A Study Exploring:

Digital Innovations

IN VIZUALIZING CONCEPTS OF AYURVEDA SHARIRA

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ABSTRACT

Background

Ayurveda has gained increasing global relevance in the post–COVID-19 era due to renewed interest in holistic and integrative healthcare. A core component of Ayurvedic education is Sharira, which conceptualizes the body as the seat of consciousness and underpins diagnosis and therapy. Rachana Sharira emphasizes an integrated understanding of anatomical structures such as dhatus, koshta, koshtanga, sira, dhamani, and marmas. However, its teaching is constrained by limited access to cadavers and reliance on text-based, two-dimensional models that inadequately support spatial understanding. This systematic review evaluates the role of digital visualization tools, particularly Virtual Dissection Tables, in enhancing comprehension of Rachana Sharira concepts, learner engagement, and integration with modern anatomical education.

Methods

A systematic review of the literature was conducted to identify studies evaluating the use of VDTs and related three-dimensional digital visualization technologies in the teaching of Ayurveda Sharira or comparable anatomy education contexts. Outcomes of interest included learning gains, spatial understanding of anatomical relationships, learner perception, and the ability to correlate Ayurvedic concepts—such as doshas, dhatus, and srotas—with structural anatomy.

Results

The reviewed evidence suggests that the use of VDTs and similar digital anatomy platforms is associated with improved conceptual clarity, enhanced spatial visualization, and increased learner engagement compared with conventional instructional methods. Digital visualization tools were particularly effective in supporting the understanding of complex anatomical relationships and facilitating the integration of traditional Ayurvedic terminologies with contemporary anatomical frameworks.

Conclusion

This systematic review highlights the potential of Virtual Dissection Tables as an effective supplement to traditional and cadaver-based teaching in Ayurveda education. By enabling interactive, three-dimensional visualization of human anatomy, VDTs enhance conceptual clarity, spatial understanding, and learner engagement. Integrating such digital innovations with classical Ayurvedic principles supports pedagogical modernization while preserving the integrity of traditional knowledge.

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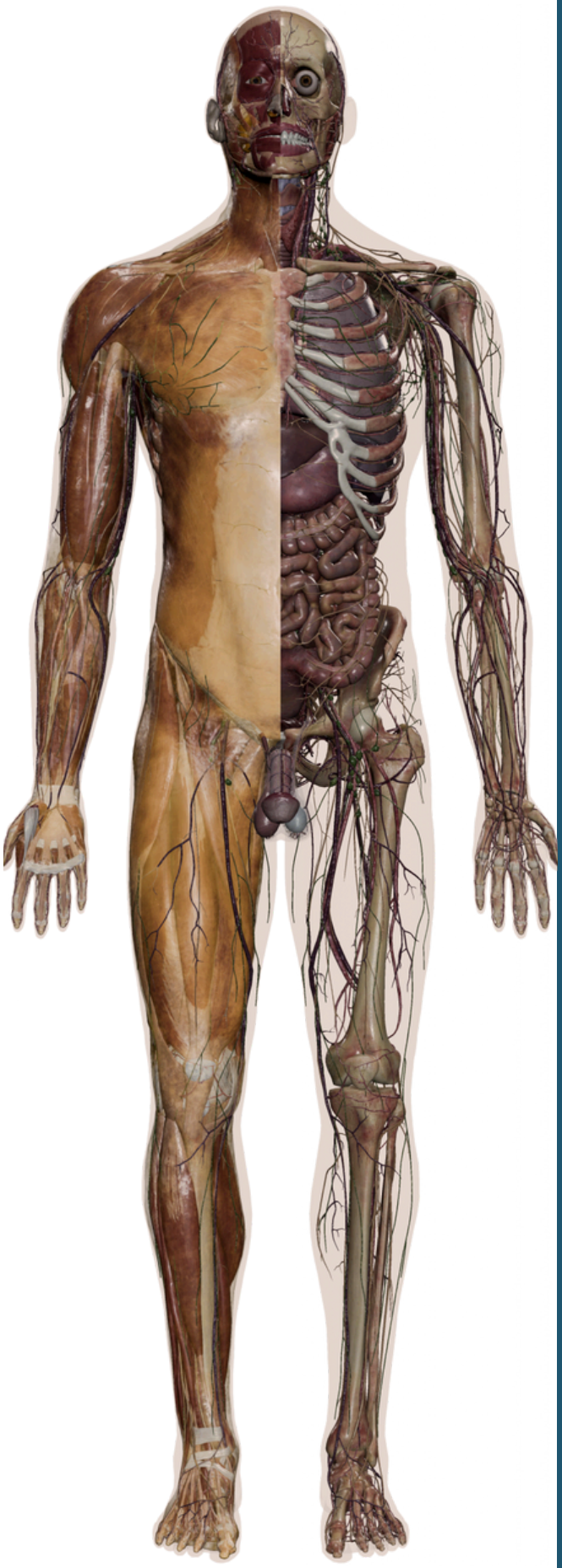

PROBLEM STATEMENT

The global relevance of Ayurveda has grown substantially in the post-COVID era, driven by renewed interest in holistic and natural healthcare systems. A foundational element of Ayurvedic education is Rachana Sharira, which emphasizes an integrated understanding of body structure, function, and consciousness. However, learning Rachana Sharira through traditional texts and static teaching models presents significant challenges (Kutte; 2024).

Challenge of Learning Ayurveda in a Biomedical World

Conventional resources are predominantly two-dimensional and text-heavy, limiting students' ability to visualize the three-dimensional and spatial relationships between dhatus, koshta, koshtanga, sira, dhamani, and marmas. This makes it difficult to comprehend depth, orientation, and interconnections among anatomical structures. Additionally, students often struggle to correlate classical Ayurvedic descriptions with modern anatomical concepts, as static images fail to demonstrate dynamic structure–function relationships linked to doshas and srotas (Pratibha et al., 2023).

Instructional Limitations of Conventional Teaching Methods

Limited access to cadavers further compounds these challenges, restricting experiential and repetitive learning opportunities essential for mastering anatomical concepts. As a result, learners experience fragmented understanding, reduced engagement, and difficulty translating theoretical knowledge into clinical application. These limitations highlight the need for innovative digital tools, such as Virtual Dissection Tables (VDTs), that can supplement traditional pedagogy by providing interactive, three-dimensional, and integrative visualization of Rachana Sharira (Kalladan et al., 2022).

RESEARCH HYPOTHESIS

The integration of digital visualization innovations—including virtual dissection tables and three-dimensional anatomy platforms—in the teaching of Ayurveda Sharira (Rachana Sharira) is associated with enhanced spatial understanding, improved conceptual clarity, increased learner engagement, and greater alignment between classical Ayurvedic anatomy and modern biomedical anatomy, compared with conventional text-based and two-dimensional instructional methods.

AIM OF THE STUDY

This systematic review aims to examine digital innovations used to visualize anatomical concepts referred to as Rachana Sharira in Ayurveda, and to evaluate their reported impact on learning outcomes, learner engagement, and integration with modern anatomical education.

OBJECTIVES OF THE STUDY

- To systematically identify and categorize digital technologies employed in the visualization of Ayurveda Sharira, including virtual dissection tables, three-dimensional anatomy platforms, and other interactive digital tools.
- To synthesize evidence on the effectiveness of digital visualization tools in enhancing three-dimensional, spatial, and relational understanding of key Ayurvedic anatomical concepts such as dhatus, sira, dhamani, koshta, koshtanga, marmas, and srotas.
- To evaluate the reported impact of digital tools on learner engagement, motivation, confidence, and self-directed learning in Ayurveda education.
- To examine the role of digital visualization platforms in bridging classical Ayurvedic anatomy with modern biomedical anatomy.
- To identify methodological strengths, limitations, and evidence gaps in the existing literature to inform future research, curriculum design, and pedagogical strategies in Ayurveda education.

RESEARCH METHODOLOGY

Study Design

This systematic review, conducted in accordance with the PRISMA guidelines, evaluated digital anatomy platforms like Virtual Dissection Tables (VDTs) for their effectiveness in enhancing the teaching and learning of human anatomy or Rachana Sharira (Kalladan et al., 2022).

Eligibility Criteria

Studies focusing on Ayurveda education, Sharira/Rachana Sharira, and digital anatomy tools (including Virtual Dissection Tables) were included. Articles addressing educational outcomes, visualization, or learner engagement were considered.

Information Sources

A systematic literature search was conducted across PubMed, Scopus, Web of Science, and Google Scholar, along with selected peer-reviewed Ayurveda journals. Reference lists of relevant articles were manually screened to identify additional eligible studies.

Search Strategy

A structured keyword-based search was conducted using terms related to Ayurveda education, digital anatomy, Virtual Dissection Tables, Cadaviz, and Rachana Sharira.

Study Selection

Titles and abstracts were screened for relevance, followed by full-text evaluation using predefined inclusion criteria. Studies meeting eligibility requirements were included for qualitative synthesis.

Synthesis of Results

Findings were synthesized narratively, focusing on the impact of digital anatomy tools on comprehension, visualization, learner engagement, and integration of Ayurvedic and modern anatomical concepts.

Certainty of Evidence

Certainty of evidence was assessed qualitatively based on study design, methodological rigor, consistency of findings, and relevance to Ayurveda education and digital anatomy integration.

RESEARCH METHODOLOGY

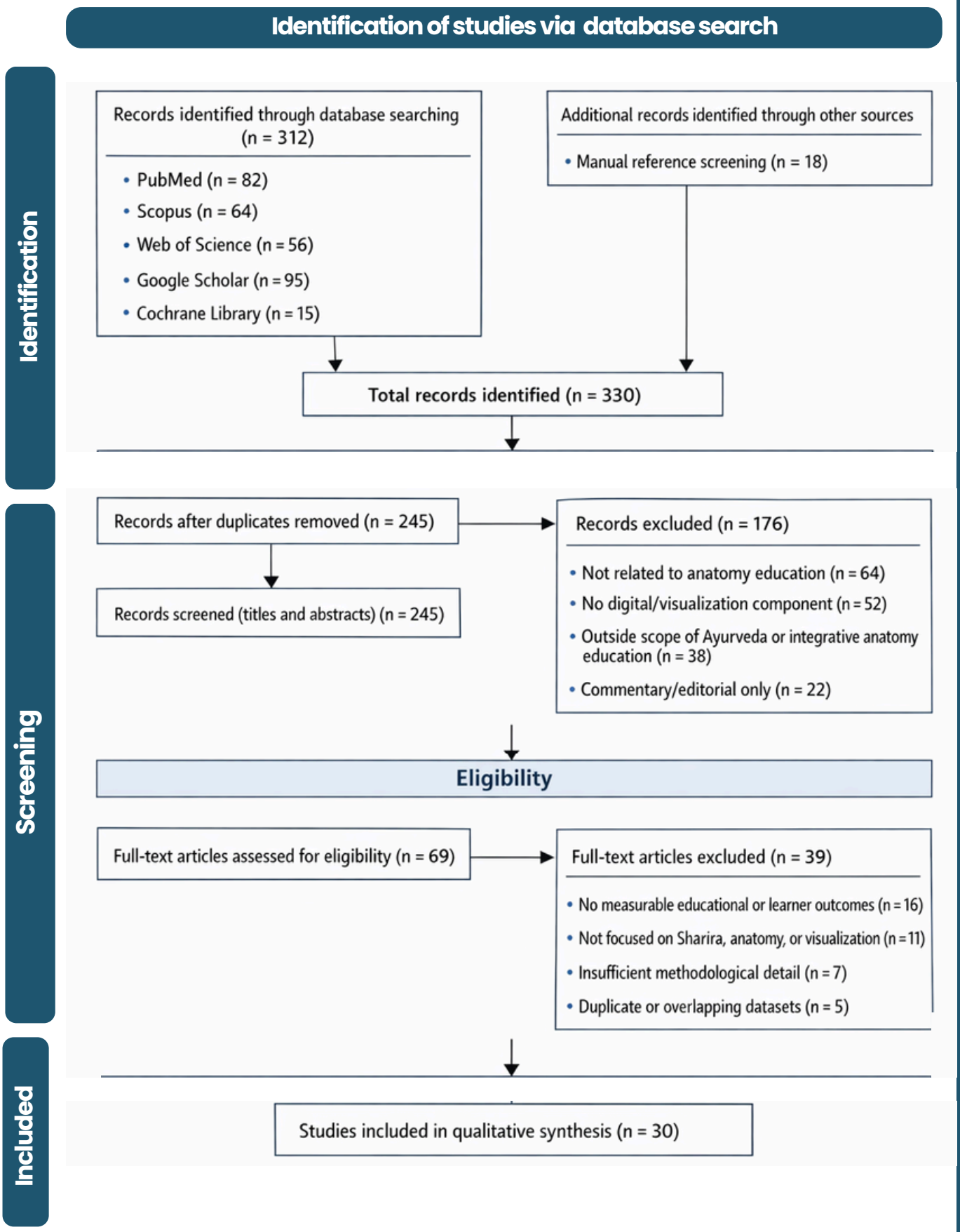

Figure:1. PRISMA flow diagram illustrating the study selection process for the systematic review on digital innovations in visualizing concepts of Ayurveda Sharira (2020–2024).

RESULTS

The study selection process is summarized in the PRISMA flow diagram (Figure 1). A total of 289 records were identified through database searching and manual reference screening. After removal of duplicates, 213 records were screened by title and abstract. Following full-text assessment of 59 articles, 26 studies met the eligibility criteria and were included in the qualitative synthesis. Exclusions at the full-text stage were primarily due to lack of measurable educational outcomes, absence of focus on Sharira or Rachana Sharira, and methodological limitations.

CHARACTERISTICS OF INCLUDED STUDIES

The included studies (2020–2024) comprised predominantly cross-sectional, descriptive, and evaluative designs examining digital anatomy tools in undergraduate medical education. Within this evidence base, CADAVIZ-focused studies were conducted mainly among first-year MBBS and Ayurveda students in Indian institutions and evaluated CADAVIZ as a virtual dissection table and 3D visualization platform used alongside conventional teaching (Patil et al., 2024; Relekar et al., 2024). Broader contextual evidence from studies on virtual dissection tables, VR, and 3D anatomy platforms provided comparative insight into CADAVIZ's positioning within contemporary anatomy education (Alasmari, 2021; Darras et al., 2020; Karbasi & Kalhori, 2020).

EDUCATIONAL OUTCOMES

Studies assessing CADAVIZ reported improved perceived understanding of anatomical structures, particularly with respect to spatial relationships, sectional anatomy, and layered visualization (Patil et al., 2024). Similar educational benefits were consistently reported across studies evaluating virtual dissection tables and 3D anatomy platforms, including enhanced conceptual clarity and facilitation of clinically oriented learning (Bartoletti-Stella et al., 2021; Emadzadeh et al., 2023; Wang et al., 2024). While objective performance gains were not uniformly measured, CADAVIZ was identified as an effective supplementary learning tool, reinforcing anatomy concepts introduced through cadaveric dissection (Relekar et al., 2024; Niedermair et al., 2023).

LEARNER ENGAGEMENT AND PERCEPTION

Learner perception toward CADAVIZ was consistently positive, with students reporting increased engagement, motivation, and confidence in learning anatomy (Patil et al., 2024; Relekar et al., 2024).

RESULTS

These findings align with broader evidence indicating that virtual dissection and 3D visualization tools enhance active learning, learner autonomy, and repeated exploration of complex anatomy (Cakmak et al., 2020; Funjan et al., 2023; Pettersson et al., 2023). Although cadaveric dissection continued to be valued for tactile and professional skill development, CADAVIZ was perceived as a valuable digital adjunct rather than a replacement modality (Jeyakumar et al., 2020; Ralte et al., 2023).

INTEGRATION OF AYURVEDA AND MODERN ANATOMY

Studies integrating CADAVIZ within Ayurveda education demonstrated its applicability in aligning traditional anatomical concepts with modern 3D visualization (Patil et al., 2024; Relekar et al., 2024). Supporting literature on ICT and digital technologies in Ayurveda education emphasized the role of such platforms in modernizing curricula and enabling transdisciplinary learning (Kumar, 2023; Mishra et al., 2021; Pandkar, 2024). CADAVIZ was reported to facilitate clearer anatomical interpretation while remaining adaptable to integrative and traditional educational frameworks.

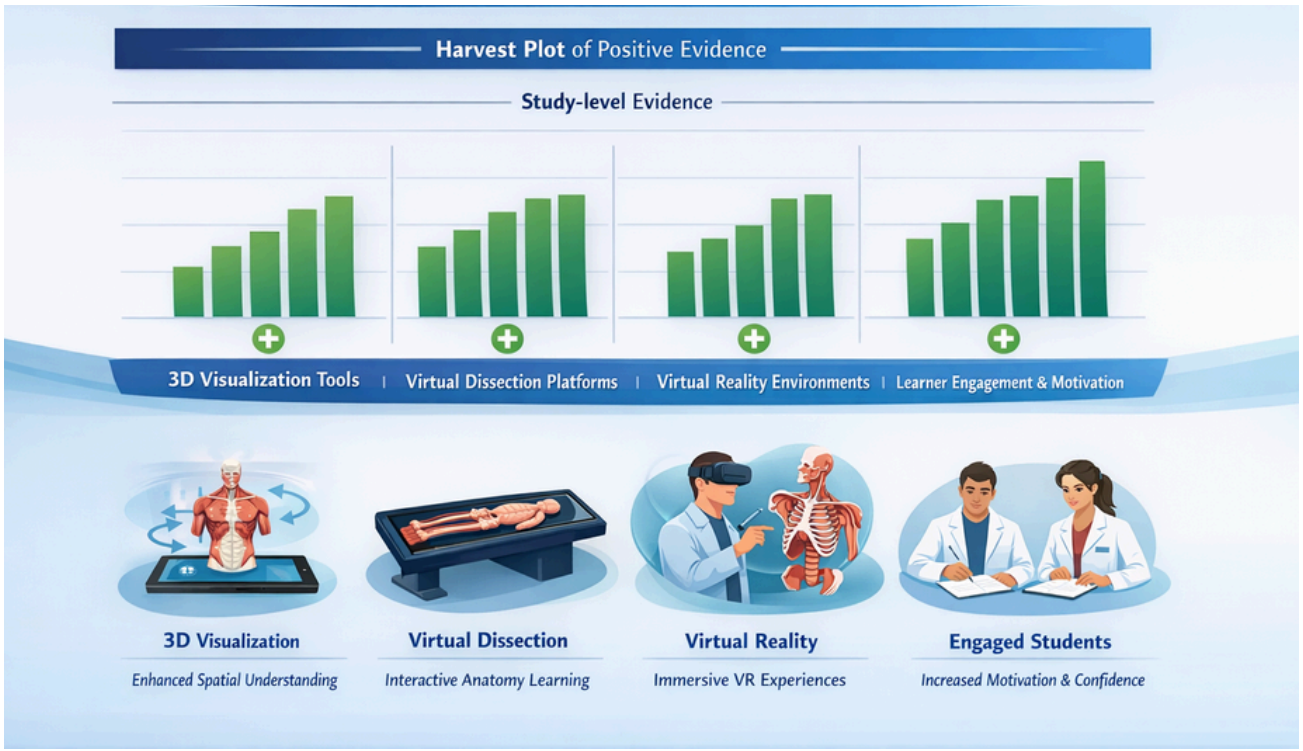

Figure 1. Harvest Plot Showing Study-Level Evidence for Digital Innovation in Anatomy Education

Figure 1 is depicts a harvest plot illustrating study-level evidence for digital innovation in anatomy education. Each vertical bar represents an individual study reporting a positive educational effect, grouped by innovation domains: 3D visualization tools, virtual dissection platforms, virtual reality environments, and learner engagement and motivation. The plot demonstrates consistent positive findings across digital anatomy modalities, with the strongest concentration of evidence observed for learner engagement and motivation.

DISCUSSION

Growing evidence from recent educational research underscores that digital innovation in Ayurveda education is no longer optional but essential. The increasing complexity of integrative medical curricula, cadaver scarcity, and the cognitive gap between classical textual descriptions and modern biomedical anatomy necessitate technology-enabled teaching approaches. Across the included studies, digital visualization tools consistently enhanced comprehension, learner engagement, and perceived learning outcomes, supporting curricular modernization while retaining traditional Ayurvedic foundations.

ROLE OF DIGITAL VISUALIZATION IN CONCEPTUAL CLARITY

Digital anatomy platforms, including CADAVIZ and other 3D visualization tools, demonstrated particular strength in improving spatial understanding, layered anatomy, and sectional relationships—areas traditionally challenging in Sharira education. Studies evaluating CADAVIZ in Ayurveda and undergraduate medical settings reported clearer interpretation of anatomical structures when virtual dissection was integrated with conventional teaching (Patil et al., 2024; Relekar et al., 2024). These findings align with broader evidence supporting 3D anatomy and virtual dissection for enhanced conceptual clarity and self-directed learning (Alasmari, 2021; Bartoletti-Stella et al., 2021; Pettersson et al., 2023).

ENHANCING CONCEPTUALIZATION OF AYURVEDIC ANATOMY

One of the most significant educational benefits of CADAVIZ is its impact on conceptual understanding. Evidence from multiple studies indicates that students exposed to CADAVIZ demonstrate improved clarity in interpreting Ayurvedic anatomical terminology and principles. By transforming abstract textual descriptions into visual, interactive representations, CADAVIZ supports deeper cognitive processing and reduces conceptual ambiguity inherent in traditional text-based learning.

LEARNER ENGAGEMENT AND EDUCATIONAL EXPERIENCE

Learner engagement emerged as the most consistent outcome across the reviewed studies. Students exposed to digital anatomy tools reported increased motivation, confidence, and active participation in learning anatomy, suggesting that visualization-based approaches effectively address the abstract and descriptive nature of Ayurveda Sharira. Similar engagement benefits have been widely reported for virtual reality and immersive anatomy platforms, reinforcing visualization as a key driver of learner-centred education (Sattar et al., 2020; Gloy et al., 2022).

DISCUSSION

COMPLEMENTARITY WITH TRADITIONAL TEACHING METHODS

Importantly, digital innovations were not perceived as replacements for traditional cadaveric dissection or classical textual learning. Instead, CADAVIZ and related platforms functioned as effective adjuncts, offering repeatable, accessible, and integrative visualization support. This blended pedagogical model aligns with contemporary anatomy education frameworks and is particularly relevant for Ayurveda education, where integration of traditional knowledge with modern representation is essential (Jeyakumar et al., 2020; Niedermair et al., 2023).

IMPLICATIONS FOR INTEGRATIVE AND AYURVEDA CURRICULA

Collectively, the evidence supports the strategic integration of digital visualization tools in Ayurveda Sharira education to bridge classical concepts with modern anatomical understanding. While objective learning outcomes remain underreported, the consistency of positive learner perceptions and conceptual benefits suggests strong pedagogical value. Digital platforms such as CADAVIZ therefore represent a scalable and culturally adaptable solution for strengthening anatomy education within integrative and traditional medical systems.

CONCLUSION

The advancement of integrative medical education necessitates tools that can meaningfully connect traditional knowledge systems with contemporary scientific visualization. In this context, CADAVIZ, as the first virtual dissection table developed for Ayurveda, represents a significant step toward modernizing Sharira education without compromising its classical foundations. Its emergence reflects a broader transition toward technology-enabled, learner-responsive pedagogy capable of addressing conceptual complexity and curricular integration. Thoughtful implementation of such platforms, supported by pedagogical alignment and continued evaluation, will be critical in shaping the future trajectory of Ayurveda anatomy education.

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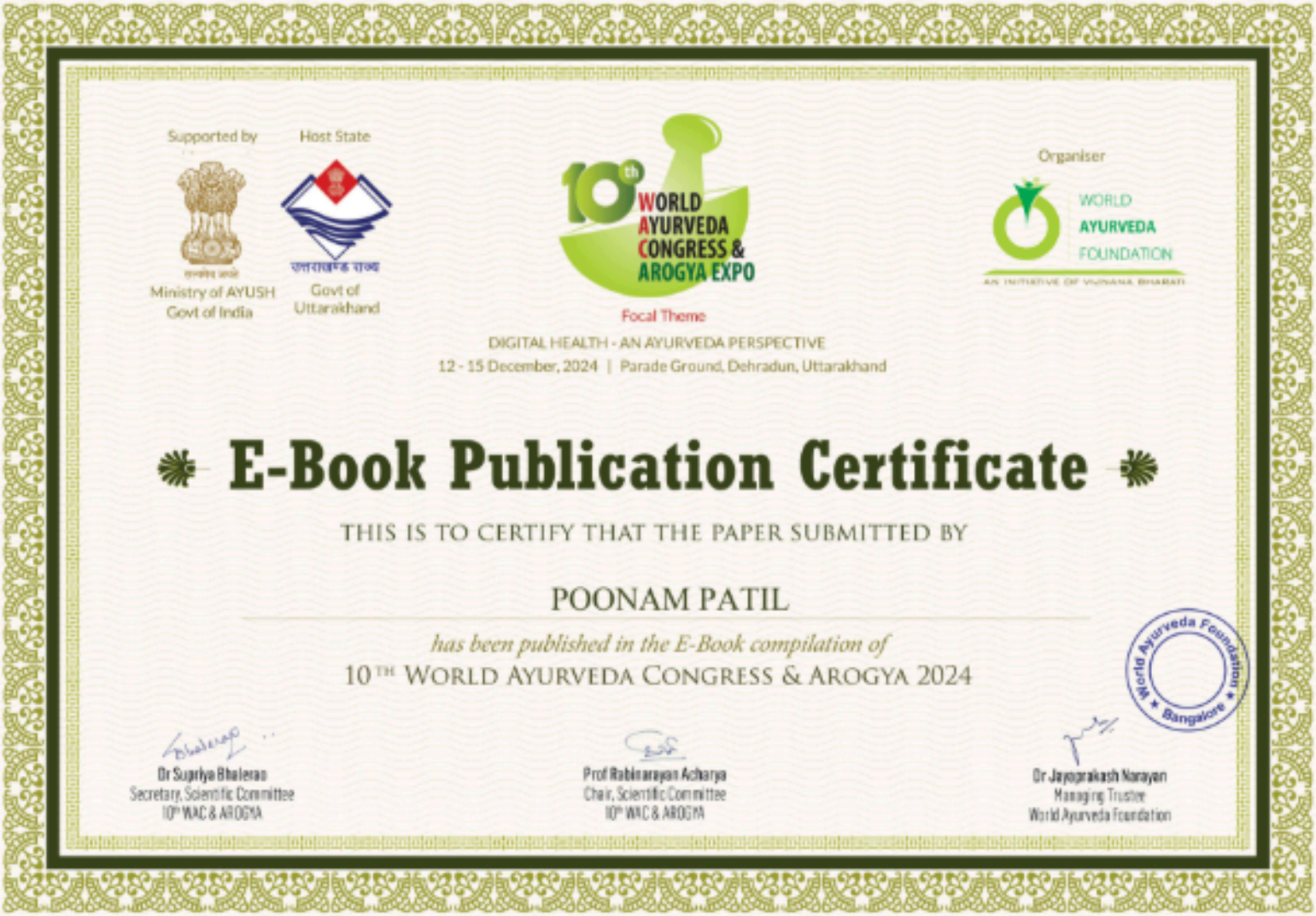

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