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Assessment of Post Stroke Disability and Its Management Using Strengthening Exercise

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ABSTRACT

Stroke is a focal episode of neurological deficit, brain tissue damage and the leading cause of death and disability. A cross-sectional analytical study was conducted to identify the disability on stroke patients, second fold of the study was experimental, and it was conducted to evaluate the efficacy of strengthening exercise on physically disabled of stroke patients. A pretested, semi-structured standard questionnaire and randomized sampling technique used to collect the data, the number of calculated sample size was 105, and SPSS version 20.0 was used for data analysis. Study periods were the 2 years duration from July 2018 to 30th June 2020. Study found that average age of the respondents was55.68 12.77 years. Among the respondents, 58.10% were male and 41.90% were female. Study revealed that mean Barthel Disability Index had 29.71 27.49 and mean Asian Stroke Disability Scale had 5.76 2.15. However, patients were suffering from physical, speaking, psychological, visual and auditory disability. There were statistically significant findings after intervention of strengthening exercise where t-value were -17.737 and 12.464, which measured by Barthel Disability Index and Asian Stroke Disability Scale. A comprehensive rehabilitation program includes muscle-strengthening exercise techniques were statistically significant effects on physical disability of stroke patients.

1. Introduction

Stroke is a disease of the brain where there is sudden onset of mostly focal lesion due to occlusion or rupture of a cerebral blood vessel and its symptomatology should last for more than twenty four hours. The incidence of stroke is increasing in this country in comparison to developed country. In our country the prevalence of stroke above the age of 40 is 370/100000 (Mohammad *et al*., 2011).Stroke is the leading cause of death and disability in Bangladesh, only a few government and non-governmental organizations provide rehabilitation for stroke patients into the Bangladesh health system (Mamin *et al.*, 2017).Oral contraceptive pill, pregnancy, connective tissue diseases with vacuities, hematological variables, drug abuse, smoking, congenital heart diseases, family history and some genetic diseases were responsible for stroke (Kristensen *et al*., 1997).In Asia, the problem of stroke has a particularly strong impact, more than half of the world's population lives in Asia, but stroke is the predominant vascular disease in many parts of Asia (Shi *et al*., 1998). The prevention, identification and control of the cardiovascular risk factors at individual and population level is poor in Asia because of ignorance and high cost of the interventions so diseases burden is likely to increase in the near future (Taylor *et al.*,1996). In a hospital based study, it was revealed that hypertension is the most important risk factor for

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stroke in Bangladesh (Rahman, 2002).History of hypertension, diabetes mellitus, central obesity, Psychosocial stress, smoking were the risk factors of ischemic stroke, whereas alcohol intake were significant risk factors for hemorrhagic stroke (Donnel*etal*.,2010). High blood pressure, smoking, severe psychological stress, atrial fibrillation, previous transient ischemic attacks, and intermittent claudication were the independent risk factors for non-hemorrhagic stroke (Harmsen *et al*., 1990). First-degree relative and genetic risk factors may be important in the incidence of intracerebral hemorrhage (Woo *et al*., 2002). Increased risk of intracerebral hemorrhage with prior cerebral infarction, and these data suggest that this occurs independent of aspirin or anticoagulant use (Gorter, 1999).

Stroke is also in the top five diseases with the greatest burden of disease, based on disability (Loo and Gan, 2012).Stroke causes long-term disability resulting from secondary complications common after a stroke such as heart disease, bedsore, urinary tract infection, respiratory infection (Eng and Tang, 2007). Physiotherapy plays a significant role in the rehabilitation of patients' functional movements after stroke. Early mobilization, balance, muscle strengthening exercise, endurance exercise, gait training, hydrotherapy and social activation of patients or his family (Macek *et al*., 2020). Cardiorespiratory training, therapeutic exercise, task-oriented training, mirror therapy, neuromuscular electrical stimulation shows promise as an intervention for stroke (Lin and Dionne, 2018). Or ofacial therapy as an emphasis of movement of tongue and hyoid muscles. (Konecny *et al*., 2017).Constraint-induced movement therapy, mental practice, intervention for sensory impairment, these may be effective intervention (Pollock *et al*., 2014).However, functional approach, Bobath approach and motor learning approach had statistically significant improvements their disability (HoChung, 2014). Physiotherapy usually provided in the first months after stroke is effective but in the chronic phase is uncertain (Ferrarello and Toro, 2011).Orthopedic principle, motor learning or mixed methods of these treatment principles (Pollock *et al*.,2008).Whereas functional training of the upper limb movement therapy, treadmill training with or without body weight support (Van Peppen *et al*., 2004).More than half of the patients who survive the first month after a stroke will require specialized rehabilitation (Pollack and Disler, 2002).The study was conducted to identify the disability of stroke patients and assess the efficacy of strengthening exercises on physically disabled stroke patients.

2. Materials and Methods

2.1 Study Populations

The study populations were the patients who were suffering different types of stroke and admitted in the National Institute of Neuro Sciences & Hospital.

2.2 Study Area and Study Sites

This study was conducted in Dhaka city. This study was employed among the patients admitted in National Institute of Neuro Sciences & Hospital (NINSH) in Dhaka city. This study sites were in NINSH. Data were collected from selected words (one male and one female) from NINSH.

2.3 Study Design and Study Periods

The present study was cross-sectional analytical study and this study was the most feasible for identifying the disability on stroke patients, and second fold of the study was experimental study that helps to explore the efficacy of strengthening exercise on physically disabled of stroke patients. These study periods were the two years duration from 1st July 2018 to 30th June 2020.

2.4 Data Collection Tools, Instruments, and Sampling Techniques

A pretested, semi-structured questionnaire and randomized sampling technique was applied to collect the data with a sample size was 105. One male and one female wardswereselectforcollectingsample,61 males and 44 females patients were included the study among them30patients were included for experimental group and another 30 patients were included for control group.

2.5 Inclusion and Exclusion Criteria

Those who are willing to give consent and participate for interview, irrespective of sex and clinically diagnosed stroke patients. Patients or attendants disagree to Participate in the study.

2.6 Calculation of Sample Size

Following formula is be used to determine the sample size.

$$n = \frac{z^2 pq}{d^2}$$

Here

n=the desired sample size

z = the standard normal deviate usually set at 1.96 which correspondents to 95% confidence level

p = 6.59% (Estimated prevalence of Stroke in Philippines) (Looand Gan, 2013)

q = 1-p =1.00-0.0659 q = 0.9341
d = degree of accuracy desired, usually set at 0.05%.

Now, required sample size
□1.96□ 2 □0.0659□0.9341

2.7 Measurement Scales

Measurement of disability of the respondents of both group (experimental and control) used by Barthel index and the Asian stroke disability scale.

$$n = \frac{\square 0.05\square}{2}$$

$$= 94.59$$
$$= 95$$

2.8 Data Processing and Analysis

When 90% response rate, so sample size = 95+10% of 95
=95+9.5
=104.5
=105
So required sample size was105.

2.9 Data Collection Technique

From the participant by face-to-face interview or attendants, socio-economic information's were collected by interview methods. Stroke related and Physiotherapy treatment and outcome related information were detected by history, physical examination and medical records if possible. Respondents' mobile numbers were included on questionnaire. Data were collected from survey of the patients those who clinically diagnosis stroke patients through questionnaire by personal interview.

2.10 Therapeutic Management

Effective rehabilitation on a coordinated activity of multidisciplinary teamwork of early mobilization and therapeutic exercise especially muscle strengthening techniques were applied for intervention.

After collection of data, it was checked and rechecked thoroughly with competently and these data were analyzed by using SPSS software version 20.After analyzed the data set all information were interpreted and presented tabulated form (univariate and bivariate), grapes (bar diagram and pie chart) and pared t-test was applied for both experimental and control groups.

2.11 Informed Consent

There was no human risk, no medication and no invasive procedure only exercise programs were done for intervention. Informed consent was taken before starting the interview of the respondents, all information was kept confidential, used only research work. Respondents had right to refuse and withdraw from the research work.

2.12 Ethical Clearance

The research proposal approved by the ethical committee of National Institute of Neuro-Sciences and Hospital, Shere-E- Bangla Nagar, Dhaka, Bangladesh.

3. Results

Table 1. Socio-demographic Information (n=105)

Variables	Items	Frequency	Percentage
Agein Years	≤30	2	1.90
	31- 40	13	12.40
	41-50	25	23.80
	51-60	26	24.80
	61-70	33	31.40
	≥71	6	5.70
	Total	105	100.00
	Mean□SD	55.68 □□12.77	
Gender	Male	61	58.10
	Female	44	41.90
	Total	105	100.00
Social Classes	Lowerclass	04	3.80
	Lowermiddle class	57	54.30
	Upper middle class	38	36.20
	Upper class	06	5.70
	Total	105	100.00
	Mean□SD	27757.14 □□21080.67	

Table 01 shows that more than 85.00% of the respondents belonged to their age group were ≥ 40 years with their mean age was 55.68□ 12.77 years. Study reveals that 58.10% of the respondents were male

and 41.90% of the respondents were female. Study found that 3.80%, 54.30%, 36.20% and 5.70% of the respondents were lower class, lower middle class, upper middle class and upper class respectively with the irmean monthly income was 27757.14 □21080.67 BDT.

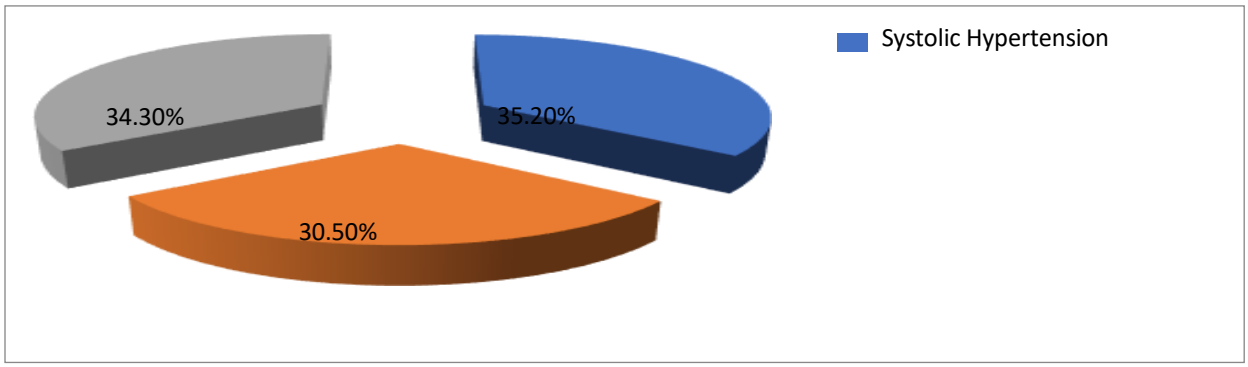

Figure 1. Distribution of the study subjects by Hypertension.

Figure 01 reveals that 35.20% of the respondents suffered systolic hypertension, 30.50% of the respondents suffered diastolic hypertension and 34.30% of the respondents had normal pressure.

Table 2. Distribution of the study subjects by disability measurement of post stroke patients (n=105).

Variables	Items	Frequency	Percentage
Barthel Index	≤ 60 (Institutionalized)	89	84.80
	61-100(Able to live independently)	16	15.20
	≥101(Capable of carried himself)	00	00
	Total	105	100.0
	Mean □□SD	29.71 □□27.49	
The Asian Stroke Disability Scale	≤3(Live independently)	15	14.30
	≥4(Need Institutionalized)	90	85.70
	Total	105	100.0
	Mean □□SD	5.76 □□2.15	

Table 02 shows that 84.80% of the respondents need institutionalized support for rehabilitation and 15.20% of the respondents able to live independently with the irmean disability was 29.71□

27.49. It was measured by Barthel Index. Study showed that 14.30% of the respondents live independently and85.70% of the respondents need institutionalized for rehabilitation with their mean disability was 5.76□2.15. It was measured by the Asian Stroke Disability Scale.

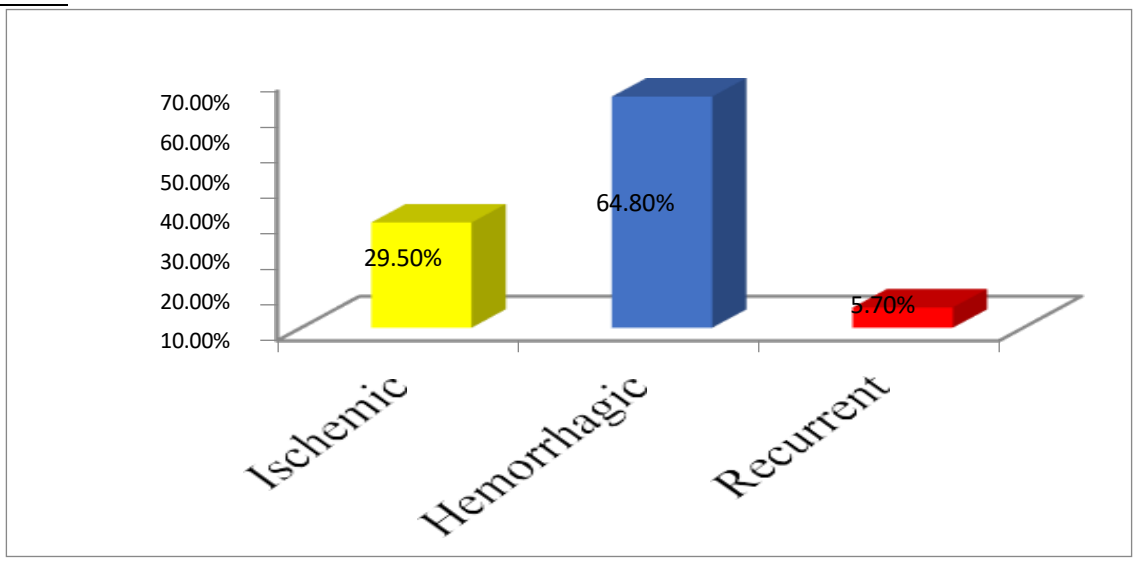

Figure 2. Distribution of the study subjects by types of stroke (n=105).

Figure 02 shows that 29.50% of the respondents suffered ischemic stroke, 64.80% of the respondents suffered hemorrhagic stroke and 5.70% of the respondents suffered recurrent stoke.

Table 3. Distribution of the study subjects by Glasgow Coma Scale (n=105).

Glasgow Coma Scale	Frequency	Percentage
≤8 (Severe injury)	41	39.00
9-12 (Moderat einjury)	40	38.10
13-14 (Mild injury)	11	10.50
15 (Normal or healthy)	13	12.40
Total	105	100.00
Mean □□SD	10.05 □□3.00	

Table 03 reveals that 39.00%, 38.10%, 10.50% and 12.40% of the respondents' severity of brain injury had severe, moderate, mild and normal respectively with their mean GCS was 10.05□□3.00 and it was measured by Glasgow Coma Scale.

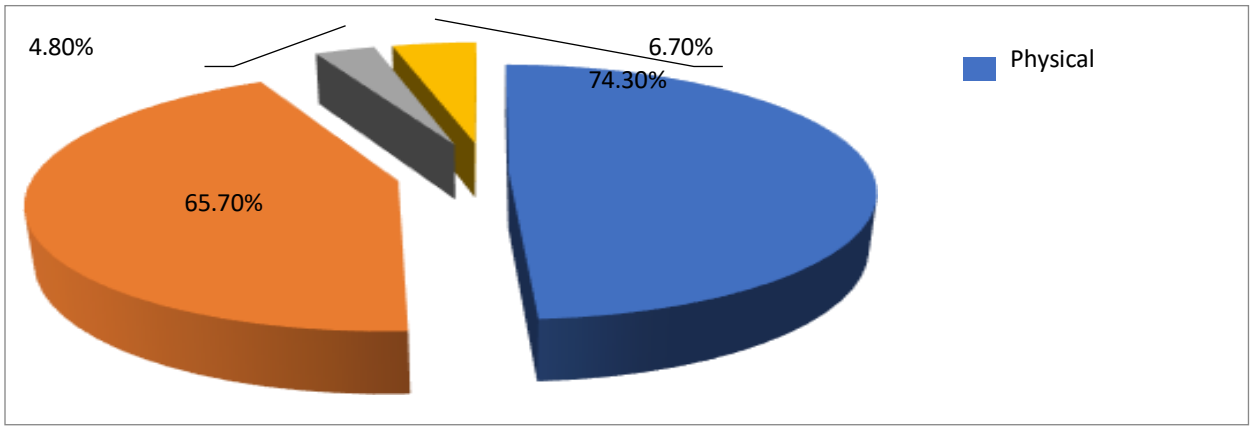

Figure 3. Distribution of the study subject by types of disability.

Figure 03 shows that 74.30%, 65.70%, 4.80%, 6.70% and 4.80% of the respondents had physical, speaking, psychological, visual, and auditory disability respectively.

Table 4. Distribution of the study subjects by findings of computerized tomography scan (n=105).

CT Scan Findings	Frequency	Percentage
Ischemic changes	25	23.80
Intracerebral hemorrhage	56	53.30
Sub arachnoid hemorrhage	19	18.10
Recurrent- First in fraction then hemorrhage	03	2.90
Recurrent- First ischemic then ischemic	01	1.00
Recurrent- First hemorrhage then hemorrhage	01	1.00
Total	105	100.00

Table 04 shows that 23.80%, 53.30%, 18.10%, 2.90%, 1.00%and1.00% of the respondents Ct scan Findings were ischemic changes, in tracerebral hemorrhage, sub arachnoid hemorrhage, (recurrent) first infraction then hemorrhage, (recurrent) first ischemic then ischemic and (recurrent) first hemorrhage then hemorrhage respectively.

Table 5. Distribution of respondents by efficacy of strengthening exercise technique (n=40+40).

Variables	Group	Mean		t-Value	p-Value
Barthel Index	Study Group	Pretest 30.87 □□21.33	Post test 65.25 □□19.99	-17.737	0.000
	Control Group	Pretest 26.87 □□25.66	Post test 28.95 □□25.06	-1.829	0.075
The Asian Stroke Disability Scale	Study Group	Pretest 5.45 □□1.60	Post test 3.17 □□1.27	12.464	0.000
	Control Group	Pretest 6.12 □□1.93	Post test 5.85 □□1.90	1.863	0.070

Paired t-test

Table 05 shows that, t-value was -17.737 which were greater than tabulated t-value 1.697 and (p=0.000>0.05) that was statistically significant findings of study group which was measured by Barthel Index of Activity. Compare to control group, t-value was -1.829 which were greater than tabulated t-value 1.697 and (p=0.075>0.05) that was statistically not significant findings which was measured by Barthel Index of Activity**.** Study revealed that t-value was 12.464 and (p=0.000>0.05) which were greater than tabulated t-value 1.697 that was statistically significant findings of study group which was measured by the Asian Stroke Disability Scale.

Table 6. Distribution of the study subjects by association between types of stroke and stroke disability of the respondents.

Types of stroke	Stroke Disability		Total	χ^2	p-value
	≤3	≥4			
Ischemic	1(1)	30(28.6)	31(29.5)	6.303	0.021
Hemorrhagic	14(13.3)	54(51.4)	68(64.8)		
Recurrent	0(0)	6(5.7)	6(5.7)		
Total	15(14.3)	90(85.7)	105(100)		

Results were expressed as number (%), $\chi 2$ experiment was conducted and $p<0.05$ was level of significance Table 06 shows that there was a statistically significant association between types of stroke and disability of the respondents of the respondents ($p=0.021<0.05$) and it was measure by Asian Stroke Disability Scale.

Table 7. Distribution of the respondents by Pearson correlation of level of disability with tabulated variables.

Variables	Variables	r-value	p-value
The Asian Stroke Disability Index	Body mass index	-0.321	0.001
	Glasgow coma scale	-0.318	0.001
	Birthel Index	-0.818	0.000
Birthel Index	Body mass index	0.218	0.025
	Random blood sugar	0.236	0.026
	Glasgow coma scale	0.392	0.000

p- value obtained from Pearson correlation test

Table 07 shows that there were negative correlations of the Asian Stroke Disability Index with Body mass index ($p= 0.001>0.05$ and $r= -0.321$), Glasgow coma scale ($p= 0.001>0.05$ and $r= -0.318$) and Birthel Index ($p= 0.000>0.05$ and $r= - 0.818$). While positive correlation of Birthel Index with Body mass index ($p= 0.025>0.05$ and $r=0.218$), Random blood sugar ($p= 0.026>0.05$ and $r=0.236$) and Glasgow coma scale ($p= 0.000>0.05$ and $r=0.392$). Study revealed that the Asian Stroke Disability Index negatively influences on Birthel Index, Body mass index and Glasgow coma scale. Whereas, Birthel Index positively influences on Body mass index, Random blood sugar and Glasgow coma scale. These findings were statistically significant.

4. Discussions

Study found that one third of the respondents age were 61 to 70 years, second age group were 41-50 years and it was the 24.80% of the respondents, another age group were 31-40 years and it was 23.80%, rest of them were 19.10%and these age group were above 71 years and below 30 years. These findings were nearly similar findings to the study carried out by Wu *et al.* in 2010. Mean age of the study subjects was 55.68 □□12.77 years, where mean age of the respondents of review were 53 ± 16 years and these findings were closely similar findings to the study carried out by Komolafe *et al*. in 2015. Among the respondents, 58.10% weremaleand 41.90% werefemale, where another similar type study found that 46.2% of the patients were male and53.8% of the patients were female (Komolafe *et al*., 2015).Study revealed that 3.80%, 54.30%, 36.20% and 5.70% of the respondents were lower class, lower middle class, upper middle class and upper class respectively with their mean monthly income was2 7757.14

□□21080.67 BDT. Opposite findings of the study carried out by Wang *et al.* in 2019 and revealed that upper class people were more suffering of stroke (Wang *et al*., 2019). Of the respondents, 20.00% lived in urban and 80.00% lived in rural area. Another similar type study conducted by Wu *et al*. in 2019 and found that rural people of China were more affected that urban people (Wu *et al*., 2019).

Study revealed that 29.50% of the respondents suffered ischemic stroke, 64.80% suffered hemorrhagic stroke and 5.70% suffered recurrent stoke. Another dissimilar finding to the study conducted by Momen *et al*. in 2016 and revealed that 66% were is chemic stroke and 34% were hemorrhagic. Study revealed that 35.20% of the respondents suffered systolic hypertension, 30.50% suffered diastolic hypertension, and 34.30% had normal pressure. Similar type study carried out by Biderafsa *et al.*, in 2015 and showed that systolic blood pressure were 3.5% and diastolic blood pressure were 4.87% in total burden of stroke risk (Biderafsa*etal*., 2015).Mean Barthel disability index was29.71□27.49 and mean Asian Stroke Disability Score was5.76□2.15. These findings were similar findings to the study carried out by Pinedo *et al*. in 2017 and Dubuc *et al.* in 2015.There was a statistically significant finding of study group after intervention of different types of muscle strengthening exercise which was measured by Barthel Index of Activity. These findings were similar findings to the study carried out by Macek *et al.* 2020 and revealed that muscle is strengthening exercise, endurance exercise, cyclic bilateral arm and leg training, gait training had significant effect on stroke disability (Macek *et al*., 2020).There was another statistically highly significant finding of study group after intervention of different types of muscle strengthening exercise which was measured by the Asian Stroke Disability Scale. Another similar type study carried out by Konecny *et al.* in 2017.

5. Conclusion

Study concludes that assessment of disability by using of Barthel Index of Activity and Asian Stroke Disability Scale and found that most of the stroke patients need institutional support for better management. However, this physical disability is managed by using muscle strengthening exercise technique and it was statistically significant. Effective rehabilitation on a coordinated activity of different types of therapeutic exercises were the components of intervention.

6. Recommendations

Based on the review findings, the following recommendations made to prevent and reduce risk of stroke.

1. Raising awareness among the population about the disability of stroke patients and its severity.
2. Continuous health education program by using print media and electronic media about the rehabilitation of stroke patients.
3. Further study is needed to assess the effective management of modern physiotherapy intervention for minimizing physical, social and psychological disability.

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