RESEARCH ARTICLE

BIOMECHANICAL ANALYSIS OF GAIT IN GERIATRIC POPULATION AFFECTED BY STROKE

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ARTICLE INFO

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ABSTRACT

Background: walking pattern is the most important factor associated with stroke whether it's about diagnosing the posterior circulation stroke, it's about predicting the patient's comeback in normal life. Gait is an unbiasedly most relevant thing that plays a very crucial role in making a patient independent and improving his/her quality of life. **Objective:** Biomechanical Analysis of Gait In Geriatric Population Affected By Stroke **Material/methods:** the vast amount of databases and literature were explored from numerous sites such as Journal of Stroke, PubMed, PubMed Central, Elsevier, IMR Press, Google Scholar, etc. in which a total of 50 articles were collected and 25 met the requirements for inclusion in this research. **Conclusion:** This study reports that the 3 Dimensional gait analysis system, 3 Dimensional motion analysis system were the most widely accepted and efficient tools to biomechanically analyze the gait parameters along with this the ten parameters shortlisted based on metaheuristic optimization model played a very significant role in gait analyses and gait rehabilitation.

INTRODUCTION

Stroke is the third most prevalent cause of years lost due to disability and the second leading cause of mortality worldwide. Maximum no. of strokes are predisposed by abrupt blockage of an artery (ischemic stroke), however hemorrhagic strokes can also happen due to the sudden hemorrhage and causes insult to the cerebral tissue.[1] There are several obstacles to physical activity (PA) for stroke survivors. After a stroke, physical inactivity must be resolved using a "systems-based" approach.[2] so what is stroke, A stroke occurs when there is vascular injury (hemorrhage, infarction) to the central nervous system, resulting in acute, concentrated neurological dysfunction..[3] Large artery artherothromboembolism, cardio embolism, and small vessel arteriolosclerosis are the main causes of 85% of ischemic strokes. Several factors, including extra cranial dissection, can cause ischemic strokes in younger person, Several clinical presentational traits can be used to identify stroke patients, as stroke is a clinical diagnosis.[4] Therefore, "stroke" and "TIA" are not definitive diagnoses; rather, they serve as a springboard for logical research and care.[3] Stroke comes under the category of cerebrovascular diseases and needs proper evaluation based on a comprehensive and evidence-based FAST approach.[5] With significant morbidity and fatality rates of up to 83%–96% in the absence of reperfusion, posterior circulation strokes—especially those brought on by acute basilar artery occlusion (BAO)—are devastating.[6] According to current advancements, reperfusion treatments are advised as successful therapy approaches for individuals suffering from acute ischemic stroke following current recommendations. However, a sizable portion of patients are unable to receive reperfusion treatments because of the stringent therapeutic window and limited access to endovascular care; in these cases, antiplatelet therapy is advised.[7] Gait abnormalities, lack of coordination, unilateral motor weakness, and limb paralysis are common motor deficits linked to TIA. Nonetheless, most clinical findings on motor deficits during a TIA have been motor weakness or reduced muscular strength. Because motor weakness is easily assessed in clinics as decreased muscular force during manual motor testing, this is one of the main reasons motor weakness is a clinical emphasis.[8] After a TIA, there may be an immediate extra risk; this risk peaks within hours of the TIA and gradually decreases over the next several days, weeks, and months.[9] Gait is a sequence of alternating, rhythmic trunk and limb motions that cause the center of gravity to move forward usually established when the person is 4–8-year-old.[10] People with moderate-to-severe post-stroke hemiparesis are limited to stereotyped movement patterns

S.NO	YEAR OF STUDY AND AUTHOR	TITLE OF ARTICLE	SYSTEM/ OUTCOME MEASURES	STUDY FINDINGS
1.	2020, wang yiji et.al [14]	Gait characteristics of post-stroke hemiparetic patients with different walking speeds	Step length, stance, swing, and double stance duration were utilised as outcome measures, together with a three-dimensional motion capture device with force plate measurement (KinemaTracer, Kissei Comtec Co., Ltd., Matsumoto, Japan) to gather spatiotemporal data during treadmill gait.	This study showed differences in various parameters by spatiotemporal analysis, the parameters were stride and step length, asymmetry, temporal changes, gait variability, and clinical utility and they found that stroke patients had low gait speeds, compensatory strategies, limb impairment, instability, and reduced strength.
2.	2016, Fumihiro Matsuda et.al [15]	Biomechanical factors behind toe clearance during the swing phase in hemiparetic patients	Stroke impairment assessment set, KinemaTracer® 3D motion capture System	The author discovered that hip elevation and limb shortening were the main factors influencing toe clearance and that they had a trade-off relationship. These results provide a fascinating example of the use of 3D motion analysis in the rehabilitation clinic to restore gait abilities. This might be useful in determining how to do targeted rehabilitation training.
3.	2015, Jessica L. Burpee a et.al [16]	Biomechanical gait characteristics of naturally occurring unsuccessful foot clearance during swing in individuals with chronic stroke	Dual belt instrumented Treadmill ambulation, spatiotemporal, gait kinematics, and gait kinetics variables LabVIEW software, toe	Data from 26 chronic stroke patients were compared in this study to observe the angle at toe-off, knee flexion velocity at toe-off, and peak knee extension during terminal stance. They discovered that the toe-off angle was higher and the peak knee extension
			clearance, foot clearance.	moment was greater, but the knee flexion velocity at toe-off was lower.
4.	2015, N. Roche	Relationship between hip flexion and ankle dorsiflexion during swing phase in chronic stroke patients	The MRC scale, the modified Ashworth scale, a manual goniometer, and a 3D gait analysis system with motion analysis system on recording frequency of 100 Hz were the outcome measures used in this study to gather data from 60 stroke patients with right (30) and left (30) hemiparesis.	This study suggests that post-stroke hemiparetic patients develop proximal (increased hip flexion) or distal (increased dorsiflexion) strategies to get ground clearance to avoid fall-related risks.
5.	2020, Kerr a et.al [18]	Biomechanical correlates for recovering walking speed following a stroke. The potential of tibia to vertical angle as a therapy target	In this study, data from 23 stroke patients were gathered, and 20 of those patients' data were compared using a video-based method, knee angular velocity, temporospatial symmetry, and tibia to vertical angle.	This study provides evidence that changing the Tibial to the vertical angle at contact at initial and step length can significantly improve the speed of the gait along with greater stability.
6.	2018, Megan E. Reissman et.al [19]	Manipulating post- stroke gait: Exploiting aberrant kinematics	This study collected data from 12 chronic stroke patients suffering from hemiparesis, outcome measures were functional gait assessment, 2- min walk test, 10- m walk test, berg balance scale, time up and go protocols, lower extremity fugl	This study has presented evidence that the cross-tilt walking in which the subject's weaker limb was on upslope side can significantly reduce the pelvic obliquity not only pelvic obliquity but also enhances toe clearance and produce a significant impact on more normative patterns of walking.
			meyr, MMSE, kinematic data during walking on treadmill recorded on the frequency of 100 Hz on 8 camera video- based motion analysis system, the most important outcome measure was pelvic obliquity angle.	
7.	2017, Jorge Latorre a b et.al [20]	Reliability and Comparison of Kinect-based methods for estimating spatiotemporal gait parameters of healthy and post- stroke individuals	With the aid of Kinect v2 software and video analysis, this study gathered data from 45 healthy participants and 38 stroke survivors or post-stroke patients and compared them based on spatiotemporal parameters. The main points of interest in this study were ankle and toe speed, knee distance, and sacrum distance from ankle and toes. The spatiotemporal parameters used in this study were speed, stride length and time, step length, time, and asymmetry, as well as double support and swing time.	This study demonstrated that using Kinect v2 software to measure the distance between the sacrum and the ankles and toes is the most dependable method for examining double support and swing duration.
8.	2025, Isaac Smith DO, MS a et.al [21]	Gait assessment in the initial Evaluation of posterior circulation stroke	This study was a retrospective study that aimed to Explore gait assessment as the	This study has revealed that the objective gait assessment (Pace, rhythm, postural instability) is the most efficient tool in ruling

			most reliable tool toruleout Posterior circulationstroke in acute vertiginous patients, they have comparedthe medical records of 311acute vertiginous patients of which 40werelater diagnosedwith Posterior circulation stroke.	out the posterior circulation stroke in acutely vertiginous patients, Basically they have divide the assessment in two parts other than imaging that is subjective gait assessment (perceived deficit with walking or balance) and objective gait assessment (pace, rhythm, postural instability) and objective gait assessment emerged as an most efficient tool before it the head impulse nystagmus test of skew exam had gained much recognition in similar studies.
9.	2017, Agnieszka Guzik a, et.al [22]	Analysis of consistency between temporospatial gait parameters and gait assessment with the use of Wisconsin Gait ScaleinPost- stroke Patients	Wisconsin gait scale, 3d gait analysis.	This study collected the data from 30 post-stroke ambulatory patients and compared it by using the Wisconsin gait scale and 3D gait analysis It found that the results between the Wisconsin gait scale and 3D gait assessment showed moderately good consistent results and proved that Wisconsin gait scale is a simple tool for analyzing gait in post-stroke hemipareitic patient.
10.	2024, Jeonghwan Lee a et.al [23]	Between-limb difference in peak knee flexion angle canidentify persons post-stroke with Stiff-Knee gait	The author conducted the retrospective study and collected data from 50 post-stroke individuals, performed gait on a split-belt treadmill at their own pace and the data was compared, the technology used to compare was 120 Hz 12-camera motion capture system, with modified halen hayes marker set, and they used embedded forced plate to quantify ground reaction force.	According to the evidences presented, The author suggested that The most reliable metric for diagnosing SKG was the variation in the peak knee flexion angle between the limbs. Therefore, we suggest that future research employing univariate Selection criteria concentrate on selecting SKG based on limb-to-limb variations in peak knee flexion angle.
11.	2024, Kohsuke Okada a et.al [24]	Categorizing knee hyperextension patterns in Hemiparetic gait and examining associated impairmentsin patientswith chronic stroke	Three-dimensional Vicon MX motion analysis system with8 cameras with100Hz frequency	This study had showed Four forms of knee Hyperextension in hemiparetic gait which were identifiedusingthe temporal-durational component.Kneeflexion strength,trunkmotor function, and ankle plantar flexor spasticity were also usedto describeknee hyperextensionpatterns. The reasons for each knee hyperextensionpattern should be addressed further to determine more efficient customized treatments.
12.	2017, Grazia Cicirelli et.al[25]	Human Gait Analysisin Neurodegenerative Diseases: a Review	In this study, the author has studied a variety of articles to obtain the conclusion for the question that gait assessment plays a significant role in supporting diagnosis and understanding abou the Progression of illnesses.	This study gives an informative insight into the present technologies to analyze the gait and also emphasizes the need for gait assessment in home based setting.
13.	2018, Delaram Jarch et.al [26]	A Review on Accelerometry- Based GaitAnalysis and Emerging Clinical Applications	In this study author has reviewed numerous articles in the context of technology for gait assessment which is an accelerometer.	This study has suggested that ear-worn sensors as accelerometers are the most cost-efficient and reliable technology in terms of consistency, sensitivity, and specificity
14.	2017, Hans Kainz et.al[27]	Reliability of four models for clinical gait analysis	This study, the author has compared the 3D gaitanalysis system with two	This study has suggested that the modified gait 2392 model showed the most reliable results of 3D gait analysis system results and

			Direct kinematics models(plug-in gait model and 6 degrees of freedom model using Vicon software) and two inverse kinematics models(two different forms of gait 2392 models usingOpen Sim software)	can be used in various clinical settings to obtain promising results in gait analysis.
15.	2020,Tishya A.L. Wren et.al [28]	Clinical efficacy of instrumented gait analysis: Systematic review 2020 update	this study, the author had compared the data of various studies to find the efficacy of 3D gait analysis system	This study suggests that the 3D gait assessment system poses a very crucial part in the prognosis of gait rehabilitation,the confidence of clinicians, and faster and long-lasting results production.
16.	2024, Datao Xu et.al [29]	A new method proposed for Realizing human gait pattern recognition: Inspirations for the application of sports and clinical gait analysis	this study, the authorhas presented a new approach to the analysis of Gait analysis, in which some of the optimal features related to gait were shortlisted using a metaheuristic optimization modelandfour classical algorithm models.	This study reconstructed the gait assessment data waveform using the newly shortlisted optimal gait features i.e 10 No.s, According to the metaheuristic optimisation model, sequential forward selection is superior than feature-based sorting of effect magnitude and the findings of earlier research, the novel method's accuracy in identifying gait patterns among the best gait characteristics was noticeably greater.
17.	2024, Jieun Cho et.al [30]	Stroke walking and balance characteristics via principal component analysis	this study, the author collected the data of 44 stroke patients and assessed them using clinical assessment and motion analysis system and proposed a principal component analysis tool for the assessment of the most precise key joint kinematics on the pelvis and lower limb during the gait cycle.	This study presented pieces of evidence in support of principal component analysis that it can play a very crucial role in correcting abnormalities at the most precise level.
18.	2024, Aida Sehle et.al [31]	Effects offlexor reflexstimulation on gait aspects in strokepatients: randomized clinical trial	In thisstudy, author performed a randomized controlled trial on 25 participants having sub-acute or chronic stroke conditions and used outcome measure 10-m walk test, 2 min walk test, and gait analysis, treatment approach used was flexor reflex stimulation from the sole with Incedo or without Incedo.	This study indicates that flexor reflex stimulation has shown significant improvements in 10 m walk test and 2-min walk test which indicates that flexor reflex stimulation improves gait rehabilitation.
19.	2023, Takuma li et.al[32]	Effect of gait training using Welwalk on gait pattern in individuals with hemiparetic stroke: a cross-sectional study	23 individuals with hemiparetic stroke were recruited in this study, and their spatiotemporal data was initially gathered using Welwalk and then compared to other gaits using ankle- foot orthoses.	This study has offered proof of Welwalk's effectiveness, In contrast to gait training with the ankle-foot orthosis, Welwalk gait training increased the affected step length, step breadth, and single support phase while suppressing aberrant gait patterns. This study suggests that despite suppressing abnormal gait patterns, Welwalk-assisted gait training may promote more successful reacquisition of gait patterns.
20.	2022, Daisuke lmoto et.al [33]	A novel gait analysis system for detecting abnormal hemiparetic gait patterns during robot-assisted gait training:A criterion validity studyamong healthy adults	This study included twelve health individuals who mimicked the hemiparetic pattern of gait of stroke individuals using the robot and their data was recorded and compared using welwalk WW-2000 and 3D motion analysis system.	study provides evidence for the efficiency of Welwalk WW-2000 in assessing gait parameters it is found that the Welwalk WW-2000 is a more efficient tool in assessing characteristics of gait during robot-assisted gait rehabilitation
21.	2021, [34]	Assessment Methods of Post- strokeGait : A Scoping Review of Technology- Driven Approaches toGait Characterization and Analysis	Reviewing and summarising research efforts on post-stroke gait quantification and analysis was the aim of this study. It focused on new technology-driven methods of gait characterisation and analysis, like the use of artificial intelligence (AI) and inexpensive, smart wearables, as well as their feasibility and potential advantages in clinical settings.	This scopic review focuses on the day-to-day clinical gait assessment it has specified that the conventional qualitative subjective assessment have more chances of errors in comparison with the newly designed quantitative objective assessments which were based on questionnaires, newly designed advanced software even nowadays emerging era of wearable sensors provide a wider window for the gait analysis because they are cheaper and more effective in nature
22.	2020, Claraselves et.al [35]	Gait rehabilitation after stroke: review of the evidence of predictors, clinical outcomes and timingfor interventions	This study examines the most recent research on the optimal practices for gait enhancement in stroke individuals and the predicted factors for gait recovery.	According to this study, the TWIST algorithm, a simple tool that can be applied in clinical practice one week following a stroke, shows that trunk control and lower limb motor control (such hip extensor muscle force) seem to be the best indicators of gait recovery. The most reliable measure of community ambulation in terms of walking performance is the 6-minute walking test.
23.	2024, Jing Wen Pan et.al [36]	Unraveling stroke gait deviations with movement analytics, more than meets the eye: a case control study	The study include 15 chronic stroke patients who were asked to perform a 10-meter walk test and 15 control	This study compared the kinematics (joint angles) and kinetics (GRF and joint moments) of a group of chronic stroke patients to a 10-meter walking challenge

		group patients their data was recorded using a 3D motion capture system with a modified calibrated anatomical system technique and compared.	with matched healthy controls. When compared to the control group in this study, the results indicate that the less damaged limb also showed abnormal biomechanical characteristics, in addition to the wounded limb, which has been extensively studied in previous studies. According to this, post- stroke gait treatment should take into account both limbs, and clinical experts can offer tailored exercises to improve stroke patients' walking abilities.
24. 2024, Jan Stenum et.al [37]	Clinical gait analysis using video- based pose estimation: Multiple perspectives, clinical populations, and measuring change	The capacity to do quantitative gait analysis in a variety of clinical populations with just basic films captured with inexpensive devices (tablets) was the main emphasis of this work.	This study provided evidence in support of four key findings: 1) an open- source human pose estimation program (OpenPose) that performs gait analysis using videos captured from several angles (e.g., frontal and sagittal), 2) Validation of this methodology through comparison with ground- truth three-dimensional motion capture in three different participant groups (adults without gait limitation, stroke survivors, and Parkinson's disease patients); 3) evidence of the ability to capture clinically significant, condition- specific gait characteristics; and 4) tracking of within- participant gait changes, which is essential for assessing rehabilitation progress and recovery.
25. 2016, P. Fernández- González et.al [38]	Instrumental gait analysis in stroke patients	This investigation was To determine, notwithstanding participant variability, what	This study used the lower limb portion of the Fügl- Meyer Assessment, which measures motor function, ranging from 15 to 33
		changes in gait pattern are typical for each individual and to assess, using a capture motion system, the gait pattern of stroke individuals with varying degrees of motor abilities.	points, and provided evidence that Kinematic pattern-related changes were among the participants' shared characteristics. Among stroke patients, there was an increase in both sides' pelvic rom; a reduction in the affected side's maximum peak of the extension during the stance phase, and an enhancement in flexion during the stance and swing periods on the unaffected side; a significant knee flexion during the initial contact; and a slight ankle plantar flexion during the initial contact on the affected side.
26. 2017, Juliet A. M. Haarman et.al[39]	Manual physical balance assistance of therapists during gait training of stroke survivors: characteristics and predicting the timing	Common scales used in stroke rehabilitation include the BBS, DGI, and 10-Meter Walking Test (10MWT). These scales assess various aspects of balance, mobility, and functional ambulation in stroke patients. Outcome measures help evaluate the effectiveness of physiotherapy interventions and track patient progress over time.	The study focused on the manual balance assistance provided by therapists to stroke survivors during gait training. It quantified the corrective forces applied by therapists, revealing that these forces are crucial for maintaining balance in subacute stroke patients. The predictive algorithm based on sacral acceleration data effectively identified the timing of balance assistance, highlighting the importance of therapist intervention in stroke rehabilitation.
27. 2021,Apoorva M. Shankaranarayana et al [40]	Gait training interventions for patients with stroke in India: A systematic review	The review used kinematic gait analysis, gait velocity, FAC, TUG, and FMA to measure the effectiveness of gait interventions. These scales assessed walking speed, mobility, and overall gait function in stroke survivors.	Activity based walk enhancement training, strengthening, and motor priming were common interventions. The findings suggested that combining strengthening with task- based training and motor priming yielded the best results for improving gait function post-stroke.
28. 2023, Anne Boddy et al [41]	Effects of a Multi- Modal Gait Training Program in an Individual with Chronic Stroke: a Case Study	This case study analysed the effect of Multi-modal Gait Training (MMGT) on gait and balance in a 63-year-old post- stroke patient. The training, including treadmill and over- ground walking, led to immediate improvements in gait speed and balance, with self- selected gait speed maintaining progress at 30-day follow-up. The ABC scale increased from 19% to 28% after one year.	The study concluded that MMGT is a safe and feasible approach for chronic stroke survivors. While short-term improvements were observed in gait and balance, long-term gains were primarily maintained in self-selected gait speed and balance confidence, supporting the effectiveness of task-specific training for stroke rehabilitation.
29. 2022, Shreya Upadhyay et al [42]	Effect of Visual Cue Training on Gait and Walking Velocity in Chronic Stroke Patients- A Quasi- experimental Study	The study used the DGI to assess balance and gait performance in various walking tasks. Additionally, *walking velocity* was measured to evaluate the speed at which participants walked, indicating	Following the intervention, walking velocity and DGI significantly improved in both groups. However, the *visual cue training group* showed more progress than the traditional training group, with a mean DGI rise of 3.26 ± 0.99 as opposed to 1.94 ± 0.52.
		improvements in motor function.	
30. 2016, Chandan Kumar et al [43]	Effectiveness of manual perturbation exercises in improving balance, function and mobility in stroke patients: a randomized controlled trial	While both interventions improved functional outcomes, as measured by the *Functional Independence Measure (FIM)*, no significant difference between the groups in **FIM** scores at the post- intervention stage is seen. This suggests that while *manual perturbation exercises* contributed to better *balance* and *mobility*, both treatments effectively supported overall functional recovery in stroke patients.	The study showed that *conventional physiotherapy alone* and *manual perturbation exercises in conjunction with conventional physiotherapy* greatly enhanced *mobility, function, and balance* in stroke patients. Significant gains were seen in the **Berg Balance Scale (BBS)* and *Time Up and Go (TUG) Test* scores, indicating improved *balance* and *mobility* in the *manual perturbation* group.

known as flexion and extension synergies, which prevent them from independently controlling the proximal and distal joints of the arm.[11] It is intriguing to be able to predict whether and when a patient will be able to walk in order to manage patient and family expectations. It is also crucial when organizing the duration of an inpatient rehabilitation program. Predicting gait recovery can therefore affect choices about the length of rehabilitation[12]. For individuals with significant initial impairment, neurophysiological and neuroimaging indicators can help forecast upper limb motor outcomes. It is possible to assess the integrity of descending motor pathways using investigations such as MRI and TMS. TMS and MRI have not been used to predict when a patient would walk on their own, and few research has looked at them as predictors of walking recovery[13].The study aimed to explore the multimodal approach in biomechanical analysis and rehab of stroke patients in the context of gait parameter which is the most affected thing in stroke patients.

METHODOLOGY

This study aimed to find articles related to impairments in GAIT due to neuromuscular disorders such as STROKE, unbiasedly 50 no. Articles were searched from reliable databases such as Google Scholar, PubMed, PubMed Central, Pedro, etc., of which 25 this much no. of articles was short-listed based on inclusion-exclusion criteria.

ELIGIBILITY CRITERIA AND RISK OF BIAS INCLUSION CRITERIA

- Articles must be published within 10 years of the study
- Articles must be available in free full-text versions,
- Articles must be in English language,
- RCT, Case studies, review of literature, and meta-analysis-based articles are being used

EXCLUSION

- Articles published ten years before the current study
- Paid articles
- Written in languages other than English
- Clinical trials, cohort, and guidelines-based articles.
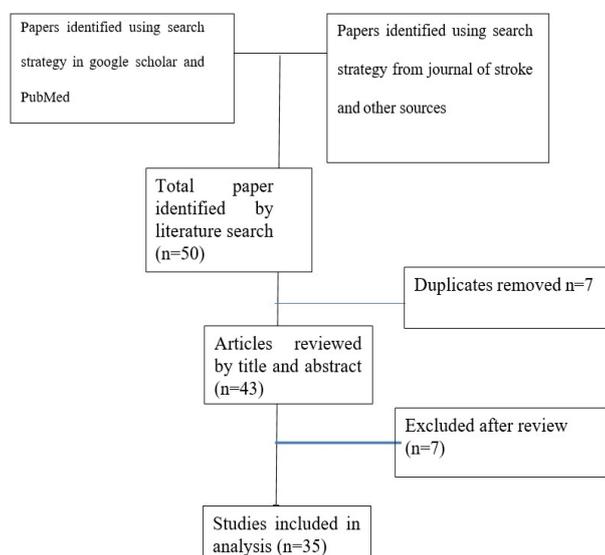
OUTCOME MEASURES

Step length
Stride length
Pattern of gait MRS score ECOG scale BORG scale Trunk control test
Functional ambulation category
International classification of functional disability Fugl Meyr assessment for the lower extremity MRC scale
NIHSS
Stroke impairment assessment set

DISCUSSION

A key part of stroke patients' rehabilitation is gait analysis, which helps doctors evaluate walking patterns, spot deficits, and provide customized mobility-enhancing therapies. Stroke greatly impacts gait mechanics since it frequently results in hemiparesis, spasticity, and impaired proprioception. Typical anomalies include reduced walking speed, asymmetrical stride length, and compensating motions like hip hiking or circumduction. Therapists can examine factors such as step symmetry, cadence, and joint kinematics using observational approaches and cutting-edge technology including motion capture, force plates, and electromyography (EMG). These data inform the creation of customized physiotherapy regimens and offer important insights into the underlying biomechanical deficiencies. Based on the results of gait analysis, interventions including task-specific training, FES, robotic- assisted gait enhancement can be tailored to improve recovery. Biomechanical walking assessment poses a very crucial part in the rehabilitation of stroke patients and it also helps in making crystal clear diagnoses, the study was performed to explore all the present technologies and manual gait analysis tools and we found that the 3D gait analysis system was the most widely accepted and used tool in the era of technology and it produces most efficient and specific results which not only help in finding the correct abnormalities in the gait pattern but also effectively reduce the recovery time. Here in this study we collected data from various databases and studied them to find the best way to analyze the gait in clinical settings with low cost and the most efficient outcomes. 10-meter walk test, Fugl Meyer scale, Dynamic gait index, and functional independence measure were some of the most accepted outcome measures used in a maximum no. of studies. 3D gait analysis system/ 3D motion capture system/video-based analysis were the most accepted gait analysis tools. Objective Gait assessment provided the most important 10 quantitative quantities to assess during gait analysis to differentiate posterior circulation stroke from acute vertiginous disorder. Gait is an integral part of every rehabilitation protocol for the neuromuscular disorder because the bedridden condition not only imposes significant risks for secondary complications but also poses the threat of discouragement, loss of confidence, loss of self-esteem, depression, stress and psychological issues that affect it also affects the social life of the person which is very important to maintain the emotional health of the patient, even staying in a same position for a longer time can cause multiple disorders such as dizziness, easy fatigue, loss of cardiovascular endurance while when a patient is assessed properly for his gait pattern and dealt according to to make him independent can improve his/her health significantly and also reduce the duration of alleviation of symptoms and it also enhances

the confidence of thepatient being active and ambulatory and also improves the arousal of the patient and improves his social presence which eventually leads to enhancements in confidence and in build of muscle strength, muscular endurance, cardiovascular endurance and it reduce the risk of secondary complication. Gait assessment pre-requisites majority of factors for a proper gait assessment patient must be ambulatory with 1 person's support or he/she should be using a walking aid at least if he/she can walk independently then the gait assessment becomes much easier and efficient, Gait assessed in a proper setting also improve the reliability and credibility of the gait assessment, objective gait assessment is much more better than subjective gait assessment because subjective gait assessment can be altered according to the clinicians experience a knowledge but objective one can be very specific to provide accurate results, manual gait assessment using objective gait assessment can provide accurate results but it can be more time taking while using some ace of the deck technology like 3D Gait analysis system can provide more accurate results in a very short time and can provide data for future comparisons which provides a therapist a baseline to provide more improvements, and using the wearable sensors during the 3D gait analysis system can enhance the efficacy of the produced results and comparison using Artificial intelligence can help in modifying the rehabilitation protocols during future re-assessments. Re-assessments provides the scope of improvement to make patient come back to normal life with least amount of difficulty.

CONCLUSION

This study aimed to find the best time-effective, cost-effective, and most efficient methods of biomechanical gait analysis in the geriatric population suffering from neuromuscular disorders such as stroke, after exploring the present literature of the last 10 years concerning the biomechanic analysis of gait and comparing them by their study finding and the type of system/software used by them we conclude that the 3D Gait analysis system using wearable sensors was the best approach to analyze the gait in a shorter period and the results produced by this can play a very crucial role in improving quality of life, making patients independent.

CONFLICT OF INTEREST: There's no conflict of interest during this research.

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