ORIGINAL ARTICLE

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EVALUATION OF UPPER LIMB FUNCTION TESTS IN STROKE PATIENTS – A SYSTEMATIC REVIEW.

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ABSTRACT:

Background: : About 50% of stroke survivors show impaired upper limb and hand function in the chronic phase. The action research arm test is a measure that appears to have general acceptance. *Aim:* To evaluate the literature available on the assessment of UL functions using the action research arm test in stroke patients . *Materials and Methods:* All interventional and non-interventional studies on PUBMED were included in the study. *Results:* : In studies, 15 different outcome measures were found. Out of these ARA is most commonly used measure in all of them (90%) .

Conclusion: This study concludes that the Action research arm test is the most reliable, convenient and feasible test to assess upper limb functions in stroke patients.

Key words: CVA, Hand, Stroke, FMT, FMA, WFMT.

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INTRODUCTION

Developing countries like India are facing a double burden of communicable and non-communicable diseases. [1-2] Stroke is one of the leading causes of death and disability in India. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas. [2] Stroke is the commonest cause of severe physical disability and survivors can suffer several neurologic impairments. [3] Moreover, about 50% of stroke survivors show impaired upper limb and hand function in the chronic phase. This impairment often causes limitations in activities of daily living and may decrease the quality of life. Thus, the study of these impairments causing the limitations is necessary. [4,5]

Selection of an appropriate outcome measure can help us learn these limitations and improve diagnosis and quantification of symptoms, aid planning and follow-up of rehabilitation interventions. [5] A standardized approach in the selection of outcome measures can lead to more efficient rehabilitation for the patient. [5] For this purpose, many valid and reliable outcome measures for the upper limb exist.

The commonly used outcome measures with good psychometric properties are Fugl-Meyer Test, the Action Research Arm Test, the Box and Block test, the Chedoke Arm and Hand Inventory, the Nine Hole Peg Test or the Wolf Motor Function Test. [5]

The action research arm test is a measure that appears to have general acceptance and embraced by many neurorehabilitation specialists.

The Action Research Arm test (ARAT) developed by Lyle is used for the study of UL functions in stroke patients. [4] The ARAT is designed for evaluation of both sides of patients, to obtain a more total description of the upper extremity function. The ARAT contains four subscales -grasp', 'grip', 'pinch' and 'gross movement'- comprising 19 items in total. Items within each subscale are ordered in such a way that if a patient accomplishes the most difficult item, this predicts success with all less difficult subscale items. Thus, the patient is credited with succeeding with all items of the subtest for that limb. On the other hand, failure with the easiest item predicts failure with all items of greater difficulty on that subscale. Thus, the ARAT has been specially constructed to save testing time. It takes no more than 10 min to examine a stroke patient on the ARAT. [6]

There have been various studies on assessment of upper limb functions using various outcome measures from the year 1998 to 2017. Most of these studies have determined the comparison between some specific outcome measures and the action research arm test. However, there is limited research on the systematic review of all these articles. Thus, the purpose of this study was to systematically review all the evidence available on assessment of the upper limb functions using the action research arm test in stroke patients. [4-6] So, aim of the study was to evaluate the literature available on the assessment of UL functions using action research arm test in stroke patients and objectives are to investigate the use and performance of Action research arm test in stroke patients and to critically evaluate the evidence on the effectiveness of Action research arm test in stroke patients.

METHODOLOGY

All interventional and non-interventional studies and articles available on the PUBMED were only being included in the research. Articles from other databases like MEDLINE, EMBASE, CINAHL and PsychINFO were excluded also articles present were in different languages and was not able to translate were excluded. Articles were selected from the Pubmed website using keywords. The keywords used were upper limb functions, action research arm test and stroke patients. PUBMED was searched by the investigator and guide. The titles and abstracts of all retrieved results were then screened for eligibility. The first screening process was aimed at narrowing down the volume of articles by rejecting all studies that were not relevant or appropriate according to the previously stated criteria. Duplicates were removed. Full-text versions of all relevant articles were evaluated by both. Descriptive statistics was used for analysing various parameters used in the included studies.Full-text versions of all relevant articles were evaluated by both. Descriptive statistics was used for analysing various parameters used in the included studies.
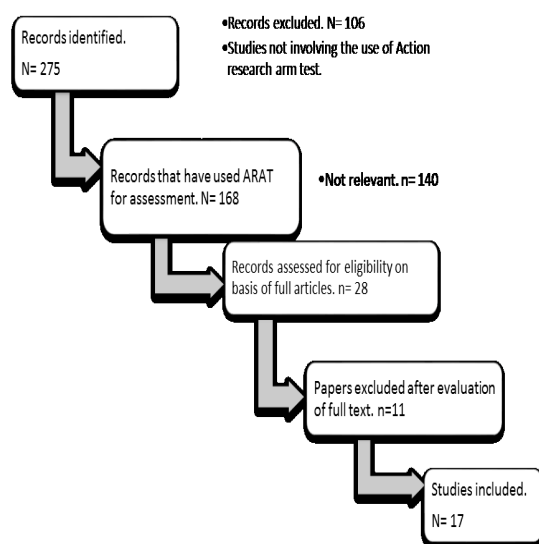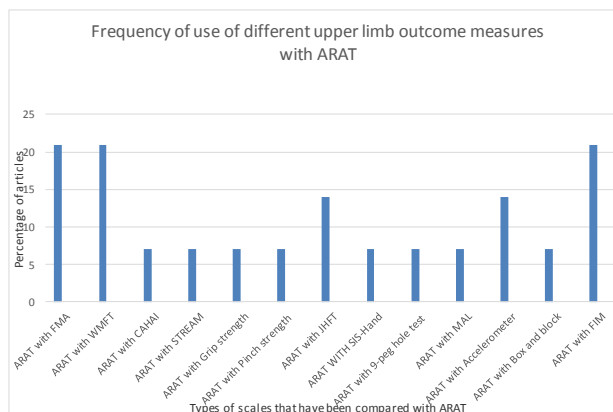
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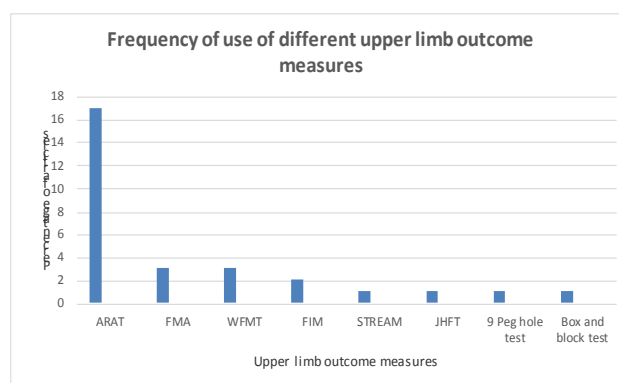

Fig 1: Showing Article review flow

RESULT

 15 different outcome measures were used in different studies. Out of these ARAT, WFMT and FMA scales were used in more than 7 studies. The ARA test is the most commonly used measure in all of them (90%). A total of 17 studies were reviewed including reliability studies, validity studies, cross-sectional studies and randomized control trials. There were 8 studies that analysed the reliability and validity of ARAT. The interrater reliability indicating ICC for the total score was 0.98. All intra- and interrater Spearman's rho and ICC values were higher than 0.98. ARAT has been compared with the following 14 scales. As FMA assesses every domain of the patient it is a lengthy and complicated method. In Functional Independence Measure (FIM) comment more on the functional limitations of the patient. STREAM also is a lengthy procedure making it a time-consuming method. Jebson hand function test also requires continuous supervision and focuses more on shoulder and elbow component. The box and block test require a large equipment kit and cannot be assessed in severe motor impairment stroke patients.9-peg hole test only assesses the intrinsic muscles. Motor activity log scales also requires a minimum of 20 mins to administer.

Graph 1: Shows percentage of comparison of Action Research Arm Scale with other scales.

Graph 1 showing the percentage of comparison of Action Research arm test with another stroke scale which used for Upper limb function in stroke patients.

Graph 2: Percentage of different scales used as an upper limb outcome measure in different studies. Graph 2 shows a higher percentage of using Action Research Arm Test to testing upper limb function test i.e 17% and very less percentage of Box and Block test to testing upper limb function test in stroke patients.

DISCUSSION:

All mentioned outcome measures used to assess upper limb function. Most studies combined upper limb outcome measures with other general measures like a lower limb, trunk etc.. The Action Research Arm test (ARAT) developed by Lyle is used for the study of upper limb functions in stroke patients. The ARAT is designed for evaluation of both sides of stroke patients, to obtain a more total description of the upper extremity function.The ARAT contains four subscales -'Grasp', 'Grip', 'Pinch' and 'Gross movement'- comprising 19 items in total.

Items within each subscale are ordered in such a way that if a patient accomplishes the most difficult item, this predicts success with all less difficult subscale items. Thus, the patient is credited with succeeding with all items of the subtest for that limb. On the other hand, if patients fail to perform the easiest item predicts failure with all difficult items on the subscale. Thus, the ARAT has been specially constructed to save testing time and it takes no more than 10 min to assess a stroke patient.[7] As per result it suggests that Fugal Mayer scale, Functional Independence Measure (FIM) & Wolf Motor Function Test (WMFT) were used commonly with Action Research Arm Test & others were used rarely and in number of articles preferred Action Research Arm Test for testing upper limb function in stroke patients; and box and block test used very rarely to find out upper limb function in stroke patients. There were 6 studies that compared Action research arm test with other upper extremity functional scales in stroke patients. Rinske Nijland, Erwin van Wegen et al compared ARAT with Wolf motor function test and he concluded that excellent inter- and intra-observer reliability of both scales. [8] The tests highly correlated with each other and their results overlaped. Additionally, they suggested a relatively higher measurement error for WMFT. [8-9] In another study author Meheroz H. et al. compared FMA motor score with ARAT and found that both are sensitive to change during inpatient acute rehabilitation and both correlated similarly with FIM total and FIM-ADL function. [10] The results indicated that the ARAT can be applied to stroke patients at generally available tables without affecting the results, making it easy and feasible to apply to stroke patients.[11] They also supported other studies stating high inter-rater reliability of ARAT. After reviewing all the 17 articles it has been concluded that the Action research arm test has high inter-rater, intra rater reliability. It is responsive to change in the first weeks and months after stroke, making it an ideal measure to determine long term upper limb prognosis in a patient. It also proves that it is a highly valid assessment tool. The MCID values prove ARAT to be sensitive to the slight change in the stroke patients and can be used in other neurological dysfunction patients. Also, ARAT does not necessarily need to be assessed at a standardized table or specific arrangement, it's feasible also required a small area to assess upper limb function as an outcome measure. Out of all these assessment tools, Action research arm test is the most reliable, valid and commonly used scale, proving it to be the best outcome measure for the assessment of upper limb functions in stroke patients.

CONCLUSION

On the basis of all the reviewed articles, this study concludes that Action research arm test is the most reliable, speedy, convenient and feasible test to assess upper limb functions in all stroke patients.

ETHICS APPROVAL AND CONSENT : Not applicable

CONSENT FOR PUBLICATION : Not applicable

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