Case Report

Modulation of Stroke-related Impairment With Physiotherapy Intervention: A Case Report of Stroke Survivor With Right Hemiparesis and Diabetes

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ABSTRACT

Objectives: Erroneous perceptions about the cause of stroke may negatively impact survival during and after stroke occurrence. Patient health decisions may be influenced by various factors, such as advice, previous experience, beliefs and online information. Some patients of African descent maintain that stroke is caused by witchcraft and its related impairments can be permanently ameliorated by divination. Accordingly, seeking medical intervention is seen as a waste of resources and time, making it difficult for health professional to offer adequate care. This study explores the importance of patient education combined with physiotherapy intervention in the modulation of stroke-related impairment amid erroneous beliefs about the incidence and management of stroke.

Case Presentation: This study is a case report of a 63 year-old Nigerian female with diabetes. She is a hypertensive stroke survivor with a complaint of inability to walk, weakness of muscle, and loss of functional movement in her right hand and leg from a year ago. She underwent 8 weeks of individualized home physiotherapy, such as progressive manual resistance exercise, transcutaneous electrical nerve stimulations (ENS), electrical muscle stimulation, task-oriented circuit training, peripheral neuromuscular stimulation, task-specific training, and gait/balance exercise, in addition, to the use of routine drugs and diet 2 h daily for 3 days a week using discrete practice.

Discussion: There was an improvement in muscle strength, hand functional abilities, gait/balance, activities of daily living and a reduction in spasticity, glucose level, body adiposity (body fat percentage (%BF), visceral fat percentage (%VF) and body mass index [BMI]) and blood pressure/derived cardiovascular indices as per post-intervention scores. Many factors could influence the patient's decision and continuous education of the patient and informal caregivers may positively influence the patient's condition and ameliorate erroneous beliefs among stroke survivors. We also provide evidence to corroborate and strengthen existing evidence that stroke-related impairments, can be modulated with physiotherapy intervention. We recommend that physiotherapists should include interventions targeted at increasing muscle mass and reducing body fat when treating stroke survivors to ameliorate the negative impact of stroke on the musculoskeletal structure, stroke recurrence, and enhancement of functional performance in activities of daily living.

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Highlights

- This case report explores the importance of patient education combined with home individualized physiotherapy intervention in the modulation of stroke-related impairment amid erroneous beliefs about the incidence and management of stroke.

- There was an improvement in muscle strength, hand functional abilities, gait/balance, activities of daily living, and a decline in severity of spasticity, glucose level, body fat percentage, visceral fat percentage (%VF), body mass index (BMI) and derived cardiovascular indices as per post-intervention scores.

- Wrong perceptions and beliefs about the cause of stroke may negatively impact survival after a stroke occurrence. Incorporating a continuous and persistent education of the patient and informal caregivers and a home-based individualized physiotherapy intervention may proffer step-by-step solutions in alleviating erroneous misconceptions about the cause of stroke and stroke-related impairments.

- We recommend that physiotherapists should include interventions targeted at increasing muscle mass and reducing body fat when treating stroke survivors to ameliorate the negative impact of stroke on the musculoskeletal structure, stroke recurrence, and enhancement of functional performance in activities of daily living.

Plain Language Summary

Wrong perceptions and beliefs about the cause of stroke may negatively impact survival after a stroke occurrence. Incorporating a continuous and persistent education of the patient and informal caregivers and a home-based individualized physiotherapy intervention may proffer step-by-step solution in alleviating erroneous misconception about the cause of stroke and stroke related impairments. This case report to explored the importance of patient education combined with home individualized physiotherapy intervention in the modulation of stroke-related impairment amid erroneous beliefs about the incidence and management of stroke. The patient muscle strength, hand function, walking speed, activity of daily living, and balance was better after eight weeks of treatment than before treatment. Additionally, we also found a reduction of spasticity, blood sugar level, and body fat. The derived cardiovascular indices such as the mean arterial pressure, rate pressure product and pulse pressure also reduced significantly. We recommend that physiotherapists should include intervention targeted at increasing muscle mass and reducing body fat when treating stroke survivors to ameliorate the impact of stroke on the musculoskeletal structure, stroke recurrence, and enhancement of functional performance in activity of daily living.

Introduction

Wrong perceptions about the cause of stroke may negatively impact survival during and after stroke occurrence in most low-middle-income countries. The factors that can influence the healthcare decisions of a patient as suggested by Hajjaj et al. [1] include beliefs, advice from friends, family, health professionals, previous experience and online information. For example, a recent study conducted in the southern part of Nigeria on the perception and belief of adults about the remission, course, and cause of a stroke revealed that stroke is caused by witchcraft and that determining the agent of cause can only be made possible by divination by an oracle and that traditional healers offer the best treatment to attain permanent cure [2]. The lack of trust and faith in God was also seen as a reason why people come down with a stroke [2]. Accordingly, seeking medical intervention during and after a stroke episode is often viewed as a waste of resources and time. Additionally, with this kind of mindset, the rate of survival during and after a stroke attack may be low. Therefore, managing people with stroke-related impairment associated with diabetes can be a very challenging task. Most of the patients died in herbal homes, and those who survived only sought medical care when the traditional treatment failed or when there was a serious complication as a result of herbal treatment. Therefore, it is pertinent to first educate caregivers and patients during and after stroke in addition to medical intervention. A stroke episode can be prevented in three ways as follows: Primordial, primary and secondary. For example, in secondary prevention, the main focus is to prevent the risk factors

that can lead to a reoccurrence [3, 4]. The risk factors associated with a stroke episode include modifiable and nonmodifiable factors. For example, medical conditions, such as hypertension, diabetes, hyperlipidemia, and other behavioral risk factors are among the major modifiable risk factors [5].

Challenges associated with a stroke episode include disturbance in psychological function, inability to carry out instrumental and basic life activities [6], loss of muscle strength/endurance, balance, proprioception, increased risk of falling leading to hip fractures, spasticity/associated reactions, loss of muscle mass, and increase in intramuscular fat. For example, challenges in balance poststroke result from a combination of decreased motor control in the trunk and limbs, abnormal sensation, and representation of the body. A deficit in balance decreases ambulatory activities in the chronic phase after stroke [7], by reducing the functional profile in ambulation and self-confidence during walking [8] and increases the fear and risk of falling/hip fractures during walking. Training that involves exercising the trunk improves dynamic sitting balance and trunk performance [9], while the dynamic balance in standing and sitting improves with task-specific training [9-11].

Similarly, the loss of muscle mass with an increase in intramuscular fat and a decrease in function and strength may negatively impact glucose metabolism [12]. Managing stroke in diabetic patients is unique because diabetic patients have other comorbidities, such as diabetic peripheral neuropathy, diabetes also alters the conduction of nerves, which in turn causes postural instability [13, 14]. Common findings seen among stroke survivors with diabetic neuropathy include peripheral nerve degeneration (pain and numbness), muscle weakness, postural instability/imbalance, and impairment in gait [14, 15].

Recent findings have shown some evidence that physiotherapy interventions in the management of stroke-related impairments among stroke survivors were mostly hospital-based in developed countries and in patients who are well-enlightened about their health condition. For example, some researchers have found that in the first 6 months post-stroke, training that involves a circuit of tasks is effective and as safe as tailored individualized treatment [16]. Additionally, a therapeutic exercise involving muscular contraction causes an increase in the permeability of the membrane to glucose by increasing the level of transporters of glucose in the plasma membrane that enhances the action of insulin on the metabolism of glucose and lowers HbA1c levels in diabetic patients [17, 18]. A systematic review by Veerbeek et al. [11] to show the efficacy of physiotherapy modalities found modest evidence of the use of transcutaneous (TENS) electrical nerve stimulations (ENS) for enhancing walking ability and muscle strength, while neuromuscular stimulations (NMS) have modest positive evidence for improving muscle strength and motor function of the weak arm, wrist, and finger flexors/extensors. Similarly, they found that trunk fixation during grasping and reaching averts trunk compensatory movement while restraining it negatively affects self-report of the amount of use of hand and arms in daily life activities. Additionally, electrostimulation and exposing the weak arm to varied stimuli, such as shape, temperature, position, and texture, can alleviate somatosensory function abnormalities and muscle tone. More so, progressive active resistance exercise of the paretic lower extremity improves muscle strength, spatiotemporal gait pattern (cadence, symmetry and stride length) and tone. A case report by Gardas and Mahajan [19] reported that peripheral neuromuscular stimulation (PNF) enhances muscle strength and function in patients with neurologic impairment. However, reports on the efficacy of home individualized physiotherapy intervention in diabetic stroke patients negatively influenced by ethnocultural beliefs and perceptions about their condition are lacking in the literature. Additionally, there is a dearth of literature on the effect of home-based physiotherapy interventions, such as progressive manual resistance exercise (PMRE) on cardiovascular parameters, body composition, and blood glucose among diabetic stroke survivors in southern Nigeria. We present a case report of a 63 year old Nigerian female, with right hemiparesis in a diabetic, and hypertensive stroke survivor who was first treated in an herbal home with a complaint of inability to walk, weakness of muscle, and loss of functional movement in her right hand and leg 1 year ago. We provided a home-based physiotherapy intervention (PMRE, electrical muscle stimulation [EMS], task-oriented circuit training [TOCT], PNF and gait/balance exercise) for 8 weeks, and health education in addition to drug therapy and diet. These interventions were done 3 times per week in the patient's sitting room mostly in the early hours of the morning (8-10 AM) and lasted for 2 h. The intervention was divided into two segments, the first was during weeks 1 to 4 and the interventions included soft tissue mobilization, myofascial release techniques, passive range of motion exercise, muscle energy technique, manual resistance exercise, coordination exercise, EMS, and grip exercise while the second was in weeks 4 to 8 with intervention comprising of PNF, PMRE, TOCT and gait/balance exercise. The patient's blood pressure, pulse, and blood glucose were measured before, during,

and after every session using equipment, such as a blood pressure and glucose monitor, chair with arm, bed, gait belt, gloves/face mask, EMS machine, body composition monitor, reflex hammer, and infra-red lamp. The purpose of this case report is to explore the importance of patient education combined with home individualized physiotherapy intervention in the modulation of stroke-related impairment amid erroneous beliefs about the incidence and management of stroke. In addition, this study elucidates some nonmedical models of belief and perception of the course, cause, and treatment of stroke.

Case Presentation

This is a case report of a 63 year old trader, a known diabetic and hypertensive patient who was doing well while managing her condition until about a year earlier when she developed a stroke. Before her episode, she had stopped taking her diabetes and hypertensive medications and was taking some local herbs believed to be effective in regulating blood pressure. A day before the episode she had felt dizzy and nearly fell while working in her vegetable garden if not for the support of a shovel she was holding and had also noticed that her mouth was twisted to one side.

On waking the next day, the patient tried to sit up from a lying position without success and had to call her husband for assistance. She was also unable to sit without support, stand, or walk and could not make any movement on the right side of her body. She denied that she vomited blood, stool and or was unconscious during this time but that she had urinated without control. She was immediately taken to her village for treatment with traditional medicine when it was glaring to her loved ones that she had developed a stroke.

In the herbal home, she was asked to sit on a hot substance for more than 1 h each day for approximately seven days and was given a local concoction (python fat with other ingredients mixed with local gin) to drink. This was the first treatment she received after having the stroke. The patient only started seeking medical management when she asked her husband who had felt ill and needed to go to the hospital that on getting there, he should also discuss her condition with the physician and ask them to prescribe medication for her. She did this when she noticed no further improvement in her condition and that she was always dizzy. Additionally, she was unable to functionally use the right hand and leg because her muscles felt weak. She was also unable to sit up from bed or stand without multiple attempts, and unable to walk without holding a cane on her left hand for fear that she could trip and fall. All this has made her unable to do her day-to-day activities.

Her drug history included normoretic, biopentin, glucophage, diclofenac, lisinopril, amlodipine, erythromycin, ciprofloxacin, gabapentin, methylcobalamin, vasoprin, zinc, calcium and multi-vitamins.

The patient first encountered a physiotherapist on the 6th of May 2022 with a major complaint of inability to walk and difficulties in making functional movements with her right hand and leg for the past 1 year. The patient was assessed on sitting, was afebrile to touch, not pale, and was oriented in time, place and person. Tests and measurements included assessments of blood pressure, blood sugar, spasticity, muscle power, balance/gait, cognitive function, basic activities of daily living, body composition and depression. A detail of this assessment is provided in Table 1. Deep and superficial sensations, proprioception, two-point discrimination, kinaesthesia, and topognosis were all intact. The Babinski sign was positive on the right. Deep tendon reflexes, such as the bicep, tricep, and quadricep were hyperreflexia on the affected side. There was no ankle clonus, shoulder drop, or muscle wasting; however, the use of the affected hand was limited, and yawning evoked movement on the affected upper limb (associated reaction). Poor coordination was indicated by a reduced ability to execute finger-to-nose or heel-to-sheen movement. Inability to execute simple tasks, such as clapping hands, taking the affected hand to the mouth/opposite shoulder or touching the forehead, poor grip strength, gripping without release, mild facial asymmetry/pains and a feeling of burning sensation on both lower and upper limbs. There was also spasticity as assessed by the modified Ashworth scale. The muscle strength (Table 1) was poorer on the right than on the left and was assessed using a manual muscle strength test.

The main focus of management was to educate the patient about stroke to alleviate negative misconceptions and beliefs and to improve muscle strength and function, standing balance, gait, muscle mass, coordination, and the execution of simple tasks with the affected upper extremity. This management aimed at enhancing the quantity and quality of gait, hand functional ability, posture control, and coordination to increase walking distance and speed while using a walking stick and to reduce dependence on activities of daily living and the use of a cane while walking. The treatment protocol is shown in Table 2 and includes 3 days per week of home-administered individualized physiotherapy for 8 weeks for 2 h per session using discrete practice and health educa-

tion. The home-administered individualized physiotherapy session was divided into two stages. The first stage was during weeks 1 to 4 and the interventions included soft tissue mobilization, myofascial release techniques, passive range of motion exercise, muscle energy technique, manual resistance exercise, coordination exercise, EMS, and grip exercise while the second stage was during weeks 4 to 8 with intervention comprising of PNF, PMRE, TOCT and gait/balance exercise. The patient's blood pressure, pulse and blood glucose were measured before, during, and after every session using equipment, such as a blood pressure and glucose monitor, chair with/without arm, bed, gait belt, gloves/face mask, EMS machine, body composition monitor, reflex hammer, and infra-red lamp. The details of the home individualized intervention are provided in Table 2. The pre and post-treatment measures are shown in Tables 1 and 3.

Results

Table 1 depicts the muscle strength of the subject before and after intervention. The muscle strength of the affected (right [RT]) shoulder flexor, extensor, abductors/adductor and elevators/depressor 8 weeks after (3/5) treatment was better compared to before (2/5) treatment. A similar outcome was found in the elbow flexors and extensor on the RT side before and after treatment (RT elbow flexor before=2/5 vs RT elbow flexors after=3/5).

Table 1. Muscle strength before and after treatment

Manual Muscle Strength		Before-treatment		8-weeks After Treatment	
		Right	Left	Right	Left
Shoulder	Flexors	2/5	5/5	3/5	5/5
	Extensors	2/5	5/5	3/5	5/5
	Abductors	2/5	5/5	3/5	5/5
	Adductors	2/5	5/5	3/5	5/5
	Elevators	2/5	5/5	3/5	5/5
	Depressors	2/5	5/5	3/5	5/5
Elbow	Flexors	2/5	5/5	3/5	5/5
	Extensor	2/5	5/5	3/5	5/5
Wrist	Extensor	1/5	5/5	2/5	5/5
	Flexors	1/5	5/5	2/5	5/5
	Lateral flexors	2/5	5/5	3/5	5/5
	Medial flexors	2/5	5/5	3/5	5/5
Hip	Flexors	3/5	5/5	4/5	5/5
	Extensors	2/5	5/5	3/5	5/5
	Abductors/adductors	3/5	5/5	4/5	5/5
Knee	Flexors	3/5	5/5	4/5	5/5
	Extensor	3/5	5/5	4/5	5/5
Ankle	Dorsiflexors	2/5	5/5	3/5	5/5
	Plantar flexors	2/5	5/5	3/5	5/5
	Supinators	2/5	5/5	3/5	5/5
	Pronators	2/5	5/5	3/5	5/5
Trunk	Flexors	3		4	
	Extensors	3		4	

Table 3. Body composition, activities of daily living, functional reach, gait/balance, sit rise test, blood sugar before and after treatment

Parameter	Before Treatment	8 Weeks After Treatment
Height (m)	1.54	1.54
Weight (kg)	55.20	53.2
BMI (kg/m^2)	23.6	22.4
Body fat (%)	31.9	28.3
Muscle mass (%)	28.8	30.5
Visceral fat (%)	8	6
Resting blood pressure (mm Hg)	180/84	142/75
Resting pulse rate (beat/min)	69	62
Fasting blood glucose (mmol/L)	8.3	6.4
Mean arterial pressure (mm Hg)	116	97
Rate pressure product	12420	8804
Pulse pressure (mm Hg)	96	67
Modified Ashworth scale upper limb	2	+1
Modified Ashworth scale lower limb	1	0
Modified ranking scale	3	3
Patient health questionnaire	17	
Barthel index	65	75
Tinetti balance	7/16	10/16
Tinetti gait	4/12	8/12
Mini-mental state examination	21/30	
Hand function exercise	Unable	Able to execute hand-mouth-shoulder-forehead

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Accordingly, the muscle strength of the RT hip flexors and abductor/adductors increased from 3/5 before to 4/5 after treatment, similar outcomes were depicted in the RT knee flexor and extensor before (3/5) and after (4/5) treatment and in the trunk muscles.

The body composition, activities of daily living, functional reach, gait/balance, sit rise test, and blood pressure/glucose before and after treatment were presented in Table 3. For body composition, there was an increase in weight (53.2 vs 55.20 kg) and muscle mass percentage (%MM) (30.5% vs 28.8%) compared to before treatment; however, there was a reduction in body fat percentage (%BF) (28.3% vs 31.9%), visceral fat (6% vs 8%), and body mass index (BMI) (22.4 vs 23.6 kg/m^2) after compared to before treatment. The resting blood pressure (142/75 vs 180/84 mm Hg), pulse rate (62 vs 69 beats per min) and fasting blood glucose (6.4 vs 8.3 mmol/L) were lower after compared to before treatment. Similar, outcome was seen in the derived cardiovascular indexes, such as rate pressure product (RPP), mean arterial pressure (MAP) and pulse pressure (PP). The Barthel index (BI) score (75 vs 65), Tinetti balance (10/16 vs 7/16), tinetti gait (8/12 vs 4/12), and hand functional (able vs unable) use were higher after than before treatment. A decline in spasticity in the UL/LL was also depicted by a reduction in the modified Ashworth scale score after the treatment (Table 3).

Table 2. Patient treatment protocol

Weeks	Objectives	Treatment Regimens
1-4	1. To relieve pain/symptoms of peripheral neuropathy hamstring tightness	Soft tissue mobilization using pain gels, myofascial release (transverse release, cross-hand release technique 3 min)
	2. To improve strength on the hemiparetic side	Passive movement to all the joints of the upper limb and lower limbs (5 sets of 20 repetitions on all joints)
	3. To improve coordination	Muscle energy techniques to decrease muscle tightness Progressive manual resistant exercise manual resistance by physiotherapist, 5 sets of 10 repetitions per set for all the major muscle groups of the upper and lower limb
	4. To prevent spasticity and shoulder subluxation on the affected side	Finger-to-nose exercise, heel-to-shin exercise
	5. To maintain the physiologic properties of the muscle on the unaffected side	Electrical muscle stimulation (pad placed on the anterior medial and posterior deltoid muscle of the affected shoulder, auto-assisted exercise on supine lying (with fingers of both hands interlocked together both elbows extended patient flexes and extend the shoulder joint 5 s of 10 repetitions per set
	6. Improve trunk flexibility	Active resisted exercise, soft tissue mobilization Row on seated position 5 sets of 10 repetitions per set
	7. To improve hand prehensile strength	Grip exercise, griping a paper between the thumb and index finger and releasing, griping, and release different shapes, spherical, round, and square
4-8	1. To promote muscle strength	Peripheral neuromuscular stimulation, progressive manual resistance exercise
	2. To improve hand functional abilities	Task-oriented circuit training (taking the hand to the mouth, to ear to opposite should, and back to thigh) 10 sets of ten repletion for each of mouth, ear, forehead, etc. Clapping of hands
	3. To improve static/dynamic balance and gait	Squatting exercise on standing- 2 sets of 10 repetitions; marching on a spot with back on the wall, side walking and forward walking exercises, ankle sway

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Discussion

The diverse nature of the African population may be indicative of the ethnocultural perception and belief about the remission, course, and cause of ailment, such as stroke. Some adults in rural communities in the southern part of Nigeria believe that stroke is caused by witchcraft and divination by an oracle and seeking solutions from traditional healers was the best choice to get a permanent cure [2] or reduce its incidence. This contradicts recommendations by Usman et al. [8] that healthcare professionals should be at the vanguard in reducing the incidence of stroke. Patient-centered care for rehabilitation of stroke rehabilitation should include the multidisciplinary team, the patient and the informal caregiver. A healthcare professional needs adequate knowledge of patient condition to be able to make informed decision about the patient's condition; however, the patients/informal caregiver need to be educated about their disease condition to reduce wrong beliefs and perceptions about their condition.

Physiotherapy interventions are a major part of the treatment offered by the multidisciplinary team in the management of diabetic and stroke-related impairments. As a major stakeholder of the multi-disciplinary team, physiotherapists have a wealth of medical information and are medically qualified to educate patients and caregivers with misconceptions about their health condition. Nevertheless, the impact of physiotherapy is still not well felt by many people in Cross River State since only a few physiotherapists are engaged in government-owned hospitals. For example, at the University of Calabar Teaching Hospital, only seven physiotherapists were employed by the government to meet the needs of over 600-capacity bed in-patient wards and the outpatient physiotherapy department. This is grossly inadequate when compared with the number of physiotherapists employed in other teaching hospitals in Nigeria where over 40 physiotherapists are engaged on a permanent appointment. Accordingly, we recommend that the government of Cross River State should ensure that there is a department of physiotherapy manned by an adequate number of physiotherapists in every hospital in the state.

This case report explored the importance of patient education combined with home individualized physiotherapy intervention in the modulation of stroke-related impairment amid erroneous beliefs about the incidence and management of stroke. The cultural factors that may have influenced our patient's belief and adherence to recommended interventions include a belief that stroke is caused by witchcraft or that it is a punishment for those who have sinned against God and that the solution can only be revealed by a native doctor through divination or by God through prayers. This was depicted in our patient who only started seeking medical intervention when her anticipated cure from the herbal home failed and when

she noticed no improvement in her condition. Cultural beliefs, advice from friends/family/healthcare professionals, previous experience and online information have been suggested as factors that can influence patient healthcare decisions [1] and even adherence to recommended medical interventions. During the management of our case, there were times when the patient reverted to the cultural belief (going to a prayer house and being given a trial of herbal concoctions). However, our continuous and persistent education of the patient and informal caregivers positively influenced the patient's condition as the patient was seen to adhere to the use of prescribed medication, diet, and the recommended home program. As demonstrated in the scores of the manual muscle strength test, cardiovascular parameter, glucose level, and body composition after 8 weeks of treatment, there was an improvement in body composition status, cardiorespiratory status, glucose uptake, and of functional abilities. The reduction in blood glucose levels may be accredited to the use of therapeutic exercise, such as PMRE. Muscular contraction during PMRE enhances the level of glucose transporter which increases the action of insulin on glucose, thereby reducing the level of glucose [17, 18]. Additionally, plus EMS (PMRE) involves contraction of the patient's muscle against the resistance of the physiotherapist was indicative of the improvement in muscle strength and gait. This corroborates the findings of Veerbeek et al. [11], who report that progressive active resistance exercise enhances muscle strength, tone, and gait pattern. Additionally, as reported by Gardas and Mahajan [19], PNF enhances muscle strength and function in patients having neurologic conditions. For example, during PNF, there is a combination of both rotational and diagonal movement to promote, facilitate, and strengthen motor control producing mass patterns in functional dimensions [19]. Improvement in the functional use of the hand was accredited to intervention with TOCT that involves the execution of a combination of different activities using discrete practice with many repetitions, such as hand-to-mouth-ear-opposite shoulder-thigh and clapping of hands. Balance and gait are coupled activities with the improvement in one leading to the improvement of the other. The improvement in gait and balance may be accredited to a combination of interventions such as task-specific training, PMRE, squatting exercise, marching on the spot, ankle sway, and over-ground walking (sideways, forward, and backward). The enhancement of balance as found in this study corroborates with the findings of Pollock et al. [10]; Cabanas-Valdés et al. [9] and Veerbeek et al. [11] that dynamic balance in standing and sitting improves with task-specific training. Additionally, in the present study, the patient's visceral fat, BMI and %BF were lower compared to before the intervention; however, the %MM was higher compared to before the intervention. This shows the efficacy of physiotherapy intervention (such as therapeutic exercise) in the management of obesity indicators. Meanwhile, the loss of muscle mass/increased intramuscular fat and reduction in muscle strength and function could negatively impact glucose metabolism [12].

The improvement in cardiovascular parameters (blood pressure, MAP, RPP and PP) and blood glucose, may be accredited to the use of a holistic approach to care since the patient was on medication, and a diabetic-specific diet, in addition to the 8 weeks home individualized physiotherapy treatment. Cardiovascular indices, such as MAP, RPP and PP are key indicators of perfusion of oxygenated blood to vital tissues and cardiorespiratory fitness. These indices were found to be lower after than before the intervention. A high value for the MAP renders a person at risk of developing a heart attack because of increased pressure on the wall of the blood vessel causing the heart to work harder than usual. Normal values for the MAP fall between the range of 70-100 mm Hg and a mean value of 83.93±9.59 mm Hg has been reported among sedentary individuals [20].

Conclusion

The findings of this study showed that many factors could influence the patient's decision about their health condition and also provide evidence that continuous and persistent education of the patient and informal caregivers may positively influence the patient's condition. We also provide evidence to corroborate existing evidence that stroke-related impairments, including muscle weakness, reduced functional ability, increase in %BF, visceral fat, BMI and abnormal glucose level can be modulated with physiotherapy intervention. It was reported that some people believed that stroke was caused by witchcraft which is made evident by divination and that native healers can offer treatment to attain a permanent cure.

Study limitations and strengths

This study should be interpreted in light of the following limitations. First, we could not use a validated outcome measure to measure the patient's belief or perception about the meaning, incidence, and treatment of stroke. Second, our interventions were focused on a single patient who received treatment at home, hence, clinicians should exercise caution for generalizations of the outcome of this study to hospital or community-based patients with the same or similar condition. Third,

the lack of adequate one-on-one follow-up after the period of treatment makes it difficult to ascertain whether the improvement shown would be maintained in the long run, however, a single phone communication with the patient suggested that the patient improvement was maintained. A single phone communication was not sufficient to determine the maintenance of improvement after treatment and as such not a sufficient follow-up, hence, future studies should provide adequate follow-up to ascertain the sustenance of improvement after home individualized physiotherapy management. Fourth, we did not assess the cognitive status and likelihood of depression after the intervention; therefore, we recommend that future studies assess the impact of home-based physiotherapy treatment on cognitive function and depression among stroke survivors. Sixth, the determination of improvement in hand function exercise using able and unable may not be objective hence future studies should utilize a more objective means of assessing improvement in hand function. However, we utilized a holistic approach in providing physiotherapy intervention at home for a diabetic patient with stroke who was previously managed in an herbal home.

Ethical Considerations

Compliance with ethical guidelines

The patient here was given a detailed explanation of the procedure and purpose of this home-based individualized physiotherapy intervention in a suitable understandable language. Verbal and written consent was obtained before the commencement of the intervention.

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Authors' contributions

Conceptualization, study design and writing the original draft: Patrick Ayi Ewah; Patient identification: Peter Agba Awhen; Review, editing and final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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