



Barriers to treatment adherence among stroke survivors attending outpatient physiotherapy clinics in North-western Nigeria

Omoyemi O Ogwumike^{1,2}, Umaru M Badaru³, Ade F Adeniyi^{1,2}

Abstract

Objective: Adherence is the extent to which an individual closely follows a prescribed component of an intervention for a desirable outcome. This study investigated barriers to attendance at appointments and clinic-based exercises during physiotherapy management of stroke survivors.

Methods: A non-probability sampling method was used to purposively recruit consenting stroke survivors who met the inclusion criteria for the study from three specialist hospitals in Kano Metropolis, North-western Nigeria. Rating scales for appointment and barriers to keep appointment, self-reports, of barriers to clinic-based exercises were used to rate adherence. Data were analyzed using descriptive and inferential statistics.

Results: Participants were aged 55.3 ± 10.0 years. 44 (84.6%) were adherent to appointment keeping, while 33 (63.5%) were adherent to clinic-based exercises. The barriers to appointment keeping most reported were lack of accompanying person to hospital (29.3%) and financial constraints (27.6%). Fatigue and pain were the most reported barriers to clinic-based exercise adherence.

Conclusion: Family support and enhanced coverage of the National Health Insurance Scheme (a financial aid for healthcare in Nigeria) may improve appointment adherence for stroke survivors.

About the AUTHORS

¹Department of Physiotherapy, College of Medicine, University of Ibadan, Nigeria

²Department of Physiotherapy, University College Hospital, Ibadan, Nigeria

³Department of Physiotherapy, Faculty of Medicine, Bayero University, Kano, Nigeria

Contact:

Omoyemi O. Ogwumike
yemfide@yahoo.com

Introduction

Adherence can be defined as an active voluntary collaborative involvement of a patient and a healthcare provider in a mutually acceptable manner to produce a desired preventive and therapeutic result (1). In physiotherapy, it is regarded as the extent to which a subject closely follows the prescribed component of a physiotherapy intervention (2). Patient adherence to prescribed rehabilitation protocols is considered to have a profound effect on achieving successful outcomes in physiotherapy (3-5). In other words, a significant relationship exists between high levels of exercise adherence and better treatment outcomes of pain levels, self-reported physical function and physical performance (6). A notable observation on adherence is that in most chronic conditions or disabilities, adherence is usually low (7).

The focus of adherence in this study surrounds individuals with the chronic condition stroke. Stroke is defined as a sudden loss of neurological function caused

by an interruption of blood flow to the brain (8). The age-standardized stroke mortality in sub-Saharan Africa is high and it range from 107 to 189 per 100,000 population in women and from 95 to 168 per 100,000 population in men in all countries except the Seychelles, where the stroke mortality rate is much lower (27 and 22 per 100,000 population in men and women, respectively) (9). To date, there are no reliable data in Nigeria. However, the result of a study conducted in Lagos, a metropolitan city in Nigeria, gave an overall crude prevalence rate of 1.14 per 1,000 (10). The increasing incidence of stroke in individuals from age 40 years (11), those who are still in the productive age group, indicates great necessity for rehabilitation. Therefore, the goal of rehabilitation is to discharge patients who have suffered a stroke as functional community-dwelling adults (12). The extent to which this goal can be achieved depends on the effectiveness of the treatment and the level of the patients' adherence with treatment procedures.



Research and Best Practice

According to Kolt et al. (13), the concept of adherence is multidimensional. It could relate to attendance at appointments, attitude to clinic-based exercises, following advice on home programs of exercises, or correct performance of prescribed exercises in terms of frequency and duration (4;14). In essence, many factors are liable to influence patient adherence to physiotherapy treatment, either positively or negatively. Thus, those factors which negatively influence patient adherence are referred to as barriers to treatment. Several previous studies on adherence to physiotherapy management have been on patients with musculoskeletal conditions (3;5;15-18). In general, very few recent studies have considered adherence in stroke survivors (14;19). This is also true in the case of Nigeria (20). The present study was designed to investigate barriers to adherence of stroke survivors to physiotherapy treatment in North-western Nigeria.

Participants and Methods

This was a cross-sectional study of stroke survivors attending outpatient physiotherapy clinics of Aminu Kano Teaching Hospital, Murtala Mohammed Specialist Hospital and Muhammad Abdullahi Wase Specialist Hospital in Kano. All three hospitals are referral centers for management of varied health conditions and are located in urban centers in Kano state, North-western Nigeria. The study was conducted from October 2011 to May 2012.

Purposive sampling technique was used to recruit participants, i.e. stroke survivors who met inclusion criteria for the study. Inclusion criteria were: ability of the patients to walk at least 10 meters on a level surface, either independently or with an assisted device, and lack of aphasia and memory loss. A short mental status questionnaire by Pfeifer, (21) was used to screen participants for memory, such that only patients who had 0-2 errors (i.e no cognitive impairment) were allowed to participate in the study. In addition, participants should be able to speak and understand either Hausa or English. Prior to the commencement of data collection, ethical approval was obtained from the University of Ibadan, the University College Hospital Ibadan research ethics committee, and all the institutional ethic committees of the hospitals from where participants were recruited. Informed consent was also obtained from all participants after explanation of the study procedure to them. Thus, only participants who fulfilled the inclusion criteria and signed the informed consent form participated in the study. For the purpose of this study, adherence to physiotherapy treatment was delimited to attendance at appointments and adherence to clinic-based therapeutic exercises. For each participant, data for adherence were taken for eight weeks and they were individually on prescribed and supervised clinic-based exercises of one session per week.

This was, however, augmented by a well-designed regular home-based exercise program (20).

Functional abilities of stroke survivors in the study

In this study, fourteen of the participants could walk only few steps independently but most of them walked up to 20 meters with the help of a relative. This group formed the light intensity exercise group. 23 participants were able to walk independently up to 40 meters but with slow gait speed and by using a walking aid such as a cane. This group made up the moderate intensity group 1. The last fifteen participants were able to walk more than 40 meters independently and made the moderate intensity group 2. All the clinic-based exercises were individualized by taking into cognisance patients' functional abilities and none of them were compelled to complete all the exercises if they were not able to.

The clinic-based exercises were:

1. General mat exercises
2. Task-oriented treadmill training
3. Strength training
4. Balance exercises
5. Walking exercises

General mat exercises

This involved activities such as range of motion and stretching exercises, assisted/resisted active upper limb exercises and weight bearing exercises on the affected upper limb. The exercises were conducted in both supine and sitting postures on the mat.

Task-oriented treadmill training

a) The light intensity group

The training intensity for the light intensity group, whose exercise capacity was up to 2.5 METs (22), was set at 45-55% of their respective heart rate reserves (using Karvonen Formula). The maximum speed of treadmill walking for this group at baseline was predetermined using the equation: $\text{Speed} = (\text{Vo}_2 - 3.5) / 0.1$ (gradient=0; $\text{Vo}_2 = \text{MET} \times 3.5$) that corresponds to a speed of 1.96mph, which was adjusted based on the heart rate response in order not to exceed the target heart rate. The frequency was once weekly. This frequency was augmented by a regular home based exercise program (20). The duration involved 30 minutes of exercise from series of 5 minutes exercise bouts with 2 minutes of rest in between bouts. The progression of treadmill exercises for the participants differed. It was progressed weekly by increasing the treadmill gradient at the same speed for some of the participants or by increasing the target heart rate, e.g. from 45-55% to 50-60%, then to 55-65% of the heart rate reserve and/or by increasing the exercise time dur-



Research and Best Practice

ing each bout say from 5 to 7 minutes of exercise before resting.

b) The moderate intensity groups 1 and 2

For both groups with an exercise capacity of 3-3.5 METs, target heart rate was 55-65% of heart rate reserve. The baseline walking speed for this group (at gradient of zero) corresponded to 2.6-3.3mph. The speed was adjusted during training so as not to exceed target heart rate. Exercise duration involved accumulation of 30 minutes of exercise from series of seven minutes exercise bouts with two minutes rest between bouts. Frequency was once a week. This was augmented by a regular home based exercise program (20). The progression varied in the same way as in the light intensity group.

Strength training

a) The sit to stand exercise

Each participant was asked to sit in a chair and stand from a sitting position as many times as possible in one minute. The maximum number of exercise repetitions performed in one minute was recorded to give pre-test maximum (PRM). The progression involved participants performing three repetitions of 60% of their individual PRM in the first two weeks, then to three repetitions of 70% of PRM the following two weeks and so on.

b) Pre-test for stepping exercise

Participants were asked to step onto and off a step as many times as possible in one minute. The maximum number of exercise repetitions performed in one minute was recorded to give PRM. This exercise was progressed the same way as the 'sit to stand' exercise.

Balance exercises

This involved the following:

- Walking exercise with visual cue manipulation, such as walking forward and taking a few steps backward on a straight walking line: Three repetitions.
- Picking up an object from the floor from a standing position: Three repetitions.
- Standing on one leg (the affected leg): Three repetitions.
- Performing cycling movement gently (around a gymnasium ball), into clock-wise and anti-clock-wise directions: Three repetitions.

Progression involved an increasing number of repetitions of the balance exercises according to the patient's ability.

Walking exercises

In this exercise, a patient was required to walk for two minutes at his/her own walking pace. The walking exercise was progressed by increasing the walking time.

Instruments

Appointment keeping rating scale

This rated attendance of participants with the aid of an attendance table used to record patients' attendance at physiotherapy out-patient clinics. The level of attendance was then calculated by dividing the total sum of appointment sessions attended by sum total of prescribed treatment sessions for each patient at the end of the study. The percentage score was then estimated. Adherence to appointments were determined as follows: Participants who had a minimum attendance score of six out of eight ($\geq 75\%$) appointments were classified as being adherent, while those with an attendance score of less than six out of eight appointments ($<75\%$) were classified as being non-adherent.

Barriers to appointment keeping rating scale

This was used to assess barriers to attendance at physiotherapy appointments. It is a 7-item scale adapted from previous studies on adherence to treatment of individuals with varied conditions (18;23-25). The items include factors perceived by individual stroke survivors as contributory to non-adherence of their physiotherapy appointments. These factors are: forgetfulness, no accompanying person to help the patient get to the hospital, financial constraints for transport and treatment, workplace constraints, previous treatment dissatisfaction, lengthy waiting times, and inconvenient treatment time. Each item was rated on a scale from 0 to 1, whereby 0 indicated "no" and 1 indicated "yes". The possible maximum score on the scale was therefore 7. During the study period, participants were asked to complete the questionnaire when they missed an appointment. Barriers to appointment were determined by estimating the mean scores on each item at the end of 8 weeks for each participant and then weighted in order of magnitude for all participants.

Modified Hopkins Rehabilitation Engagement Rating Scale (mHRERS)

This scale rated the level of adherence of stroke survivors during clinic-based rehabilitation. This was done by the physiotherapist at the end of each treatment session. The modified instrument selected 2 items from the original Hopkins Rehabilitation Engagement Questionnaire by Kortte et al. (26), and scoring was done on a 6-point rating scale ranging from 1 (Never) to 6 (Always) with a minimum score of 2 and a maximum score of 12. The level of adherence of a participant was calculated as the ratio of a participant's score to the highest score (i.e. 12) on the (mHRERS). Participants with a score of nine or more out of twelve ($\geq 75\%$) were rated as being adherent, while those with less ($<75\%$) were regarded



Research and Best Practice

as non-adherent. A mean score was then calculated for each participant at the end of the study to determine his or her level of adherence. Total mean scores were then calculated both for adherent and non-adherent participants. The internal consistency of the original instrument is ($\alpha=0.91$) and inter-rater reliability (ICC, $r=0.73$) [25]. The mHRERS was validated on 25 stroke survivors and a Cronbach's alpha of 0.74 was obtained.

Patient Self-report of Barriers to Clinic-based Exercise

This is an 8-item self-report in which individual participants were asked to rate the difficulty encountered in a day while trying to undergo prescribed exercises. The items on this scale were derived from the work of Miller (12), Campbell et al., (15), Sluijs, (27). These items include: poor knowledge of the exercise, increased pain during exercise, exercise is not enjoyable, exercise is not helpful, patient gets tired very easily, number of exercises were too much, patient cannot do exercise for long, and patient is afraid of falling during exercise. Participants were asked to rate on a Likert scale (4: strongly agree; 3: agree; 2: disagree; 1: strongly disagree). Least possible score was 8, while maximum possible score was 32. A reliability test of the self-developed instrument on 25 stroke survivors yielded a Cronbach-alpha of 0.93. The scores obtained on each item were summed up and divided by the total number of the study participants (N=52) each week. This gave the weekly mean score of an item. At the end of the study for each participant (i.e. after eight weeks), the grand mean scores of each item in the scale were computed by adding all the weekly mean scores and dividing the total by eight. Items with greater grand mean scores in order of magnitude were those that posed greater barriers to clinic-based exercise adherence by the participants.

Data were analyzed with the aid of descriptives: mean, frequencies, standard deviation and percentages. Inferential statistics using Chi-square, Pearson's Correlation coefficient and unpaired t-tests were also done. Chi-square analysis was used to find the association between the dichotomized adherence scores (adherent and non-adherent) and each of the participants' socio-demographic variables (nominal and ordinal variables). Pearson's correlation was used to find the relationship between mean scores of clinic adherence and mean score of each barrier item (ratio variables).

Results

66 stroke survivors who gave their informed consent and met the inclusion criteria for this study were recruited through purposive sampling. 14 of them voluntarily withdrew their participation at varied stages of the study. The remaining 52 stroke survivors 27 males

(51.9%) and 25 females (48.1%) completed the the eight-week study. Mean age of participants was (55.3±10.0), age range was 35-75 years. Ten (19.2%) had tertiary education and were employed by the government, while others were self-employed or non-employed at the time of the study. The range of time since the stroke of these participants ranged from 10-20 weeks (Table 1).

Table 1 Characteristics of participants in the study

Variables	n	%
Age (mean ±SD) years		
Males (53.3 ± 9.9)	27	51.9
Females (57.6 ± 9.8)	25	48.1
Occupation		
Government employed	10	19.2
Self-employed	21	40.4
Not employed	21	40.4
Educational Level		
None	11	21.2
Primary/Secondary	31	59.6
Tertiary	10	19.2
Time since stroke (weeks)		
10	15	28.9
12	18	34.6
16	13	25.0
20	6	11.5
Side of Hemispheric affection		
Right	28	53.8
Left	24	46.2

Appointment keeping of stroke survivors

In this study, 19 (36.5%) of the participants had 100% attendance, 16 (30.8%) missed one appointment, 9 (17.3%) missed two appointments, while 8 (15.4%) missed 3 out of a total of 8 appointments. Thus, on the whole concerning appointment keeping, forty-four (84.6%) of the participants with a mean attendance score of (86.1±13.5) were adherent, while 8 (15.4%) with a mean score of (67.43±17.9) were not adherent.

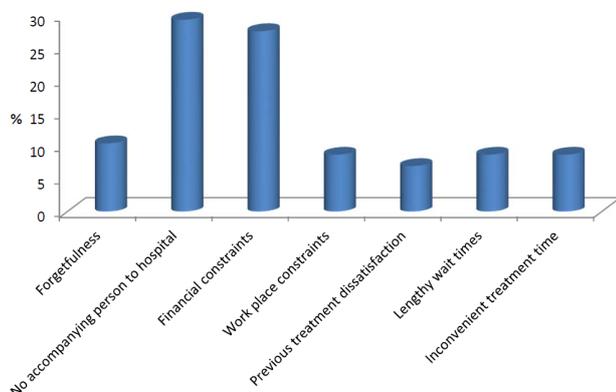
Reported barriers to appointment keeping

Barriers influencing adherence of stroke survivors to appointment keeping included: 17 (29.3%) lacked an accompanying person when going to the hospital, 16 (27.6%) had financial constraints, and for 6 (10.3%), forgetfulness was the most frequently reported barrier. (Figure 1)



Research and Best Practice

Figure 1 Reported barriers to appointment keeping for stroke survivors



Adherence during clinic-based rehabilitation

For clinic-based exercise adherence, 33 (63.5%) of participants with mean score of (77.5±12.4) were adherent while 19 (36.5%) with mean score of (48.3±8.5) were non-adherent. Factors reported by participants as barriers to clinic based exercise adherence had fatigue as the most frequently reported, closely followed by pain during exercise. Pearson's correlation analysis showed that a significant negative correlation ($P < 0.05$) existed between mean scores of barriers to clinic-based adherence and the following items on patient self-reported barriers to clinic based exercise: I cannot do much exercise because of my pain, I become tired very easily, I just do not enjoy doing exercise, exercise is too much, exercise duration is too lengthy. On the other hand, there was no significant correlation between mean scores of clinic-based adherence and the items: 'poor knowledge of exercise', 'fear of falling' and 'exercise will help me' (Table 2).

Table 2 Correlation between the scores of clinic based adherence and each item on patient self-report of barriers to clinic based exercise (N=52)

Barriers to Exercise	r-value	P-value
Poor knowledge of exercise	-0.4	0.21
I cannot do much exercise because of my pain	-0.78	0.02*
I am afraid of falling while exercising	-0.49	0.32
I become tired very easily	-0.71	0.05
I just do not enjoy doing any exercise	-0.56	0.04*
Exercise will not help me	-0.37	0.37
Exercise is too much	-0.85	0.01*
Lengthy exercise duration	-0.76	0.03*

* Statistically significant ($P < 0.05$)

Socio-demographic characteristics of participants and adherence to appointments and clinic-based exercise

A comparison of socio-demographic characteristics of participants such as gender, educational level and occupation using Chi-square analysis was found not to be significantly associated with appointment adherence

($P > 0.05$) (Table 3). In addition, Spearman's correlation analysis revealed that the time passed since the incidence of stroke ($r = 1.8$, $p = 0.2$) and the age ($r = 0.82$, $p = 0.56$) of participants were not significantly associated with adherence to appointment. Furthermore, socio-demographic characteristics of participants, such as gender and educational level, were not significantly associated with clinic-based exercise adherence. Also, the side of hemispheric affectation (either right of left) was not significantly associated ($p = 0.14$) with clinic-based exercise adherence.

Discussion

This study investigated factors which acted as barriers to treatment adherence among stroke survivors attending out-patient physiotherapy management in North-west Nigeria. The principal factors considered under adherence were appointment keeping and attitude toward clinic-based exercise. The observation in the study was that, judging by their mean attendance rate, stroke survivors were more adherent to appointment keeping than to clinic-based exercise, while about one-third of the participants were not adherent to clinic-based exercise.

Reported barriers to appointment keeping by stroke survivors

In this study, the most reported barriers to appointment keeping by stroke survivors, in order of magnitude were non-availability of accompanying persons to hospital, financial constraints and forgetfulness.

As stroke has been described as a leading cause of adult disability (28), the importance of family support on stroke survivors cannot be over-emphasized. This is because stroke survivors have difficulties performing day-to-day activities like dressing, eating and moving around and this reduced functional ability may last a considerable period of time (29). Family members, therefore, are under the obligation to provide essential support for these individuals with varied levels of cognitive and physical difficulty (30). In view of the hectic day-to-day life activities of individuals in the family in the modern day world, it may not be out of place that stroke survivors may sometimes find it difficult to adhere to treatment due to lack of accompaniment to the hospitals. Thus, families with a stroke survivor have to undergo a lot of stress in order to provide optimal support to the individual with stroke so as to meet this challenge. In essence, participants in this study who had good adherence to appointment keeping were able to do so because the family members made a lot of effort in accompanying them to the hospital for treatment.



Research and Best Practice

Table 3 Association of participants' characteristics with adherence to appointments and clinic-based exercise

Variables	Appointment Keeping			Clinic Based Exercises		
	Adherent n	Non-adherent n	P-value	Adherent n	Non-adherent n	P-value
Gender						
Male	21	6	0.25	18	9	0.84
Female	23	2		15	10	
Educational Level						
None	10	1	0.84	5	6	0.36
Primary/Secondary	25	6		21	10	
Tertiary	9	1		9	1	
Occupation						
Government employed	8	2	0.68	6	4	0.61
Self-employed	17	4		12	9	
Non-employed	19	2		15	6	
Side of Hemispheric Affection						
Right	24	4	0.56	16	12	0.14
Left	20	4		17	7	

Note: Only Fisher's exact test values are presented in the table because some of the cells in the association table have $n < 5$. Chi square values are used only when all cells have $n \geq 5$. n = number of participants; P = probability value.

The report of financial constraints as barriers to physiotherapy appointment adherence could be explained by the availability and accessibility of financial and social support for the stroke survivors. In this study, only few participants were employed under the Nigerian government civil service. The National Health Insurance Scheme (NHIS) is a provision of financial support for healthcare for individuals employed in civil service of the federal government of Nigeria. However, not all aspects of healthcare were covered by this scheme and not all individuals may access the healthcare support fund. Thus participants in self-employment and the unemployed were not capable of accessing this fund. Therefore, such individuals have been unable to meet up with the financial requirement that is necessary to adhere to physiotherapy treatment throughout the continuum of care required for their rehabilitation. However, self-employed stroke survivors who had lucrative private businesses or family members who were relatively financially buoyant may be able to pay for physiotherapy care for a longer duration as required. However, effort is being made presently to improve coverage of financial support of healthcare through NHIS for Nigerians. The result of this study on financial constraints as a barrier to treatment adherence is similar to those of previous researchers such as Forkan (31), Garcia Popa-Lisseanu et al. (18), and Marwaha et al. (23).

Although participants in this study were screened for memory problems, reports of forgetfulness as a barrier to adherence to appointment keeping were high.

This was probably more notable where family members were not always available to assist the patient to the hospital. Consequently, strategies geared toward reminding patients and relatives of the appointment dates, as telephone calls and text messages may improve adherence to appointments. Asvat also reported forgetfulness as a barrier to appointment adherence in physiotherapy outpatients (24).

Barriers to clinic-based exercise adherence

Stroke survivors in this study reported fatigue and pain most frequently as barriers to clinic-based exercise adherence. Fatigue is a common problem associated with stroke survivors and has been described as an important clinical determinant of a progressively disabling pattern of reduced physical activity after stroke (32;33). According to West and Bernhardt (34), the mere fact that most stroke survivors would usually have been inactive during their in-patient hospital stay, as part of the acute phase of rehabilitation immediately post-stroke, may also contribute to fatigue. Post-stroke fatigue may, therefore, interfere with the rehabilitation process with consequent negative impact on patient recovery. In essence, stroke survivors may therefore require exercise prescription, which is individually structured, closely monitored and carefully graduated in order to encourage adherence during clinic-based exercises. Previous studies reported a relationship of post-stroke fatigue with depressive symptoms in stroke survivors (35;36). However, participants were not assessed for depression in this study. Pain is also a common feature in stroke survivors, commonly re-



Research and Best Practice

ferred to as central post-stroke pain syndrome. It occurs when the stroke causes damage to parts of the brain that process sensory stimuli, so these areas of the brain fail to respond properly and, in effect, register all stimuli as pain (32). The resulting malfunctioning of sensory stimuli may thus lead to chronic and disabling pain, which prevents active involvement in clinic-based exercise adherence.

Socio-demographic characteristics of participants and treatment adherence

No significant differences were observed in adherence of male and female stroke survivors to appointment keeping. This result is similar to that of Asvat (24). In addition, no differences were found in adherence of male and female stroke survivors to clinic-based exercise adherence. This finding is similar to that of Kolt and Mc Evoy (16). Neither educational level nor occupation of participant stroke survivors reflected any influence on clinic-based exercise adherence. This may be due to the fact that many of the afore-mentioned factors played a more prominent role as barriers to treatment adherence compared to socio-demographic characteristics of this group of stroke survivors. It may also be due to the fact that the sample size of the population in this study is limited. This may therefore mean that the result pertaining to effect of socio-demographic characteristics on barriers to physiotherapy treatment adherence in stroke survivors in this study may not be broadly generalized.

Conclusion

Support of stroke survivors by family members in hospital attendance is highly essential. Wider coverage of the National Health Insurance Scheme in Nigeria to include individuals with chronic conditions as well as for individuals that are not employed by the federal government is advocated. This will improve available financial means for healthcare of the stroke survivors and hence may improve appointment adherence.

Competing Interests

None declared.

References

- (1) Meichenbaum D, Turk DC. Facilitating Treatment Adherence: A Practitioner's Guidebook. 2010; New York: Plenum Press.
- (2) Bassett SF, Prapavessis, H. Home-based physical therapy intervention with adherence enhancing strategies versus clinic based management for patients with ankle sprains. *Phys Ther* 2007; 87:1132-43.
- (3) Brewer BW, Van Raalte, JL, Cornelius AE, et al. Psychological factors, rehabilitation adherence and rehabilitation outcome after anterior cruciate ligament reconstruction. *Rehabilitation Psychology* 2000; 45, 20-37.
- (4) Jack K, McLean SM, Moffett JK, et al. Barriers to treatment adherence in Physiotherapy outpatient clinics: A systematic review. *Man Ther* 2010; 15:220-8.
- (5) Al-Eisa E. Indicators of adherence to physiotherapy attendance among Saudi female patients with mechanical low back pain: A clinical audit. *BMC Musculoskeletal Disorders* 2010; 11:124.
- (6) Pisters MF, Veenhof C, Schellevis et al. Exercise adherence improves long-term patient outcome in patients with osteoarthritis of the hip and/or knee. *Arthritis Care Res* 2010; 62:1087-94.
- (7) Rone-Adams SA, Stern, DF, Walker, V. Stress and compliance with a home exercise program among caregivers of children with disabilities. *Pediatr Phys Ther* 2004; 16:140-8.
- (8) O'Sullivan SB, Schmitz TJ. *Physical Rehabilitation* (5th edition). Jaypee Brothers, New Delhi. 2007; 705-761.
- (9) Mensah GA. Epidemiology of stroke and high blood pressure in Africa. *Heart* 2008; 94:697-705.
- (10) Danesi M, Okubadejo N, Ojini F. Prevalence of stroke in an urban, mixed income community in Lagos, Nigeria. *Neuroepidemiology* 2007; 28:216-223.
- (11) Obiako OR, Oparah SK, Ogunniyi, A. Prognosis and outcome of acute stroke in the University College Hospital Ibadan, Nigeria. *Niger J Clin Pract* 2011; 14:3.
- (12) Miller KK. Adherence with physical therapy home exercise programme 1-6 months after discharge from physical therapy by individuals post-stroke [dissertation]. Indianapolis, School of Health & Rehabilitation Sciences Indiana University, 2009.
- (13) Kolt GS, Brewer BW, Pizzari T, et al. The sport injury rehabilitation adherence scale: a reliable scale for use in clinical physiotherapy. *Physiotherapy* 2007; 93:17-22.
- (14) Miller NH, Hill M, Kottke T. et al. The multilevel compliance challenge: recommendations for a call to action. A statement for healthcare professionals. *Circulation* 1997; 95:1085-90.
- (15) Campbell R, Evans M, Tucker M, et al. Why don't patients do their exercises? Understanding non-compliance with physiotherapy in patients with osteoarthritis of the knee. *J Epidemiol Community Health* 2001; 55:132-8.
- (16) Kolt GS, McEvoy JF. Adherence to rehabilitation in patients with low back pain. *Manual Therapy* 2003; 8:110-116.
- (17) Lyngcoln A, Taylor N, Pizzari T, et al. The relationship between adherence to hand therapy and short-term outcome after distal radius fracture. *J Hand Ther* 2005; 18: 2-8.
- (18) Garcia Popa-Lisseanu MG, Greisinger, A, Richardson, M, et al, Determinants of treatment adherence in ethnically diverse, economically disadvantaged patients with rheumatic disease. *J Rheumatol* 2005; 32:913-9.
- (19) Duncan, PW, Horner, RD, Reker, DM, et al. Adherence to postacute rehabilitation guidelines is associated with functional recovery in stroke. *Stroke* 2002; 33:167-77.
- (20) Ogwumike OO, Badru UM, Adeniyi AF. Factors influencing adherence to home-based exercise by Stroke survivors in North-West Nigeria. *IJTRR* 2014; 3:1. doi 10.5455/ijtrr.00000023
- (21) Pfeiffer E. A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *J Am Geriatr Soc* 1975; 23, 433-41.
- (22) Haskell WL, Lee IM, Pate RR, et al. Physical activity and public health updated recommendation for adult from American College of Sports Medicine American heart association. *Circulation* 2007; 116:1081-93
- (23) Marwaha K, Horabin H, McLean SM. Indian physiotherapists' perceptions of factors that influence the adherence of Indian patients to physiotherapy treatment recommendations. *Int J Physiother Rehab* 2010; 1:9-18.
- (24) Asvat H. Adherence to attending appointments at Chris Hani Baragwanath hospital outpatient physiotherapy department. An unpublished dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, in fulfilment of the requirements for the degree of Masters in Physiotherapy. 2011
- (25) Paterson BL, Charlton P, Richard S. Nonattendance in chronic disease clinics: a matter of non-compliance? *J Nurs Health Chronic Illn* 2010; 2:63.
- (26) Korrtte KB, Falk LD, Castillo RC, et al. The Hopkins Rehabilitation Engagement Rating Scale: development and psychometric properties. *Arch Phys Med Rehab* 2007; 88:877-84.
- (27) Sluijs EM, Kok GJ, van der Zee J. Correlates of exercise compliance in physical therapy. *Phys Ther* 1993; 73:771-82.
- (28) Raina P, Dukeshire S, Lindsay J, et al. Chronic conditions and disabilities among seniors: an analysis of population-based health and activity limitation surveys. *Ann Epidemiol* 1998; 8:402-9.
- (29) Mayo NE, Wood-Dauphinee S, Cote R, et al. Activity, participation, and quality of life 6 months poststroke. *Arch Phys Med Rehab* 2002; 83:1035-42.
- (30) Cameron JI, Cheung AM, Streiner DC, et al. Factor structure and reliability of the Brain Impairment Behaviour Scale. *J Neurosci Nurs* 2008; 39:172-9.
- (31) Forkan R, Pumper B, Smyth N, et al. Exercise adherence following physical therapy intervention in older adults with impaired balance. *Phys Ther* 2006; 86:401-10.
- (32) Michael KM, Allen JK, Macko RF. Fatigue after stroke: Relationship to mobility, fitness, ambulatory activity, social support and falls efficacy. *Rehabil Nurs* 2006; 31:210-17.
- (33) Mead G, Bernhardt J, Kwakkel G. Stroke: Physical fitness, exercise, and fatigue. *Stroke Res Treat* 2012;2012:632531
- (34) West T, Bernhardt J. Physical activity pattern of acute stroke patients managed in a rehabilitation focused stroke unit. *Biomed Res* 2013;2013:438679
- (35) Van de Werf SP, Van de Broek HL, Anten HW. Experience of severe fatigue long after stroke and its relation to depressive symptoms and disease characteristics. *Eur Neurol* 2001; 45:28-33.
- (36) Glader E, Stegmayr B, Asplund K. Poststroke fatigue: a 2-year follow-up study of stroke patients in Sweden. *Stroke* 2002; 33:1327-33.