

## Outcome Profile of Achilles Tendon Vibration on Gait Performance in Ambulatory Stroke Patients: A Treatment Outcome Study

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### Abstract

**Introduction:** *Stroke is the second leading cause of death throughout the world.*

**Objective:** *The objective of the study was to find out the treatment outcome profile of Achilles tendon vibration on gait performance in ambulatory stroke patients.*

**Materials and Methods:** *It was a cross sectional comparative study. 20 ambulatory stroke patients were treated by Achilles tendon vibration from 6 to 8 weeks with a frequency of 4 to 6 sessions per week. A pre tested semi structured questionnaire & purposive sampling technique was done to collect data. Treatment outcome was assessed by Wisconsin Gait Scale.*

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**Results:** *The mean age of the respondents were  $54.00 \pm 1.148$  years with a range from 30 to 70 years. Highest respondents were from 46 to 60 years. 75% of the respondents were male and 25% of the respondents were female. Highest respondents were more than 65 kg. 60% of the respondents were affected in right side and 40% of the left side. The mean Wisconsin Gait score were  $26.55 \pm 5.889$  with a range from 17 to 37 points before treatment. Gait score were  $24.50 \pm 5.753$  with a range from 16 to 37 points after treatment by Achilles tendon vibration. That indicated that Achilles tendon vibration got treatment outcome on gait performance in ambulatory stroke patients that measured by Wisconsin Gait Scale. P-value was  $<0.05$  that was statistically highly significant & was measured by Wisconsin Gait Scale. There was a significant effect ( $P < 0.05$ ) of Achilles tendon vibration on gait performance in ambulatory stroke patients.*

**Conclusion:** *Achilles tendon vibration is statistically sound on gait performance in ambulatory stroke patients that was measured by Wisconsin Gait Scale.*

**Key words:** Achilles tendon vibration, Gait, Stroke, Wisconsin Gait Scale

## INTRODUCTION:

Stroke is the second leading cause of death throughout the world.<sup>1-7</sup> Stroke is mainly serious problem in Asia. More than 60% of the world's populations live in Asia. A lot of its countries are developing economies. Mortality from stroke is higher in Asia than in Western Europe.<sup>1-5</sup> This mortality rate is much higher than that in the South East Asia region.<sup>8</sup> The incidence of stroke is increasing in developing countries like Bangladesh as compared with developed countries.<sup>9-13</sup> This incidence happened due to lack of health care education, unhealthful diet as well as more people adopting inactive lifestyles in developing countries.<sup>14</sup> The mortality rate among the adult Bangladeshi population was 234 per 1000 people & the mortality rate due to stroke in Bangladesh is 108.3 per 100,000 people.<sup>8</sup> Bangladesh is a small as well as developing country and the industrialization process was also getting momentum. Now a day,

various types of neurological problems are increasing due to rapid industrialization and mechanization. Ambulatory stroke problem on of them and patients may suffer prolong period, ultimately they were burden to family and society.<sup>8 & 15</sup> Impairments resulting from stroke lead to persistent difficulties with walking and subsequently, improved walking ability is one of the highest priorities for people living with a stroke. In addition, walking ability has important health implications in providing protective effects against secondary complications common after a stroke such as heart disease or osteoporosis.<sup>16</sup> The tendon vibration technique has been widely used to investigate the influence of proprioception, particularly muscle spindle endings in spatial perception and motor control which will help on gait performance on ambulatory stroke patients.<sup>17</sup> The objective of the study is to find out the treatment outcome profile of Achilles tendon vibration on gait performance in ambulatory stroke patients.

## **MATERIALS & METHODS:**

It was a cross sectional comparative study which was conducted to find out the treatment outcome profile of Achilles tendon vibration on gait performance in ambulatory stroke patients. 20 ambulatory stroke patients were recruited in this study. Ambulatory stroke patients were treated by Achilles tendon vibration from 6 to 8 weeks with a frequency of 4 to 6 sessions per week. Treatment outcome profile was assessed by Wisconsin Gait Scale by before and after the intervention. Patients were followed up in the outpatient department of the Physiotherapy centre, Ibn Sina Hospital & Diagnostic Centre (FK Unit), Kallaynpur, Dhaka, Bangladesh. Non randomized purposive sampling technique was done for sample selection as study subject. This study was an academic part of the Masters course that's why it had to finish according to academic calendar. However it was started on January 2015 and it was finished on June 2015. Only ambulatory stroke patients with first-time stroke and both male & female respondents between the age of 30 and 70 years were included in the study. Patients having recurrent stroke, aphasia, severe cardiac illness (myocardial infarction), fracture, pregnancy were excluded in this study. A pre tested semi structured questionnaire, Wisconsin

Gait Scale, digital weight machine & measuring tape was used as data collection instrument. Pen, pencil & paper were used as a data collection material. After data collection, data was stored & quality control check was performed. Statistical package of Social Science (SPSS), version 16 was used for data analysis. After data collection, data was stored & quality control checked for their completeness, correctness & internal consistency in order to exclude missing or inconsistent data. Corrected data were entered into the computer. Data analysis was done according to the objectives of the study. P-value more than 0.05 was considered insignificant.

**The Wisconsin Gait Scale (WGS)** was used to evaluate the gait problems experienced by a patient with hemiplegic following stroke. This can be used to monitor the effectiveness of rehabilitation training. The tool is comprised of 14 items that measure clinically relevant temporal and distance gait parameters and kinematics that are frequently altered after a stroke. A total summative score which can be ranged from 13.35 to 42.0 was calculated for the items. The minimum score was 13.35 & maximum score was 42. The higher score, the more seriously affected the gait & lower score indicate better gait performance.<sup>28</sup>

## RESULTS:

Study showed that 25%, 55% and 20% of the respondents belonged to age group 30-45 years, 46-60 years and above 60 years respectively. The mean age of the respondents were  $54.00 \pm 1.148$  years with a range from 30 to 70 years. Highest respondents were from 46 to 60 years (Table 1).

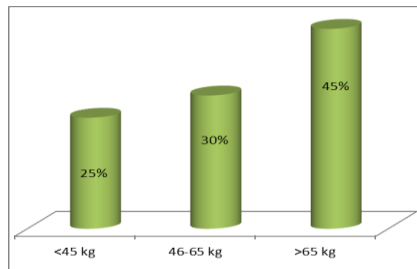
**Table1: Distribution of respondents by age (n=20)**

Age in years	Achilles tendon vibration	
	Frequency	Percentage
30-45	5	25
46-60	11	55
>60	4	20
Total	20	100
Mean $\pm$ SD	$54.00 \pm 1.148$	

Study found that 75% of the respondents were male and 25% of the respondents were female (Table -2).

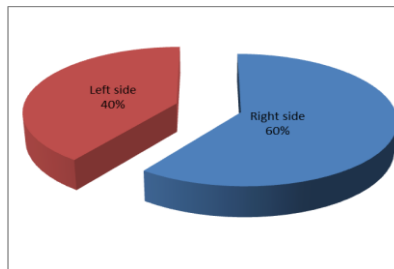
**Table 2: Distribution of respondents by sex (n=20)**

Sex	Achilles tendon vibration	
	Frequency	Percentage
Male	15	75
Female	5	25
Total	20	100



**Figure 1: Distribution of respondents by body weight (n=20)**

Study showed that 25%, 30% and 45% of the respondents were <45 kg, 46-65 kg and > 65 kg respectively. Highest respondents were more than 65 kg (Figure 1).



**Figure 2: Distribution of respondents by affected side (n=20)**

Study showed that, 60% of the respondents were affected in right side and 40% of the left side (Figure 2).

Study revealed that 75% of the respondents were affected < 6 months, 15% were affected from 7 to 12 months, 10% were affected > 13 months (Table 3).

**Table 3: Distribution of respondents by duration of problem (n=20)**

Duration of problem	Achilles tendon vibration	
	Frequency	Percentage
<6 month	15	75
7-12 Month	3	15
>13 month	2	10
Total	20	100

Study found that 60% of the respondent were found 21-30 points, 20% were found <20 points, & 20% were found >30 points among ambulatory stroke patients before treatment. The mean Wisconsin Gait score were  $26.55 \pm 5.889$  with a range from 17 to 37 points before treatment (Table 4).

**Table 4: Distribution of respondents by Wisconsin Gait Scale (Before treatment) (n=20)**

Wisconsin Gait Scale	Achilles tendon vibration	
	Frequency	Percentage
<20 points	4	20
21-30 point	12	60
>30 points	4	20
Total	20	100
Mean $\pm$ SD	$26.55 \pm 5.889$	

This study showed that 65% of the respondent were found 21-30 points, 25% were found <20 points, & 10% were found >30 points among ambulatory stroke patients after treatment by Achilles tendon vibration. The mean Wisconsin Gait score were  $24.50 \pm 5.753$  with a range from 16 to 37 points after treatment by Achilles tendon vibration (Table 5).

**Table 5: Distribution of respondents by Wisconsin Gait Scale (After treatment) (n=20)**

Wisconsin Gait Scale	Achilles tendon vibration	
	Frequency	Percentage
<20 points	5	25
21-30 points	13	65
>30 points	2	10
Total	20	100
Mean $\pm$ SD	$24.50 \pm 5.753$	

Table 6 showed that the mean Wisconsin Gait Score were  $26.55 \pm 5.889$  with a range from 17 to 37 points before treatment & the mean Wisconsin Gait Score were  $24.50 \pm 5.753$  with a range from 16 to 37 points after treatment by Achilles tendon vibration. That indicated that Achilles tendon vibration got treatment outcome on gait performance in ambulatory stroke patients which were measured by Wisconsin Gait Scale. According to Wisconsin Gait Scale, Lower score suggesting higher gait performance.

**Table 6: Distribution of respondents by mean Wisconsin Gait Scale (Before & after treatment)**

Achilles tendon vibration	Mean Wisconsin Gait score	
	Before treatment	After treatment
	$26.55 \pm 5.889$	$24.50 \pm 5.75$

Table 7 showed that t-value was 5.832 which were greater than tabulated t-value (2.845) and p-value was  $<0.05$  that was statistically highly significant & was measured by Wisconsin Gait Scale. There was a significant effect of Achilles tendon vibration on gait performance in ambulatory stroke patients.

**Table 7: Distribution of respondents between before & after treatment by paired t- test**

Achilles tendon vibration	Mean Wisconsin Gait Scale		t-Value	P- value
	Before treatment	After treatment		
	$26.55 \pm 5.889$	$24.50 \pm 5.75$	5.832	0.000

## DISCUSSION:

This experimental study was conducted to find out the effect of Achilles tendon vibration on gait performance in ambulatory stroke patients of 20. This Study showed that 25%, 55% and 20% of the respondents belonged to age group 30-45 years, 46-60 years and more than 60 years respectively. Similar findings have been highlighted in many others studies of Keenan MA, Kollen B and Hesse SA et. al editors.<sup>18- 20</sup> Study showed that the mean age of the respondents was  $54.00 \pm 1.148$  years with a range from 30 to 70 years. In the previous study showed that the mean age of the hemiplegic patients was 59.30

years<sup>21</sup> & 68 years ranging in age from 42 to 87 years.<sup>22</sup> In the previous study revealed that the mean age for male & female stroke patients were 66 years & 70 years respectively.<sup>23</sup> This study showed that most of the stroke was affected in the 46 - 60 years followed by more than 60 years. In the previous study revealed that most of the stroke patients were affected in the 51-60 years followed by 61 to 70 years & another more study revealed that stroke occurred more commonly in elderly.<sup>1, 3 & 24-26</sup> This study showed that 75% of the respondents were male and 25% of the respondents were female. Another more study revealed that male respondents were more than female.<sup>4, 22 & 26</sup> The stroke prevalence was significantly higher among males compared with females.<sup>26</sup> The frequency of stroke in Asian men was greater than Asian women but the frequency of stroke was higher in European both men & women.<sup>23</sup> This study showed that most of the stroke were affected those who had more than 65 kg body weight followed by 46 to 65 kg body weight. Another study showed that the mean body weight was higher with stroke patients compared to non stroke respondent.<sup>26</sup> This study showed that, 60% of the respondents were affected in right side and 40% of the left side. Previous study showed that the incidence of both right and left sided hemi paresis was almost equal.<sup>3</sup> Study revealed that better improvement occurred on gait performance of ambulatory stroke patients after completed 6 to 8 weeks rehabilitation program by Achilles tendon vibration. Previous study showed that significant improvement ( $P < 0.05$ ) occurred on posture & gait performance of the stroke patients after completed 6 weeks rehabilitation program like whole body vibration.<sup>29</sup> Study found that t-value was 5.832 which were greater than tabulated t-value (2.845) & p-value was  $< 0.05$  that was statistically significant findings which was measured by Wisconsin Gait Scale. Similar findings have been supported to the finds of previous study of Pizzi A, et.al editors<sup>22</sup> & Turani N, et. al. editors.<sup>27</sup> This study was correlated with the findings of previous study of Ceyte H, et al editors<sup>17</sup> & Tankisheva E, et al editors<sup>29</sup> who found that using vibration improved the balance & gait performance of stroke patients.



## **CONCLUSION:**

Stroke rehabilitation should start as early as possible for best possible recovery to be achieved. Specifically how near the beginning treatment should start is less well accepted. Achilles tendon vibration is statistically sound on gait performance in ambulatory stroke patients that measured by Wisconsin Gait Scale. Further study should be needed to evaluate the effect of Achilles tendon vibration on gait performance in ambulatory stroke patients.

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