

# Participation Restriction due to Arm and Leg Motor Impairment after Stroke Rehabilitation in the Tamale Metropolitan Area, Ghana

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## ABSTRACT

**Purpose:** *The study was conducted to examine the relationship between arm and leg motor impairment in stroke survivors and participation restriction, post rehabilitation, within the Tamale metropolis.*

**Method:** *The participants were 102 stroke survivors from the Tamale metropolitan area, who had undergone at least 3 months of rehabilitation. Upper limb motor assessment was followed by lower limb motor assessment based on the Manual Muscle Test. Levels of participation restriction were measured using the London Handicap Scale. Correlation analysis of motor impairment and participation restriction were done using Spearman rank correlation analysis.*

**Results:** *The mean age of post-stroke participants was 62.08 years (95% CI= 59.77-64.39), with men comprising 67.65% and 32.35% women. The Spearman rank correlation co-efficient between arm motor impairment and participation was 0.8343, depicting a strong positive relationship between the aforementioned variables. The correlation between leg motor impairment and participation yielded 0.8013. Conversely, leg motor impairment was found to have a stronger relationship with participation restriction in comparison to arm motor impairment.*

**Conclusion and Implications:** *The strong relationship between limb motor impairment and participation restriction suggests that clinicians and disability experts involved in rehabilitation should take cognisance of the social implication of motor impairment in order to make informed decisions. Further to this, arm and leg assistive devices could be useful in reducing the levels of participation restriction among persons with stroke within the Tamale metropolis.*

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**Limitations:** *A major limitation is that motor impairment was assessed solely on the ability to perform voluntary movement (muscle power). Sensory disturbances and motor coordination difficulties do have the potential to influence participation restriction. Additionally, the exclusion of stroke survivors who are unable to communicate implies that external validity of the research is limited.*

**Key words:** *Disability, upper limb, lower limb, Manual Muscle Scale, London Handicap Scale*

## INTRODUCTION

Stroke, also known as cerebrovascular accident, is universally documented as a major cause of disability among stroke survivors and is one of the most frequent causes of difficulties in activities of daily living (ADLs) among older adults (Higgins et al, 2005). Majority of persons with stroke will have significant arm and leg motor impairments and related disabilities that are likely to affect functional independence and contribute to participation restriction (Desrosiers et al., 2003). For post-stroke survivors with a paretic arm, Kwakkel et al. (2003) reported that a paltry 11.6% achieved complete arm recovery within 6 months. In many survivors with more severe forms of stroke, the affected upper limb hardly ever becomes useful, even after therapy (Dimyan & Cohen, 2011). The specific nature of the disabilities post-stroke is quite diverse and varies with the specific areas of the central nervous system (CNS) that have sustained the damage (Staines et al., 2009). Beyond physical disabilities, cognitive impairment is equally pervasive with rates of 24% to 39% among ischaemic stroke survivors (Douiri et al., 2013). This cognitive impairment could range from the mild to the more severe or dementia type (Zou et al., 2004) and often sets in 3 months post-stroke (Nys et al., 2005).

Besides promoting physical recovery, a major task in post-stroke rehabilitation is to minimise psychosocial morbidity and to enhance stroke survivors' reintegration into their families and communities. The WHO (2008) framework of Functioning, Disability and Health (ICF) reaffirms the importance of persons with disabilities participating in society. This often embodies social integration, potential to return to work and subsequent work performance (Chau et al., 2009).

Incidence of stroke is higher among men (30-80%) than women, and Blacks have a 50-130% higher incidence than Whites. The incidence increases with age, rising nine-fold between 55 and 85 years of age, with over 60% of stroke survivors being

over the age of 65 years (Roth, 2002). A retrospective study of in-patients with stroke at the Komfo Anokye Teaching Hospital in Kumasi, Ghana, over a two-year period, yielded a mean age of 63.7 years (Agyemang et al., 2012) with a mortality rate of over 40%.

Strokes can be classified into two major categories: ischaemic and haemorrhagic (National Institute of Neurological Disorders and Stroke, 2015). Ischaemic strokes are caused by the disruption of the blood supply to the brain, while haemorrhagic strokes result from the rupture of a blood vessel or an abnormal vascular structure. About 87% of strokes are ischaemic, the rest being haemorrhagic (Donnan et al., 2008). However some studies do report a slightly higher rate of ischaemic stroke. In a study involving 39484 post-stroke survivors, Andersen et al. (2009) reported a nearly 90% ischaemic stroke incidence as compared to haemorrhagic stroke.

The absence of a curative therapy makes rehabilitation the most viable modality targeted at improving quality of life after stroke (Gresham et al., 1995). Although primary prevention of stroke is central to the fight against stroke and stroke-related disabilities, there is convincing evidence that enhanced, methodical stroke management including rehabilitation can reduce mortality and morbidity (Langhorne & Duncan, 2001). Stroke rehabilitation consists of an expansive set of biomedical, psychological, social, vocational, and educational interventions that can be implemented in a variety of institutional and community-based settings. Rehabilitation services are usually provided by a multidisciplinary team, whose composition depends on the stroke survivor's physical, psychological (cognitive) and emotional needs. The key aim in stroke rehabilitation is to assist each survivor to achieve the highest possible degree of individual physical independence, as well as enhance the psychological well-being. Physical independence and psychological well-being are not just useful at the personal level but are designed to enhance the reintegration of persons with stroke into mainstream society (Roth, 1998).

Participation restriction connotes the personal and societal implications of health conditions. Specifically, it refers to the difficulties an individual may have in involvement in life situations (WHO, 2001). Participation in society such as being responsible for others and work (Hawker & Gignac, 2006) may be of more concern to persons with disabilities than the underlying impairments and activity limitation (Harwood et al, 1994).

The London Handicap Scale (LHS) is a measure of perceived disadvantage encountered as a result of chronic illness (Harwood et al., 1994). The LHS

is constructed via the descriptive framework of handicap instituted by the World Health Organisation in the International Classification of Impairments, Disabilities and Handicaps or ICIDH (WHO, 1980). The ICIDH defines handicap in six dimensions: mobility, orientation, occupation, physical independence, social integration and economic self-sufficiency. Although the concept of handicap has been superseded by the model of participation in the latest framework of the WHO (1997), the specific dimensions of the LHS are still appropriate and are equally represented in the newer classification. Based on the LHS, Harwood et al. (1994) found mobility to be highly restricted among post-stroke participants. Similarly, D'Alisa et al. (2005) reported that majority of stroke survivors had difficulty with physical independence. Sturm et al. (2002) reported widespread work-related disadvantages in persons with stroke but discovered that majority of participants had no difficulty with orientation. Conversely, Lo et al. (2008) reported significant challenges with orientation among persons with stroke.

Very few studies have attempted to draw a link between impairments and levels of participation of affected individuals. Hamzat and Peters (2009) deduced a positive relationship between motor function and participation among persons with stroke. Similarly, Desrosiers et al. (2003) found leg impairment and disability to be more related to handicap situations (based on assessment of Life Habits) compared to arm impairment and disability.

This study would have useful implications at the stroke-survivor level, rehabilitation level and government/institutional level. By highlighting the challenges they face as they attempt to reintegrate into mainstream society within the Tamale Metropolis, the study is helpful in informing remedial action for stroke survivors. Since the prevention of participation restriction is at its very core, the study is important at the rehabilitation level. It is a timely reminder of the societal implications of arm and leg motor impairment post-stroke, and the need for clinicians and disability experts to adopt interventions that limit such impairments. Simultaneously, it could serve as a basis for advising stroke survivors in their choice of assistive devices. At the government/institutional level, the study would inform policy in terms of procuring assistive devices for persons with disabilities within the metropolis as it would determine which impairment (arm or leg) relates more to participation restriction.

The Tamale metropolis is one of the 26 districts of the Northern region of Ghana and, being centrally located, serves as the capital of the region. It has a total land area of 646.90sqkm with a population of 233,252 as per the 2010 Population and

Housing Census (Ghana Statistical Service, 2014). Within the metropolis, stroke rehabilitation begins with medical management in the various public and private hospitals including the leading referral hospital, Tamale Teaching Hospital (TTH). Persons with stroke are then referred to the physiotherapy department of the TTH to start physical rehabilitation on an out-patient basis. TTH additionally offers psychological rehabilitation through clinical psychologists for stroke survivors who require the service. A number of non-governmental organisations support the rehabilitation process by providing various assistive devices for persons with stroke.

### **Aim**

The aim of the study is to examine the relationship between arm and leg motor impairment and participation restriction. Specifically, the study seeks to establish the correlation between arm motor impairment and participation restriction, and between leg motor impairment and participation restriction, as well as to ascertain which limb (arm or leg) motor impairment is more responsible for participation restriction.

## **METHOD**

### **Study Population**

Persons with stroke who had undergone at least 3 months of physical rehabilitation within the Tamale metropolitan area were included. Other inclusion criteria were the absence of severe co-morbid conditions that could contribute to participation restriction, such as difficulties with vision and amputated limbs. Additionally, post-stroke persons with significant cognitive impairment or unable to communicate were excluded from the study.

Cognitive functioning of participants was assessed using the Montreal Cognitive Assessment (MoCA). Participants had to attain a score of 26 or higher (categorised as normal cognitive functioning) on the MoCA to be included in the study.

### **Sample Size**

Sample size was determined using the precision (estimation) method.

$P$ , is the proportion of persons with stroke with arm and leg motor impairment (after a minimum of 3 months of rehabilitation) obtained from the pilot study.

This proportion included all participants who obtained a score of less than 5 in either the affected upper limb or lower limb (or both) based on the manual muscle testing.

Z, is the significance level using a 95% confidence level.

d, is the precision level

Thus P= 63.33% Z= 1.96 d= (+/-) 8%

$$\frac{n = Z^2P(1-P)}{d^2}$$

$$\frac{n= 1.962(0.6333)(1-0.6333)}{0.082}$$

n= 139

### Sampling Technique

A sampling frame was developed based on the history of attendance of physical rehabilitation sessions at the Tamale Teaching Hospital. The sampling frame was numbered from the first unit to the last unit. A total of 302 participants made up the sampling frame.

The numbers corresponding to the participants were entered into Stata version 12. The syntax "sample 46" was then issued with Stata automatically selecting 139 numbers by simple random sampling without replacement. These numbers were then juxtaposed against the sampling frame to select the participants.

### Data Collection

Data was collected at the physiotherapy department of the Tamale Teaching Hospital, from selected participants who were still undergoing rehabilitation (physical/medical). For selected participants who had completed their rehabilitation, follow-up was done at their homes and motor assessment was followed by the measurement of participation restriction.

Motor assessment was scored by making the participant lie in the supine position. Affected upper limb motor score was obtained by assessing shoulder flexors, elbow flexors and grip, first against gravity and then with gravity eliminated if the participant found it extremely difficult to move against gravity. In most cases

the scores of the three individual movements were the same. Thus an overall upper limb motor score of say 3 was awarded, based on the manual muscle scale. In cases where the scores of those three movements varied, the median score was used as the overall upper limb score.

Affected lower limb motor score was obtained by assessing hip flexors, knee flexors and ankle dorsiflexors - first against gravity and then with gravity eliminated if the participant found moving against gravity extremely difficult. In most cases, the scores of the three individual movements were the same. Thus an overall lower limb motor score of say 3 was awarded, based on the manual muscle scale. In cases where the scores of those three movements varied, the median score was used as the overall lower limb score.

Level of participation restriction was measured by administering the six-level London Handicap Scale (LHS). The scale was thoroughly explained to participants, with emphasis on measuring the extra disadvantage experienced due to the absence of physical, social and attitudinal facilitators that would have mitigated the impact of their motor impairment.

### **Data Management and Analysis**

Data management involved a daily electronic entry and cleaning of all completed data collection sheets by the principal investigator. Data was stored in Stata version 12 and backed up on Google drive for easy retrieval and safety. The data sheets were then kept safe under lock and key.

Data was analysed using Stata version 12. Continuous numeric variables were summarised using mean and standard deviation. Categorical variables were summarised using percentages and frequencies. Scatter plots were utilised to depict the visual correlation between limb motor scores and levels of participation restriction. Inferential statistics involved the use of Spearman rank correlation analysis that compared limb motor scores to levels of participation restriction.

### **Ethical Considerations**

Approval was sought and granted by the Ethics Committee of the Committee on Human Research, Publications and Research of Kwame Nkrumah University of Science and Technology (KNUST). Ethical approval was also granted by Tamale Teaching Hospital. Participants and researchers signed an informed consent form that allowed participants to withdraw from the study at any time they wished.

Proper record- keeping and storage ensured confidentiality of data related to participants.

## RESULTS

### Demographic Profile and Stroke Characteristics of Study Participants

The demographic and stroke characteristics of the study participants and the associated 95% confidence intervals for each variable are presented in Table 1. A non-response rate of 26.61% was recorded, with a total of 102 participants completing the study. Just under a third of the participants were women, with over two-thirds being men. Ischaemic stroke was the most dominant stroke type. Over half of participants had left-sided stroke.

**Table 1: Demographic and Stroke Characteristics of Participants**

Variable (n=102)95% confidence interval		
Age (mean $\pm$ SD)	62.08 $\pm$ 11.76	59.77 - 64.39
<b>Gender</b>		
Men	69 (67.65%)	57.66% - 76.58%
Women	33 (32.35%)	23.42% - 42.33%
<b>Type of Stroke</b>		
Ischaemic	82 (80.39%)	79.82% - 93.95%
Haemorrhagic	11 (10.78%)	6.05% - 20.19%
Unknown	9 (8.82%)	
<b>Hemiplegic Side</b>		
Right	42 (41.18%)	31.52% - 51.36%
Left	60 (58.82%)	48.64% - 68.48%
Bilateral	0 (0%)	
No. of Months post Stroke	13.40 $\pm$ 8.20	11.79 - 15.01
No. of Months on Rehab	6.18 $\pm$ 3.30	5.53 - 6.83

Table 2 presents the arm and leg motor scores of study participants. Scores 3 and 4 are the bimodal scores for arm motor impairment, with the score of 1 having the least frequency. Leg motor impairment has the score of 5 as its mode, with the score of 1 having the least frequency.



**Table 2: Arm and Leg Motor Scores of Study Participants**

Arm Motor Score	No. of Participants (n=102)	Leg Motor Score	No. of Participants
1	4 (3.92%)	1	1 (0.98%)
2	15 (14.71%)	2	8 (7.84%)
3	31 (30.39%)	3	28 (27.45%)
4	31 (30.39%)	4	30 (29.41%)
5	21 (20.59%)	5	35 (34.31%)

### Components of Participation Restriction and its Ranking by Study Participants

Figures 1a, 1b, 1c, 1d, 1e and 1f present the breakdown of the ordinal variable participation restriction. Over a third of participants felt they were minimally disadvantaged in terms of mobility, while less than 1% felt they were most disadvantaged. Close to two-thirds felt they experienced no disadvantage in terms of physical independence, in contrast to over 20% who felt minimally disadvantaged. Three out of every four participants had some level of work-related disadvantage. Four out of every five participants felt they experienced no disadvantage in terms of social integration. Less than 7% of participants claimed they experienced any disadvantage in terms of orientation. About one out of four participants felt they were not disadvantaged in terms of economic self-sufficiency.

### Components of Participation Restriction

Key: ND: No Disadvantage, MD: Minimal Disadvantage, MD\*: Mild Disadvantage, MD\*\*: Moderate Disadvantage, MD\*\*\*: Most Disadvantage

### Figure 1a: Mobility

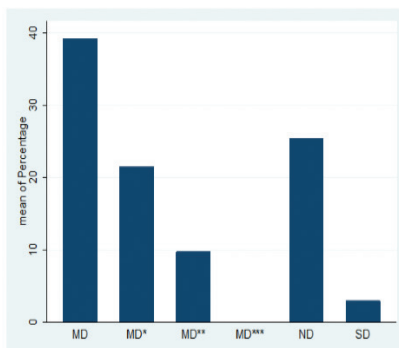


Figure 1b: Physical Independence

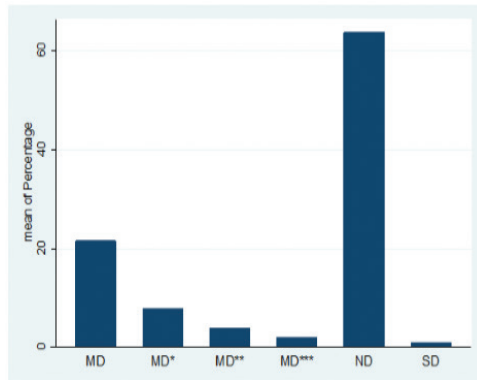


Figure 1c: Occupation

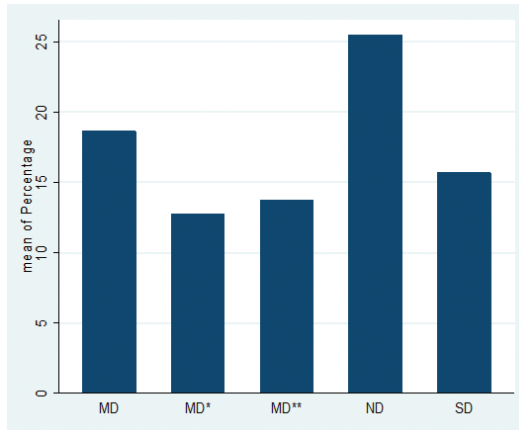
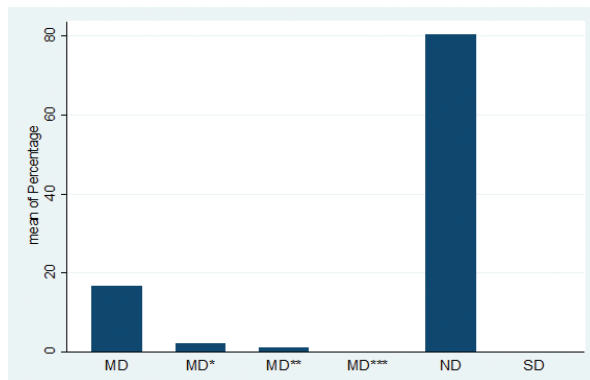
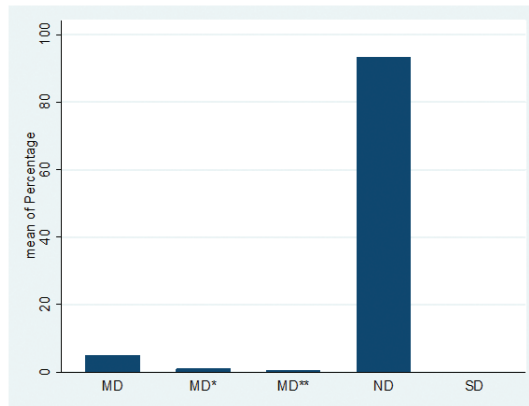
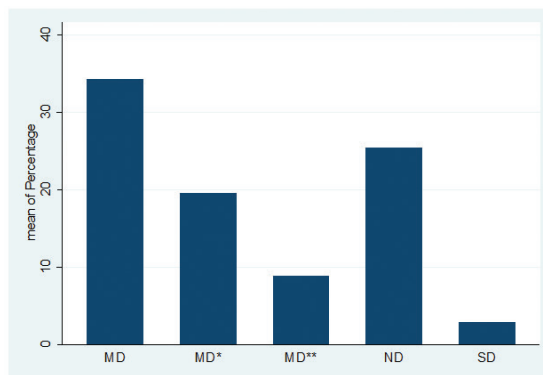


Figure 1d: Social Integration

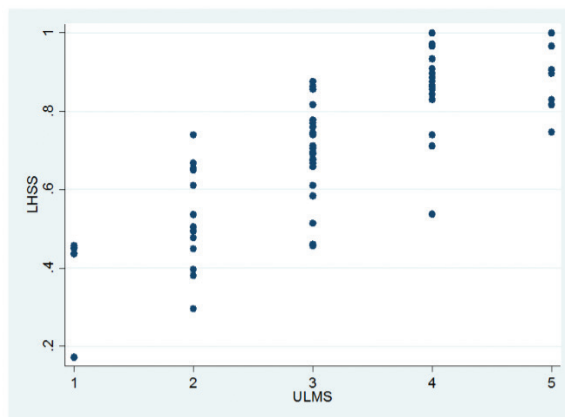


**Figure 1e: Orientation****Figure 1f: Economic Self-Sufficiency**

### **Correlation between Arm Motor Impairment and Participation Restriction**

Figure 2 presents the visual correlation between arm motor impairment and participation restriction. The scatter plot largely indicates a linear relationship between the two aforementioned variables. Lower upper limb motor scores are associated with lower levels of participation and vice-versa, an indication of a positive association and monotonicity.

**Figure 2: A Scatter Graph depicting LHSS scores versus ULMS scores of Study Participants**



Key: LHSS: London Handicap Scale Score (Participation restriction)

ULMS: Upper Limb Motor Score (Motor impairment)

Table 3 presents the Spearman rank correlation test on upper limb motor impairment and participation restriction. The correlation co-efficient reveals a strong positive correlation between the two aforementioned variables.

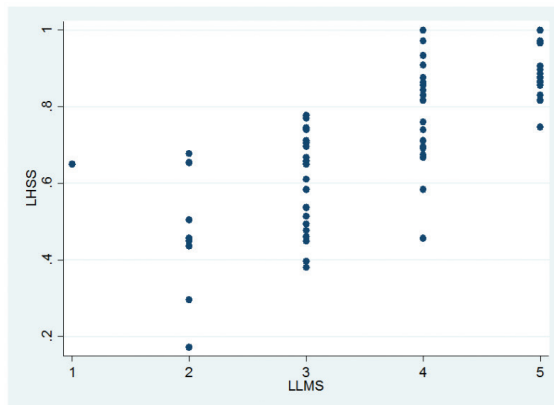
**Table 3: Spearman Rank Correlation Analysis of Arm Motor Impairment and Participation Restriction**

Number of observations	102
Spearman's $r_s$	0.8343
P-value	0.0000

### **Correlation between Leg Motor Impairment and Participation Restriction**

Figure 3 presents the visual correlation between leg motor impairment and participation restriction. The scatter plot largely indicates a linear relationship between the two aforementioned variables. Higher LLMS are associated with higher levels of participation and vice-versa, an indication of a positive association and monotonicity.

### Figure 3: A Scatter Graph depicting LHSS scores versus LLMS scores of Study Participants



Key: LHSS: London Handicap Scale Score (Participation restriction)

LLMS: Lower Limb Motor Score (Motor impairment)

Table 4 represents the Spearman rank correlation test on upper limb motor impairment and participation restriction. The correlation co-efficient reveals a strong positive correlation between the two aforementioned variables.

#### Table 4: Spearman Rank Correlation Analysis of Leg Motor Impairment and Participation Restriction

Number of observations	102
Spearman's $r_s$	0.8013
P-value	0.000

#### Comparison of Correlation of Arm Motor Impairment and Participation Restriction against Leg Motor Impairment and Participation Restriction

Both arm motor impairment and leg motor impairment show a strong positive association with participation restriction albeit differences in numerical strength. The Spearman correlation co-efficient of arm motor impairment and participation restriction yields 0.8343 while that between leg motor impairment and participation restriction yields 0.8013. Thus, arm motor impairment is more strongly related to participation compared to leg motor impairment.

## DISCUSSION

### Demographic Profile and Stroke Characteristics of Study Participants

The mean age of post-stroke study participants was 62.08 years ( $\pm 11.76$ ) with an average of 13.40 ( $\pm 8.20$ ) months between the onset of stroke and time of research. Taking cognisance of the standard deviation associated with the mean age, the reported mean age of study participants largely fits into the age range (55 and 85 years) at which incidence of stroke is highest as espoused by Roth (2002). The mean age reported in this study compares favourably with that of Agyemang et al (2012) who reported a mean age of 63.7 years in a 2-year retrospective study of stroke survivors at the KomfoAnokye Teaching Hospital in Kumasi, Ghana. In terms of the incidence of stroke between the two genders, men had roughly 35% higher incidence than women. This higher incidence of stroke in men is, however, anticipated by Roth (2002) who postulated the incidence of stroke as 30-80% higher in men as compared to women.

The 80.39% incidence of ischaemic stroke as against 10.78% of haemorrhagic stroke is largely consistent with incidence rates reported by Donnan et al (2008) and Andersen et al (2009) who reported 87% and 90% respectively for the incidence rate of ischaemic stroke. There were 9 cases of stroke that defied classification as either ischaemic or haemorrhagic, possibly due to a lack of conclusive evidence from brain imaging techniques or, in some rare cases, study participants not undergoing brain imaging at all.

Left cerebral hemispheric infarctions that result in right hemiplegic stroke appear to be more common as compared to right cerebral hemispheric infarctions, especially among young adults (Naess et al, 2006). This is usually attributed to hemodynamic differences between the left and right carotid artery circulations. Usually there is a higher blood flow velocity in the left carotid artery compared to the right, with resultant higher stress and intimal damage in the left hemisphere of the brain (Rodriguez et al, 2003). However, relative to this study, left hemiplegic stroke was more prevalent among participants (58.82%) as against right hemiplegia (41.18%). This could probably be due to other causal factors such as embolism having contributed to stroke among participants. Contrary to the aforementioned finding, Hedna et al (2013) had majority of ischaemic stroke survivors exhibiting right half hemiplegia. A mean of 6.18 months of rehabilitation implies that most participants had achieved or were close to achieving their respective maximum functional and motor recovery levels as envisaged by Verheyden et al (2008).

### **Correlation between Arm Motor Impairment and Participation Restriction**

The Spearman rank correlation of 0.8343 is an indication of strong positive relationship between the two aforementioned variables. This trend largely agrees with Hamzat and Peters (2009) who deduced a positive relationship between motor function and participation.

It holds that the more severe the arm motor impairment, the higher the level of participation restriction experienced by the post-stroke participant and vice-versa (Nijland et al, 2010). This conforms to the anticipated principle that post-stroke survivors with more severe motor impairments are likely to succumb to the numerous societal barriers that they encounter -especially those barriers related to mobility, physical independence, occupation and economic self-sufficiency - as these barriers, by their physical nature, require sufficient motor power to handle them. Further to this, participants with more severe arm motor impairment are equally at a disadvantage with regard to social integration and orientation, the other two parameters that complete the six-level participation restriction.

A participant with more severe arm motor impairment is likely to be restricted to his immediate environment due to difficulties in executing activities associated with the arm (Hamzat & Peters, 2009). Thus, social interaction is likely to be restricted to his/her immediate family, and integration with larger society is virtually non-existent, further contributing to participation restriction. Again, more severe arm motor impairments are likely to be obvious to other members of larger society, leading to a “discredited” form of stigmatisation that subsequently hampers social integration. Last but not the least, a more severe arm motor impairment is likely to be an indication of a severe injury in the brain (Carr & Shepherd, 2011). This direct injury to the brain (ischaemic or haemorrhagic) could probably lead to difficulties in orientation as experienced by participants.

### **Correlation between Leg Motor Impairment and Participation Restriction**

The Spearman’s rank correlation co-efficient of 0.8013 is an indication of a strong positive association between leg motor impairment and participation restriction. It connotes that the more severe the leg motor impairment, the higher the level of participation restriction (Desrosiers et al, 2003). Leg motor impairment is likely to have a negative impact on mobility, physical independence, occupation and economic self-sufficiency as these components of participation share a common activity - walking. Since the lower limb (leg) is primarily responsible for walking, any form of impairment that impacts it has an adverse effect on this activity. The

problem is further compounded by the fact that impaired walking by post-stroke survivors leads to compensatory mechanisms in other body systems (Lennon et al, 2013). This results in fatigability and further restricts participation in society.

Difficulty in walking (an activity limitation) equally has a negative impact on social integration as it serves to limit encounters with members and facilities of the larger community. As asserted by Sarfo et al (2017), other factors that limit social integration post-stroke include stigmatisation and other attitudinal barriers - more so for post-stroke participants with obvious leg motor impairments. A more severe leg motor impairment is possibly indicative of more severe initial injury in the brain, hence the likelihood of difficulties with awareness of the external environment (orientation).

### **Comparison of Correlation of Arm Motor Impairment and Participation Restriction vis-a- vis Leg Motor Impairment and Participation Restriction**

The Spearman rank correlation coefficient between arm motor impairment and participation restriction yielded 0.8343, while that between leg motor impairment and participation restriction yielded 0.8013. This could be interpreted as arm motor scores having a stronger relationship with participation, as the London Handicap Scale (LHS) measures participation restriction in a negative sense. Conversely it can be stated that leg motor impairment relates more to participation restriction compared to arm motor impairment. It would appear that there are hardly any previous studies which link limb motor impairment to participation restriction.

The implication of this deduction is that for persons with stroke within the Tamale metropolis, residual post-rehabilitation leg motor impairment is more likely to limit their participation in society, than arm motor impairment. Specifically mobility, physical independence, occupation, social integration, orientation and economic self-sufficiency as a unit is hindered more by leg motor impairment than by arm motor impairment.

A particular activity limitation that could account for the more debilitating effect of leg motor impairment on participation is possible difficulty in walking. The limiting effect is felt at home and subsequently accentuated at the societal level. Furthermore, difficulty in walking implies higher energy levels are required to undertake activities of daily living as espoused by Staines et al (2009). Higher energy demands imply fewer activities of daily living and subsequently physical deconditioning thrives (Patterson et al, 2007). Thus, a vicious cycle sets in that



could account for the more debilitating effect of leg motor impairment on participation as compared to arm motor impairment.

On the other hand, arm motor impairment is unlikely to have such far-reaching consequences although the implication of each participant's arm motor impairment is unique. The upper limb - a relatively smaller limb compared to the lower limb - has little impact on mobility. Moreover, the unaffected upper limb in persons with stroke has the potential to adequately compensate for the affected upper limb in some activities.

## **CONCLUSION and RECOMMENDATIONS**

The greater level of participation restrictions associated with leg motor impairment is possibly an indication that limited leg-dependent mobility did greatly influence the other domains of participation restriction assessed in this study. However, the strong positive correlation between arm motor impairment and participation restriction means that arm motor functioning is equally vital in mitigating participation restriction post stroke. In light of these findings, the study makes the following recommendations.

Rehabilitation experts (clinicians and non-clinicians) ought to draw a link between stroke-related impairments and the social implication (participation restriction) of those same impairments in order to make informed decisions. This implies the assessment of recovery in persons with stroke should not be solely based on the presence or absence of impairments but should include the challenges (physical, social and attitudinal barriers) these individuals are likely to encounter within society. Following this, disability practitioners need to focus on interventions that are aimed at reducing the impact of barriers (physical, social and attitudinal) as these barriers are likely to engage the attention of persons with stroke more than the underlying impairment.

With respect to policy in procuring assistive devices, the study clearly demonstrates that both arm and leg assistive devices would be useful in reducing participation restriction in the Tamale metropolitan area. In terms of a choice between the two aforementioned devices, leg assistive devices would be more useful in improving participation of persons with stroke within the metropolis.

Further research should be conducted to link the three components of disability - impairments, activity limitation and participation restriction - so as to draw a complete picture of disability for persons with stroke.

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