THE REHABILITATION JOURNAL
P-ISSN: 2521-344X / E-ISSN: 2521-3458

T. Rehabili. J.
Volume 07, Issue 04
December 2023

RAND PUBLICATIONS
HERF HEALTH EDUCATION RESEARCH FOUNDATION

EDITORIAL TEAM

Editorial

Contemporary issues in neuro-rehabilitation

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ABSTRACT

Stroke is prevailing as the third most common neurological condition on a global scale and an estimated 25.7 million people are those who have survived it. Stroke is one of the overburdening conditions in about 33% of all individuals affected by permanent disability. Because of the high incidence of risk factors especially in Asia (including Pakistan) with an approximation of 250 cases per one lac persons. Occurrence is mostly seen in the older population and is often found with certain other co-morbidities such as dementia. To enhance the post-stroke quality of life in the geriatric population, especially the ones with existing co-morbidities. Physical rehabilitation of stroke plays a vital role [1].

Studies have demonstrated that the rehabilitation of patients with stroke is a lifelong process during which the survivors sequentially develop new physical habits, and transform their activities of daily living [2]. Stroke rehabilitation treatment protocol lasts quite a long. Therefore, it is sometimes tiresome for the patients and their families because of frequent visits to healthcare settings. Additionally, due to a shortage of skilled and specialized rehabilitation professionals, there is a scarcity of quality treatment protocols and as a result, the objectives of most of the rehab programs are not practical and achievable. Thus, preventing the patients from making a significant recovery [3].

The evidence does not support guidelines that are being followed in the healthcare systems of our country regarding stroke management. While working with individuals recovering from stroke and other neurological disorders, rehabilitation generally focuses on strength training [4].

Despite the fact, that the urban population in developing nations like Pakistan has now access to medical facilities such as stroke rehabilitation, the country's rising population is resulting in an overburdening of the healthcare system leading to sloppiness of all the medical services including rehabilitation [3]. Although most rehabilitation professionals and physical therapists know the fact that the traditional techniques used in neuro rehab are not always effective, still they use them on their patients, this lack of evidence-based practice may be due to inaccessibility to authentic clinical practice guidelines and other physiotherapy databases [4]. For instance, relying on outdated techniques such as range of motion exercises and stretching exercises for treating stroke patients is not as effective as using proprioceptive neuromuscular facilitation exercises to improve the coordination and functional ability of patients, thereby improving motor function along with balance and gait[5].

Conventional approaches in rehabilitation management particularly in the domain of neurology are becoming ineffective due to the huge demand that chronic neurological illnesses are placing on our healthcare system. New creative techniques, including integrated care pathways, are needed to obtain better outcomes [6].

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Citation

Suleman M, Malik MAA, Sarki MR S. Contemporary issues in neuro rehabilitation. T Rehabili. J. 2023:07(04); 01-02 doi: 10.52567/trehabj.v7i04.9

Article History

Received on: 28-05-2023
Revision on: 14-08-2023
Published on: 30-09-2023

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The process of governing skillful clinical and administrative pathways is needed to overcome situations associated with a rise in the number of admissions and long stays in hospitals or healthcare resources. Implementing more innovative approaches by management can achieve better outcomes with a reduction in admissions and shortened hospital stays. It will cohesively lead to effective treatment guidelines, greater patient satisfaction, and improved quality of life. Most of European countries are regulated by integrated rehabilitation services to help patients navigate healthcare services more effectively for an impressive, person-centered approach to rehabilitation care [6].

Unified rehabilitation at the current regional and national level with updated approaches and action plans along with evidence-based clinical practice guidelines is required to safeguard the delivery of person-centred rehabilitation care. Thus, we can conclude that there is a dire need to promote the development and implementation of standardized care in neuro-rehabilitation centers for enhancement in the quality of rehabilitation services. In addition to the use of digital media platforms for spreading awareness among the general masses, regulation and periodic review of rehabilitation services are also required.

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https://doi.org/10.52567/trehabj.v7i04.9

Research Article

Factors predicting stroke specific quality of life in post stroke aphasia

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ABSTRACT

Background: Understanding the factors that predict stroke-specific QoL in post-stroke aphasia patients in Pakistan is crucial for developing targeted interventions and improving the rehabilitation process.

Objective: To determine the factors that predicted the stroke-specific quality of life in post-stroke aphasia patients in Pakistan.

Methodology: This cross-sectional analytical study was conducted over 18 months from June 2021 to December 2022 at RHS Rehabilitation Centre Islamabad Pakistan. A total of n=134 independent participants with fluent and non-fluent aphasia at least six months post-stroke, and able to follow one-step commands were included in the study through a non-probability convenient sampling technique. The stroke-specific quality of life (SS-QoL) scale was used to assess the quality of life in the participants, while the list of predictors was developed from the literature. SPSS version 21 was used for statistical analysis.

Result: A multiple regression was run to predict the quality of life from marital status, gender, family status, patient's socioeconomic status, types of strokes, types of aphasia, and comorbidities. These variables statistically significantly predicted quality of life {$F(13,12)=10.366$, $p<0.001$}. All variables cause 47.8% (*Adj. R2=0.478*) variance in stroke-specific quality of life in aphasia patients.

Conclusion: The male gender, married marital status, middle and upper socioeconomic status, ischemic stroke compared to hemorrhagic stroke, fluent aphasia, and cardiac disease compared to other comorbidities positively affect the quality of life in post-stroke aphasia patients. However, age and the family system did not show any impact on the quality of life.

Keywords: aphasia; diabetes; quality of life; stroke

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Citation

Bhutta NI, Sethi SW, Habiba U, Omer A, Syed S, Shah ST, Haroon R, Butt E. Predictors of post-stroke aphasia quality of life. T Rehabili. J. 2023:07(04); 03-08 doi: 10.52567/trehabj.v7i04.22

Article History

Received on: 19-08-2023
Revision on: 12-09-2023
Published on: 03-09-2023

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INTRODUCTION

Stroke is the most well-known reason for handicaps and a main source of mortality around the world [1]. In Pakistan, the load of stroke and complications are huge [2]. One of the common complications related to stroke is aphasia which is the loss of language due to damage in the left lobe of the brain; the changes that are also observed are emotional and psychosocial and Speech impairment or weakness of one side of the body can happen [3]. In addition, aphasia is suggested to a vast forecaster of a bad quality of life after a stroke [4].

Aphasia is present in 21–38% of acute stroke patients and is associated with high short- and long-term morbidity, mortality, and expenditure [5]. Recovery from aphasia is possible even in severe cases. While speech-language therapy remains the mainstay treatment of aphasia [6]. A valid prognosis of aphasia could be made within 1 to 4 weeks after the stroke depending on the initial severity of aphasia. Initial severity of aphasia was the only clinically relevant predictor of aphasia outcome. Sex, handedness, and side of stroke lesion were not independent outcome predictors, and the influence of age was minimal [7].

Quality of life (QoL) remains an important post-stroke outcome and a crucial challenge for medical care. Special attention should be paid to QoL in post-stroke patients with aphasia because it is a common post-stroke disorder with high prevalence [8, 9]. In recent studies, the severity of aphasia seemed strongly correlated with QoL, even more so than cancer or Alzheimer's disease perhaps because our modern society relies on fast and efficient communication in the oral and written modalities [10,11]. Therefore, identifying and managing specific factors such as impaired language and communication after stroke is essential to improve patients' QoL [4].

Quality of life is affected in Aphasia after stroke which includes the following socio-economic factors age, gender, level of education, marital status, occupation, and monthly income [12]. The clinical factors that had significant associations with Quality of life after stroke Aphasia were level of dependence and disability, type of stroke, side of the lesion, type of aphasia, and level of language impairment [13]. Social isolation, emotional distress, and most of the co-morbidities (hypertension, depression, diabetes, and cardiac disease) affect the quality of life after stroke aphasia [12, 14].

Prior studies have investigated the variables that affect the quality of life after a stroke in patients with aphasia from different populations. To the best of the authors' knowledge, no research has been done on the population of Pakistan. Given that bio-psychosocial variables, including aphasia type, age, and kind of stroke, are important determinants of quality of life unique to post-stroke aphasia patients. Investigating their relationship with this outcome in the Pakistani population is vital, therefore. Thus, the objective of this study was to determine the variables influencing stroke-specific quality of life among Pakistani patients with post-stroke aphasia in Pakistan.

METHODOLOGY

Study design: This was a cross-sectional analytical study conducted in the RHS Rehabilitation Centre (No: RHS/EC/08-12-2021-04), Islamabad from January 2021 and December 2022. This study was approved by the Research and Ethical Committee (REC) Health Education Research Foundation (HERF) (HERF/Research/REC/No-2021-012). And was carried out according to the principles stated in the Declaration of Helsinki. Written informed consent was obtained from participants as well as from the caregivers to participate in the study.

Participants: The independent participants with fluent and non-fluent aphasia at least six months post-stroke, and able to follow one-step commands were included in the study. The stroke patients diagnosed with Global aphasia, having cognitive impairment, and/or unable to communicate were excluded from this study. A non-probability convenience sampling technique was used for sample collection.

Outcome measures: To predict the quality of life of post-stroke aphasia patients the following factors age, gender, marital status, family status, socioeconomic status, type of stroke, type of aphasia, and comorbidities were included after a thorough review of literature and discussion with clinical experts. Based on the WHO disability assessment scale, the SS-QOLS is a measure for assessing the quality of life of stroke patients. The scale consists of 12 categories with between three and six items each, a total of 49 questions. A minimum score of 1 (total help needed) and a maximum score of 5 (no help needed) are assigned to each question on a 5-point Likert scale. Both verbal and nonverbal techniques are used to obtain the data using a questionnaire. Values vary from 49 to 245; higher values indicate a greater quality of life, while lower levels indicate a worse quality of life[15]. Although the participants were able to communicate through writing to avoid recall bias the presence of a caregiver was ensured for the accuracy of data collection.

Sample size: A total of n=136 sample size was calculated through G power, keeping effect size medium (0.15), α error margin at 0.05. To avoid β error probability, the power (1- β) was set at 0.90%

https://doi.org/10.52567/trehabj.v7i04.22

and the total number of predictors was 8. A total of n=298 stroke patients were evaluated for the inclusion criteria and n=134 subjects fulfilled the inclusion criteria.

Statistical methods: The data was presented in the table and graphs as mean±Sd and n(%). The multiple linear regression test was applied to predict the quality of life after a specific stroke aphasia. The dummy variables were created of categorical variables including gender, marital status, family status, socioeconomic status, type of stroke, type of aphasia, and comorbidities, while the age was in continuous variable. The SPSS version 28 was used for data analysis.

RESULTS

The mean age of the n=134 study participants was 64.87±7.90 years. A total of n=66 (49.3%) was male and the remaining n=68 (50.7%) were females. The mean score of stroke specific quality of life (SS-QoL) showed that the mean score of the participants was 50.60±16.93. The frequency distribution can be seen in Figure 1.

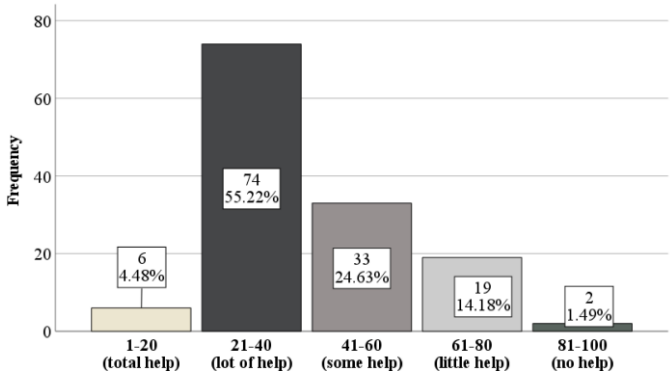

Figure 1: Frequency distribution of SS-QoL

A multiple regression model was run to predict quality of life from age, marital status, gender, family status, patient's socioeconomic status, types of strokes, types of aphasia and comorbidities. This model significantly predicted quality of life {F (13,120) =10.366, p<0.001}. All variables cause 47.8% (Adj. R2=.478) variance in stroke specific quality of life in aphasia patients.

Table1. Quality of life predictors among post Stroke aphasia patients

		N	Mean	Std.	*β*	95% CI	Sig.
Age	-	137	64.87	7.90	-0.13	-.50 to .23	0.459
Marital status	Married	79	52.66	16.69	-	-	-
	Single	19	57.89	18.73	-8.41	-16.43 to -.46	0.043*
	Widow	27	39.26	12.98	-6.06	-12.61 to 3.51	0.193
	Widower	9	51.11	10.54	-5.89	-14.99 to 3.84	0.218
Gender	Male	66	56.97	15.38	-	-	-
	Female	68	44.41	16.15	-6.93	-12.89 to -1.27	0.022*
Family	Joint	53	53.58	18.30	-1.71	-6.87 to 3.65	0.520
	Nuclear	79	48.61	15.91	-	-	-
	Single parent	3	50.00	14.14	-3.23	-24.43 to 14.95	0.741
Socioeconomic status	Lower	62	45.16	9.53	-	-	-
	Middle	62	50.97	17.99	5.73	-10.44 to .97	0.103
	Upper	10	82.00	11.35	36.45	20.77 to 41.67	0.000***
Types of stroke	Hemorrhagic	61	46.56	15.37	-	-	-
	Ischemic	73	53.97	17.53	11.86	5.98 to 17.06	0.000***
Types of aphasia	Fluent aphasia	29	50.34	13.75	-	-	-
	Non fluent aphasia	105	50.67	17.77	-12.47	-19.60 to -5.33	0.001**
Comorbidities	Hypertension	89	48.54	13.78	-	-	-
	Diabetes	20	48.00	22.85	1.34	-5.32 to 8.88	0.720
	Cardiac disease	25	60.00	19.14	10.79	4.15 to 17.78	0.002**

[a]Reference variables; p<0.05, p<0.01**, p<0.001***; SD-Standard deviation; CI-Confidence Interval*

Individually, post-stroke aphasia patients' quality of life (QoL) was not significantly impacted by age or family system (p<0.05). However, compared to married people, stroke patients with aphasia were shown to have a significantly worse QoL if they were single (p=0.043), although widowhood or widower hood (p<0.05) were not significant predictors. In terms of gender, male participants significantly predicted higher QoL compared to female participants (p=0.022). When

https://doi.org/10.52567/trehabj.v7i04.22

compared to participants from lower socioeconomic backgrounds, higher class participants significantly predicted better QoI (p<0.001), while middle class participants did not (p=0.103). When compared to those who had haemorrhagic stroke, participants with ischemic stroke significantly predicted improved QoI (p<0.001). Furthermore, compared to fluent aphasia, non-fluent aphasia significantly predicted QoI (p<0.001). While diabetes was not a predictor of QoI (p=0.720) in post-stroke aphasia, participants with heart illness significantly predicted higher QoI (p<0.001) as compared to hypertension. (Table 1)

DISCUSSION

The main objective of the study was to predict the quality of life after stroke aphasia. It was hypothesized that there is a significant effect of age, gender, marital status, family status, socioeconomic status, type of stroke, type of aphasia, and comorbidities on quality of life after stroke aphasia. The result showed that all factors significantly predicted the quality of life in post-stroke aphasia patients, except age and family status.

The current study showed a non-significant impact of age and quality of life in aphasia because most of the participants were severely affected where lot of help was needed to perform their daily tasks. In a previous study, age has not been associated with improved QoL in patients with stroke aphasia [16]. Some studies showed that younger individuals showed greater improvement in communication related QoL [17, 18]. As Hyejin Lee et al conducted a study on aphasia where they also observed the quality of life with associated factors Age is one of them where they showed that age affects the quality of life based on the severity of aphasia [12].

Marital status is a significant predictor of quality of life in aphasic patients. The current study showed that a higher score shows an improved quality of life in married than the others who are single, widow, and widower. Because married people are dependent on their spouse, they have their caretakers and are emotionally strong because of their motivational level but the other participants who were single, widows or widowers had decreased quality of as they are already in some way mentally or emotionally targeted. A recent study was conducted in South Korea at the national level where differences in quality of life depending on marital status in men and women were observed. The EQ-VAS scores of men were a more sensitive indicator of the decline in the quality of life that occurred with marriage problems than the decline associated with single status. However, the decline in QOL associated with single status was greater than that associated with marriage problems using the EQ-5D [19].

In the current study, the females had decreased quality of life after post-stroke aphasia. The possible reasons are bio-psychosocial differences between males and females regarding illnesses. Generally, females have a lower quality of life than males due to sociocultural problems, challenges by their traditional household activities ignorance of their healthcare needs, and increased depression, stress, and anxiety. These factors further reduce the quality of life with chronic illnesses like stroke [20, 21]. On the other hand, a previous study showed improved quality of life in females rather than males because females are fluent, decreased repetitions, increased information content, and comprehensive speech [22].

Quality of life in aphasia after stroke showed a significant impact on socioeconomic status where the current study showed improved quality of life in the upper class while the lower class and middle class showed decreased quality of life because there may be the reason of financial issues, no support, loss of awareness and no treatment facilities are provided. Previous studies in support of the current study that there is a relation between the severity of aphasia the socioeconomic status. When there is high income the quality of life improves while the family with low socioeconomic status have decreased QoL [23, 24].

In a study conducted by Mariana Mendes Bahia et al on quality of life after post-stroke aphasia and differences between fluent and non-fluent aphasia, the result showed a high score in fluent aphasia which shows that better quality of life than the non-fluent aphasia [25]. Non-fluent aphasia may cause difficulty in communication which affects the psychologically due to depression, anxiety, stress social isolation, and dependency on caregivers to communicate and participate in any task that involves effort or energy. These all reasons decrease the quality of life in post-stroke aphasia patients [12]. The current study also showed that there is variation between fluent and non-fluent aphasia regarding the quality of life after post-stroke aphasia.

A current study showed that the type of stroke is a significant predictor of quality of life after post-stroke aphasia; the ischemic stroke has better QoL than the hemorrhagic stroke because decreases the cognitive abilities and increases the severity of aphasia. A study was conducted by Seo KC et al on Post-stroke Aphasia to evaluate the quality of life on Ischemic Versus hemorrhagic stroke which supported the current study [26]. A study reported that aphasia due to hemorrhagic stroke positively impacts the quality of life than ischemic stroke. The hemorrhage may cause dislocation of the AF fiber

https://doi.org/10.52567/trehabj.v7i04.22

bundles due to compression effects of the hematoma, but in ischemic stroke, these AF fiber bundles destroyed [10]. So an ischemic stroke has less effect the speech and comprehension than a hemorrhagic stroke [27].

The current study showed that family status does not have a significant impact on quality of life after stroke aphasia although the joint family system had a higher score in quality of life than the other family system. The literature suggests that in South Asia, the joint family system positively impacts the quality of life in chronic illnesses than the other family systems. Because the joint family system supports them physically, emotionally, mentally, and socially which improves the quality of life [28].

The literature suggests that presence of comorbidities including hypertension, diabetes mellitus, and cardiac disease can affect the quality of life after stroke [29]. In the current study, it was observed that the presence of comorbidities leads to decreased Qol in patients with aphasia. The result of the current study suggested that post-stroke aphasia patients with hypertension had low QOL as compared to cardiac disease. Hyperglycemia and cardiac disease i.e. atrial fibrillation reduce the blood supply to the brain which impairs the cerebral auto-regulation and decreases cerebral perfusion, which aggravates the injury to the blood-brain barrier due to ischemia, which may further aggravate the stroke and aphasia [30]. Hypertension may also contribute to reduced cerebral blood flow and perfusion, induce an ischemic effect, and cause shrinkage of the brain, which may triple the risk for cognitive decline and dementia. These factors also affect the aphasia and may reduce the Qol [31].

There are psychological factors like depression, anxiety, and stress which were not studied, may affect the results of current research.

CONCLUSION

It is concluded that, the male gender, married marital status, middle and upper socioeconomic status, ischemic stroke compared to haemorrhagic stroke, fluent aphasia, and the cardiac disease compared to other comorbidities positively affect the quality of life in post stroke aphasia patients. But the age and family system did not show any impact on the quality of life. It is recommended that multiple centered studies, to predict the quality of life with large sample size as well with more detailed bio psychosocial factors, must be considered.

DECLARATIONS & STATEMENTS

Author's Contribution

NIB: substantial contributions to the conception and design of the study.
SWS and UH: acquisition of data for the study.
AO and SS: interpretation of data for the study.
STS: analysis of the data for the study.
NIB and RH: drafted the work.
NIB, SWS, UH, AO, SS, STS, RH and EB: revised it critically for important intellectual content.
NIB, SWS, UH, AO, SS, STS, RH and EB: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by Research and Ethical Committee of Health Education Research Foundation (HERF/Research/REC/No-2021-012) as well as from Ethical Committee of RHS Rehabilitation Centre, (No: RHS/EC/08-12-2021-04).

Consent Statement

The written informed consent was obtained from participants as well as from the care givers to participate in the study.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions

Acknowledgments

Thanks to the participants of this study for sharing their personal experienceswith pain

Conflicts of Interest

The authors declare no conflict of interest.

Funding

This research received no funding. The authors declare that no funds, grants, or other support were received during the conduction of research and preparation of this manuscript.

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https://doi.org/10.52567/trehabj.v7i04.22

Research Article

Barriers to utilizing low vision devices among non-users with low vision: A cross-sectional study

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ABSTRACT

Background: By recognizing and comprehending the obstacles that prevent low vision devices (LVDs) from being used effectively, the burden of blindness can be reduced.

Objective: To find the barriers to the utilization of low-vision devices (LVDs) among non-users in patients with low vision.

Methods: A cross-sectional study was conducted in the low vision department of Al-Shifa Trust Eye hospitals in Rawalpindi, Pakistan for a duration of six months from July 2021 to December 2021. Low-vision individuals with visual acuity <6/18 fulfilling the criteria of low vision and prescribed low-vision devices over the period of 6 months but not using them were included in this study. A total of **n=**420 patients were evaluated for eligibility, out of which n=255 were prescribed low-vision devices due to low vision. The data was collected on the self-structured questionnaire in accordance with the tenets of Helsinki's declaration.

Results: Out of n=255, a total of n=105 were using (acceptance) and n=150 were not using (non-acceptance) the LVDs. Out of 15 possible barriers, fear of being perceived as blind N=120(80%) is the major cause of non-acceptance of devices among low-vision individuals. It was followed by difficulty in handling low-vision devices n=106(70.7%) and low affordability n=106(70.7%). While fear of loss of job 2(1.3%) was selected as the least occurring problem in non-acceptance of devices.

Conclusions: Leading barriers included stigma, lack of information, concern over losing one's job, fear of being viewed as blind, and low necessity.

Keywords: blindness; low vision; low-vision devices.

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Citation
Tariq I, Ayyub F, Tanveer M, Iqbal S, Shahzadi A. Barriers to utilizing low vision devices among non-users with low vision: A cross-sectional study. T. Rehabili. J. 2023:07(04); 09-13 doi: 10.52567/trehabj.v7i04.38.

Article History
Received on: 09-03-2023
Revision on: 01-11-2023
Published on: 08-11-2023

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INTRODUCTION

World Health Organization (WHO), defines low vision patient as a person having visual acuity of less than 20/60 to light perception or having a visual field of less than 10° from the point of fixation, even after receiving medical, surgical, and/or standard refractive correction but he/she is capable of performing the activities of daily life [1, 2]. According to the Vision Loss Expert Group (VLEG), 253 million individuals worldwide are visually impaired. People with vision impairment make up about eighty-nine percent of the population in low- and middle-income nations (LMIC) [3, 4].

There is a connection between visual impairment (VI) and falling, fractures, and a higher mortality rate. Psychological issues, such as depression and anxiety, are more likely to develop in those with visual impairment. People with reduced vision can improve their quality of life by receiving vision rehabilitation, which instructs them on how to use their remaining eyesight more effectively [5]. They might regain or maintain their independence with the aid of various visual and adaptive aids. Devices for people with limited vision are an efficient way to provide visual rehabilitation, according to the literature [6]. Despite the fact that low vision services help patients by enhancing their quality of life [7], awareness of the services among eye care professionals (ECPs) and low vision service uptake remain low, even in developed nations [8].

The need for low vision services and their uptake are not aligned. A number of barriers may make it more difficult for people to access low vision services including limited low vision services or there may not be enough experts with the necessary training to offer these services [9]. Some studies reported that social stigma, difficulty in handling the devices, lack of knowledge, fear of loss of job, poor communication between eye care professionals and patients, low affordability and fear of being viewed as blind also appear as a main barrier [10-12].

Many low vision patients have been prescribed low vision devices, but they are not using them due to some barriers. By being aware of these obstacles, campaigns can be developed to raise awareness among patients, healthcare workers, and public. It will also motivate patients to use their devices in their daily life activities so that their quality of life may improve, and they can live an independent life. So, this study aims to assess the barriers faced by low-vision patients in utilizing low-vision aids.

METHODOLOGY

This cross sectional study was conducted from July 2021 to December 2021 at the low vision department of Al-Shifa Trust Eye Hospital, Rawalpindi Pakistan (ASTEH) after approval from Ethical Review committee (ERC-72/AST-21). This study included patients who were prescribed low-vision devices (LVD) and had visual acuity of less than 6/18. The patients of age fewer than 10 years, having distance acuity of less than 1/60, and low intellectual levels were excluded from this study.

The data was collected through non-probability sampling technique. A total of n=420 participant were evaluated for the selection criteria, n=255 patients were prescribed with low vision aids (LVA). Out of which n=150 patients (not using LVA) fulfilled the inclusion criteria and remaining n=105 (using LVA) were excluded from the study.

The outcome variable of this study was barriers to using low vision aids (LVAs), which was measured by asking those questions that were scaled into yes and no. The first section of the questionnaire gathered data on the patients' socio demographics while inquiries on their eye health and low vision aids were part of the second section. The last part consists of questions about the barriers to low-vision devices, which was based on similar studies published previously [5].

Before participation in this study, verbal informed consent was also taken from every individual. At every stage of the study, the confidentiality of the patient's data was upheld, and the ethical standards of research were properly considered. All the data was collected under the supervision of experts in this field. Distance and near visual acuity of the patient was recorded using an Early Treatment Diabetic Retinopathy Study (ETDRS) chart and Lighthouse near vision chart respectively. After that, visual acuity with the prescribed low vision devices was recorded with which vision gets improved and then the questionnaires was filled for not using it to find the barriers. For the patients of age, less than 16 years' parents or caregivers were the main decision-makers who answer the questions on the behalf of the children.

The Statistical Package for Social Sciences (SPSS) version 21 was used to enter and analyze the responses. The tables and charts were used to depict the frequency and percentages for categorical variables and the mean standard deviation for continuous data.

RESULTS

A total of n=72(48.0%) was male and remaining n=78(52%) was female. The n=83(55.3%) of participant's age were between 17-25 years, while n=39(26%) was between 26-45 years and remaining n=28(18.7%) had age more than 45 years. The other demographic characteristics of study participants can be seen in table 1.

https://doi.org/10.52567/trehabj.v7i04.38

Table 1: Demographic characteristics of the patients

Variables	Category	Frequency	Percentage (%)
Occupation	Students	92	61.3
	Jobholders	18	12.0
	Laborers	15	10.0
	Homemaker	17	11.0
	Others	8	5.3
Telescope	Vista View	64	42.7
	Monocular	26	17.3
	Binocular	34	22.7
	None	26	17.3
Magnifier	Stand	3	2
	Handheld	11	7.3
	Illuminated	31	20.7
	None	105	70

The major causes of low vision reported were maculopathy n=39 (26%), RP n=22(14.7%), Albinism n=16(10.7%), Diabetic retinopathy n=10(6.7%), Retinal detachment n=10(6.7%) and Nystagmus n=10 (6.7%), cataract n=9 (6%) Glaucoma n=9 (6%), ARMD n=7(4.7%) and others n=18 (11.8%).

The mean score of best-corrected distance visual acuity (BCDVA) of the left and right eyes were 1.07±0.36 and 1.04±0.32 diopters respectively. The mean near vision was1.48±0.84diopters.

Fear of being perceived as blind N=120 (80%) followed by difficulty in handling the device N=106 (70.7%) and low affordability N=106 (70.7%), visual fields restriction N=103 (68.7%), discomfort N= 94 (62.7%) were the major barriers for not using low vision devices. The other barriers can be seen in table 2. Most patients were prescribed by Telescopes followed by filters and non-optical devices. (Figure 1)

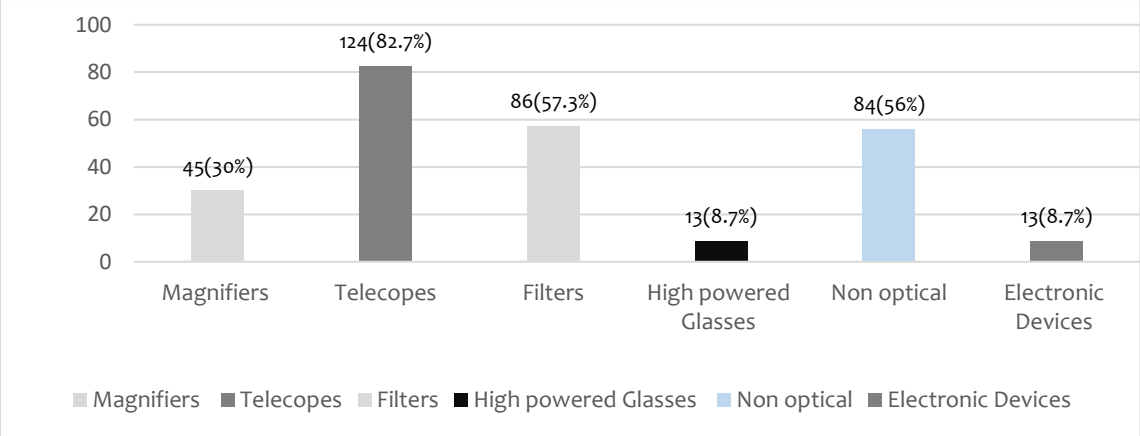

Fig 1: Low-Vision Devices

Table 2: Frequency distribution of Barriers perceived using Low vision devices

Variables	No	Yes
Fear of being perceived as blind	30(20)	120(80)
Low affordability	44(29.3)	106(70.7)
Difficulty in handling the device	44(29.3)	106(70.7)
Visual fields get restricted	47(31.3)	103(68.7)
LVDs cause discomfort	56(37.3)	94(62.7)
Lack of knowledge	58(38.7)	92(61.3)
People make fun	59(39.3)	91(60.7)
Social stigma	68(45.3)	82(54.7)
Tiring/cumbersome to use	71(47.3)	79(52.7)
Time-consuming	96(64.0)	54(36.0)
Poor communication between eye care professionals and patients	100(66.7)	50(33.3)
Low necessity	123(82)	27(18)
Lack of family or social support	127(84.7)	23(15.3)
Denial of the magnitude of the illness	141(94.0)	09(6.0)
Fear of loss of job	148(98.7)	2(1.3)

DISCUSSION

Assessing the barriers patients with low vision have utilizing low-vision devices was the main goal of this study. It was seen that many of the patients are afraid of being perceived as blind by using low-vision devices which include telescopes, filters, non-optical aids and magnifiers. This is followed by difficulty in handling low-vision devices, and some cannot afford these devices due to other reasons.

Sylvester et al [13] found that most barriers in low vision patients include lack of awareness, high cost of low vision devices, and social stigma or denial related to low vision. However, this study [13] was an organizational study i.e, the response of health care

https://doi.org/10.52567/trehabj.v7i04.38

practitioners was recorded instead of low vision patients, and data was collected from the practitioners from different organizations. Even with this research model the major barrier in the study remains the denial and unacceptability in social platforms along with the high cost of low-vision devices.

K S Khimani et al [14] stated that social anxiety and depression (76%) and denial of the need for low vision aids (71%) are the major cause of barriers to the utilization of the devices. Similarly, Charles Walter et al [15] also reported that the psychological and economic barriers remain at large in low-vision patients who are seeking and availing low-vision related management. Interestingly, in another report, the rate of non-acceptance was high in the patients that have retinitis pigmentosa and high refractive error as the use of low vision devices reduces the already restricted visual fields and impairs depth. (10) The restricted visual field in the current study was found to be the 4th major barrier in the non-acceptance of low vision aids.

Previous studies at different times and regions also showed that the major cause of low vision is macular pathologies, then comes retinitis pigmentosa and diabetic retinopathy. [10,16] Wong et al [17] also added that in East Asia, refractive error is likewise the main factor contributing to visual loss. Age-related macular degeneration is the main contributing factor, according to J. Lindsey et al. [18] The majority of mentioned studies agree with the current study on the leading cause of low vision in different areas and regions.

Because of decreased visual acuity, the patients could not self-administer the questionnaire. The questions were thus read loudly, and responses were recorded according to observation of researcher. This technique may have introduced a bias that has affected the patient's responses. This study was cross-sectional, further longitudinal studies are required to determine the leading barriers in utilizing low vision devices.

The sample size of the current study was low and the data for the barrier identification was not obtained from the users of LVAs.

CONCLUSION

The current study revealed that leading barriers included stigma, lack of information, concern over losing one's job, fear of being viewed as blind, and low necessity. The burden of blindness can be lessened by addressing the underlying factors that lead to the underuse of low vision devices.

DECLARATIONS & STATEMENTS

Author's Contribution

IT: substantial contributions to the conception and design of the study.
IT and FA: acquisition of data for the study.
MT and AS: interpretation of data for the study.
SI: analysis of the data for the study.
SI and AS: drafted the work.
IT, FA, MT, SI and AS: revised it critically for important intellectual content.
IT, FA, SI, MT and AS: final approval of the version to be published and agreement to be accountable for all aspects. of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted after getting approval from the Research Ethical committee of Al-Shifa Trust Eye Hospital, Rawalpindi (ERC-72/AST-21).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

None to declare.

Funding

None to declare.

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https://doi.org/10.52567/trehabj.v7i04.38

Research Article

Effects of additional functional strength training on mobility in children with hemiplegic cerebral palsy

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ABSTRACT

Background: Cerebral palsy (CP) affects the mobility and functional strength of children which leads to a decline in the quality of life of children. Functional strength training may considered objective-oriented to achieve some specific activity level and improve the overall performance of children.

Objective: To determine the effects of additional functional strength training on mobility in Children with Hemiplegic Cerebral Palsy (HCP).

Method: A single-blind randomized control trial (NCT05878756) was conducted on (n=40) children with hemiplegic cerebral palsy (HCP) at the National Institute of Rehabilitation Science, Islamabad. Children who can follow commands, not using assistive devices, and are not being treated in any other rehabilitation services were included. Children aged 4-12 years were recruited through a non-probability convenient sampling technique and a total of n=40 participants were randomly divided into Group A (n=20) which received conventional therapy along with functional strength training for 4 weeks, while Group B (n=20) only received conventional physical therapy. Both groups received intervention for 4weeks. The tools, Gross Motor Function Measure (GMFM) used for the severity of mobility and, five times sit-to-stand (FTSTS) to assess functional lower extremity strength, transitional movement balance, and fall risk in older adults, were used at baseline and post-treatment assessment.

Results: Both groups had improvements in strength and mobility but there was significant improvement in strength and mobility in Group A after 4th week ($p \leq 0.05$). However, no significant increase in the dimension of lying and kneeling was observed. Comparison within both groups for dimensions of walking, running, and jumping in both groups showed significant improvement ($p=0.045$). According to the result of GMFM scoring, a significant improvement in the interventional group (A) as compared to Group B ($p=0.003$).

Conclusion: It is concluded that additional functional therapy has a better outcome as compared to conventional therapy on mobility and strength of children with CP

Keywords Cerebral palsy; functional strength training; mobility; gross motor function measure; gross motor function classification system

Clinical Trials.gov Identifier: NCT05878756

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Citation

Afzal MT, Tariq S, Khan MS, Tariq Z, Anjum H, Sairien S. Effects of additional functional Strength Training on mobility in Children with Hemiplegic Cerebral Palsy. T Rehabili. J. 2023:07(04); 14-19 doi: 10.52567/trehabj.v7i04.8.

Article History

Received on: 05-07-2023
Revision on: 20-12-2023
Published on: 21-12-2023

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INTRODUCTION

Cerebral palsy (CP) is a group of everlasting movement disorders [1]. In HCP; patients have unilateral impairment including, decreased ROM, strength, coordination, and sensation often affecting their bimanual activities and limiting their participation[2]. Moreover, infants with cerebral palsy may face difficulty in rolling over, sitting, crawling, or walking and might be labeled as delayed until or unless no prominent sign or symptom is observed[3]. In addition to this, children with cerebral palsy also have weak and stiff muscles and tremors[4].

strength training is important for children with cerebral palsy, which improves flexibility, postures, strength, and walking in children with cerebral palsy so that they can perform their ADLS and IADLs more easily and improve appearance, health, overall function, and general well-being[5,6]. Functional physical therapy is based on the supposition that an increase in motor impairments causes participation restrictions and a decrease in activity limitation[7,8,9]. Functional activities are learned by the repetitive practice of goal-oriented tasks in each functional situation. This approach instead of focusing on normality, it focuses on functionality[10]. In this way, the child must practice a given task functionally rather than normally[9, 10].

It is vital to research functional strength training in children with hemiplegic cerebral palsy. Since their motor deficiencies interfere with their day-to-day functioning, strength training, focuses on certain weaknesses and offers a comprehensive approach to recovery. Customized treatment regimens and an enhanced quality of life may result from this, supporting evidence-based therapies and more successful rehabilitation techniques. It was hypothesized that additional functional training significantly improves symptoms associated with hemiplegic spastic CP. So, the purpose of this study was to determine the effects of additional functional strength training on mobility in Children with Hemiplegic Cerebral Palsy (HCP).

METHODOLOGY

It was a single-blinded randomized control trial RCT conducted NCT05878756) at the National Institute of Rehabilitation Medicine Islamabad from April 2020 to September 2020 after the approval from the Yusra research ethical committee (Ref no: YIRS/02/20).

Children aged 4 -12 years, who can follow commands, not using assistive devices (GMFCS Level I & II), and not being treated in any other rehabilitation centre, were included. The children having fixed contractures underwent surgery, received Botulinum Toxin diagnosed cases of mental retardation due to seizure, and having acute illness and inflammation were excluded.

The participants were recruited through a non-probability convenient sampling technique. A total of n=40 samples was calculated by G*Power with the effect size small (0.273), with α error margin at 0.05. To avoid β error probability, the power (1- β) was set at 0.80% [6].

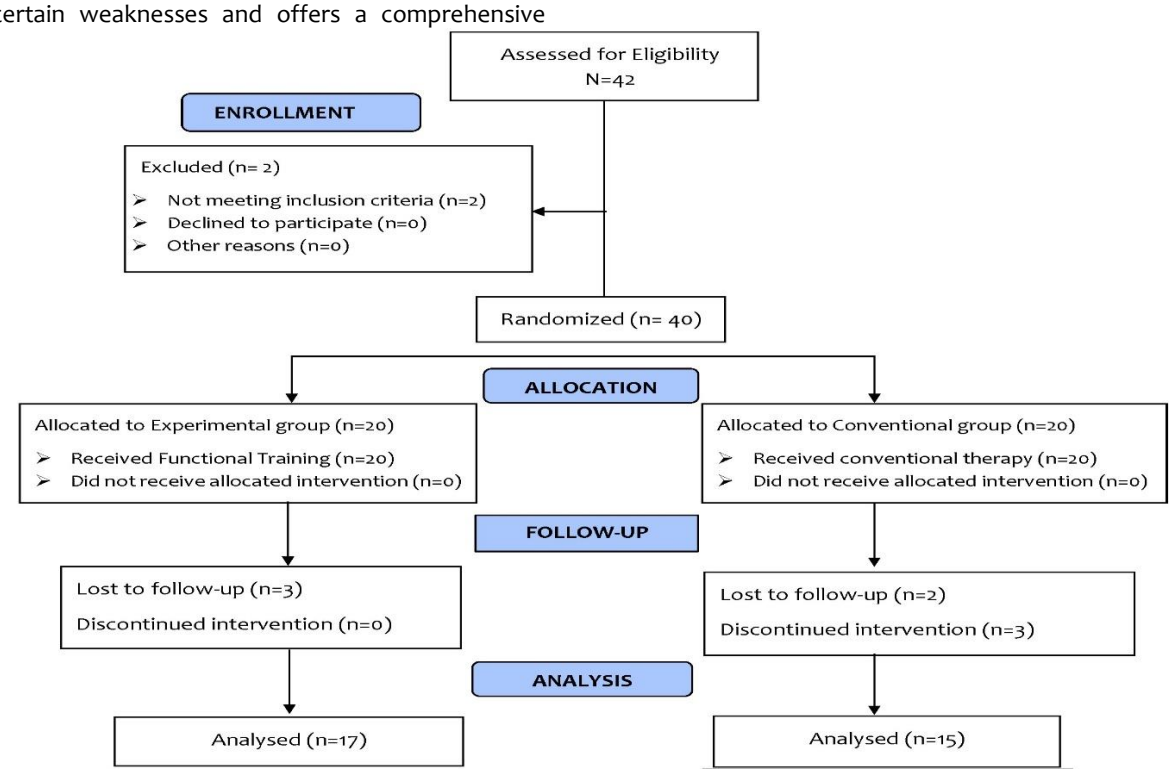

Figure 2: CONSORT diagram

https://doi.org/10.52567/trehabj.v7i04.8

Patients with HCP were randomly allocated to Group A (n=20) which received functional strength training in addition to conventional therapy and Group B (n=20) only received conventional physical therapy. In Group B n=5 children did not continue the treatment plan due to parent's problems while in group A n=3 children left the treatment due to seizures and unstable health conditions. A total of n=32 participants were included in the data analysis. (Figure 1).

The parents of all participants signed the informed consent form. The assessment was done two times at baseline and after 4th week of intervention. The tools used in this study were a Gross Motor Function Measure (GMFM) and Five time sit to stand test (FT-STS).

GMFM is used to determine gross motor function capacity and has five dimensions that are A, B, C, D, and E. Dimension A measures lying and rolling, Dimension B measures sitting, dimension C measures kneeling and crawling, Dimension D measures standing and dimension E measures walking along with running and jumping [13]. The FTSTS is used to measure the time needed by participants to complete consecutive STS cycles as fast as possible[14]. At the start, every participant in both groups was assessed for lower limb strength through FTSTS. The total time in seconds taken by the child to complete the task was noted at baseline and 4th week.

Both groups received a total of 30-minute sessions of conventional therapy (stretching exercises). In addition to conventional therapy, Group A was also given a functional strength training program. Functional strength training was given as a home program consisting of ten tasks. Before giving the functional strength training program at home, it was elaborated on in detail. All ten tasks were applied to participants of Group A at baseline week. For the convenience of parents of children with hemiplegic cerebral palsy; the tasks were given in printed form. The printed form of tasks was both in Urdu and English version with the pictures given in front of each task. The number of repetitions and days on which tasks were to be performed were mentioned on the form. The ten tasks were sit-to-stand (STS), one-leg standing, weight shifting (from one side of the body to the other), step-ups, lateral step-ups, squatting against a wall, picking an object from a standing position, walking forward, walking backward, and kicking the ball. The data was collected from participants during the baseline week and after 4th week. (Table 1)

SPSS 21 was used to analyze the data. The test of normality was applied to all variables to assess the homogeneity of a sample at baseline. The decision to apply a parametric or non-parametric test was made based on the Shapiro-Wilk test. which suggested the use of a parametric test, and an independent sample T-test for the between the group differences, while a paired sample t-test was used for within-group changes during the baseline week and after the 4th week of training.

Table 1: Intervention Protocols

	Group A (FST+CPT)	Group B (CPT)
1st and 2nd week	• In this group stretching exercises are performed for 4 weeks. • Static stretching exercises such as trunk rotation, flexion, and extension; hip flexors stretch, standing hamstring stretch; plantar flexors stretch, shoulder, elbow and wrist flexors and supinator. • Stretching applied for 30 sec holds with 30 sec rest. 5 times for each muscle group.	
3rd week	• STS (5 minutes), one leg standing (5 minutes), weight shifting (5 minutes), step-ups (5 minutes), lateral step-ups (5 minutes) • 1-minute rest between each task.	-
4th week	• squatting against wall (5 minutes), picking an object from standing position (5 minutes), walking forward (5 minutes), walking backward (5 minutes), kicking the ball (5 minutes) • 1-minute rest between each task.	-

STS-Sit to stand.

RESULTS

A total of n = 32 children with HCP, including n=23 males and n = 9 females participated in this trial and successfully received the intervention. Group-wise gender distribution was n=11 males and n=6 females in Group A and n=12 males and n=3 females in Group B. There were n=10 cases of right hemiplegic cerebral palsy and n=7 cases of left HCP among the patients in Group A. In contrast, there were n = 8 cases of right HCP and n = 7 cases of left HCP in the Group B group. Within-group analysis regarding STS, GMFM mentioned. (Table 2)

A comparison between Group A which received conventional therapy along with task-oriented functional training given as a home program and Group B which received only conventional therapy was made. In Group A group time taken to complete STS was comparatively more decreased than in Group B. In Group A, the mean STS was decreased at post-training. While in Group B, mean STS decreased very little in the 4th week (Table 3).

https://doi.org/10.52567/trehabj.v7i04.8

Table 2: Within group changes in STS, & GMFM

Variables		Group A		Group B	
		Mean ± SD	p-value	Mean ± SD	p-value
STS	Baseline	17.04 ± 8.32	0.00***	17.20 ± 8.32	0.00***
	After 4th week	12.3 ± 4.29		16.01 ± 4.29	
GMFM	-	-	-	-	-
Lying and rolling	Baseline	43.80 ± 6.97	0.00***	42.18 ± 5.08	0.00***
	After 4th week	44.60 ± 6.28		48.47 ± 4.45	
Sitting	Baseline	46.53 ± 5.54	0.00***	47.00 ± 6.33	0.00***
	After 4th week	49.60 ± 5.91		54.11 ± 6.47	
Crawling and Kneeling	Baseline	33.26 ± 6.63	0.00***	33.82 ± 4.29	0.00***
	After 4th week	35.13 ± 5.02		38.00 ± 2.59	
Standing	Baseline	23.00 ± 6.02	0.00***	23.17 ± 5.63	0.00***
	After 4th week	24.86 ± 5.82		28.88 ± 5.01	
Walking, running and jumping	Baseline	47.26 ± 9.24	0.00***	47.64 ± 6.28	0.00***
	After 4th week	49.53 ± 9.65		56.23 ± 8.39	

Significance level: p<0.05, p<0.01**, p<0.001****

Table 3: Difference of Group A and Group B regarding STS, GMFM

Variables		Group A	Group B	P –value
		Mean ± SD	Mean ± SD	
STS	Baseline	17.04 ± 8.32	17.20 ± 8.32	0.946
	After 4th week	12.3 ± 4.29	16.01 ± 4.29	0.041*
GMFM	-	-	-	-
Lying and rolling	Baseline	43.80 ± 6.97	42.18 ± 5.08	0.454
	After 4th week	44.60 ± 6.28	48.47 ± 4.45	0.052
Sitting	Baseline	46.53 ± 5.54	47.00 ± 6.33	0.827
	After 4th week	49.60 ± 5.91	54.11 ± 6.47	0.049*
Crawling and Kneeling	Baseline	33.26 ± 6.63	33.82 ± 4.29	0.285
	After 4th week	35.13 ± 5.02	38.00 ± 2.59	0.048*
Standing	Baseline	23.00 ± 6.02	23.17 ± 5.63	0.932
	After 4th week	24.86 ± 5.82	28.88 ± 5.01	0.045*
Walking, running and jumping	Baseline	47.26 ± 9.24	47.64 ± 6.28	0.89
	After 4th week	49.53 ± 9.65	56.23 ± 8.39	0.044*

Significance level: p<0.05, p<0.01**, p<0.001****

DISCUSSION

The objective of a recent study was to determine the effects of additional functional strength training on mobility in Children with Hemiplegic Cerebral Palsy (HCP). According to the results, combined therapy i.e. functional therapy along with conventional therapy proves to be beneficial for mobility and strength among children with hemiplegic cerebral palsy, so an alternate hypothesis was accepted.

In 4th week of the training session, there was a decrease in time taken by the participants of both groups to complete FTSTS. However, Group A showed a greater decrease in the time taken to complete FTSTS as compared to Group B. However, the P value is not significant as the duration of training was just 4 weeks. A study was conducted, to see the effect of FTSTS on lower limb strength in CP children at pre and post-training. The training was for six weeks. The median of time spent for FTSTS in participants was considerably decreased from 21.8 at pre-training to 14 sec at post-training. The *P* value was 0.03[17].

After the completion of the four-week training session, no significant p-value was seen for dimensions A (lying and rolling) and C (kneeling). However, an increase in dimensions B (sitting), D (standing), and E (walking, running and jumping) was seen. A study was conducted to check the effect of physical activity on CP children. The dimensions A and C showed a significant difference. so the findings of dimension C are in line with recent research while that of dimension A contradicts[18].GMFM was used to evaluate standing and walking ability in HCP children in the present research. Dimensions D and E were slightly increased. A study was conducted to assess dimensions D and E only in children with cerebral palsy. The duration of the study was ten weeks. The walking ability was assessed by a 6-minute walk test. There was a highly significant difference of p=0.005 seen at the end of a training session in GMFM, dimensions D and E. In the present study, there was a less significant increase in p-value. However, it can be improved by increasing the number of weeks as reported by Anderson[19].

The results of the recent study are also supported by the results of a study done by Eun-YoungParka1 et.al. They performed a meta-analysis to check the effect of strengthening exercises in children with CP. A total of 13 studies were chosen and all showed a positive increase in muscular strength provided if a session is given three

https://doi.org/10.52567/trehabj.v7i04.8

times/day for at least forty to fifty min. There was an improvement in the GMFM score was also seen[20]. According to a study, a total of 10 adults participated in the research. Out of ten adults, seven were male and three were female. The strength training program was often weeks. There was an improvement in lower limb strength with improvement in STS. So, the results were in favor of the implication of s strength training program for CP children[20].

This study showed an increase in strength and mobility after a four-week training session.in dimension D (standing) and E (walking) of the GMFM. This finding was in line with the study to check the effect on mobility in CP children through task-oriented training. The training session was of five weeks. Dimensions D and E were improved[21]. In this research, the effect of functional strength training on GMFM total percentage score was considerably increased. However, the mean for GMFM total score percentage in Group A was increased in 4th week. This finding was related to the study to check the effect of strength training in cerebral palsied children pre and post-training. The training was of eighteen weeks. Three readings were taken i.e. at baseline, 6 weeks, and 18th week. The total mean score for GMFM percentage was increased in both groups[22].

This study has some limitations that need consideration, it was not convenient for the patient to come daily so a home program was given to groups. Due to lack of follow-up, unable to take assessments after six weeks.

CONCLUSION

The study concluded that combined therapy including functional therapy along with conventional therapy proves to be beneficial on mobility and strength among children with HCP. It makes children more independent in managing daily tasks and enhances the functional status to achieve the optimal goals.

DECLARATIONS & STATEMENTS

Author's Contribution

The following format should be used for author's contribution.
MT: substantial contributions to the conception and design of the study.
SS and ST: acquisition of data for the study.
MS: interpretation of data for the study.
ZT: analysis of the data for the study.
HQ: drafted the work.
MA, ST, MS, ZT, HQ and SS: revised it critically for important intellectual content.
MA, ST, MQ, ZT, HQ and SS: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted from January 2020 to December 2020 in the department of physiotherapy, National Institute of Rehabilitation Medicine, Islamabad. (Ref No: NIRM/ADM/20). Ethical approval was taken from Research Ethical Committee of Yusra Institute of Rehabilitation Sciences, Islamabad (Ref No: YIRS/02/20).

Consent Statement

Informed consent was obtained from attendants and parents of children involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

The authors declare no conflict of interest.

Funding

None to declare.

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https://doi.org/10.52567/trehabj.v7i04.8

Research Article

Effects of moderate physical activity on HB level and psychological well-being in females – A randomized control trial

Rabbyya Kausar[1]*, Qurat Ul Ain[2], Saima waqar[3], Muhammad Manan Haider Khan[4], Mian Omer[5], Humsa Ashraf[6]

ABSTRACT

Background: Physical activity reduce mortality and prevent many chronic diseases; it can promote healthy cognitive and psychosocial function. It is also important to understand the moderate physical activity's affects hemoglobin levels.

Objective: To determine the effects of moderate physical activity on HB level, and psychological well-being in females.

Methodology: A single blinded, randomized control trial was conducted on n=30 participants for a period of 6 months. The participants with the age 18-25 years were recruited through non-probability convenient sampling technique and randomly divided into two groups experimental and control group. The data was collected at the baseline after the six weeks of intervention. The outcome measures were Hb level and psychological wellbeing through perceived stress scale (PSS).

Results: The mean age of study participants was 19.59±1.32 years. While mean BMI of the participants was 24.22±3.43 kg/m^2. The result showed significant increase in hemoglobin concentrations in experimental group as compared to control group ($p<0.001$) after 6th week intervention. On the other hand, there were no significant differences between both group ($p=0.63$) at the end of intervention.

Conclusion: Moderate physical activity group suggests that the intervention had a positive impact on this hemoglobin parameter. However, since there were no significant differences in perceived stress levels.

Keywords: hemoglobin; brisk walking; psychological well-being; push-ups; sit ups; stress scale; physical fitness.

Clinical Trail #: NCT05059314

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Citation

Kausar R, Ain QU, Waqar S, Khan MMH, Omer M, Ashraf H. Effects of moderate physical activity on HB level and psychological well-being in females – A randomized control trial. T Rehabili. J. 2023:07(04); 20-25 10.52567/trehabj.v7i04.44.

Article History

Received on: 05-12-2023
Revision on: 21-12-2023
Published on: 21-12-2023

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INTRODUCTION

Anemia is a worldwide public health issue that affects people of all ages, although it is more common in young girls [1]. The females of reproductive age had iron deficiency anemia 50% worldwide. According to reports, anemia affects 50% of Pakistani women who are of reproductive age, and in Punjab, a province in Pakistan, 21% of women in the 9–29 age group also struggle with of life[4].

Physical activity reduce mortality and prevent many chronic diseases such as hypertension, diabetes, stroke, and cancer, it can promote healthy cognitive and psychosocial function [5]. The physical activity can stimulate erythropoiesis and increase red cell mass as well as plasma volume, resulting in increased blood volume reflect in increased hemoglobin concentration [6].

Regular physical activity, such as exercise and yoga, has been shown to improve mental health, particularly stress reduction. In addition to promoting social relationships, improving sleep, elevating cognitive performance, regulating neurotransmitters, and lowering the risk of diseases like depression and anxiety, it also contributes to long-term mental well-being.

Most of the literature showed that level of physical activity is associated with Hb level and stress. But there is paucity in the literature regarding the cause-and-effect relationship of PA on Hb and stress. Literature shows there is a lack in any defined physical activity, which can affect the Hb concentration and stress. Currently no study was found in Pakistan regarding effectiveness of Physical activity on Hemoglobin concentration in young female. Internationally there is also conflicting result about the effect of exercise in anemia [3].It was also observed in a study that 33.4% of the students had anemia. However, a greater proportion of hostilities (39.2%) was discovered than among day scholars (23.1%) [1]. Anemia has been demonstrated to have an impact on mental health and learning abilities. It can also result in anger, exhaustion, trouble concentrating, weakness, and increased susceptibility to infection. Consequently, anemic patients may tend to be poor in quality increasing or decreasing Hb level [7]. So objective of the current study is to determine physical activity improving hemoglobin concentration and stress in young female.

METHODOLOGY

A single blinded, randomized controlled trial was conducted after taking approval from Research Ethical Review Committee of Riphah international University (RIPHAH/RCRS/REC/Letter-00929), at Fazaia Bilquis College of education for women, PAF Nur Khan, Rawalpindi Pakistan for a period of 6 months. The informed consent was taken prior to the study and in accordance with the Deceleration of Helsinki. The inclusion criteria were undergraduate females with the age criteria of 18-25 years, who had hemoglobin level <12, and showed willingness to participate in the study. While participants were excluded with lower limb musculoskeletal injury, head Injury or trauma in past 6 months, any neurological or musculoskeletal condition and who had acute or chronic infections diseases.

Using a non-probability convenient sampling procedure, n=30 of the n=70 participants who were evaluated for inclusion criteria were found to meet the requirements. The participants were randomly assigned into experimental group (n = 15) and a control group (n = 15).

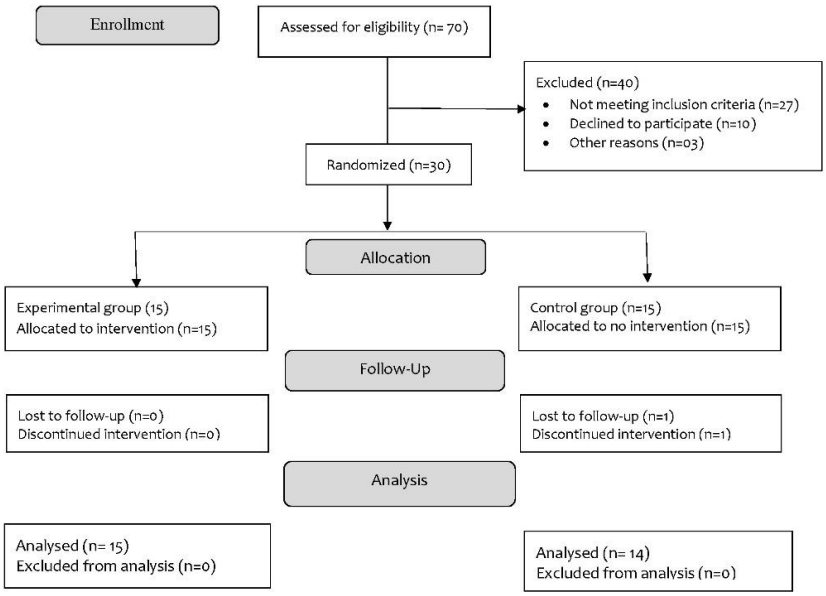

Figure 1: Consort diagram

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The experimental group were given 30 minutes of brisk walking (moderate physical activity) along with the warmup and cool down exercises before and after the intervention, respectively. The duration of the intervention was 5 days a week for 6 continuous weeks. However the control group were advised to continue routine acitivities. The data was collected baseline and post interven after the six weeks. One (n=01) participant from the control group was anot appeared in the post assessment due to loss of followup. (Figure 1)

The randomization was done through sealed envelope method. It was a single blinded study, and to overcome the biasness the assessing researcher was unaware whether the participant was in experimental or control group.

The general demographic data including age and BMI was measured at baseline. BMI is divided into four groups based on the Asian-Pacific cutoff points and is computed as weight in kilograms divided by height in meters squared (kg/m2) [8]. The outcome measures were Hb level and psychological wellbeing. The Hb level was measured through Hb level test, and psychological wellbeing was measured through perceived stress scale [9]. The assumptions of parametric tests were met, thus for with-in group analysis paired sample t-test was used. While for between the group changes, independent t-test was used. The level of significance was set at $p<0.05$ and SPSS version 22 was used to analyze the data.

RESULTS

The mean age of study participants was 19.59±1.32 years. While mean BMI of the participants was 24.22±3.43 kg/m^2. The Distribution of BMI can be seen on figure 2.

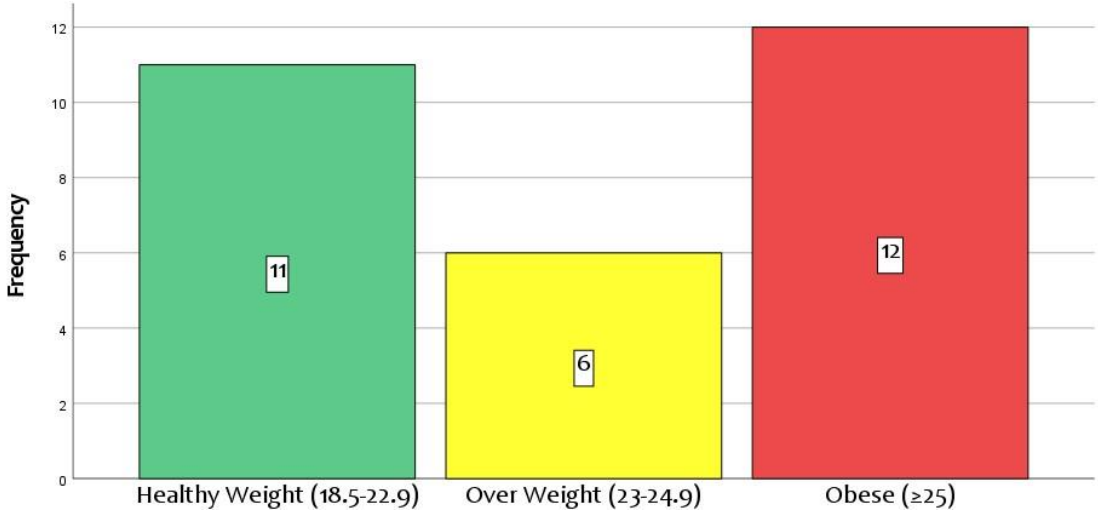

Figure 2: Frequency distribution of BMI (n=29)

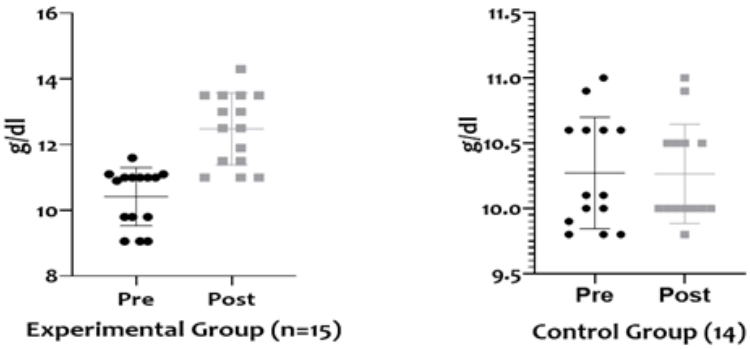

Figure 3: With-in group changes in hemoglobin level and Perceived Stress

The significant changes were observed in experimental group regarding pre-post analysis of hemoglobin level (10.41±0.88 vs. 10.90±.42, MD=-48, p=0.02) and perceived stress 25.4±2.13 vs. 23.8±3.54, MD=-.19, p=0.04) after 6th week of moderate physical activity. While in the control group no significant changes were observed in hemoglobin level (10.27±.42 vs. 10.26±.37, MD= 0.6, p=0.47) and perceived stress (24.21±2.88 vs. 24.50±4.29, MD=-.28, p=0.86). (Figure 3)

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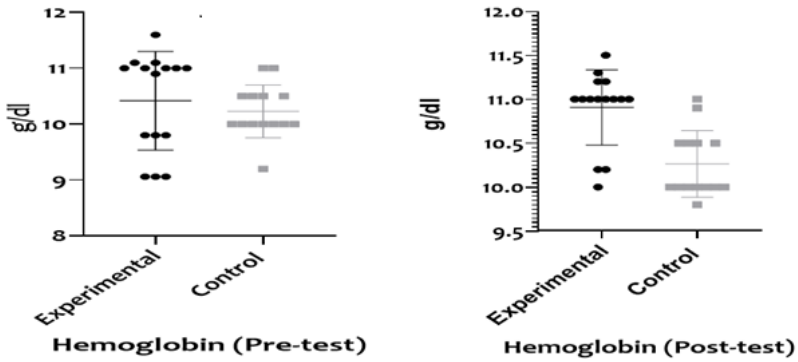

Figure 4: Comparing Hb level and Perceived Stress between groups.

As the data was comparable at the baseline, the result of independent t-test showed significant increase in hemoglobin concentrations in experimental group as compared to control group (10.91+0.42 vs. 10.26±0.37, MD=-.64, p<0.001) after 6th week intervention. On the other hand, there were no significant differences between both group after 6th week regarding perceived stress (23.8±3.54 vs. 24.50±4.29, Md=-.7, p=0.63) at the end of intervention. (Figure 4)

DISCUSSION

The purpose of the study was to determine the effects of moderate physical activity on Hb level, and mental health. According to the results of the study moderate physical activity i.e. brisk walk significantly improved Hb level, and mental health measured on perceived stress scale after 6-week of intervention.

In a recent study, moderate physical activity significantly improve hemoglobin level in blood which is in coherence with the previous study, which demonstrated that brisk walk for long duration improve hemoglobin status [10]. Previous studies reported if a person is involved in a physical activity, muscles work to manage the deficiency and balance the need of oxygen. Therefore, the capability of muscles leads to improve oxyhemoglobin that increase hemoglobin concentration [11, 12]. Another study reported physiological responses such as exercise induce the condition of hypoxia which increase the production of transcription factor. Thus, this mechanism leads to the excessive transportation of oxygen through blood via erythropoietin-mediated erythropoiesis [11, 12].

A study reported that aerobic exercise increased hemoglobin (Hb) concentration and hematologic factors in young females [13]. The increased Hb lead to increase oxygen carrying capacity and maximal oxygen capacity [14]. This is because the network or cell will need more oxygen when doing activities so that there is adaptation in binding oxygen in the blood [15]. But another study conducted on sedentary women suggest that exercise reduce the red blood cells (RBC), hemoglobin (Hb), and hematocrit (HCT) in sedentary women [16-18].

Moreover, results of the recent study showed no significant improvement in mental health measured on perceived stress scale after 6-weeks of intervention of moderate physical activity. But previous study contradict the results of recent study in which brisk walk improves psychological health [19]. Psychological health can be improved by improving cognition and reducing depression and anxiety [20, 21]. However the exact mechanism of improved mental health in unclear but it is associated with neuro-protective effect of exercise. Moderate physical activity has a positive impact on mental health, lowering stress through the production of endorphins, elevating mood through the increase of serotonin and dopamine, and regulating cortisol. Long-term psychological benefits, social engagement, mind-body connection, improved sleep quality, and cognitive performance are all observed [22].

A few female students reported that during their most recent menstrual cycle, the severity of their dysmenorrhea had decreased. It is possible that moderate physical activity triggers the release of endorphins, which are endogenous analgesics that could effectively relieve menstrual cramps, lower stress levels, and thereby lessen menstrual discomfort while elevating mood. Regular physical exercise is also associated with improved general health, which may help to promote more regular menstrual period [22, 23].

This study is a pilot study with small sample size and single centered which limits the generalizability. Moreover, there is variation among the participants regarding the BMI, so can be interact as confounder and may affect the results.

CONCLUSION

The observed increase in hemoglobin concentrations in the experimental group suggests that the intervention had a positive impact on this hematological parameter. However, since there

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were no significant differences in perceived stress levels between the experimental and control groups, more comprehensive study is necessary to better understand the underlying reasons impacting these outcomes, considering the reported observed changes in stress levels and hemoglobin levels.

DECLARATIONS & STATEMENTS

Author's Contribution

The following format should be used for author's contribution.
RK: substantial contributions to the conception and design of the study.
RK and QUA: acquisition of data for the study.
RK and QUA: interpretation of data for the study.
RK and QUA: analysis of the data for the study.
RK and QUA: drafted the work.
RK and QUA: revised it critically for important intellectual content.
RK and QUA: final approval of the version to be published and agreement to be accountable for all aspects.
of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted after taking approval from Research Ethical Review Committee of Riphah international University (RIPHAH/RCRS/REC/Letter-00929), at Fazaia Bilquis College of education for women, PAF Nur Khan, Rawalpindi Pakistan for a period of 6 months. The informed consent was taken prior to the study and in accordance with the Deceleration of Helsinki.

Consent Statement

Informed consent was obtained from all subjects involved in the study

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments

None to declare.

Conflicts of Interest

None to declare.

Funding

None to declare.

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https://doi.org/10.52567/trehabj.v7i04.44

Research Article

Quality of life among first ray amputated diabetic foot ulcer patients

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ABSTRACT

Background: The quality of life among first-ray amputations due to diabetic foot ulcers is of paramount importance in understanding the holistic impact of this surgical intervention.

Objective: To explore the quality of life among first-ray amputated diabetic foot ulcer patients.

Methods: A descriptive cross-sectional study was done using non-probability convenient sampling. The data was collected from Ghurki Trust Teaching Hospital and Shalamar Hospital. A total of n=68 Patients with type II diabetes with first-ray amputation six months ago who aged between 40-65 years were included in this study. The quality of life was accessed through the SF-36 questionnaire. Data analysis was done by using SPSS version 23. Informed consent was taken from every participant and told all the risks and benefits of the study.

Results: In this study of diabetic foot ulcer patients aged 45-64 with a mean age of 52±4.33 years, there were 30 females (44.12%) and 38 males (55.88%). Of the participants, 44 (64.7%) reported a good quality of life, while 24 (35.29%) reported a poor quality of life. The overall quality of life was poor, with a score of 39.92±12.89. Specifically, physical functioning (46.32±24.41), emotional well-being (44.71±16.61), social functioning (36.88±17.46), and general health (46.62±21.03) were poor, while physical (82.35±29.63), emotional (82.35±29.63), role limitations, and pain (62.17±17.77) were good.

Conclusion: The current study concluded that the overall quality of life among first-ray amputated diabetic foot ulcer patients is low.

Keywords: amputation; diabetic foot ulcer; diabetes mellitus, first ray; quality of life; SF-36 questionnaire.

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Citation
Tariq H, Khalid M, Saleem F, Mustafa A, Yousaf I, Allah SM. Quality of life among first ray amputated diabetic foot ulcer patients. T Rehabili. J. 2023:07(04); 26-30 doi: 10.52567/trehabj.v7i04.39.

Article History
Received on: 02-03-2023
Revision on: 19-12-2023
Published on: 24-12-2023

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INTRODUCTION

Type II diabetes mellitus has affected 56 million people in Europe, leading to foot ulceration and amputation [1]. Diabetes causes many minor and major complications and one of the main complications is diabetic foot ulcers which are non-traumatic lesions on the skin of the foot [2] [3].

The prevalence of foot ulcers in the southwest is 11.6%. The overall mortality rate after amputation ranges from 13–40% at 1 year, 35–65% at 3 years, and 39–80% at 5 years [4]. Diabetic foot ulcers (DFU) require much more time to heal and can also become chronic despite treatment [5]. DFU leads to amputation in most cases. As the risk of limb amputation is higher in diabetics than in non-diabetics. First-ray amputation is the removal of first hallux and first metatarsal. It may reduce mobility and affect overall well-being [6].

Thus, some literature is available internationally on the quality of life of amputees, there may have been little research done specifically on Pakistani patients with diabetic foot ulcers who had first-ray amputations. This study can close the knowledge gap and help us better grasp the problems and requirements of this population. So, the objective of the study was to explore the Quality of life among first-ray amputated diabetic foot ulcer patients.

METHODOLOGY

A descriptive cross-sectional survey was conducted on n=68 diabetic foot ulcer patients. The study setting was the Department of Community Health Services, Ghurki Trust Teaching Hospital Lahore (Ref.No.LCPT/2053). The sampling technique was nonprobability convenience sampling. The duration of the study was 6 months from July 2021 to December 2021.

Patients with type II diabetes with first ray amputation six months ago who aged between 40-65 years were included in this study. Patients with burns, tumors, infections, and traumatic patients were excluded from the study.

The sample size was 68 which was calculated by using the World Health Organization (WHO) sample size calculator with 0.046% prevalence (P) [7], 95% confidence interval (1-α), and 0.05 precision (d). Prior informed consent from all patients was taken. The quality of life was accessed with a short form 36(SF-36) health survey questionnaire which has a 0 to 100 score, 0 with the lowest value depicting poor quality of life, and 100 with the highest value showing good quality of life. "Poor" quality of life is defined as a mean score less than 50 in any of the health domains "Good" quality of life is defined as a mean score of 50 or higher in physical and emotional role limitations. Considerable evidence was found for the reliability of the SF-36 (Cronbach's α >0.85, reliability coefficient >0.75 for all dimensions except social functioning). The SF-36 scoring process involved two steps. Initially, numeric values were transformed to establish a higher score indicative of a more favorable health state, spanning from 0 representing the worst possible to 100 indicating the best possible[8]. Notably, the outcome data exhibited normal distribution, prompting the consolidation of items within the same scale through averaging, thereby generating eight mean health domain scale scores. Noteworthy, any items left unanswered by respondents were excluded from consideration. Consequently, the ultimate domain score represented the average across all items within a scale that participants responded to. Subsequently, these domain scores were categorized into different levels of quality of life, encompassing poor and good.

Data was entered by using Statistical Package for Social Sciences (SPSS) version 23 and the same software was used for data analysis. The study variables were presented in the form of descriptive statistics including mean, standard deviation, frequency, and percentages (tables, graphs, and percentages).

RESULTS

The age range of first ray amputated diabetic foot ulcer patients was 45 to 64, with a mean age of 52 ±4.33 years. A total of n=30(44.12%) of the participants were female, while n=38 (55.88%) was male. The n=46(33.19%) of the participants have > 3 months of history of first ray amputation.

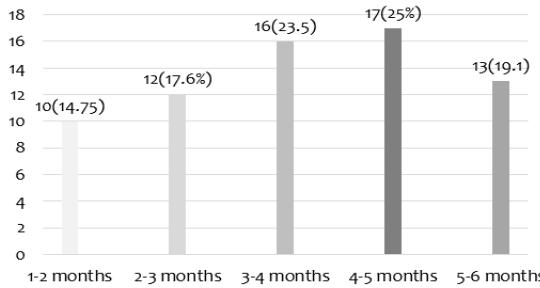

Figure 1: Duration after First Ray Amputation

DISCUSSION

The study examined the quality of life among diabetic foot ulcer patients who had undergone first-ray amputations. The findings offer insights into the well-being of these patients. The study included a group of patients with an average age in their early fifties. The gender distribution was roughly equal, and a significant portion of the participants had a history of first-ray amputation exceeding three months. Some of the participants reported having a good quality of life, while others described their

https://doi.org/10.52567/trehabj.v7i04.39

quality of life as poor. The overall quality of life, as measured by the SF-36 questionnaire, was relatively low. The study revealed variations in different aspects of quality of life. Participants faced challenges in areas related to physical functioning, emotional well-being, social functioning, and general health.

Table 1: Descriptive Analysis of SF-36 Categories (QOL)

SF-36 Categories	Mean	Std. Deviation	Max	Min	Range
Physical Functioning	46.32	24.41	80.00	10.00	70.00
Role Limitations/Physical	82.35	29.63	100.00	0.00	100.00
Role Limitations/Emotional	82.35	29.63	100.00	0.00	100.00
Energy/Fatigue	46.67	12.54	62.50	25.00	37.50
Emotional Wellbeing	44.71	16.61	60.00	20.00	37.50
Social Functioning	36.88	17.46	55.00	10.00	37.50
Pain	62.17	17.77	90.00	45.00	45.00
General Health	46.62	21.03	70.00	20.00	50.00
Overall Quality of life	39.92	12.89			

The findings of this study are consistent with previously published works on the subject [9, 10]. Research has consistently demonstrated that people who have had amputations, particularly because of diabetic complications, frequently face difficulties in a variety of quality-of-life areas [11]. Physical functioning may be hampered by restrictions on mobility and daily life activities. The psychological effects of amputation and its consequences on body image and self-esteem can have an impact on emotional well-being. Reduced involvement in social and recreational activities may undermine social functioning. The mental and emotional effects of amputation may also harm general perceptions of health [12].

The participants were able to handle their responsibilities and activities despite having an amputation, according to the observed favorable outcome in the physical and emotional role-limits domains [13]. This might be explained by the availability of the right support, therapy, and coping mechanisms, all of which have been found to improve post-amputation adaption and functional results [14].

The current study's findings are comparable with those of several earlier studies, showing a pattern regarding how lower extremity amputations specifically those caused by ulcers—affect several aspects of quality of life (QOL) [15-17].

The physical domain of QOL was found to be poorer than the social domain as reported by the study conducted by Irene Aprile et al. This conclusion is in line with the current study, which also found a low quality of life in terms of physical functioning as compared to social aspect[3]. This shows that those who have their first ray amputated because of diabetic foot ulcers can encounter issues with both their physical capabilities and their ability to connect with others.

According to previous research, ulcer amputations decrease the quality of life because they reduce physical and psychosocial functioning in the lower extremities. Except for the finding that patients with amputations had lower levels of depression and cognitive functioning, these results are comparable with those of the current study in terms of physical functioning [18]. In contrast to healed ulcers, persistent ulcers are linked to a reduction in health-related quality of life (HRQL), according to a study by Gunnel Ragnarson Tennvall et al. This conclusion, that there is a lower quality of life in the areas of physical functioning, emotional well-being, and overall health, is consistent with the findings of the current study. The study also showed that amputation can worsen the quality of life, enhancing the detrimental effects. The study also highlighted that amputation can further lower the quality of life, highlighting how detrimental amputation is across several QOL areas [2].

The study by David Boutoille et al. shed light on how ulcers and amputation affect quality of life. The study emphasized that ulcers had a higher impact on quality of life (QOL) than amputation, particularly because of things like discomfort and problems with peripheral vascular disease. The findings of the current investigation, which showed the low quality of life across some domains, including physical functioning, where pain and vascular problems may have contributed to the observed decline in QOL confirm this viewpoint[19]. These findings are consistent with those of earlier research.

According to studies by Garca-Morales et al, neuropathy, a frequent side effect of diabetic foot ulcers, significantly lowers the quality of life. Given that neuropathy can affect both physical and emotional well-being, which in turn affects multiple domains of QOL[20], this conclusion is consistent with the findings of the current study. These findings are consistent with those of earlier research.

The study by Sara L. Borkosky made clear the bad prognosis connected to partial first-ray amputation. Although not directly related to QOL domains, this research highlights the difficulties people may encounter after such amputations,

https://doi.org/10.52567/trehabj.v7i04.39

which may be a factor in the QOL decline that has been found across several domains [21].

The current study's findings are in line with a large body of prior research, which shows that first-ray amputation brought on by diabetic foot ulcers can have a major influence on several quality-of-life categories. According to prior research that has highlighted the physical, psychological, and vascular aspects contributing to these outcomes, the domains of physical functioning, emotional well-being, social functioning, and general health were recognized as being notably affected.

However, it is important to recognize that the study has several limitations. First off, the study's sample size was very small, which would have limited how broadly the results could be applied.

CONCLUSION

The current study concluded the quality of life following first-ray amputation becomes compromised due to the multifaceted impacts of the amputation-induced changes. These effects manifest across physical, emotional, and social aspects of health among patients with diabetic foot ulcers. Notably, the results show a significant reduction in both physical and social functioning, whereas the other quality of life categories show relatively more positive results. To further understand QOL among those who have had their first ray amputated because of diabetic foot ulcers, more research with a large sample is required, as well as a thorough investigation of potential contributing factors.

DECLARATIONS & STATEMENTS

Author's Contribution

The following format should be used for author's contribution.
HT: substantial contributions to the conception and design of the study.
HT and MK: acquisition of data for the study.
MK and FS: interpretation of data for the study.
AM: analysis of the data for the study.
IY and SMA: drafted the work.
HT, MK, FS, AM, IY and SMA: revised it critically for important intellectual content.
HT, MK, FS, AM, IY and SMA: final approval of the version to be published and agreement to be accountable for all aspects.
of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted on n=68 diabetic foot ulcer patients. The study setting was Department community Health Services, Ghurki Trust Teaching Hospital Lahore (Ref.No.LCPT/2053).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments

None to declare.

Conflicts of Interest

None to declare.

Funding

None to declare.

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https://doi.org/10.52567/trehabj.v7i04.39

Research Article

Effects of moderate intensity intermittent training versus continuous training on indices of cardio-metabolic health in women with hyperlipidemia

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ABSTRACT

Background: Moderate intensity intermittent and continuous training are in practice for muscle strengthening and physical activity. These trainings can be used for cardiometabolic health of hyperlipidemic patients.

Objective: to determine the effects of moderate-intensity intermittent versus continuous training on indices of cardio-metabolic health in women with hyperlipidemia.

Methods: A randomized clinical trial was conducted at Milestone Fitness Gym in Sialkot from August to December 2021. Women between 30 to 40 years old with hyperlipidemia were included by using a non-probability convenience sampling technique. A total of Twenty (n=20) participants were randomly divided into two groups by lottery method. Moderate-intensity intermittent training was given to Group A (n=10), and moderate-intensity continuous training was given to Group B (n=10) by the gym trainer 3 days per week for 5 weeks. The lipid profile for hyperlipidemia, step test, modified Borg Scale and timed up-and-go test were used for cardiometabolic health and assessed at the baseline and after 5 weeks of training.

Results: The mean age was 34±3.43 years. There was no significant difference (p≥0.05) in lipid profile, lipid profile, Borg scale, and time up and go test when between both groups analysis was done. While within-group analysis shows that there was a significant difference (p<0.05) in all outcome measures of both groups.

Conclusion: It is concluded that both techniques, moderate-intensity intermittent versus continuous training were effective equally on indices of cardio-metabolic health in women with hyperlipidemia.

Keywords: continuous training; moderate intensity intermittent training; hyperlipidemia.

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Citation

Zulfiqar S, Rehman SSU, Ikram M. effects of moderate intensity intermittent training versus continuous training on indices of cardio-metabolic health in women with hyperlipidemia. T Rehabili. J. 2023:07(04); 31-35 doi: 10.52567/trehabj.v7i04.40.

Article History

Received on: 07-06-2023
Revision on: 04-12-2023
Published on: 25-12-2023

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INTRODUCTION

Hyperlipidemia is a term used to describe high blood fat levels, such as cholesterol and triglycerides. Hyperlipidemia is most associated with rich fat diets, sedentary lifestyles, obesity, diabetes, and genetic causes. Middle-aged females are more prone to hyperlipidemia due to fertility reasons, at this age, most of the women are getting hysterectomy, oophorectomy, or hormonal imbalances [1]. The prevalence of hyperlipidemia in Pakistan was 37.1% [2]. The general frequency of hyperlipidemia was 33.8%, with the associated risk of triglyceride (TG) was 12.8%; hypercholesterolemia was 16.1%, high-density lipoprotein cholesterol (cHDL) was 15.0% and low-density lipoprotein cholesterol (cLDL) was 42.2% [3].

The cardiovascular risk factors were observed and results show an overall predominance of hypercholesterolemia of 12% and a frequency of dyslipidemia that reaches somewhere in the range of 32.8% [4]. Hyperlipidemia is a significant general medical issue with expanded occurrence and predominance worldwide. Hyperlipidemia-specific biomarkers would work on clinical findings and helpful treatment at early disease stages [5]. The previous investigation looked at the impacts of intermittent training on heart rate variability (HRV) in 2020 [6].

In women with coronary disease, treating hypercholesterolemia can lower mortality from coronary heart disease [7]. Exercise is essential for treating these issues and assisting with metabolic abnormalities [8]. Consistent workouts of moderate intensity (CMI) demonstrate consistency in effectiveness. Running at a high intensity for short intervals increases exercise adherence since it is affordable and has positive health effects [9, 10]. Exercises that are both aerobic and anaerobic, particularly those that are intermittent and continuous and have a range of intensities, remove body fat. With little research contrasting the effects of continuous versus intermittent exercise, both exercise modes have benefits based on age and intent [11, 12].

Although the combination of moderate-intensity intermittent training versus continuous training, including diet modification and patient education, may have been effective for hyperlipidemia, no reported studies have compared whether moderate-intensity intermittent intensity versus continuous training alone is effective in treating hyperlipidemia without diet modification. Moreover, women might respond differently to various exercise protocols. Some might find it more sustainable and engaging to perform intermittent training, while others might prefer continuous training. Investigating which protocol leads to better results for hyperlipidemia patients is important. The study's objective was to determine the effects of moderate intensity versus continuous exercises on indices of cardiometabolic health in females.

METHODOLOGY

This randomized clinical trial (NCT05078736) was conducted at Milestone Fitness Gym in Sialkot from August to December 2021. The research and ethical committee (REC) of Riphah International University Islamabad (Lahore Campus), Pakistan, approved the study protocol with the reference number REC/RCR & AHS/21/0409. All the participants provided written informed consent to participate in the study.

Women with hyperlipidemia ages ranging from 30 to 40 years were included because at this stage females are less fertile, so the risk of hyperlipidemia is high, while women with any serious cardiac, musculoskeletal, or systemic conditions were excluded.

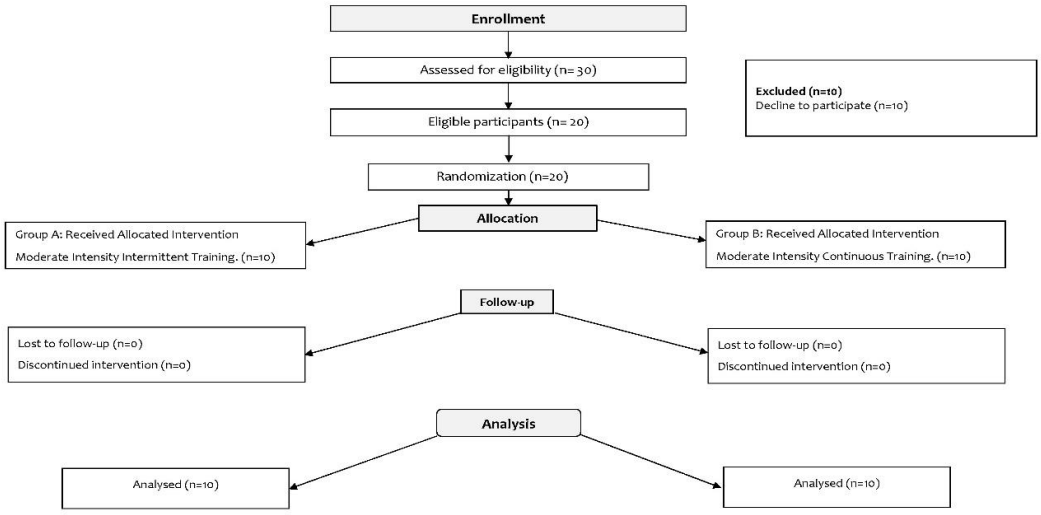

Figure 1: Consort Diagram

The sample size was n=20 with a 10% attrition rate calculated from Epi tool software by adding the mean and standard deviation of previous literature by using the outcome measure Borg scale [13]. The screening was carried out of n=40 participants through a nonprobability sampling technique, n=30 fulfilled the inclusion criteria, and n=20 finally gave written consent for enrolment in the study. Outcome assessors were blinded in this study. Patients were blindly allocated into two groups Group A and B by lottery method. There was no dropped-out participant. All the study participants were divided into two groups by lottery method. The CONSORT diagram is shown in Figure 1.

Group A Performed Moderate-intensity intermittent training, running 5 km at 70% of the maximal aerobic speed (1 km running with 1-minute passive recovery) for 5 weeks including 3 days per week [14]. 10 10-minute warm-up and cool-down sessions were also included.

Group B Performed moderate-intensity continuous training, participants ran continuously the same 5 km at 70% of maximal aerobic speed, gym trainer performed exercises for 5 weeks including 3 days per week. 10 minute warm-up and cool-down session was also included in both groups [15].

To measure the hyperlipidemia, and lipid profile a blood test consisting of triglycerides, HDL, LDL, and cholesterol was done in Excel Lab Sialkot. The step test, Modified Borge scale (MBS), and Timed up and Go test (TUG) were used to measure cardiometabolic health after receiving the interventions. The Step up test presented good test-retest reliability (ICC = 0.87; 95% CI = 0.79-0.91), it was used to measure a person's aerobic fitness [16]. The Modified Borg scale (MBS (Borg Rating of Perceived Exertion (RPE) scale), developed by Swedish researcher Gunnar Borg, has excellent interrater reliability (ICC = 0.94) and convergent validity, it used for measuring an individual's effort and exertion, breathlessness and fatigue during physical work and so is highly relevant for occupational health and safety practice. In its simplest terms, it provides a measure of how hard it feels that the body is working based on the physical sensations that the subject experiences, including increased heart rate, increased respiration or breathing rate, increased sweating and muscle fatigue [17]. The Timed up and Go test (TUG) has good test–retest reliability (ICC 0.80–0.99), validity, and sensitivity to change, it was used to assess mobility, balance, walking ability, and fall risk [18].

The data of the Lipid profile, Modified Borg scale, step test and down test, and Timed Up and Go test were measured at baseline and after 5 weeks. Data analysis was performed using SPSS 25. Using the Shaphiro-Wilk test to determine the data's normality, it was determined that the data had a normal distribution ($p \geq 0.05$). The independent t-test and the paired-sample t-test were then used in a parametric analysis to compare variables between groups and within groups, respectively.

RESULTS

The mean age in both groups was 34.00 ± 3.43 years, while mean body mass index was 25.64 ± 2.50 kg/m^2.

Across the groups, the comparison showed that there was no statistical difference between the treatment methods ($p>0.05$). But in pairwise comparison, both groups were statistically significant, showing that both treatment plans were equally effective and showed clinical improvement shown in Table 1 and 2.

Table 1: Across and Within Group Analysis of Borg Scale, TUG, HR and lipid profile

		Group A	Group B	MD	p-value
Modified Borg Dyspnea Scale (MBS) for dyspnea	Pre	7.10±2.23	7.90±1.66	-0.8	0.437
	Post	2.70±1.15	5.40±1.71	-2.7	0.132
	MD	4.4	2.5	-	-
	p-value	0.00***	0.00***	-	-
Time Up and Go Test (TUG)	Pre	15.70±8.34	20.40±7.19	-4.7	0.468
	Post	6.40±4.16	12.10±6.34	-5.7	0.148
	MD	9.3	8.3	-	-
	p-value	0.00***	0.00***	-	-
Heart Rate (HR)	Pre	73.40±3.80	72.10±2.72	1.3	0.209
	Post	87.90±7.82	97.20±4.91	-9.3	0.061
	MD	-14.5	-25.1	-	-
	p-value	0.00***	0.00***	-	-
LDL (low-density lipoprotein) cholesterol	Pre	161.60±9.46	164.10±12.52	-2.5	0.390
	Post	143.50±8.19	157.10±11.52	-13.6	0.468
	MD	18.1	7	-	-
	p-value	0.00***	0.00***	-	-
HDL (high-density lipoprotein) cholesterol	Pre	36.40±5.42	37.80±4.70	-1.4	0.402
	Post	56.80±7.94	44.50±4.14	12.3	0.125
	MD	-20.4	-6.7	-	-
	p-value	0.00***	0.00***	-	-
Triglyceride	Pre	193.40±23.55	179.70±28.58	13.7	0.517
	Post	146.90±10.17	159.30±20.56	-12.4	0.058
	MD	46.5	20.4	-	-
	p-value	0.00***	0.00***	-	-
Cholesterol	Pre	218.10±16.07	219.80±13.64	-1.7	0.344
	Post	180.80±16.34	201.50±16.28	-20.7	0.866
	MD	37.3	18.3	-	-
	p-value	0.00***	0.00***	-	-

Significance level: p<0.05, p<0.01**, p<0.001****

https://doi.org/10.52567/trehabj.v7i04.40

DISCUSSION

This study aimed to compare the effects of moderate-intensity intermittent and continuous training on indices of cardio-metabolic health in women with hyperlipidemia. There was no significant difference in both groups, but both groups were clinically effective.

From previous literature, it was proved that moderate-intensity training was more effective in reducing the cardio-metabolic indices and in this study, both treatments were equally effective either continuous or intermittent. Because aerobic exercises always have some physiological effect and improve lipid profile faster as compared to any other exercise. These exercises improve the health status and physical function in any case as these two trainings of moderate intensity (continuous and intermittent) show no difference in between-group comparisons because there was no difference in the intensity but show significant difference in within-group comparisons [19].

A study was conducted in 2019 on MIIT in players between the ages of 16 to 30 years and they concluded that moderate-intensity intermittent training is used to increase functional capacity and physical activity; they found significant improvement in Time Up and Go Test readings. In comparison to the recent study conducted on females with hyperlipidemia, MIIT and CT were used as treatment plans and results show significant improvement in the Time Up and Go Test so this study correlates with the current study [20]. Another study was conducted on continuous training in weight lifters and marathon runners with ages ranging from 15 to 35 years in 2020 and they concluded that continuous training has significant improvement in the time up and go test but in the current study Time up and go test and cardiometabolic indices were also monitored and both groups show significant results. Results show that exercises have positive effects on the cardiometabolic indices either continuous training or intermittent training was used [21]. The previous study was conducted in 2019 by Lange and Kucharski, on the effects of aerobic exercises in patients with hyperlipidemis from the age of 25 to 35 years and they concluded that aerobic exercises are used to treat hyperlipidemis as it sounds safe and easy to practice. In contrast to the recent study, this study has only aerobic exercises while the current study used continuous and moderate intensity intermittent training programs as a treatment plan for the patients with diagnosed hyperlipidemia at the gym and results prove that both techniques have the same effects on cardiometabolic indices and physical activity [22].

Another study was conducted by Zhang and Zou in 2021 on MIIT in overweight females aged 20 to 35 years, only MIIT was used as a choice of treatment. They concluded that moderate-intensity intermittent exercises are used for different purposes in gyms and one of the major ones is the fat reduction they introduced these trainings as fat reduction booster exercises. The results of this study were strongly correlated with the recent study, as a recent study was conducted on 30 to 40-year-old females with hyperlipidemia, MIIT and CT were used as treatment plans. Results prove that moderate-intensity Continuous and intermittent training show significant improvement in cholesterol which is the combination of all fat components of the body [23].

There are also some limitations in the study as there was no monitoring of level of exertion and VO2 max. The sample size was not as sufficient as in previous studies. There was no control over the use of medications (by participants) during treatment sessions.

CONCLUSION

It was concluded that moderate-intensity intermittent and continuous training techniques were equally effective on indices of cardio-metabolic health in women with hyperlipidemia while there was no significant difference between the two groups.

DECLARATIONS & STATEMENTS

Author's Contribution

The following format should be used for author's contribution.
SZ: substantial contributions to the conception and design of the study.
SZ and SSUR: acquisition of data for the study.
SSUR and MI: interpretation of data for the study.
MI: analysis of the data for the study.
MI: drafted the work.
SZ, SSUR and MI: revised it critically for important intellectual content.
SZ, SSUR and MI: final approval of the version to be published and agreement to be accountable for all aspects. of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted at Milestone fitness gym in Sialkot from August to December 2021. The research and ethical committee (REC) of Riphah International University Islamabad (Lahore Campus), Pakistan, approved the study protocol with the reference number of REC/RCR & AHS/21/0409.

Consent Statement

Informed consent was obtained from all subjects involved in the study.

https://doi.org/10.52567/trehabj.v7i04.40

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

None to declare.

Funding

None to declare.

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https://doi.org/10.52567/trehabj.v7i04.40

Research Article

Modified consistency dysphagia diet protocol for Pakistan: Development perspective

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ABSTRACT

Background: Increased in life expectancy has led to the increased need for texture-modified foods for dysphagia patients, to maintain their nutrition status. At present clinical practices in Pakistan are marred with no standard diet protocols resulting in misunderstanding in recommended consistencies of both food and fluid, hence compromising patients' safety, necessitating the work of dysphagia diet protocol.

Objectives: To develop a dysphagia diet consistency protocol for Pakistan.

Methods: A descriptive study recruited 16 Speech-Language Pathologists and dieticians from Rawalpindi & Islamabad using convenient sampling from October 2018 to March 2019. The sample included SLPs and dieticians working for at least 1 year with dysphagia patients. To ensure the process of standardization list of food and fluids was generated by the professionals to analyze the various food textures with the help of a viscometer that contributed to labelling and defining the textures. With the help of the International Dysphagia Diet Standardization Initiative Flow Test, Fork Drip Test, Spoon tilt test, Fork Pressure Test, Spoon Pressure Test, and Finger Test, a list of food and fluid items categorized into 8 levels which help the management of dysphagia patients in clinical practice.

Results: The current study developed a dysphagia diet protocol and categorized 29 foods and fluids as per the IDDSI framework. 10 items were placed in level 0 (Thin). 2 items were placed in level 1 (slightly thick). 2 items were placed in 2 (mildly thick) 1 item was placed at level 3. Level 4 included 2 items. Level 5 included 3 items. Level 6 included 4 items and Level 7 included 6 regular daily food items.

Conclusion: The study successfully developed a standardized dysphagia diet consistency protocol consisting of 29 commonly readily available and popular foods consumed by Pakistanis and placed these items under 8 levels of the International Dysphagia Diet Standardization Initiative (IDDSI) recommendations.

Keywords: dysphagia; food consistency; IDDSI; swallowing disorders; texture modification.

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Citation

Irum A, Mubeen R, Saqulain G, Khalid S. Modified Consistency Dysphagia Diet Protocol for Pakistan: Development Perspective. T Rehabili. J. 2023:07(04); 36-42 doi: 10.52567/trehabj.v7i04.41

Article History

Received on: 01-011-2023
Revision on: 19-12-2023
Published on: 25-12-2023

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INTRODUCTION

Dysphagia, also known as difficulty swallowing, is defined as an abnormal delay in the passage of food from the oropharynx to the stomach [1]. This delay can happen at any point during the four stages of swallowing—the oral, oropharyngeal, pharyngeal, or esophageal stages—with voluntary control only occurring during the first stage [2]. Roughly 8% of people worldwide suffer with dysphagia, which is frequently accompanied by concomitant diseases like stroke and neurological illnesses. Dysphagia is very common in Pakistan; it affects 17% of people in the 44–49 age group and 22.3% of people in the 55+ age group [4]. Dysphagia is a common observation in intensive care units, where it is recorded at a rate of 47.4% [2]. It is distributed throughout a range of illnesses, including 65% in acute stroke, 50% in Parkinson's disease, 31% in multiple sclerosis, 30 to 100% in motor neuron disease, and 13 to 57% in dementia [5].

Dysphagia sufferers may have difficulty preparing and delivering boluses, as well as experience symptoms like drooling, food or fluid leakage, and food sticking in the mouth. Common problems include difficulty swallowing, difficulty clearing the throat, and coughing during swallowing. Chest infections, malnourishment, dehydration, and even death are possible consequences of dysphagia. Taking dysphagia seriously is essential because of these serious repercussions [6].

The management of dysphagia entails three steps: restitution, which aims to restore disrupted function; compensation, which includes postural adjustments and swallowing techniques; and adaptation, which adjusts food consistency to improve nutrition and swallowing. For example, it might be advised to thicken liquids or choose diets with a softer consistency to address issues like choking when drinking or severe dysphagia [3,6].

The research highlights the important effects of the consistency on food transportation and breathing-swallowing coordination in diets with mixed consistency [7]. Food texture modifications, made possible by a variety of drugs and cutting-edge techniques like 3D printing, are essential for the management of dysphagia [8]. The need for foods with altered textures has increased as the number of elderly people increases. This is because patients with dysphagia need to consume enough calories, nutrients, and amino acids [9]. Optimizing the rheological and physicochemical properties of food is crucial for enhancing the swallowing process. But there are differences in terms and degrees of food and drink modifications throughout the world, which makes standardization difficult [10].

It is crucial to address undernourishment in dysphagia patients, emphasizing the significance of dietary adjustments, such as adjustments to texture and consistency [11,12]. A framework that is widely accepted is offered by the International Dysphagia Diet Standardization Initiative (IDDSI), which rates textures from 0 to 7 for liquids and 3 to 7 for food. The goal of this project is to harmonize terminology between contexts and cultural backgrounds. The IDDSI framework has been proven reliable in clinical settings; positive correlations between IDDSI fluid thickness levels and water-based swallow tests support the framework's applicability in clinical settings [13]. The crucial role that texture modification plays in managing dysphagia, indicating the need for standardized methods that can be applied globally [14].

This study fills in a significant knowledge gap regarding speech and language pathology in Pakistan by emphasizing the underutilization of the IDDSI protocol for the treatment of dysphagia. This problem is made worse by the disparities in dietary preferences among cultures and the lack of qualified speech pathologists. By integrating recommendations between dieticians and speech-language pathologists, the research seeks to improve patient safety by developing a standardized dysphagia diet consistency protocol specific to Pakistan.

METHODOLOGY

This descriptive study recruited n=16 participants from Islamabad and Rawalpindi using convenient sampling. Study was conducted over a period of 6 months from 1st October 2018 to 31st March 2019. Ethical approval was obtained from the Research Ethical Committee of Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad vide Ref # RIPHAH/RCRS/REC/00408 and informed consent of the participants.

Sample included speech & Language Pathologists with at least one year post graduate experience of handling dysphagia patients and Dieticians working with dysphagia clients.

Tools utilized included Viscometer; IDDSI [14] including IDDSI Flow Test, Fork Drip Test, Spoon Tilt test, Finger Test, Fork Pressure Test, Spoon Pressure Test, Finger Test and self-check list for categorizing different food and fluid textures for diet protocol.

Protocol development procedure followed included development of list of food and fluid items through input of n=04 dysphagia trained SLP's, dieticians and literature search by the researcher.

https://doi.org/10.52567/trehabj.v7i04.41

The fluid and food items of the list derived were then subjected to checking by using viscometer and IDDSI testing, since consistencies of texture and rheological analysis is required to be done by applying force to establish the viscosity of food and fluids. This is done because viscosity is the internal friction of a liquid or its ability to resist flow. This was done by the researcher in the presence of the participants at their workplace. This helped the researcher in labelling and defining the particular textures which were categorized within the levels that have been explained by IDDSI framework. The aim of IDDSI [15, 16] was to introduce terminologies of diet at global level and provide standardized consistencies with the collaboration of Speech and language pathology, dietitian, nutrition, food scientists, physicians, and nurses. These consistencies are divided into 8 levels which help for the management of dysphagia patients in clinical practice. The IDDSI Functional Diet Scale has strong criterion validity and consensual validity. The IDDSI Functional Diet Scale can be easily used with high reliability by clinicians [17]. Final list was then applied on N=16 speech and language pathologist and dieticians to evaluate their knowledge of different consistencies (figure 1)

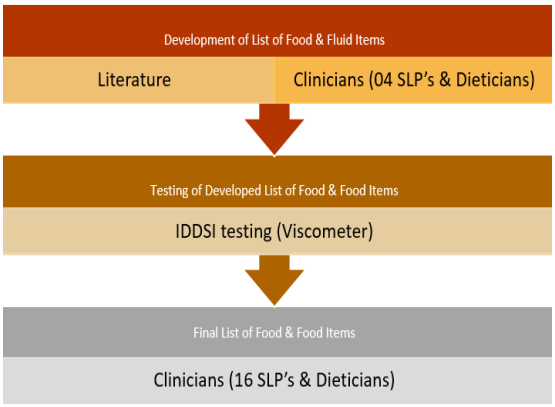

Figure 1: Steps of Protocol Development Process

The IDDSI Flow test is recommended for 0-3 levels, it can be implemented by use 10 ml syringe. For level 4 due to extreme thickness flow cannot be possible from 10 ml syringe in 10 second so spoon test, IDDSI fork test or spoon tilt tests are suggested to determine the consistencies. Protocol of each testing method is considered during testing the items [16]. Method is depicted in figure 2.

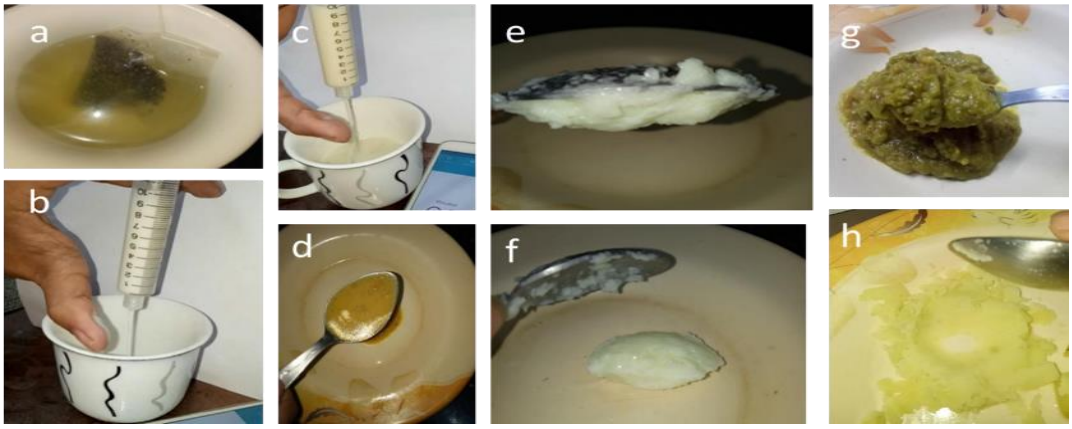

Figure 2: Methods of Protocol Development Process.

Data was analyzed on SPSS- Version 21. Results were presented in frequency and percentage. The comparison about consistency of food, between SLPs and dietician was done by Chi-square test. The $p<0.05$ was considered as significant.

RESULTS

Current study sample included n=16 professionals including 8(50%) SLP's and 8(50%) Dieticians with majority 14 (87.5%) with Master's qualification and 2 (12.5%) with Bachelor's degree. The current study identified and divided 29 food and fluids into eight levels of consistencies and water. Level 0 - Thin was assigned based on IDDSI Flow test results to foods which they revealed fast flow like water and could be drunk from a cup, straw or nipple (age-appropriate skill) (figure 2-a). There were some discrepancies evident in the subjective findings of the dieticians and SLPs of which 7 (43.75%) SLPs and 1(6.25%). All these items are readily available and culturally suitable.

Level 1-Slightly Thick was assigned on basis of IDDSI Flow Test to foods which took little effort to drink because it was thicker than water and can easily pass through a straw, syringe and nipple and thickness was equal to 'anti-regurgitation' infant formulas available in market (figure 2-b).

Level 2-Mildly thick was assigned on the basis of IDDSI flow test to shakes and homemade yogurt, since its thickness was compared to thin liquid and was shapeable and could pour rapidly from a spoon (figure 2-c).

https://doi.org/10.52567/trehabj.v7i04.41

Level 3-Liquidized Moderately Thick was assigned to Curry on basis of IDDSI flow test, Fork Dip and Spoon tilt tests. Its thickness was such that it could be sucked from a standard straw or could be drunk from a cup by some effort. However, it could not be molded on a plate, eaten with spoon or fork. It could be swallowed without oral processing and had smooth texture with no lumps (figure 2-d).

Level 4-Pureed Extremely thick was assigned on basis of fork pressure test, fork dip test, spoon tilt test and finger test to foods like plain yogurt and custard because it was possible to eat by spoon or fork but could not be drunk through a cup or sucked through a straw. It could be poured but movement was very slow due to gravity and could be molded with no lumps and not sticky. (Figure 2-e,f)

Level 5- Minced & Moist was assigned on basis of fork pressure test, fork drip test, spoon tilt test, and chopstick and finger test. It was possible to eat it with spoon, fork or chopstick, was soft and moist without separation of thin liquid and small lumps could be seen (pediatric, lump size 2mm, whereas adult 4mm). It was possible to scooped and shape it in a plate and lumps could be easily squashed in mouth with tongue (figure 2-g)

Level 6- Soft and Bite sized was assigned to mashed banana, potato; khichari and rice on basis of fork pressure test, spoon pressure test, chopstick test and finger test. It could be age appropriately bite sized and chewing was required, and force of tongue was required for swallowing (figure 2-h)

Level 7-Regular was assigned to readymade nuggets, shami kabab, chapatti, churi, French toast and kheer. It could be hard, crunchy or soft with no size restriction and could be smaller or greater than 8 mm in children and 15 mm in adults. It has dry, chewy crispy crunchy bits with dual consistency or mixed consistency of food and liquid (figure 2-h).

Feedback was taken from SLP's and dieticians to highlight suitable food items for Pakistani population and then matched according to standardized testing methods of IDDSI. Association of knowledge of consistency of food was matched for their profession and educational level to assess whether these parameters have any effect (Annexure 1)

The study results showed significant difference between professionals (SLP's vs dieticians) as regards consistency of some food items including black coffee (p=0.003), yakhni (p=0.026), Dalia (p=0.037) and Rice (p=0.037). While as regards educational qualification there was significant difference in opinion of professionals for lassi (p=0.017), plain yogurt (p=0.043), dalia (p=0.017) and rice (p=0.018). (Annexure 1)

DISCUSSION

Current study developed a dysphagia diet consistency protocol consisting popular foods consumed by Pakistanis and placed these items under 8 levels of the International Dysphagia Diet Standardization Initiative (IDDSI) recommendations. These include Level 0 (water, green tea, black coffee, yakhni, sharbat/ or fruit juice, tea, lemonade, rooh afza, and lassi); Level 1 (squash and Raita); Level 2 (milk shakes and homemade yogurt); Level 3 (Curry); Level 4 (plain yogurt and custard); Level 5 (mashed potato, mashed banana, daal; Level 6 (mashed banana, potato; khichari and rice); Level 7 (readymade nuggets, shami kabab, chapatti, churi, French toast and kheer).

Literature also reveals that there have been efforts to develop semi quantitative or at least qualitative grades of texture - modified food which could fit the requirements of cases with different severity of dysphagia, so that patient could avoid the risks of low viscosity fluids, dry, hard and solid food, and food lacking homogeneity and low consistency since swallowing low - viscosity drinks may cause aspiration etc [18].

Since modification of texture of food and fluid items is essential for the management of dysphagia and in Pakistan commercial thickeners availability is limited. It is also noted that the physiochemical properties of saliva can affect the viscosity of fluids like Gum-containing thickeners compared to synthetic thickeners in which case the consistency was acceptable when it came in in contact with human saliva. Hence it was important to list food and fluid items having a natural consistency and texture under varying circumstances [19]. Feedback was taken from SLP's and dieticians to highlight suitable food items for Pakistani population and then matched according to standardized testing methods of IDDSI. Factually, the textures and consistencies of both solid foods and liquid being used in some countries cannot be implemented globally in other cultures and countries due to diversity in the food and liquid diets of these countries [20].

In current study there were some discrepancies evident in the subjective findings of the dieticians and SLPs of which some participant referred to black coffee as slightly thick while some also referred to yakni as slightly thick. all these items are readily available and culturally suitable. Milk shakes and yougurt are placed under mildly thick and fall in level2. Karhi (yoghurt& gramflour based) is liquidized moderately thick that is in level 3. Level 4 includes plain yougurt and custard. Level 5 includes lentils (Daal), porridge (Dahlia) and minced meat (Keema). Level 6 includes Mashed Patato, Mashed Banana, Khichari and rice whereas Level 7 includes regular daily food items like Ready-made nuggets, Shami

https://doi.org/10.52567/trehabj.v7i04.41

Kabab, Chapaati, Churi, French toast and Kheer. All ingredients of these fluids and food items can easily available at low price in Pakistan, hence suitable for the population. The difference in the opinion of SLPs and Diaticians might be due to the fact that not all professionals are handling dysphagia patients. Similarly in Australia opinions of 580 professionals were utilized to establish standard diet protocol including 39 labels for thickened fluids and 95 different ones for texture altered foods for use in Australia [21]. In 2016, a study reported 50 labels for consistency modified diet, 26 SLPs and 42 dieticians responded with up to 17 labels for particular foods and hence IDDSI recommendations were adopted [22].

The IDDSI is considered the most accurate method and is the gold standard and has the quality of resolving of difficulties regarding swallowing and to ensure quality of practice [15], in different cultures as utilized in our case. Similarly, a study reported that training was provided to nurses and health care staff with the aim to match the culturally used food items with the standards of IDDSI and to categories the texture in 8 levels. This successfully addressed the needs of individual patients and the results revealed tremendous benefits of IDDSI [23]. Hence IDDSI framework has a significant importance and advantageous for recommendation of consistency modified precision diet for dysphagia cases [20].

In the current study, initially all textures were measured using the viscometer, however, the difference in temperatures affects certain consistencies including custards having a starch base [24], therefore viscometer assessment was reserved only for thin and thick liquids and syrups. When compared with the IDDSI it yielded similar findings as IDDSI for fluids like milk, water, tea, yakhni, and black coffee which is in consistency with available literature [25].

Royal College of speech and language therapist and The British Dietician Associations' collaboration resulted in development of the National Descriptors modifying texture which include two groups including fluids and food. Fluids were further divided into i) thin fluids; ii) naturally occurring thick fluids and; iii) thickened fluids. Texture wise the food is divided in A, B, C, D, E and normal category on basis of consistencies [26]. However it must be kept in mind that enrichment of food to cater to patients' energy needs who is already confounded by illness is also essentially required. According to Carroll a thick puree diet can be utilized for enrichment at one meal to cater to the short term requirements of energy [27]. Current study is the first of its type in Pakistan, however further work is recommended to include more items in the diet protocol.

Due to a handful of professionals working with dysphagia in Pakistan, the number of participants was limited. The protocol covers a range of textures, however the number of options in each division is restricted, hence addition of more items in future studies is recommended.

CONCLUSION

Current study successfully developed a preliminary dysphagia diet consistency protocol consisting of 29 foods items that are common, consumed regularly and frequently recommended by clinicians for their patients in Pakistani population. These items have been added to a list as per the International Dysphagia Diet Standardization Initiative (IDDSI) recommendations into 8 levels to cater to the needs of the Pakistani

DECLARATIONS & STATEMENTS

Author's Contribution

The following format should be used for author's contribution.
AI: substantial contributions to the conception and design of the study.
AI and SA: acquisition of data for the study.
SUR: interpretation of data for the study.
RM: analysis of the data for the study.
GS: drafted the work.
AI, SA, SUR, RM and GS: revised it critically for important intellectual content.
AI, SA, SUR, RM and GS: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted after Ethical approval was obtained from the Research Ethical Committee of Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad vide Ref # RIPHAH/RCRS/REC/00408 and informed consent of the participants.

Consent Statement

Informed consent was taken before inclusion in the study.

Data Availability Statement

Data related to the study is available on request form the principal author.

Acknowledgments

None to declare.

Conflicts of Interest

Authors declare that there is no conflict of interest.

Funding

None to declare.

https://doi.org/10.52567/trehabj.v7i04.41

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https://doi.org/10.52567/trehabj.v7i04.41

Annexure 1: Difference between SLPs and Dietician's opinion about Food Consistency recommended for dysphagia patients.

			Profession (n)			Education (n)		
Food Consistency (IDDSI Category)	Food Consistency opined by professionals	n	SLP (8)	Dietician (8)	X^2, p-value	BS/BA (2)	MS/MA (14)	X^2, p-value
Water (Thin)	Thin	16	8	8		2	14	
Black Coffee (Thin)	Thin	8	1	7	9, 0.003**	2	6	2.28, 0.131
	Slightly thick	8	7	1		0	8	
Green tea (Thin)	Thin	15	7	8	1.06, 0.302	2	13	0.152, .696
	lightly thick	1	1	0		0	1	
Yakhni (Thin)	Thin	11	3	8		2	9	
	Slightly thick	2	2	0	7.27, 0.026*	0	2	1.04, 0.595
	Mildly thick	3	3	0		0	3	
Squash (Thin)	Thin	1	0	1		0	1	
	Slightly thick	13	7	6	1.08, 0.584	2	11	0.527, .768
	Mildly thick	2	1	1		0	2	
Sharbat (Thin)	Thin	5	2	3		2	3	
	Slightly thick	8	4	4	0.533, 0.766	0	8	5.03, 0.081
	Mildly thick	3	2	1		0	3	
Tea (Thin)	Thin	5	2	3		2	3	
	Slightly thick	10	5	5	1.2, 0.549	0	10	50.03,0.081
	Mildly thick	1	1	0		0	1	
Lemonade (Thin)	Thin	10	5	5		1	9	
	Slightly thick	5	2	3	1.2, 0.549	1	4	0.457, .796
	Mildly thick	1	1	0		0	1	
Rohafza (Thin)	Thin	4	2	2		0	4	
	slightly thick	7	4	3	2.47, 0.48	1	6	2.068,0.558
	Mildly thick	3	2	1		1	2	
	Liquidized moderately thick	2	0	2		0	2	
Lassi (Thin)	Thin	1	0	1		1	0	
	Slightly thick	7	3	4	1.64, 0.44	1	6	8.16, 0.017*
	Mildly thick	8	5	3		0	8	
Plain Yoghurt (Pureed extremely thick)	Slightly thick	1	0	1		1	0	
	Mildly thick	7	4	3	1.14, 0.767	1	6	8.16, 0.043*
	Liquidized moderately thick	2	1	1		0	2	
	Pureed extremely thick	6	3	3		0	6	
Dalia (Minced & Moist)	Mildly thick	1	0	1		1	0	
	Liquidized moderately thick	7	6	1	6.57, 0.037*	1	6	8.16, 0.017*
	Pureed extremely thick	8	2	6		0	8	
Homemade Yogurt (Mildly thick)	Mildly thick	7	4	3		2	5	
	Liquidized moderately thick	6	3	3	0.476, 0.79	0	6	2.94, 0.23
	Pureed extremely thick	3	1	2		0	3	
Shakes (Mildly thick)	Slightly thick	4	3	1		1	3	
	Mildly thick	5	2	3	5.2, 0.158	1	4	1.83, 0.609
	Liquidized moderately thick	4	3	1		0	4	
	Pureed extremely thick	3	0	3		0	3	
Daal (Minced & Moist)	Liquidized moderately thick	9	6	3		1	8	
	Pureed extremely thick	3	0	3		1	2	
	Minced & moist	2	2	0	8, 0.092	0	2	1.778, 0.777
	Soft	1	0	1		0	1	
	Regular	1	0	1		0	1	
Mashed banana (Soft & Bite sized)	Liquidized moderately thick	2	2	0		0	2	
	Pureed extremely thick	5	2	3	4.34, 0.227	1	4	0.849, .838
	Minced & moist	2	0	2		0	2	
	Soft	7	4	3		1	6	
Mash Potato (Soft & Bite sized)	Liquidized moderately thick	1	1	0		0	1	
	Pureed extremely thick	6	3	3	4.67, 0.198	1	5	0.762,0.859
	Minced & moist	3	0	3		0	3	
	Soft	6	4	2		1	5	
Raita (Slightly thick)	Slightly thick	2	1	1		0	2	
	Mildly thick	9	7	2	7.78, 0.051	1	8	1.02, 0.797
	Liquidized moderately thick	4	0	4		1	3	
	Regular	1	0	1		0	1	
Baisin curry (Liquidized moderately thick)	Mildly thick	2	1	1		0	2	
	Liquidized moderately thick	6	4	2	1.81, 0.613	1	5	0.544, .909
	Pureed extremely thick	7	3	4		1	6	
	Soft	1	0	1		0	1	
Custard (Pureed extremely thick)	Mildly thick	2	2	0		0	2	
	Liquidized moderately thick	1	1	0	4.33, 0.228	0	1	7.62, 0.055
	Pureed extremely thick	12	5	7		1	11	
	Soft	1	0	1		1	0	
Qeema (Minced & Moist)	Minced & moist	11	5	6		2	9	
	Soft	2	1	1	0.424, 0.809	0	2	1.04, 0.595
	Regular	3	2	1		0	3	
Ready nuggets (Regular)	Soft	1	1	0	1.07, 0.302	0	1	0.152, .696
	Regular	15	7	8		2	13	
Shami kebab (Regular)	Liquidized moderately thick	1	1	0		0	1	
	Soft	3	3	0	5.33, 0.069	0	3	0.762, .683
	Regular	12	4	8		2	10	
Churi (Regular)	Minced & moist	4	1	3		1	3	
	Soft	2	0	2	4.6, 0.1	1	1	4.57, 0.102
	Regular	10	7	3		0	10	
French toast (Regular)	Minced & moist	2	2	0		0	2	
	Soft	3	0	3	5.09, 0.078	0	3	1.04, 0.595
	Regular	11	6	5		2	9	
Rice (Soft & Bite sized)	Minced & moist	7	6	1		0	7	
	Soft	8	2	6	6.71, 0.037*	1	7	8, 0.018*
	Regular	1	0	1		1	0	
Kheer (Regular)	Liquidized moderately thick	13	7	6	0.41, 0.522	1	12	1.46, 0.226
	Pureed extremely thick	3	1	2		1	2	
Roti (Regular)	Minced & moist	1	1	0	1.067, 0.302	0	1	0.152,0.696
	Regular	15	7	8		2	13	
Khichari (Soft & Bite sized)	Minced & moist	5	3	2		0	5	
	Soft	7	2	5	2.49, 0.289	2	5	2.94, 0.23
	Regular	4	3	1		0	4	

https://doi.org/10.52567/trehabj.v7i04.41