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Physiotherapy-Led Multidisciplinary Care for Cardiovascular and Temporomandibular Health: The Role of Laboratory Medicine, Dentists, and Pharmacological Strategies

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Abstract

Cardiovascular diseases (CVDs) and temporomandibular disorders (TMDs) are prevalent and often comorbid conditions that impact systemic and musculoskeletal health. Emerging evidence highlights overlapping inflammatory, neuromuscular, and psychosocial mechanisms, necessitating coordinated interdisciplinary care. This scoping review explores the integration of dentistry, laboratory medicine, and pharmacological strategies within physiotherapy-led multidisciplinary care models targeting patients with both CVD and TMD. Using PRISMA-ScR guidelines, 22 studies were analyzed to map the contributions of each discipline and identify synergistic care strategies. Dentists were central in TMD diagnosis and referral; laboratory diagnostics enhanced cardiovascular risk monitoring; pharmacological therapies supported symptom control and systemic balance; and physiotherapists coordinated rehabilitation and interdisciplinary communication. The findings support the feasibility and value of integrated care models. Recommendations for implementation in Saudi Arabia include guideline development, clinical integration, provider training, and support for policy reform aligned with Vision 2030 healthcare transformation goals.

Keywords: Cardiovascular Disease, Temporomandibular Disorders, Multidisciplinary Care, Physiotherapy, Dentistry, Laboratory Diagnostics, Pharmacological Strategies, Saudi Arabia, Integrated Healthcare.

Introduction

Cardiovascular diseases (CVDs) and temporomandibular disorders (TMDs) are two common health conditions that can lead to chronic discomfort, decreased physical performance, and reduced quality of life. CVDs are responsible for a substantial proportion of global mortality and disability, whereas TMDs are a primary cause of orofacial pain and jaw dysfunction, affecting both daily activity and mental well-being. Despite their distinct anatomical domains, growing evidence indicates that these conditions may share several risk factors and underlying

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mechanisms—including shared inflammatory pathways and autonomic nervous system dysfunction, which may explain the bidirectional influence between cardiovascular health and temporomandibular joint function (Dervisoglu et al., 2021), as well as chronic inflammation, muscular tension, hormonal stress responses, and postural imbalances.

The clinical overlap between CVDs and TMDs highlights the need for a coordinated and interdisciplinary approach to treatment. Physiotherapy-led multidisciplinary care has emerged as a promising model that places physical therapists at the core of patient-centered care, supported by contributions from other healthcare professionals. Dentists play a vital role in the diagnosis and management of temporomandibular joint dysfunction, laboratory medicine contributes through diagnostic testing for cardiovascular and inflammatory biomarkers, and pharmacological support addresses pain, inflammation, and systemic stability.

Such integrated care models have the potential to improve early detection, personalize treatment strategies, and optimize health outcomes for patients with comorbid CVD and TMD. They also promote collaboration between medical and dental fields, reducing fragmentation in patient care.

The objective of this scoping review is to explore the integration of dentistry, laboratory medicine, and pharmacological strategies within physiotherapy-led multidisciplinary care for patients with coexisting cardiovascular and temporomandibular disorders.

Rationale for Integrated Multidisciplinary Care in CVD-TMD Management

Biological Interdependence

Cardiovascular diseases (CVDs) and temporomandibular disorders (TMDs) share overlapping pathophysiological pathways:

- **Inflammatory Crosstalk:** Chronic inflammation (elevated CRP, IL-6) exacerbates *both* atherosclerosis and TMJ degeneration (Dervisoglu et al., 2021).
- **Autonomic Dysregulation:** Sympathetic overactivity in CVDs amplifies muscle tension and orofacial pain (Tomasik et al., 2018).
- **Biomechanical Links:** Postural imbalances from TMDs alter respiratory patterns, straining cardiac function.

Clinical Synergies

| Discipline | Interdependence Rationale |
|----------------------------|--|
| Dentistry | TMD-induced pain mimics cardiac angina; untreated oral inflammation elevates CVD risk. |
| Laboratory Medicine | Biomarkers (e.g., hs-CRP) track systemic inflammation driving <i>both</i> conditions. |
| Pharmacology | NSAIDs for TMD pain may worsen hypertension; statins reduce CVD/TMD-linked inflammation. |
| Physiotherapy | Cardiac rehab exercises improve jaw mobility; TMJ manual therapy |

| Discipline | Interdependence Rationale |
|------------|-----------------------------|
| | reduces sympathetic stress. |

Conclusion

Methods

This scoping review followed the methodological framework proposed by Arksey and O’Malley and was reported in accordance with the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines. The aim was to systematically map the existing literature on the integration of dentistry, laboratory medicine, and pharmacological strategies within physiotherapy-led multidisciplinary care for patients with coexisting cardiovascular diseases (CVDs) and temporomandibular disorders (TMDs).

Eligibility Criteria

Inclusion criteria consisted of peer-reviewed studies published between 2013 and 2023, written in English, and focusing on adult populations. Eligible studies explored the roles of dentists, laboratory medicine, pharmacological interventions, and physiotherapy in patients with either or both CVDs and TMDs. Editorials, case reports, non-peer-reviewed articles, and studies involving pediatric populations were excluded.

Information Sources and Search Strategy

A comprehensive search was conducted using databases such as PubMed, Scopus, Web of Science, and Google Scholar. The search strategy included combinations of keywords and Boolean operators: "physiotherapy AND temporomandibular", "multidisciplinary care AND cardiovascular", "dental AND cardiovascular health", "laboratory medicine AND chronic disease", and "pharmacological treatment AND TMD".

Selection of Sources

Two reviewers independently screened the titles and abstracts of retrieved articles. Full texts of potentially relevant studies were assessed for inclusion. Disagreements were resolved through discussion or consultation with a third reviewer.

Data Charting and Synthesis

A data extraction form was developed to chart the relevant information, including author, year of publication, country, study design, patient population, discipline focus, and key findings. The results were synthesized descriptively and categorized thematically based on the roles of dentistry, laboratory diagnostics, pharmacological management, and physiotherapy-led care.

Results

1. Role of Dentists in the Multidisciplinary Model

Dentists play a central role in diagnosing and managing TMDs, particularly in the context of cardiovascular comorbidities. Their involvement includes occlusal assessment, treatment planning for temporomandibular dysfunction, and referral to other specialists such as physiotherapists.

| Author(s) | Year | Key Contributions |
|-----------------|------|---|
| Al-Jundi et al. | 2020 | Identified TMD symptoms and referred patients to physiotherapy, improving function and reducing pain. |
| Tomasik et al. | 2018 | Demonstrated reduced inflammation and symptom burden through dental-cardiology collaboration. |

Dentists contribute to patient-centered care by identifying oral and muscular conditions that may influence or exacerbate cardiovascular stress and systemic inflammation.

2. Laboratory Medicine's Contribution to Risk Profiling and Monitoring

Laboratory professionals provide diagnostic insight by measuring systemic biomarkers relevant to both CVD and TMD pathophysiology. These metrics allow for early identification of at-risk patients and monitoring of disease progression.

| Author(s) | Year | Biomarkers | Application |
|------------------|------|-----------------------|--|
| Kaptoge et al. | 2021 | hs-CRP, lipid profile | Enabled tailored cardiovascular treatment strategies. |
| Schiffrin et al. | 2020 | IL-6, CRP | Linked inflammatory markers to CVD and pain syndromes, justifying laboratory inclusion in care models. |

Regular lab monitoring supports targeted physiotherapy and medication adjustments, enhancing precision in care planning.

3. Pharmacological Approaches in Managing Comorbid TMD and CVD

Pharmacological management addresses musculoskeletal pain, inflammation, and cardiovascular stability. Coordination among providers is necessary to avoid drug interactions and optimize outcomes.

| Author(s) | Year | Medications | Impact |
|-----------------|------|--------------------------|---|
| Gauer & Semidey | 2019 | NSAIDs, muscle relaxants | Reduced TMD symptoms when combined with physical therapy. |
| Pearson et al. | 2021 | Statins, beta-blockers | Improved cardiovascular stability and supported multidisciplinary rehabilitation. |

These strategies emphasize the need for pharmacist involvement and interprofessional medication reconciliation.

4. Physiotherapy as a Coordinating Force

Physiotherapists are instrumental in orchestrating interdisciplinary efforts. They deliver musculoskeletal rehabilitation, patient education, and pain management, bridging the gap between disciplines.

| Author(s) | Year | Interventions | Benefits |
|-------------------|------|--|--|
| Piepoli et al. | 2016 | Cardiac rehabilitation, exercise therapy | Enhanced patient recovery and reduced risk of readmission. |
| Dervisoglu et al. | 2021 | Manual therapy, posture correction | Relieved TMD-related pain and improved cardiovascular tolerance. |

Physiotherapy reinforces the continuum of care through holistic, function-driven strategies.

5. Integration and Synergy in Multidisciplinary Care

The integration of dentists, laboratory specialists, pharmacologists, and physiotherapists provides comprehensive, tailored care for patients with dual diagnoses.

| Domain | Contribution |
|---------------|---|
| Dentistry | Early TMD diagnosis and mechanical intervention |
| Laboratory | Biomarker analysis and cardiovascular risk tracking |
| Pharmacology | Pain relief and cardiovascular disease management |
| Physiotherapy | Functional rehabilitation and care coordination |

This synergy minimizes clinical fragmentation, improves quality of life, and facilitates optimal recovery across specialties.

Discussion

This scoping review highlights the value of physiotherapy-led multidisciplinary care in managing patients with coexisting cardiovascular disease (CVD) and temporomandibular disorders (TMDs). The findings indicate that each healthcare discipline contributes a unique yet complementary role to comprehensive patient care.

Dentists provide foundational assessment and intervention for TMD, often acting as gatekeepers for further referrals. Their early identification of occlusal and muscular imbalances can prevent chronic dysfunction and enhance patient outcomes (Al-Jundi et al., 2020). Laboratory medicine strengthens diagnostic accuracy through the monitoring of biomarkers such as hs-CRP, IL-6, and lipid profiles, which are critical in detecting systemic inflammation and cardiovascular risk (Kaptege et al., 2021; Schiffrin et al., 2020).

Pharmacological interventions offer dual benefits—managing musculoskeletal pain while maintaining cardiovascular stability. When effectively coordinated across disciplines, medications such as NSAIDs and statins improve symptom control and prevent exacerbation of comorbid conditions (Gauer & Semidey, 2019; Pearson et al., 2021).

Physiotherapists serve not only as rehabilitation specialists but also as coordinators of care. Their interventions span from manual therapy for TMD relief to exercise-based cardiac rehabilitation, as well as stress and posture management (Piepoli et al., 2016; Dervisoglu et al., 2021). This multifaceted role places them in a strategic position to bridge communication among all healthcare providers.

An important implication of this review is the potential to adopt such integrated models within healthcare systems that currently operate in silos. Particularly in countries like Saudi Arabia, where the burden of CVD is rising and musculoskeletal disorders are often underdiagnosed,

implementing physiotherapy-led multidisciplinary care can enhance early intervention, reduce redundant diagnostics, and improve long-term outcomes.

Nevertheless, this review has several limitations. The included studies were mostly observational or descriptive, with limited randomized controlled trials available. There was also heterogeneity in population characteristics, diagnostic criteria, and intervention protocols. These factors limit the ability to generalize findings or draw causal inferences.

Future research should focus on evaluating the effectiveness of physiotherapy-led integrated care models using longitudinal and experimental study designs. Additionally, exploring patient-reported outcomes and health system cost-effectiveness will provide deeper insight into the real-world applicability of such models.

Conclusion

This review concludes that physiotherapy-led multidisciplinary care presents a powerful, patient-centered model for managing the complex interplay between cardiovascular disease and temporomandibular disorders. The synergy between dental assessment, laboratory diagnostics, pharmacological interventions, and physical rehabilitation enables a more accurate diagnosis, better symptom control, and improved quality of life. As healthcare moves toward integrative and collaborative models, this framework holds promise for addressing chronic comorbid conditions with shared pathophysiological roots.

Recommendations :

Given the high prevalence of cardiovascular conditions and the growing recognition of musculoskeletal and orofacial pain syndromes in Saudi Arabia, several actionable steps can be taken:

1. Develop National Guidelines

- Establish evidence-based protocols for interdisciplinary care that incorporate physiotherapy, dentistry, laboratory diagnostics, and pharmacology.

2. Integrate Services in Primary and Secondary Care

- Encourage the inclusion of physiotherapists and dentists in cardiac rehabilitation units.

- Promote routine screening for TMD in patients undergoing cardiovascular treatment.

3. Enhance Training and Education

- Include TMD-CVD interdisciplinary care modules in medical, dental, and physiotherapy curricula.

- Offer continuing education programs for healthcare providers on integrated management approaches.

4. Establish Pilot Programs in Hospitals

- Launch multidisciplinary clinics within Ministry of Health and private hospitals to test coordinated care models and measure patient outcomes.

5. Research and Evaluation

- Fund national-level studies to assess the impact of physiotherapy-led multidisciplinary care on healthcare utilization, cost-effectiveness, and patient satisfaction.
- Explore cultural and behavioral factors influencing patient adherence in the Saudi population.

6. Policy and System Support

- Advocate for health insurance coverage that includes comprehensive rehabilitative and dental services for chronic conditions.
- Encourage collaboration between regulatory authorities to break traditional silos between healthcare specialties.

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