 2023) exist due to the heterogeneity of patient's populations and bio-markers measurement methods (Puerto Valencia et al., 2024). Thus, there should be specific standardization of inclusion and exclusion criteria needed to further analyse the significant association and changes in inflammatory markers in Low Back Disorder (Sima et al., 2024).

The role of exercise on prostate health is still vague in as much as it can be a means to improving patient's quality of life; its effect for subgroups of patients where the prognosis may be less favorable is yet to be examined (Aja et al.,2025; IJzelenberg et al., 2024). Although, muscular activity and movement Bio-markers to identify NSLBP patients have been proposed and their measurement properties partially assessed a lack of consensus concerning a robust and standardized bio-mechanical approach to assess low back pain (Moissenet et al., 2021); evaluating recommendations and long-term outcomes of exercise on inflammatory Bio-markers in NSLBP using rigorous well-designed studies will be crucial in informing health-care providers and empowering people to manage their condition (Alonso-Sal et al., 2024; Comachio et al., 2024).

To avoid duplication of studies, a preliminary literature search on several occasions has been done on COnnecting REpositories(CORE), review registries and every electronic database listed in the information sources to identify similar published articles and protocols. It has been confirmed that this systematic review is the first to investigate the effects of aerobic exercise on the prostate bio-markers of adult low back pain patients.
As low back pain is a public health concern; findings from this study will provide empirical direction to highlighting the systemic benefits of aerobic exercise on prostate bio-markers and inflammatory profiles. It will also serve as a means to enlighten adults with low back pain to adopt supervised aerobic exercise programs for chronic low back pain management and reduce the long-term reliance on pain-medications and improve back mobility.

Condition being studied Low back pain is a common manifestation in healthy adult males and those with prostatic diseases. It can be attributed not just to ergonomic or lifestyle factors but systemic inflammatory cascades.
Identified inflammatory markers such as IL-6 and Enhancer of Zeste Homolog 2 (EZH2) EzHz, can be overly expressed in metastasis of prostate cancer to the lower back (Bhatti et al., 2025; Chu, 2022 & Crocetto et al., 2025) It is on this note that researchers seek to explore exercise therapy interventions, that will target the tumor micro-environment.

METHODS

Search strategy During the preliminary searches, inclusion of the third keyword (Low back pain) to search strings for the various databases was too restrictive and yielded no results. It is likely low back pain is not indexed with aerobic exercise and prostate bio-markers or it may be a potential gap. However, the researchers found out that there are articles on aerobic exercise and low back pain which will be described in the literature review of this study.
Since the primary focus of this study revolves on aerobic exercise impact on prostate bio-markers/ micro-environment, a comprehensive search strategy which include the use of Medical Subject Headings (MeSH) terms, synonyms and key words that represent these two variables within the topic: "Effects of Aerobic Exercises on the Prostate Bio-markers of Adult Low Back Pain Patients" was adopted.
The databases will be searched from inception and apply no search limits. To account for data specific indexing, variations in keyword synonyms will be searched in the advanced menu using Boolean operator (OR). Then there will be combination of each searches for the variables of the topic using Boolean Operators (AND) in the search history.

The search string developed for every electronic database is as follows:

PUBMED:
#1: ((((((((((((((((((Aerobic Exercise[Title/Abstract]) OR (Elliptical[Title/Abstract])) OR (Endurance Training[Title/Abstract])) OR (Aquatic Aerobics[Title/Abstract])) OR (Walking[Title/Abstract])) OR (Jumping jacks[Title/Abstract])) OR (Cycling[Title/Abstract])) OR (Running[Title/Abstract])) OR (Aerobics[Title/Abstract])) OR (Dancing[Title/Abstract])) OR (Treadmill[Title/Abstract])) OR (Aquarobics[Title/Abstract])) OR (Rowing[Title/Abstract])) OR (Jogging[Title/Abstract])) OR (Skiing[Title/Abstract])) OR (Kickboxing[Title/Abstract])) OR (Swimming[Title/Abstract])) OR

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(Burpees[Title/Abstract])) OR (Home-based exercise[Title/Abstract])

#2: ((((((((((("Prostate"[Mesh]) OR ("Prostate-Specific Antigen"[Mesh])) OR ("Prostatic Neoplasms"[Mesh])) OR ("Prostatic Neoplasms, Castration-Resistant"[Mesh])) OR ("Prostatic Diseases"[Mesh])) OR ("Prostatitis"[Mesh])) OR ("Prostatic Hyperplasia"[Mesh])) OR ("Kallikreins"[Mesh])) OR ("Tissue Kallikreins"[Mesh])) OR ("Prostatic Secretory Proteins"[Mesh])) OR ("Seminal Vesicle Secretory Proteins"[Mesh])) OR ("Seminal Plasma Proteins"[Mesh])) OR ("Prostate-Specific Membrane Antigen")

#3: (#1) AND (#2)

COCHRANE LIBRARY:
#1: (Aerobic Exercise OR Elliptical OR Endurance Training):ti,ab,kw OR (Aquatic Aerobics OR Walking OR Jumping jacks OR Cycling OR Running):ti,ab,kw OR (Aerobics OR Dancing OR Treadmill OR Aquarobics OR Rowing):ti,ab,kw OR (Jogging OR Skiing OR Kickboxing):ti,ab,kw OR (Swimming OR Burpees OR Home-based exercise):ti,ab,kw
(Word variations will be searched)

#2: MeSH descriptor: [Prostate] explode all trees
#3: MeSH descriptor: [Prostate-Specific Antigen] explode all trees
#4: MeSH descriptor: [Prostatic Neoplasms] explode all trees
#5: MeSH descriptor: [Prostatic Neoplasms, Castration-Resistant] explode all trees
#6: MeSH descriptor: [Prostatic Diseases] explode all trees
#7: MeSH descriptor: [Prostatitis] explode all trees
#8: MeSH descriptor: [Prostatic Hyperplasia] explode all trees
#9: MeSH descriptor: [Kallikreins] explode all trees
#10: MeSH descriptor: [Tissue Kallikreins] explode all trees
#11: MeSH descriptor: [Prostatic Secretory Proteins] explode all trees
#12: MeSH descriptor: [Seminal Vesicle Secretory Proteins] explode all trees
#13: MeSH descriptor: [Seminal Plasma Proteins] explode all trees
#14: "Prostate-Specific Membrane Antigen"

#15: #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14

#16: #1 AND #15

PROQUEST

S1: noft(Aerobic Exercise) OR noft(Elliptical OR Endurance Training OR Aquatic Aerobics) OR noft(Walking OR Jumping jacks OR Cycling) OR noft(Running OR Aerobics) OR noft(Dancing OR Treadmill) OR noft(Aquarobics OR Rowing) OR noft(Jogging OR Skiing) OR noft(Kickboxing OR Swimming) OR noft(Burpees) OR noft(Home-based exercise)

S2: noft("Prostate" OR "Prostate-Specific Antigen") OR noft("Prostatic Neoplasms" OR "Prostatic Neoplasms, Castration-Resistant") OR noft("Prostatic Diseases" OR "Prostatitis") OR noft("Prostatic Hyperplasia") OR noft("Kallikreins") OR noft("Tissue Kallikreins") OR noft("Prostatic Secretory Proteins") OR noft("Seminal Vesicle Secretory Proteins") OR noft("Seminal Plasma Proteins") OR noft("Prostate-Specific Membrane Antigen")

S3: [S1] AND [S2]

HINARI (PUBMED)
#1: ((((((((((((((((((Aerobic Exercise[Title/Abstract]) OR (Elliptical[Title/Abstract])) OR (Endurance Training[Title/Abstract])) OR (Aquatic Aerobics[Title/Abstract])) OR (Walking[Title/Abstract])) OR (Jumping jacks[Title/Abstract])) OR (Cycling[Title/Abstract])) OR (Running[Title/Abstract])) OR (Aerobics[Title/Abstract])) OR (Dancing[Title/Abstract])) OR (Treadmill[Title/Abstract])) OR (Aquarobics[Title/Abstract])) OR (Rowing[Title/Abstract])) OR (Jogging[Title/Abstract])) OR (Skiing[Title/Abstract])) OR (Kickboxing[Title/Abstract])) OR (Swimming[Title/Abstract])) OR (Burpees[Title/Abstract])) OR (Home-based exercise[Title/Abstract])

#2: ((((((((((("Prostate"[Mesh]) OR ("Prostate-Specific Antigen"[Mesh])) OR ("Prostatic Neoplasms"[Mesh])) OR ("Prostatic Neoplasms, Castration-Resistant"[Mesh])) OR ("Prostatic Diseases"[Mesh])) OR ("Prostatitis"[Mesh])) OR ("Prostatic Hyperplasia"[Mesh])) OR ("Kallikreins"[Mesh])) OR ("Tissue Kallikreins"[Mesh])) OR ("Prostatic Secretory Proteins"[Mesh])) OR ("Seminal Vesicle Secretory Proteins"[Mesh])) OR ("Seminal Plasma Proteins"[Mesh])) OR ("Prostate-Specific Membrane Antigen")

#3: (#1) AND (#2)

CINAHL via EBSCO Host
S1: XB (Aerobic Exercise) OR XB (Elliptical OR Endurance Training) OR XB (Aquatic Aerobics) OR XB (Walking OR Jumping jacks) OR XB (Cycling OR Running) OR XB (Aerobics OR Dancing) OR XB

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(Treadmill OR Aquarobics) OR XB (Rowing) OR XB (Jogging) OR XB (Skiing) OR XB (Kickboxing OR Swimming) OR XB (Burpees OR Home-based exercise)
S2: XB (MH "Prostate" OR MH "Prostate-Specific Antigen" OR MH "Prostatic Neoplasms+" OR MH "Prostate-Specific Membrane Antigen" OR MH "Prostatic Neoplasms, Castration-Resistant" OR MH "Prostatic Diseases+" OR MH "Prostatitis" OR MH "Prostatic Hypertrophy") OR XB (Kallikreins) OR XB (Tissue Kallikreins) OR XB (Prostatic Secretory Proteins) OR XB (Seminal Vesicle Secretory Proteins) OR XB (Seminal Plasma Proteins)
S3: S1 AND S2

PEDRO
Abstract & Title: Prostate Aerobic
When Searching: Match all search terms with (AND)

Studies retrieved from this search result will be screened for all Low back Pain outcomes. Any limitation encountered from the study will be clearly explained.

Participant or population Studies involving adult low back pain patients with prostate bio-markers.

Intervention Available studies on aerobic exercise programs carried out by any health care professional.

Comparator No intervention.

Study designs to be included Randomized Controlled Trials only.

Eligibility criteria Exclusion Criteria

1. Studies that do not investigate the effect of aerobic interventions on prostate bio-markers in adult male human.
2. Aerobic interventions in non-human models.
3. Publications in any language other than English.
4. Studies with inconclusive findings.
5. Randomized Controlled Trials with only abstracts and no open access to their full text articles.
6. Preliminary studies and observational works such as pilot studies and case reports as they are prone to high risk of bias.
7. Research works published beyond October, 2026.

Information sources The bibliographic databases that will be searched for this systematic review include:
i.PubMed
ii.Cochrane Library
iii.ProQuest
iv.Hinari (Pubmed)
v.CINAHL via EBSCO Host
vi.PEDro.

Main outcome(s) Inflammatory markers, PSA levels and Tumor micro-environment.

Additional outcome(s) Pain Intensity and Quality of Life.

Data management Results retrieved from the database searches will be imported into Rayyan systematic review software for data management; screening of duplicate studies; inclusion and exclusion of studies that meet the eligibility criteria. This study will utilize the (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) PRISMA 2020 guidelines flowchart to give details of studies throughout the study selection and exclusion process.

Quality assessment / Risk of bias analysis The methodological quality of the included studies will be assessed using the Physiotherapy Evidence Database (PEDro) quality appraisal tool for interventions in physiotherapy and rehabilitation.
This study will strictly follow every criteria listed for administration of PEDro Scale, an 11 item checklist that determines the quality of a clinical trial. The first criterion (eligibility criteria were specified) is not included in the final scoring as it serves as an applicability measure for the other items that follow. A score of 1 is awarded for each "Yes" response and a score of 0 for each "No" response. On summing all the “YES” responses; PEDro Scale is scored: 0–3 = Poor; 4–5 = Fair; 6–8 = Good and 9–10 = Excellent (PEDro Scale, 1999; PEDro, 2025).
The PEDro scale is a validated and reliable rating tool that helps clinicians distinguish high-quality from low-quality clinical trials as low-quality clinical trials can present misleading findings that influence evidence-based practice. However, this scale does not validate a study’s conclusion (PEDro Scale, 1999 ; Cashin & McAuley, 2020).

Strategy of data synthesis Qualitative synthesis and thematic analysis methods will be used to analyze extracted data in order to address the review questions. The review findings will be organized to create a comprehensive narrative of the overall findings that represents patterns, trends

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and gaps regarding the Effects of Aerobic Exercises on the Prostate Bio-markers of Adult Low Back Pain Patients.
This is solely for clinical expertise and informative purposes in further research concepts in optimizing prostate health through aerobic exercise.

Subgroup analysis For each included trial, data will be extracted regarding
the: i) Author(s) and year of publication
ii)Country
iii) Intervention Settings
iv) Inclusion and exclusion criteria
v) Participant characteristics (Sample size & age)
vi) Intervention Model(s)
vii) Control/Comparison
viii) Principal interventionalist
ix) Period of the intervention
x) Follow-up periods
xi) Outcomes accessed and their assessment tool
xii) Pre intervention measures
xiii) Post intervention measures
xiv) Pre control measures
xv) Post control measures
xvi) Results and conclusion.

Sensitivity analysis The study will depend largely on its thematic findings to draw conclusions on the review questions.

Language restriction English Language.

Country(ies) involved The study is carried out in Nigeria.

Other relevant information The article selection and data extraction will be performed by the primary reviewer (A.C.C) while a second reviewer (E.S.A) will independently examine data for reliability. Both reviewers are well trained in performing systematic reviews. In cases of disagreements, a third reviewer (A.U.) will be consulted to procure further discussions and arrive at a consensus.

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Keywords Aerobic Exercise; Prostate Bio-markers and Low back Pain.

Dissemination plans The first author will oversee the identification of the specialty peer-reviewed journal where the study findings will be published and guide the corresponding author on the submission process. Plans will be made to submit the research work at national and international conferences to create more awareness and support evidence based practice.

Contributions of each author

Author 1 - Canice Chukwudi Anyachukwu - Conception of the research topic, Critics of the research, Designating INPLASY for protocol registration, 1st Reviewer, Financial Contribution, Supervision of the project, Drafting and revising the manuscript.
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