



A Retrospective-Comparative Analysis of Advanced and Basic Physiotherapy Treatment Protocols for Neck Pain using Clinical Software-Based Outcome Data from Bangalore-based Clinic

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Abstract

Background: Neck pain is a highly prevalent musculoskeletal disorder and a leading cause of disability, reduced productivity, and impaired quality of life, particularly among individuals with sedentary and desk-based occupations. With advances in physiotherapy practice, treatment has evolved from traditional modality-based approaches to protocol-driven, multimodal, and technology-assisted rehabilitation. However, real-world comparative evidence evaluating ADVANCED versus BASIC physiotherapy protocols using routine clinical data remains limited.

Objective: To retrospectively compare the effectiveness of ADVANCED and BASIC physiotherapy treatment protocols for neck pain using clinical software-based outcome data from a Bangalore-based physiotherapy clinic network.

Methods: A retrospective comparative study was conducted using anonymised electronic health records from PHYSIOTATTVA Physiotherapy Clinics across Bangalore between November and December 2025. Ninety patient records (age 20–60 years) diagnosed with non-specific or mechanical neck pain were included. Participants were categorised into two groups: BASIC physiotherapy protocol (hot/cold packs, TENS, ultrasound, IFT, basic ROM and strengthening exercises; n = 34) and ADVANCED physiotherapy protocol (super inductive magnetic system, shockwave therapy, high-intensity laser therapy, EPIR, manual therapy, neurodynamic mobilisation, ergonomics training, and progressive strengthening; n = 56). Outcome measures included pain intensity using the Numeric Pain Rating Scale (NPRS) and functional disability using the Neck Disability Index (NDI), assessed at baseline and discharge. Statistical analysis involved paired and independent t-tests, with $p < 0.05$ considered statistically significant.

Results: Both groups demonstrated statistically significant improvements in NPRS and NDI scores from baseline to discharge ($p < 0.001$). While between-group differences were not statistically significant at discharge, the ADVANCED physiotherapy group showed greater mean reductions in pain and disability scores compared to the BASIC group, particularly among patients with chronic neck pain. The average treatment duration was comparable between groups.

Conclusion: Both BASIC and ADVANCED physiotherapy protocols are effective in reducing pain and disability in neck pain patients. However, ADVANCED physiotherapy protocols demonstrated greater clinical improvement, especially in chronic conditions, suggesting added benefits of multimodal, technology-assisted, and patient-centric rehabilitation. Retrospective analysis of clinical software data from PHYSIOTATTVA serves as valuable real-world evidence to support evidence-based physiotherapy practice.

Keywords: Neck Disability Index (NDI); Neck Pain

Introduction

Pain or any discomfort in the neck with or without referring to one or both upper extremities, which lasts for more than 1 day, is termed as the Neck pain [1]. An individual can also feel pain or discomfort around the shoulders, upper back, or towards the head, primarily accompanied by neck pain. It has been increasing with a prevalence rate of 46% to over 68% in the Bangalore urban population, mainly among residing individuals with IT professionals or desktop job workers. Neck pain is a world-wide leading cause for reducing prolificacy, disability, and impaired quality of life. One of the major risks of developing neck pain is posture/positions followed by a sedentary lifestyle, weight lifting, falls/trauma, work-related musculoskeletal disorders, stress/psychological aspect and smoking. Neck pain is a common musculoskeletal disorder in work/jobs with a static position of the neck, which results in a lot of overloading/underloading on the musculoskeletal system, causing muscle strain, muscle inflammation, early spondylotic changes in the cervical spine, and intervertebral disc issues. As far as 70% of individuals suffering from neck pain have an impact on daily activities and participation, causing dysfunction in their lifetime [1].

Continuous static positions like flexion, hyperflexion, and extended head cause major changes in an individual, which is also responsible for impairment and major disability among neck pain patients. In 2017, APTA revised neck pain clinical guidelines and classified them into four categories: neck pain with mobility deficits, with movement coordination impairments, associated headaches, and with radiating pain [2]. Neck pain management in physiotherapy has multiple approaches in treatment with variants of protocols using electrotherapeutic modalities, soft tissue mobilisation, manual hands-on techniques, therapeutic exercises, and pain neuroscience education. Although neck pain is known to be highly common in incidence and prevalence, there's lack of comprehensive, detailed research calculating its disability, availability, and awareness of advanced physiotherapy management to reduce pain and better quality of life in healthcare systems [1]. With advanced healthcare systems using AI-driven technology, all patients' records have been maintained under validated software tools, which include comprehensive physiotherapy assessment, daily administration reports, patients' SOAP notes, and detailed physiotherapy treatment plan and management with clinical outcome measures [3].

Physical examination consisted of pointers as follows: history taking, symptoms, observation, palpation, pain measurements, sensory & motor assessments, specific tests, outcome measuring scores, differential diagnosis, diagnostic images (if any), and based on these, intended for appropriate diagnosis [3]. Physiotherapy management is a combination of Electrotherapy, Exercise therapy, Manual therapy, and education, which are key options for evidence-based treatments. Psychological and multidisciplinary treatments are also part of the remarkable difference in Neck pain management [4]. Electrotherapy comprises Transcutaneous electrical muscle stimulation (TENS), Interferential therapy (IFT), Russian current (RC), Ultrasound therapy (US), and traditional modalities [5,6]. Technology modalities are upgraded advanced therapy includes Pulsed Electro-Magnetic field therapy (PEMF), Super Inductive Magnetic System (SIS) [7], Shock-wave therapy (SWT), Magnetotherapy, Electronic Post-isometric relaxation current (E-PIR), High- Intensity Laser therapy (HILT), and De-Compression therapy (D-COM), which have shown analgesic effects and are safe and effective to use in the treatment of musculoskeletal injuries [6]. Therapeutic exercises vary from land-based to aquatic-based exercises for neck-specific stretching, mobility, breathing exercises, biofeedback training, neurodynamic mobilisation, endurance, or strength training [4]. Later, Passive treatment approaches were practised classically with limited emphasis on long term rehabilitation or functional outcomes. Physiotherapy now is protocol-driven, manual, and demanding more in speeding recovery with a reduction in recurrence. In recent decades, physiotherapy has emerged with good evidence of advanced patient centric tailor-made protocols using the human body as a multimodal approach for therapeutic management [3,7,8]. Evidence supported exercise regimes better than before are static and dynamic cervical stabilisation exercises, manipulation techniques, neuromuscular education, motor control training, proprioceptive training, eye-head-hand co-ordination, balance and coordination training, cognitive behavioural therapy (CBT), postural correction training, technology assisted rehabilitation [8-10]. The consolidation of clinical software systems at user accessibility has further transformed daily physiotherapy practice by system data recording, progress tracking, detailed assessment and evaluation with treatment outcome measures, thereby enhancing clinical accountability and research potential [12].

Purpose and Aim of study

Despite the updated research now available, there's still a further lack of real-world evidence which compares the effect of advanced versus basic physiotherapy interventions using daily collected patients' clinical records and data. These data have been collected from Physiotattva, Physiotherapy Clinics, geographically distributed across 21 branches in Bangalore. Therefore our aim of our study is to do a retrospective comparative analysis using clinical software-based outcome data, which provides an important window to assess evolving physiotherapy treatment protocols. These study results will be a yardstick to add to valuable research in evidence based management in the treatment of neck pain patients.

Materials and Methodology

Study design, duration of study, study setting and data collection

This is a retrospective comparative study designed to examine physiotherapy treatment records from the duration of November and December 2025 in the setting of Physiotattva, Physiotherapy Clinics. It is at a Bangalore-based outpatient physiotherapy clinics using uniform anonymised clinical software records. Patients' records with a diagnosis of Neck pain were screened.

Inclusion and Exclusion criteria

The inclusion criteria includes adults with age of 20 - 60 years, Diagnosed with Non-specific or Mechanical neck pain, Completed their physiotherapy sessions as prescribed, Complete baseline and discharge outcome data available, Mentally stable individuals, participants can have history of other musculoskeletal condition like OA but not active presently, well controlled health condition like anxiety or depression that not affecting participation or pain reporting.

The exclusion criteria are in brief history of any surgeries in Face, Head, Neck, Spine, Thorax; History of Whiplash injury or Trauma, Tumor or Infection, Non-consent individuals, Mentally retarded or language barrier or who unables to understand command, Unstable medical systemic illness like CV, Hepatic or Renal emergencies, Neurological deficit or Red flags conditions, Incomplete or missing clinical records.

Data sampling method and Sample size

The sampling method for this study is purposive sampling. Using software data, firstly, Diagnosis, Age, Location and Desired duration (November and December 2025) were filtered and out of which 95 patients' records were selected as the sample size. The consent form was prepared before the data was collected and was taken from research participants on the first day of their physiotherapy treatment.

Intervention groups are divided into two groups: Basic Physiotherapy protocol group - Hot or Cold pack, TENS, US, IFT, basic range of motion exercises (ROM) and general strengthening exercises. Advanced Physiotherapy protocol group - SIS, SWT, HILT, EPIR, Manual therapy, Neurodynamic mobilisation techniques, Ergonomics training, Progressive strengthening and conditioning, and technology-assisted rehabilitation.

Outcome measures used in this study were pain intensity, measured by the Numeric Pain Rating Scale (NPRS), and functional disability, assessed by the Neck Disability Index (NDI). These outcome data were extracted from clinical software records from baseline to discharge of that patient's record. From 95, 5 were not selected due to 1 data in the record being incomplete, 2 data in the record have opted for both treatment options, 1 data in the record has opted for only Exercises, including Strength and conditioning, and 1 data in the record has opted for only Aquatherapy.

Data analysis

Statistical analysis was done using descriptive statistics to summarise demographic data. Paired t-tests assessed for differences within-group, and independent t-tests were used to find comparisons between outcome measures of groups and within the groups. A p-value <0.05 was considered statistically significant.

Results

Results showing a total of 90 patients' records were included in the study analysis, divided into 2 predominantly co-hort groups: Advanced group (n = 56) and Basic group (n = 34).

There's a higher prevalence of Male participants in the advanced group of 58.9%, whereas the basic group has 50% of each gender represented. Demographic baseline data analysis showing the mean age of the advanced group was 36.16 ± 9.12 years and 34.06

± 8.72 years for the basic group. On the data of occupation, the advanced group had 39.4% of Desktop job workers and 32.4% were in the basic group. The patient’s record showing Chronic pain was majorly 57.1% in the advanced group than 44.1% in the basic group, and later having 32.4% of acute pain. Nearly all patients recorded poor posture across both groups, 96.4% in the advanced and 82.4% in the basic. Cervical radiculopathy with 17.9% and muscle strain with 21.4% were the most frequent diagnoses of the advanced group, whereas 20.6% of muscle strain and 8.8% of myalgia and trapezitis were diagnoses of the basic group.

The mean treatment duration in both groups was 10 days. The average treatment duration of both groups was 10.84 ± 5.11 days for the advanced and 10.32 ± 6.00 days for the basic group.

Within-group analysis

Paired t-tests results showed statistically significant improvements within the group using NPRS and NDI as variables from the baseline outcomes, as shown in Table 1.

Advanced group					
NPRS		NDI		t	p
At baseline (Pre)	At discharge (Post)	At baseline (Pre)	At discharge (Post)		
6.55 ± 2.04	2.20 ± 1.57	33.57 ± 20.55	9.64 ± 10.82	t = 14.69,	p < .001
Basic group					
NPRS		NDI		t	p
At baseline (Pre)	At discharge (Post)	At baseline (Pre)	At discharge (Post)		
6.35 ± 1.37	2.21 ± 1.95	31.79 ± 17.65	8.97 ± 10.99	t = 6.93	p < .001

Table 1

Between-group analysis

Independent t-test results compare the outcome measures of the advanced group and the basic group. There is no statistically

significant difference between the patient records of both interventional groups at baseline and at discharge, as shown in Table 2.

Outcome Measure	Group	Mean	SD	t	p-value (2-tailed)
Pre NPRS Score	Advanced vs. Basic	6.55 vs. 6.35	2.04/1.37	0.507	.613
Post NPRS Score	Advanced vs. Basic	2.20 vs. 2.21	1.57/1.95	-0.025	.980
Pre NDI Score	Advanced vs. Basic	33.57 vs. 31.79	20.55/17.65	0.419	.676
Post NDI Score	Advanced vs. Basic	9.64 vs. 8.97	10.82/10.99	0.284	.777

Table 2

The result from the Paired sample test shows that both treatment protocols were highly effective and efficient in pain

management from NPRS and reducing disability score from NDI, as shown in Table 3.

Group			Sig (2-tailed)
Advanced	Pair 1	Pre - Post NPRS	.000
	Pair 2	Pre - Post NDI	.000
Basic	Pair 1	Pre - Post NPRS	.000
	Pair 2	Pre - Post NDI	.000

Table 3

The advanced therapy group is one step ahead with pain management from the mean scores difference of NPRS between the advanced group of 4.35 which is higher compared to the basic group of 4.14, irrespective of Chronicity of condition, Diagnosis or Number of treatment sessions after Advanced physiotherapy protocol.

Duration of Pain	Advanced group (mean change)	Basic group (mean change)
Acute	-16.30	-18.09
Chronic	-25.91	-21.07

Table 4

With the Two-way ANOVA test, the mean scores difference between NDI scoring and duration of pain which shows higher negative values under the Advanced group showing greater improvement with disability among Chronic patients post Advanced physiotherapy protocol as shown in table 4.

Thereby both the groups showed statistically significant improvement in NPRS and NDI score from the baseline to discharge ($p < 0.05$). The advanced physiotherapy protocol group illustrated a significant reduction in pain and disability compared to the basic group.

Discussion

These findings of the retrospective comparative study analysis are applicable to daily clinical physiotherapy practice suggesting primarily that both physiotherapy protocols are statistically significant in effectiveness and efficiency in reduction in pain intensity and disability, despite however there is greater absolute mean difference supporting advanced physiotherapy protocols show better clinical outcomes which is relatable to many other researcher’s findings [11].

In utilization of upgraded modern rehabilitation techniques is more favourable to contribute improvement in result of advanced physiotherapy protocol group. Overall physiotherapy rehabilitation is to result in enhanced clinical reasoning, managing pain, reducing recurrence of pain, reducing the incidence of repetitive pain, maintaining physical and functional well being, and to improve quality of life. Using the above approach in mind, data collected from a Bangalore based clinics, it aims to reduce symptoms of

patients as earliest to convenience to return to their physical functions and abilities. The above findings reinforce strong points in management of the first line of treatment option for mechanical and non-specific neck pain conditions. With the present research availability and above findings of this study shows neck pain management in physiotherapy - a multimodal and functional oriented physiotherapeutic approach [3].

Additionally, using validated clinical software enabled objective clinical outcome evaluation & corporate real-world clinical evidence in electronic health records [12].

In spite of that between group analysis was not statistically significant, but the advance physiotherapy protocol group shows greater mean differences than the basic group which determines these interventions aids in neuromuscular control, physiological changes, central pain modulation, better tissue healing and functional reintegration contributes to improvisation in patients recovery pathway.

An important observation was between groups, disability mean difference among chronic pain patients records were higher in the advanced physiotherapy protocol group than the other. Chronic pain is considered poor with movement patterns, contributing psychological and psychosomatic pains, and central pain sensitivity [14]. These get highly addressed by advanced interventional group by manual therapy, pain desensitization, neuromuscular reeducation, patients education, consistency leading to minimizing disability scores.

Due to a higher number of poor posture among the study population, reflecting high risk of occupational or work related musculoskeletal disorders (WMSD’s) accentuate the importance of ergonomic education and posture correction training as necessary components of physiotherapy management. Role of preventive measures among WMSD’s is critical, which reduces high injury cost, improves work performance and productivity [13,15]. On top of these, this study has not included assessment on ergonomics, nor on work place which can be taken into consideration for future recommendations.

Conclusion

Implications of Advance therapy protocol in daily physiotherapy practice offer more added benefits of better chronic pain

management with notable reduction in disability irrespective of number of days of treatment duration than the traditional physiotherapy protocols. This reduces patients' number of visits to clinics, reduces recurrence rate, reduces healthcare cost and quicker return to functional abilities. This indicates that physiotherapy protocol supports patient centric approach with better clinical decision making as per patients need, chronicity with advanced technology. Retrospective analysis of software based data serves as a valuable tool evaluating effectiveness and helping to evaluate evidence based clinical practice in real.

Limitations and Future scope of this study

This study limits over therapist expertise, adherence to utilisation of clinical guidelines, lack of long term follow-up. Psychosocial aspect of patients. A higher number of sample sizes can be analysed for future recommendations. Also correlation with age, gender and occupation with specific or multiple structured intervention can be considered.

Conflict of Interest

There was no conflict of interest in conducting this study. Funding of the study.

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