

The Knowledge of Physiotherapy Practitioners on the Effects of Strengthening Exercises on Stroke Patients at Selected Hospitals in Lusaka District

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ABSTRACT

Background: Physical inactivity has been established to be an independent risk factor for a range of chronic diseases and conditions that threaten the health of the nation. Therefore, the role of strengthening exercises in patients who had stroke is to prevent further disability.

Objectives: To determine the knowledge of physiotherapy practitioners on the effects of strengthening exercises on stroke patients at selected hospitals in Lusaka District.

Methodology: This was a cross-sectional, descriptive study which utilized quantitative methods. The sample size of 57 participants, both males and females in the age group of 19 to 65 years were chosen using purposive sampling technique. The Excel software program, Chi-Square test and Statistical Package for Social Science (SPSS) were used to capture and analyze the data.

Results: In this study, 43 physiotherapy practitioners participated and the response rate was 75%. The majority were females (74%) while (26%) were males. Most of the participants (55%) had the Bachelor of Science Degree while 12% had Master of Science. According to the results, 70% of the participants defined physical activity as an activity which involved skeletal muscles that led to energy expenditure above resting level. The majority of the practitioners reported positive results from using strengthening exercises to improve stroke outcomes. Specifically, 74% of them rated the outcomes as satisfactory, while 26% rated them as very satisfactory. The results also showed that physiotherapy practitioners have the required knowledge with regard to the effects of strengthening exercises in stroke patients. However, they preferred other forms of exercise that were less demanding on their schedule.

Conclusion: The physiotherapy practitioners had adequate knowledge about the benefit of physical activity and the effects of strength training on stroke patients. They all agreed that to yield better results, the right time to commence strength training was soon after occurrence of a stroke. However, this knowledge did not influence their decision to use strength training in post stroke rehabilitation more, which suggested that they did not base their decisions on evidence.

Keywords: Stroke management, Modalities, Strengthening exercises, Physiotherapy, Practitioners, Knowledge, Effects

1. INTRODUCTION

Physiotherapy is a healthcare profession responsible for human function and movement. Its core value is to enhance the quality of life of individuals and populations

at large [1]. It is the most practiced allied health discipline world over [2]. Also, physiotherapy maximises potential through promotion, prevention, intervention, habilitation and rehabilitation [1].

Consequently, physiotherapists use education, specialized programming and a holistic approach to care in order to promote wellness and an increased quality of life [3]. In addition, physiotherapists are trained health care specialists in prevention, detection, evaluation, treatment and rehabilitation of neuro-musculoskeletal system movement and function [4]. They are important contributors to healthcare and have been charged with the responsibility of improving individuals' health status for a lifespan [5]. However, physiotherapists pay more attention to curative care than to health promotion and prevention.

According to a historical review of physiotherapy practice as far back as 1996 [6], out-patient physiotherapy can enhance the functional abilities of stroke patients, even when initiated at a late stage of rehabilitation. The study found significant improvements in mobility among the participants who received physiotherapy interventions. [7] Affirmed that physiotherapy is prescribed in stroke patients in order to enhance recovery. Equally, early rehabilitation mitigates secondary musculoskeletal changes and abnormal movement strategies. Therefore, the three main fields of practice in the discipline of physiotherapy are musculoskeletal, neurological and cardio-respirological or cardio-pulmonary [2]. There are also three main interventions in stroke management namely cardiorespiratory, resistance and mixed training [8]. Standard rehabilitative therapies include muscle strengthening (isometric and isokinetic exercises) to improve power and endurance of affected and unaffected muscle groups [9].

Several authors point out that in the rehabilitation of patients, resistance is achieved using weights or elastic bands, and aerobic exercise training by treadmill, over-ground walking or recumbent cycling [8, 9, 10]. Although physiotherapy rehabilitation improves recovery of function and mobility after stroke, the NICE guidelines [11] recommend a minimum of 45 minutes of

exercises five days a week as part of a seven-day specialist stroke rehabilitation service. As for patients who cannot manage 45 minutes of physical activity, the five days a week with high intensity should still be maintained with a shorter time frame. According to [12] high intensity therapy is needed to relearn lost abilities.

In tandem with Evidence-based Practice (EBP), the knowledge of physiotherapy practitioners should translate into effective clinical practice and patient care [13]. Regarding knowledge, [14] revealed that the measures taken by the public and timely medical attention given to patients post stroke is influenced by knowledge and perceptions regarding stroke and its risk factors. A study [15] revealed that information on the knowledge of physiotherapists and students regarding strength training was scarce, and that both physiotherapy practitioners and students had insufficient knowledge about strengthening training. The translation of knowledge into implementation and practice requires change of knowledge, attitude and behaviour [16, 17]. These authors were quick to point out that the barriers to knowledge translation are lack of knowledge and skill, negative or outdated attitudes and inefficient systems. The fact that health professionals base their decision-making on theoretical knowledge, personal experiences and views of experts during stroke rehabilitation implies that research-based knowledge is excluded [18]. Health practitioners who promote physical activities are those who have the knowledge and thus command a good understanding of its benefits [17]. Practitioners do not have the skills, authority, knowledge and resources to translate findings from clinical trials into clinical practice [19]. It's important to acknowledge that the transfer of knowledge from research into clinical practice is a challenge and takes time [20, 21]. For example, models on upper limb interventions have been developed in research but physiotherapists involved in stroke rehabilitation have not translated this

knowledge into clinical practice. Therefore, there is a knowledge gap between research and practice [20, 21].

As for the frequency and intensity of rehabilitation, [22] considered 17 hours of therapy over a 10-week period to be necessary for significant positive effects on the body function, activities and participation level. The evidence-based analysis conducted by [23] supports the use of higher-intensity physiotherapy to improve limb motor function and capacity to perform ADL post stroke. In stroke rehabilitation, it is important to consider factors such as intensity, specificity and task because these are likely to influence mobility and ADLs intervention outcome measures [24].

1.1 Types of treatment modalities

Mobility is highlighted as one of the interventions that include fitness and muscle strengthening in the rehabilitation of stroke survivors [9]. Selective muscle strengthening is conducted using isometric and isokinetic exercises, which improves muscle power and endurance. Various physiotherapy approaches have been developed in order to facilitate motor recovery and improve function of stroke patients [25]. Other treatment modalities are over-ground walking and balance training, body weight-supported treadmill training, robotic gait assist devices, and functional electrical stimulation [9, 25]. Researchers have taken keen interest in investigating harnessed treadmill training with or without body weight because it is believed that it can improve walking in post stroke patients [26]. A study [27] revealed that treadmill and over-ground training are beneficial in improving gait speed in stroke patients. Nonetheless, [28] recommended strength training for the upper and lower limbs, although they insist that strength training should not be a stand-alone modality but should supplement fitness training and task-specific training.

Motor dysfunction resulting from stroke in stroke survivors is responsible for their

immobility, limited involvement in activities of daily living and participation in society, and their inability to return to professional activities [29]. Therefore, rehabilitation training has proved to be the most effective remedy for reduced motor function in stroke [28, 29]. Physiotherapy rehabilitation uses direct, specific and scientifically effective modalities to treat stroke patients [30]. Of these modalities, the recommended are early mobilization, treatment of shoulder pain and subluxation, mobilization of the feet, treatment of somatosensory functions, balance, sit-to-stand training, muscle strengthening and endurance.

1.2 Factors that influence the selection of treatment modalities

Authors point to the fact that there are several approaches to physiotherapy treatment that are useful in post stroke [31, 32]. In neuro-rehabilitation, resistance strength training of muscles is encouraged even though its uptake in clinical practice is quite limited [33]. Nonetheless, [34] highlights the factors influencing selection of treatment modalities during rehabilitation as social-demographic factors (age, gender, race and socio-economic status), clinical factors (the initial injury, co-morbidities, post-stroke depression and rehabilitation therapeutics) and genetic factors. Furthermore, these factors influence the utilization of strength training as well as its impression on neuro-therapy post brain injury. The systematic review revealed that physiotherapists preferred to use a mixture of approaches than a single approach for better outcomes [32]. Furthermore, [35] affirmed that post stroke motor recovery is a complex, dynamic and multifactorial process in which interplay among genetic, pathophysiological, socio-demographic and therapeutic factors determines the overall recovery trajectory.

The two principles guiding physiotherapy treatment in post stroke are firstly, the adaptability of the adult central nervous system and secondly, progressive skilled

motor practice [9]. The adult central nervous system adapts by re-organising itself to recover tarnished cognitive and motor functions. Then the progressive, skilled motor practice ensures that the attention, motivation and learning networks of the brain are engaged effectively post stroke. The limiting factor to uptake of strength training is patient tolerance [36] because body weight exercises are difficult to gauge. Therefore, strength training was known to increase muscle tone. Physiotherapists often include strength training as a component of rehabilitation program during stroke interventions even though it is not implemented in line with evidence-based guidelines [37]. Other factors influencing selection of strength training are enjoyment, knowledge, interpretation and implementation of strength training, inconsistency in applying the principles of strength training, research engagement (limitations of research findings), limited resources, clinical preference of colleagues.

In conclusion, [37] confirmed that many physiotherapists have knowledge of the principles of strength training but implement them without a comprehensive understanding. The objectives of this study were to establish the knowledge of physiotherapy practitioners regarding strengthening exercises, establish the modalities commonly used by physiotherapy practitioners in stroke patient rehabilitation, and to determine the factors that influence the selection of treatment modalities.

2. MATERIALS & METHODS

2.1 Design

The purpose of this study was to determine the knowledge of physiotherapy practitioners on the effects of strengthening exercises in stroke survivors. A descriptive cross-sectional study design was used. Descriptive cross-sectional studies are observational studies which analyse data from a population at a single point in time. They typically measure the prevalence of

one or multiple health outcomes, determinants of health and describe features of a given population [38].

2.2 Participants

A total of 43 practicing physiotherapy practitioners of both genders between 19-65 years old (32 Females and 11 Males) were enrolled to participate in this study from five (5) government hospitals in Zambia's Capital City of Lusaka. Physiotherapy practitioners were eligible to participate in this study if they treated patients with stroke. Among the five hospitals selected were two tertiary hospitals namely University Teaching Hospital (UTH) and Levy Mwanawasa Teaching Hospital (LMTH), and three First Level hospitals (Chainama Hills College Hospital, Kanyama and Chilenje First Level Hospitals). The five hospitals were purposively selected on the basis of accessibility and higher numbers of practicing physiotherapy practitioners there at. Written and informed consent was obtained from the participants prior to the commencement of this study. A pilot study was conducted on (5) physiotherapy practitioners from Chawama First Level Hospital. Ethical clearance was solicited from Lusaka Apex Medical University Bio-Research Ethics Committee (LAMUBREC) and the National Health Research Authority (NHRA).

2.3 Questionnaire design and development

A therapist-focused knowledge translation intervention for improving patient adherence in musculoskeletal physiotherapy practice questionnaire was used to collect data from participants. This questionnaire developed [39] was adopted and adapted to suit the purpose of this study. The questionnaire had 27 questions divided into four sections. **Section One** collected socio-demographic data (questions 1-8), **Section Two** contained information on the knowledge of physiotherapy practitioners (questions 9-16), and **Section Three** looked

at the effects of strengthening exercises (questions 17-23) while **Section Four** examined the factors that influence physiotherapy practitioners' choice of treatment modalities (questions 24-27).

2.4 STATISTICAL ANALYSIS

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) Version 27 software. Descriptive statistics expressed as frequencies, percentages, means, and standard deviation were used to summarise data. Inferential statistics were performed to determine associations between variables. The results were presented as tables, pie charts and graphs. A P-value < 0.05 (5%) was considered to be statistically significant.

3. RESULT

3.1 Sociodemographic profile of participants

A total of 57 questionnaires were distributed to physiotherapy practitioners and 43 participants successfully completed the questionnaires and returned them, giving a response rate of 75%. The socio-demographic characteristics of the study cohorts are presented in **Table 3.1**. Most participants were in the age range of 20-30 years (34.8%) followed by 53 years and above (32.6%) with a mean age and standard deviation of 34.9 ± 8.3 . The participants were mostly females 74.2% (n=32) and males were 25.6% (n=11). Even though most of them (46.5%, n=20) had work experience of 1-5 years, a good number of physiotherapy practitioners (23.3%, n=10) ranged between 16-20 years of work experience and only 2.3% (n=1) had worked for over 30 years. This study also revealed that more than half of the practitioners (55.8%, n=24) were graduates from University of Zambia (UNZA), with another good number being from Evelyn Hone College (EHC, 27.9%, n=12). Equally, most practitioners (55.8%, n=24) had graduated with a Bachelor of Science in Physiotherapy followed by Diploma holders (32.6%, n=14). The University Teaching

hospital had the highest number of participants (39.5%, n=17) followed by those from Levy Mwanawasa Teaching Hospital (34.9%, n=15).

Table 3.1: Socio-demographic characteristics (n=43)

Characteristics	N (%)	Mean \pm SD
Age	43	34.9 \pm 8.3
20-30	15 (34.8%)	
31-41	4 (9.3%)	
42-52	10 (23.3%)	
53 and above	14 (32.6%)	
Gender		
Male	11 (25.6%)	38.7 \pm 7.2
Female	32 (74.2%)	33.6 \pm 8.4
Marital status		
Single	11 (25.6%)	
Married	31 (72.1%)	
Widowed	1 (2.3%)	
Work experience		
1-5 years	20 (46.5%)	
6-10 years	3 (7.0%)	
11-15 years	4 (9.3%)	
16-20 years	10 (23.3%)	
20-25 years	5 (11.6%)	
Above 30 years	1 (2.3%)	
Qualification		
Diploma	14 (32.6%)	
Degree	24 (55.8%)	
Masters	5 (11.6%)	
Institution graduated from		
Evelyn Hone College	12 (27.9%)	
LAMU	4 (9.3%)	
UNZA	24 (55.8%)	
Other	3 (7.0%)	
Place of work		
Kanyama Level1 hospital	7 (16.3%)	
Levy Mwanawasa Teaching Hospital	15 (34.9%)	
University Teaching hospital	17 (39.5%)	
Chainama Hills College Hospital	4 (9.3%)	

3.2 The knowledge of physiotherapy practitioners regarding strengthening exercises

This section comprised of questions on knowledge of physical activity, the source of information, right time to start strength training, type of management commonly used by physiotherapy practitioners, the practice of strength training, and the benefits of strength training.

The results in **Table 3.2** below revealed that the majority of the participants (70%, n=30) defined physical activity as an activity involving skeletal muscles leading to energy expenditure above resting levels. All physiotherapy practitioners (100%, n=43) indicated that they had heard about strength training, their source of information being

their respective universities and colleges through lectures (55.5%, n=25). Others indicated that they had learned about it through reading articles (32.7% (n=14). Most physiotherapy practitioners recommended the commencement of strengthening exercises immediately one has a stroke (88%, n=36) while 5% (n=2) said the training can commence after a year. The most prominent type of management was conventional (traditional) management which is mostly practiced on a one-on-one basis (76.7%) rather than in a group. There was consensus that strength training was more beneficial (97.7%) and effective (86%, 0.91 ± 0.29) in stroke management.

Table 3.2: Strength training and sources of information

Variable	N/%	Mean ± SD
Heard of strengthening exercises		
Yes	43 (100%)	
No	0 (%)	
Source of information		
Colleagues	2 (10.9%)	0.14 ± 0.35
Articles	14 (32.7%)	0.42 ± 0.49
Social media	0 (%)	0.00 ± 0.00
University	25 (45.5%)	0.58 ± 0.49
Hospital	2 (10.9%)	0.14 ± 0.35
Right time for strengthening exercises		
Immediately after stroke has occurred	36 (88%)	
3-6 months after stroke has occurred	5 (7%)	
After 1 year	2 (5%)	
Approaches in daily practice		
Conventional (Traditional) management	24 (55.8%)	
Contemporary management	19 (44.2%)	
Benefits of strengthening exercises		
Yes	42 (97.7%)	
No	1 (2.3%)	

Table 3.3 below describes the reasons why participants chose a particular modality during stroke rehabilitation. Strength training (13.4%), PNF (13.4%) and progressive exercises (13%) were more practiced than any other modalities, strength training emerging as the most helpful modality to patients in stroke management. Other modalities were used because they

were easy 27.5% (0.26 ± 0.44), consumed less time 35% (0.33 ± 0.47) and were effective 30% (0.28 ± 0.45). Of the participants, 7.5% (0.07 ± 0.25) did not respond to this question.

Table 3.3: Reason for choice of modality

Variable	Frequency	Percentage (%), SD
Have you ever used strength training		
Yes	43	100
No	0	0
Reason for choosing strengthening exercises		
Strengthening exercises are convenient	6	0.14 ± 0.35 (13.9%)
Strengthening exercises are effective	37	0.91 ± 0.29 (86%)
It was the only option I had	0	0.00 ± 0.00 (0%)
I had less patients to manage	0	0.00 ± 0.00 (0%)
Reason for choosing other modalities		
They are easy	11	0.26 ± 0.44 (27.5%)
They are cheap	3	0.07 ± 0.25 (7.5%)
They are less time consuming	14	0.33 ± 0.47 (35.0%)
They are more effective	12	0.28 ± 0.45 (30.0%)

Note. 'n' indicates the number of respondents who selected each response, as 'yes'

Table 3.4 illustrates the most prescribed frequency of performing strength training as 3 times per week (55.8%) using a workload of 5kg of two sets (32.5%) for 15-20 minutes per session (53.5%).

Table 3.4 Distribution of frequency, workload and timing of exercises

Variable	Frequency	Percentage (%)
Timing of exercises		
Rarely or never	16	37.2
15-20 minutes	23	53.5
20 -45 minutes	4	9.3
30 – 60 minutes	0	0
Workload		
None	10	23.3
One set	10	23.3
Two sets	14	32.5%
Three sets	9	20.9
Frequency		
1-2 times per week	18	41.9
3 times per week	24	55.8
4-5 times per week	1	2.3

In assessing the outcomes of rehabilitation using strength training, the majority (73.8%, n=31) rated it as satisfactory (Figure 3.1).

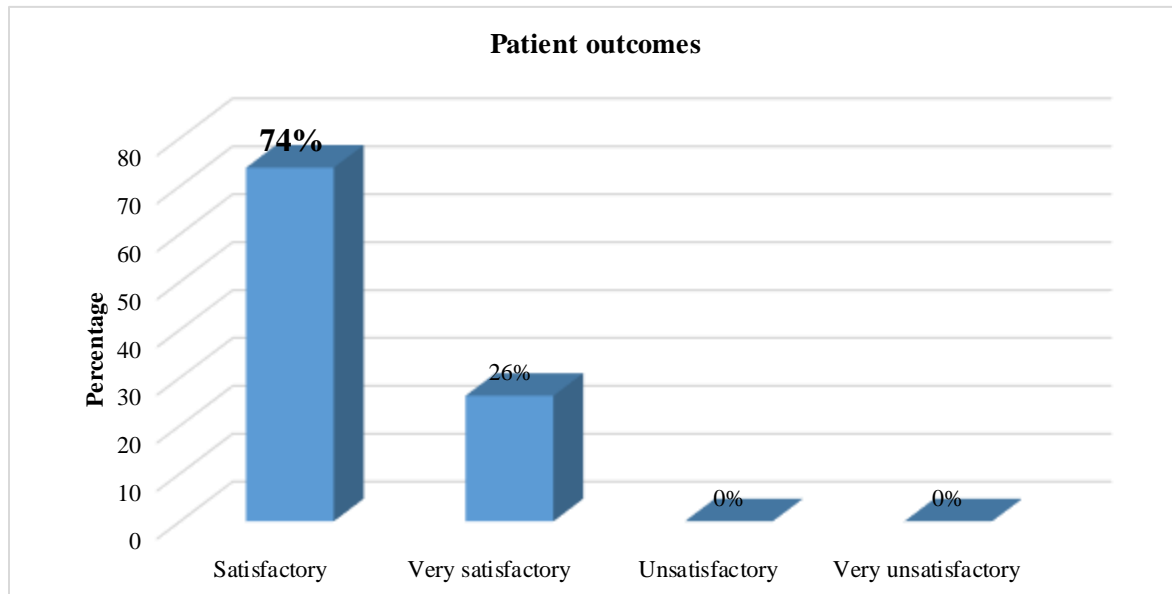


Figure 3.1: Patient outcomes using strengthening exercises

3.3 Comparison of age, knowledge, and experiences between institutions

The results in **Figure 3.2** show that 23.3% (n=10) of graduates with experience of 1-5 years were from EHC and there was no statistical significance between graduating institution and work experience ($p < .058$).

This was followed by the work experience between 16-20 years graduates from UNZA (18.6%, n=8). Cumulatively, most participants (47%, n=20) from all study institutions were in the range of 1-5 years' work experience.

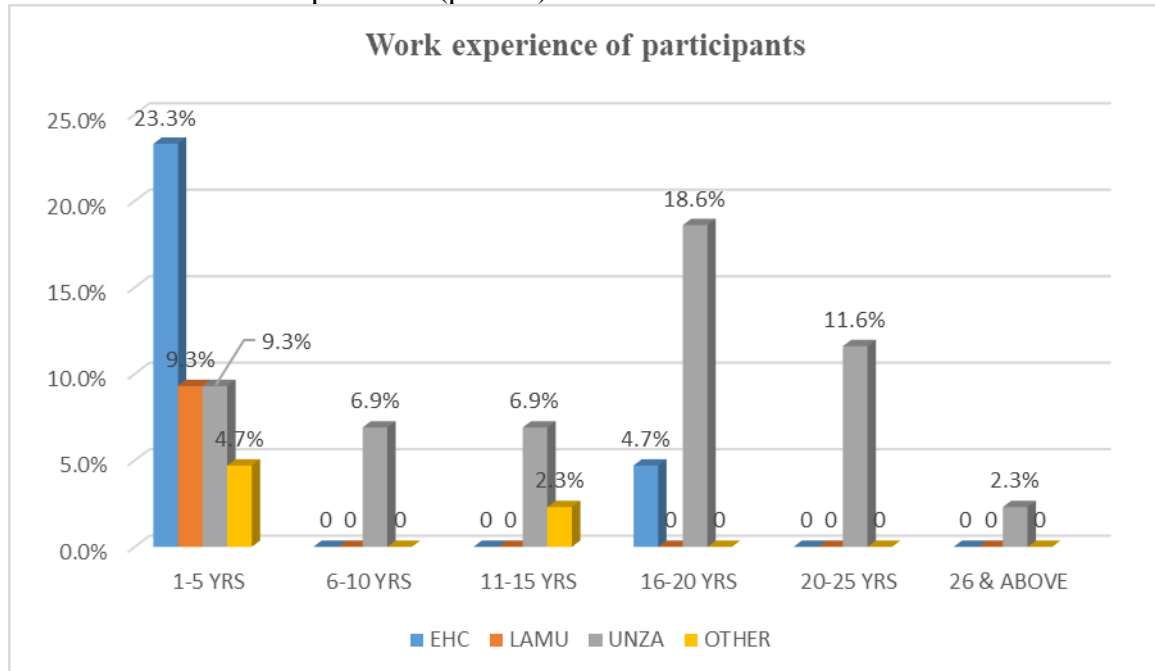


Figure 3.2: Comparing work experience against training institutions

In terms of qualifications (**Figure 3.3**), most participants with a Bachelor of Science in Physiotherapy (46.5%, n=20) were from UNZA, followed by Diploma graduates from EHC (25.6%, n=11). Cumulatively,

most participants were degree holders (55.9%, n=24). There was a statistical significance between qualifications and the training institution ($p < .000$).

Whether strengthening exercises were beneficial in post stroke, 54.8% participants from UNZA said yes followed by EHC (Table 3.5). Cumulatively, 97.6% (n=42) affirmed that strength training was beneficial in post stroke patients. However,

2.3% (n=1) said no and there was no statistical significance between graduating institution and the knowledge on benefits of strength training in post stroke patients ($p < .847$).

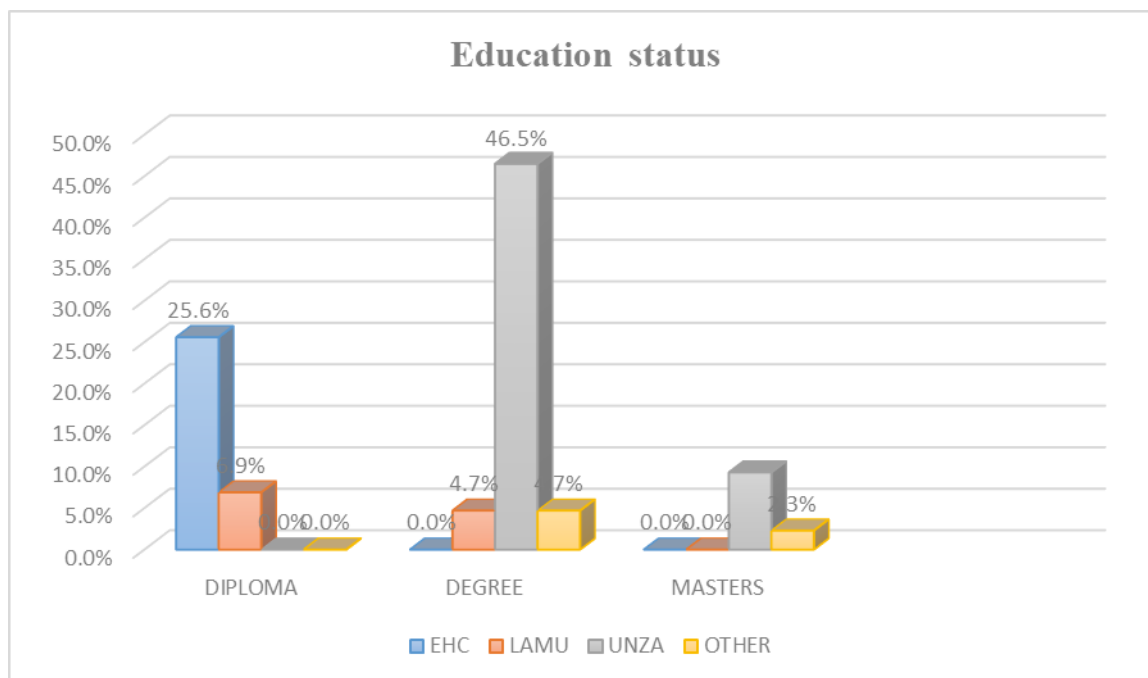


Figure 3.3: Qualifications of participants

Table 3.5: Benefits of strengthening exercises in post stroke

Description	Percent (n) distribution of institution graduated				P-Value
	EHC	LAMU	UNZA	Other	
Do you think strengthening exercises are beneficial to a stroke patient?					
Yes	27.9 (12)	9.3 (4)	53.5 (23)	6.9 (3)	.847
No	0 (0)	0 (0)	2.3 (1)	0 (0)	

3.3 The relationship between socio-demographics and strength training

The Pearson's correlations test was used to test for associations between socio-demographic variables and strengthening exercises as well as to ascertain statistical significance set at $p < 0.01$ (Table 3.6). There was no statistical significance between the age, work experience, and qualifications of practitioners and their

knowledge regarding strengthening exercises in stroke. However, there was a very high statistical significance between the age of the participants and work experience ($p = .853$) and a low significance when compared with qualifications ($p = .461$). Equally there was a moderate relationship between the qualifications of the practitioners and their work experience ($p = .611$).

Table 3.6: The relationship between demographic data and strengthening exercises

		age	Work experience	qualification	Knowledge on strengthening exercises in stroke patients
Age	Pearson Correlation	1	.853**	.461**	.242
	Sig. (2-tailed)		.000	.002	.118
	N	43	43	43	43
Work experience	Pearson Correlation	.853**	1	.611**	.140
	Sig. (2-tailed)	.000		.000	.372
	N	43	43	43	43

Qualification	Pearson Correlation	.461**	.611**	1	.296
	Sig. (2-tailed)	.002	.000		.054
	N	43	43	43	43
Knowledge on strengthening exercises in stroke patients	Pearson Correlation	.242	.140	.296	1
	Sig. (2-tailed)	.118	.372	.054	
	N	43	43	43	43

** . Correlation is significant at the 0.01 level (2-tailed).

4. DISCUSSION

4.1 Response rate

In this study the response rate was 75% because physiotherapy practitioners started working in shifts as a way of mitigating COVID-19. Therefore, some participants did not return the questionnaires. A study was conducted to investigate the current clinical practice of Saudi Arabian physiotherapists in stroke rehabilitation involving 287 participants [40]. Out of this number, 197 participants returned the questionnaires giving a response rate of 69%. Compared to this study, the Saudi Arabian response rate was much lower and the assumption is that most of the physiotherapists had less than 5 years' work experience in stroke rehabilitation.

4.2 Demographic characteristics of participants

The gender distribution in this study showed that female participants were more (74%) than male participants (26%). The reason could be that the female workforce is higher than the male workforce in Lusaka at these selected hospitals. Literature consistently insists that physiotherapy is a traditional, white, middle-class feminine dominated profession with a proportion of 4:1 in the UK and has remained so to date in Canada [41, 42, 43, 44]. Another study [45] concurred by highlighting that physiotherapy practice and training was started by two female nurses, hence admission to the profession was restricted to females. However, their retrospective study showed that physiotherapy in Nigeria is male oriented than female, probably because the first physiotherapists in the country were British-trained males. In fact, the male physiotherapy proportion has increased from 16% in 1986 to 27% in 2001 to entail that the male folks with their masculine workforce are slowly taking over the

profession [46]. Equally, [47] revealed a high level of male physiotherapy graduates than females from the University of Zimbabwe since its inception in 1987. The reason for choosing physiotherapy by male students in Zimbabwe was because of the number of points they had at A' level (72%) and job availability (72%) [47].

In developed countries, Sweden is so far the only country where physiotherapy evolved as a male dominated program, training army officers with aristocratic and middle-class backgrounds [48]. This confirms that physiotherapy along with nursing and teaching are female-dominated professions. Both studies conducted in Zambia revealed that female (60%, 64%) were more than male (40%, 36%) physiotherapists [49, 50]. However, this study had a higher percentage of female participants than what was obtained in both studies. A similar study conducted in the province of Quebec, Canada showed that 76.6% of physiotherapists were females [51]. In addition, the ratio of female to male students in five universities was 54%:46%. On the contrary, the study conducted [40] showed a lower number of female practitioners (33.5%) compared to male practitioners (66.5%). In a study conducted to establish the demographic transformation of the physiotherapy profession in South Africa, results showed that 80% were females [52]. On the contrary, results from the study [53] state that male students are three times likely to choose physiotherapy education because of their passion for sports and physical activity than females. [54] insist that physiotherapy is largely a white, female and middle-class dominated profession even though Muslim women are underrepresented during training due to cultural norms.

The highest age range for study participants was 20-30 years old (34.8%), followed by over 53 years (32.6%) with a mean age of 34.9 (SD \pm 8.3). The reason could be that the Zambian government recently recruited young health personnel while a good number of older workforce is in the range of 50 and above years. In a study instituted [47], the mean age was 22 years and 95% were below 25 years. Another study recorded the age range of 18-26 years with standard deviation of \pm 2.39.

Most participants in this study worked at the University Teaching Hospital and Levy Mwanawasa Teaching hospital because these are big referral hospitals in Zambia. They are also used as teaching sites and clinical placements for all medical students. As for graduating institutions, UNZA recorded the highest grandaunts because it is one of first universities in Zambia and the first to offer Bachelor of Science and Master's degree in physiotherapy in Zambia. EHC scored the highest in diploma graduates because it has been the only college graduating diploma students in physiotherapy until the recent advent of LAMU and other universities.

4.2.1 Work experience and educational status

According to the results of this study, 46.5% of the participants had work experience of 1-5 years while 2.3% had worked for more than 30 years. [55] agrees with these results because their study too had a higher number of participants (75.6%) with less than 5 years' work experience. Seemingly, these results are similar to those obtained by [40] which showed that 51.8% participants had clinical work experience of between 1-5 years except 4.1% who worked for more than 20 years. In contrast to our study, [49] revealed a majority of participants who had more than 5 years' work experience while a few had more than 15 years' work experience.

In addition, most participants (55%) in this study were degree holders who had graduated from the University of Zambia with only 11.6% Masters' graduates.

Equally, [49] revealed that 60% and [40] 58.4% were degree holders among the participants compared to 20% and 13.2% Master's degree holders respectively. This shows that there is still a big number of physiotherapy practitioners with bachelor's degree followed by diploma certificates and fewer Masters' holders in Zambia. Most physiotherapy practitioners in this study worked from the University Teaching (39.5%) and Levy Mwanawasa Teaching Hospitals (34.9%). These are big specialty hospitals in Lusaka and the entire country with a high population of patients. Apparently, no physiotherapists from private facilities were included in this study.

4.3 Knowledge of physical activity (PA)

Physical activity in post stroke patients improves cognitive functioning, quality of life, and reduces the chance of having another stroke [56]. One important task of physiotherapists is to promote wellness through physical activity interventions in stroke patients [52]. Physiotherapists have a pivotal role in promoting PA, but they have inadequate knowledge about WHO guidelines on PA which leads to inadequate promotion of PA in their clinical practice [57]. The results of this study showed that 70% of physiotherapy participants had knowledge relating to physical activity and energy expenditure of skeletal muscles. Further a fraction of practitioners (14%) described physical activity as bodily movement and stroke as damage to brain cells. This resonates with several authors that define physical activity as bodily movements produced by skeletal muscles that leads to energy expenditure [58, 59, 60, 61]. Describing physiotherapists' knowledge of PA, [56] intimate that it is bodily physical outcomes directed than life-enhancing activities. Apparently in [62] participants had a high knowledge of physical activity and were more likely to detect an inter-attribute similarity relationship among pieces of newly presented information than participants recorded with low perceived knowledge.

The majority of physiotherapists testified to encouraging stroke patients to maintain an active lifestyle through physical activity [63]. The fact that they prescribed PA to clients and promoted it is a sign that they had sufficient knowledge. According to [64], 7% of the participants had moderate aerobic physical activity recommended while 25% recommended muscular type and 4% identified both aerobic and muscular type of activity. However, barriers to the effective delivery of strength training includes physiotherapists' knowledge, confidence in their skills, limitations in their resources, workplace culture and research engagement [37]. Upon exposure to different definitions of physical activity, participants' level of knowledge did not significantly affect the importance of assessments. Physiotherapists in the Nigerian study had limited knowledge of physical activity guidelines in that PA promotion minimally (49.1%) translate into the practice of physical activity [65].

4.4 Knowledge of strength training in stroke patients

Participants in this study recorded a 100% knowledge about strength training in stroke patients which indicated high levels of perceived know-how during patient handling and treatment. It reflects the importance of information dissemination rather than the tendency to over-rate the importance of different sources of information which participants attain during their assessments. [66] Physiotherapists gave inadequate encouragement to stroke patients to do physical training compared to the nurses. This has a bearing on how much knowledge physiotherapy practitioners have and the evidence-based practice. [67] Educators of undergraduate physiotherapy in Ireland expressed need for re-education in physical activity, exercise promotion and exercise prescription because they were not satisfied with their limited knowledge. [68] Physiotherapists are well vested with PA promotion and exercise prescription but the manner of prescribing differs and is inconsistent. This revealed a lack of

knowledge and training to prescribe physical activity and strength training. In another study [15] revealed that physiotherapy practitioners had minimal utilisation of strength training because of inadequate professional education on its application. However, the majority of them (90%) had sufficient knowledge about strengthening exercises because they often prescribed it to their patients. A study [37] revealed that many physiotherapists had insufficient knowledge, lack of confidence and skills in implementing specific principles of strength training. This led to the conclusion that physiotherapists were likely to implement strength training interventions with which they were familiar, confident and efficient and identified a lack of time to dedicate to further developing their knowledge. To mitigate these challenges, a rehabilitation centre in Ottawa started using a video-conferencing for rehabilitation consultation [69]. The relationship between demographic characteristics and the knowledge of physiotherapy practitioners on strengthening exercises was tested at $p < 0.01$. There was a very high statistical significance between the age of the participants and work experience ($p = .853$) and a low significance between age and qualifications ($p = .461$). Equally, there was a moderate relationship between the qualifications of the practitioners and their work experience ($p = .611$). This implies that the age, qualifications, and work experience influenced the knowledge of physiotherapy practitioners on strengthening exercises.

4.4.1 Right time to start strengthening exercises

There is a strong directional difference in the knowledge of physiotherapy practitioners as to when the right time is to start strengthening exercises in post stroke patients, leading to conflictual information among participants. In this study there was an overwhelming consensus of 87.8% that strengthening exercises should start immediately one has suffered a stroke. Many studies recommend that strengthening

exercises should be commenced immediately after the occurrence of stroke [70, 71, 72, 73]. According to [74], activity limitations manifest by reduced ability to perform daily tasks and at 6 months post stroke, 40% of stroke survivors have difficulties with basic self-care. Stroke survivors experience marked reduced physical activity and fitness. This is the reason why strength training should be commenced as soon as possible [75]. Early mobilisation in the acute phase serves to prevent and treat complications as well as to improve functional independence [76]. Very early mobilisation post stroke is useful for improving the prognosis after acute stroke [77]. Backing this idea, [78] stated that early mobilization within 24 to 48 hours is best because during this time, better outcomes can be achieved than after 3 months post stroke.

Both early mobilisation after 3 days of stroke and within 24 hrs of stroke yield same results [79]. Studies [71, 80] suggest that more than 30% of stroke survivors report participation restrictions even 4 years after stroke. Equally, 6 to 12 months after stroke, survivors with ambulatory ability have substantially diminished cardiorespiratory fitness. Nonetheless, [81] indicates that the brain relearns normal movements faster if rehabilitation is commenced early and where rehabilitation is delayed, it is hard for stroke survivors to recover their functional independence. Predicting stroke recovery, when that will be and to what extent is a concern/focus of all researchers, patients, clinicians in rehabilitation. Majority, 70% recover 3 months post stroke [81] in acute phase - 3 weeks post stroke robotic assisted. [82] patients admitted 30 days for rehabilitation had better functional outcomes and shorter stay than those admitted later.

Some studies such as one conducted by [71] recommended commencement of rehabilitation at 6 days to 6 months post stroke. [80] >30% of stroke survivors report persistent participation restrictions 4 years after onset of stroke. Similarly, [30]

suggests that early mobilization can commence within 24hrs depending on the condition of the patient. [73] highlights that physical activity is highly recommended within the first 2 weeks of stroke. This study revealed a relationship between the time when exercises are initiated and outcomes. [83] suggests that early mobilization for 15-45 minutes, done three times in a day commenced after 24hrs helps to improve functional capacity and reduce complications.

4.5 Stroke management approaches in daily practice

The participants in this study mostly used traditional methods or conventional management (55.8%) in their daily practice to rehabilitate stroke patients compared to contemporary management. Traditional rehabilitation method targeted movement disorders and changes in joint mobility which calls for application of specific, mobilization treatment techniques. Physiotherapy practitioners recognized the benefits of strengthening exercises in stroke rehabilitation. Most of them chose strengthening exercises because this modality is the most effective. [84] showed preference for contemporary management which is more suitable than traditional management because its focus is on the knowledge, skills, behaviors and values required in the educational resource which is valuable for clinical reasoning and ruled out the challenges faced during patient handling. [85] disclosed that aerobics and resistance strength training are not only an effective method of improving muscular strength and endurance but also physical function in post stroke patients. This is affirmed through concurrent studies conducted by [86]. Strength training increased muscle strength and muscle power due to neuromuscular adaptation, increased muscle size in CSA (cross-sectional area) and altered connective tissue stiffness [87, 88] which revealed that strength training increased muscle strength, muscle power, walking speed, neuromuscular function, mobility and activities of daily living.

However, some practitioners in this study chose to use other modalities because they were less time consuming compared to strength training. Another reason could be the old belief that strength training increases muscle spasticity [89, 90, 91]. Another line of thought is that resistance training is a form of physical activity that has been traditionally perceived as a component of training programs limited to athletic individuals [92]. Strength training is a type of physical activity designed to improve muscle fitness [93]. Several studies have actually ascertained that strength training helps to reduce spasticity [94, 95, 88, 96].

4.5.1 Treatment modalities

Other than contemporary management, the participants in this study mostly used traditional methods or conventional management (55.8%) in their daily practice to rehabilitate stroke patients. This is aligned to a study conducted in Kano [97] where physiotherapists preferred conventional therapy to contemporary therapy. [98] confirms that contemporary therapy is the oldest technique used in stroke rehabilitation. Physiotherapy practitioners in our study chose proprioceptive neuromuscular facilitation (PNF) with an equal number choosing strengthening exercises as the most preferred modality of treatment (13%). Accessions are that practitioners most frequently (77.6%) use NDT/Bobath followed by PNF [40].

Both a randomized pilot study [99] and a systematic review [100] found that most of the respondents received PNF and neuro-developmental treatment (NDT) Bobath training because they are effective and the most preferred treatment approaches in stroke rehabilitation. Nonetheless, there is no substantial evidence of their efficacy [100, 101]. [97] in Nigeria established that most physiotherapy practitioners used Bobath/NDT, Brunnstron/PNF, convention and task-oriented training. Even though Bobath and Brunnstron training were the preferred treatment approaches in stroke rehabilitation. In Saudi Arabia, practitioners

(77.7%) preferred Bobath for stroke rehabilitation. The implication is that we need to change the current mentality of practitioners relying on individual preference to research-based treatment modalities using evidence-based practice (EBP) in stroke rehabilitation [101]. Seemingly, NDT/Bobath and PNF are the most popular and preferred approaches to the extent that newer and evidence-based treatment approaches are only practiced by fewer practitioners [102].

The article review by [72] specified the two main approaches in neurological physical therapy as traditional classical specific intervention techniques and eclectic approach. [33, 102] observed that physiotherapy practitioners often use the eclectic approach in neuro-rehabilitation more than single based treatment approach. This may suggest the need to re-educate the brain prior to stroke onset and promote patients' self-independence to perform activities of daily living. This line of thought that PNF and constraint-induced movement therapy (CIMT) are commonly used and practiced approaches in stroke rehabilitation aligns well to [72]. However, [103] concluded that patients who are subjected to strength training have improved balance, good posture and coordination with greater mobility and flexibility, which give them a better quality of life. [30] supports the use of early mobilization of limbs, somatosensory functions, balance, muscle strengthening and endurance, gait training, mirror therapy, CIMT, robotics and virtual reality, hydrotherapy, electrotherapy, education and social activation of the patient and family. On the other hand, strengthening exercises facilitate patient movement and promote bone growth and strength, full recovery and maintenance of muscle mass [104].

4.5.2 Frequency, workload and timing of exercises

The physiotherapy practitioners chose 15-20 minutes training while carrying a 5kg weight per day which entails patients'

adherence levels during strengthening exercises. The patients were exposed to different sets of workload ranging from 1 to 3 repetitions and were expected to attend training 5 times per week depending on their tolerance levels, with the minority of the participants who chose 4 to 5 times per week, while the majority chose 3 times per week attendance (55.8%). In this study the type of workload the patient was exposed to gives us insight on the capabilities and progress the patient has made from the time they started treatment, hence proving an effective positive outcome of stroke rehabilitation on the use of strengthening exercises in stroke patients.

Authors testify to the fact that protocols to frequency, intensity, time and type of strength training are not specific in early stroke rehabilitation [71]. The responses of participants in our study are similar to results obtained in a systematic review that showed the intensity of doing exercises ranges from 2-5 times a week between 25-90 minutes [87]. Other authors attest that frequency of training ranges between 2-5 sessions per week and 4-12-week duration [88].

Several studies propose one to three (1-3) series of eight repetitions at 60% - 80% of 1RM, twice or three times a week, although it seems that a workload of only 40% has positive effects [105, 106, 107]. A meta-analysis recommended a duration of 21-40 minutes, frequency 3-5 days a week for 3 weeks to 6 months is deemed beneficial to facilitation of aerobic fitness, walking speed and walking endurance in post stroke [105]. Furthermore, [107] prescribed exercises with more repetitions of between 10-15 against a reduced workload (% of 1RM). [108] subjected participants to resistance exercises (RE) at different intensities at 55%, 70% and 85% 1RM workload. Results revealed that workload values were greater at 55% 1RM and lower at 70-85% 1RM. The strength for workload lies mainly between 50% and 80% although it seems that a workload of only 40% also has positive effects [33, 108, 109]. Furthermore,

[109] confirmed that the intensity of exercises should be 70-80% of 1RM. On the contrary, [110] favours high intensity of exercises (70%) for 3 months than lower intensity.

4.6 Factors that influence the selection of treatment modalities

Out of all modalities of treatment available, most practitioners chose strength training (87.7%, 0.91 ± 0.29). The reason for this choice was because practitioners perceived strength training as the most effective modality. However, some physiotherapy practitioners preferred other modalities because these are less time consuming (35.0%, 0.33 ± 0.47). Another factor identified in this study was the age of stroke patients. Results revealed that patients with stroke in the age range of 26-36 years were likely to have better prognosis after strengthening exercises compared to those older. The majority of participants rated patient outcomes after strengthening exercises as satisfactory (73.8%). Literature categorically state that selection of modalities or techniques is mostly based on personal preference, experience, patients' presentation than on evidence-based basis [40, 72, 97]. In resonance to barriers from our study, [33] identified lack of time, excess workload, reduced staff and poor cognitive abilities of the patients. In another study by [101], the common barriers among clinicians which influenced the choice of stroke rehabilitation were time and availability of resources. The results from the study by [111] revealed that the most common barrier to implementation of stroke rehabilitation was lack of time followed by challenges with staffing. Other challenges were lack of training or education, therapy selection, prioritization, availability of equipment, team functioning and communication.

5. CONCLUSION

The research evidence demonstrates that physiotherapy practitioners had adequate knowledge of physical activity and the effects of strength training on stroke

patients. Those who chose strength training found this modality very effective and convenient. On the other hand, practitioners chose to use alternative modalities because they were easier to use, economical on time, more effective and cheaper. This simply shows that firstly, the choice of modalities was not at evidence-based level. Secondly, the knowledge of some physiotherapy practitioners did not translate into better uptake or integration of strength training into stroke rehabilitation.

Declaration by Authors

Ethical Approval: Approved

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