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Recovery of Function Is Dependent upon Extent of Injury & Goal Oriented Therapy: A Case Study

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Abstract

Back ground and purpose: Goal oriented therapy plays a pivotal role in a rehabilitation programme with spinal cord injury patient. To focus upon the extent of injury should be considered as an important part before framing the protocol.

Case description: The patient was a 22years male with quadriplegia (c2 level) with associated fractures of manubrium sterni and lateral 1/3rd of right clavicle. This case study describes a proper assesement, reassessment and goal oriented treatment protocol in a c2 fracture, incomplete spinal cord injury patient should be the primary focus in rehabilitation for a early and better prognosis.

Further the level and extent of the injury, the time of start of rehabilitation program and intensive goal oriented therapy is of greater importance.

This study focuses on functional independence at first then on generalized fitness, coordination and balance.

Outcome: In this the level of functional indepence got improved in 28 days time period with the use of goal oriented, patient centric intensive therapy. The patient was able to do his ADL activities with minimal assistance.

Key words: cervical spinal cord injury, quadriparesis, functional independence

Introduction

Spinal cord injury hampers the life on an individual crushing down both the patient's physical and mental health. It results in paralysis of various muscles below the site of injury. Further it affects various systems of the body ranging from musculoskeletal to urogenital[1]. The livelihood of the patient gets hugely affected.
A study of 2012 shows that the occurrence of SCI in developing countries is around 2.5million/year further stated a gender differentiation which showed 82.8% were males and the mean age group affected was 32.4years.Further the study concluded that motor vehicle accidents and fall from height being the commonest cause [3]. Spinal injuries can be classified on bass of mechanism injury as: flexion injury, flexion-rotation injury, vertical compression injury, extension injury, flexion- distraction injury, direct injury, indirect injury due to violent muscle contraction [4]. With the new innovations and researches the life expectancy has increased but a patient suffering with SCI still lags behind .The Quality of life of such patient are still questionable if are not provided with early and proper physiotherapy intervention at appropriate time. Key factors influencing the life expectancy on SCI patients are age at onset, level and extent of injury. Individual with incomplete injury and injury below the level of c6 have a better prognosis and faster recovery the patients finances and mental health of family members are the most affected due to the need for long stay at hospitals and various rehabilitation centres[2].

REHABILITATION

Rehabilitation of a SCI patient is a team work in which a physiotherapist plays a vital role. AS per WHO Rehabilitation is defined as a progressive, dynamic, Goal-oriented and often time –limited process, which enables an individual with impairment to identify and reach his/her optimal mental, physical, cognitive and functional level. In case of SCI patient the rehabilitation programme should be more focused on the level and extent of injury and goal oriented therapy .Further keeping in consideration of patients and its care givers mental health the focus should be to bring back to his near normal life and aid him in earning his livelihood and functional life with ease. More over studies have shown activity dependent plasticity helps in early recovery as it cause activation of spinal pathways above and below the level of injury[2]. Further the activation of the pathway leads to restoration and promotion of new connections.[5]

Case description

A 22 year old boy presented to physiotherapy dept of institute of health sciences, Chandaka, Bhubaneswar with a complaint of inability to perform his ADL, inability to sit independently, stand and walk .Further he had a complaint of pain in his right hip. There was a history of RTA, 2 months ago. He had undergone surgery for the same i.e c3 lateral max screw and rod fixation for displaced fracture of c2 vertebral body.

On observation

Mode of ambulation- wheel chair
Body built-endomorphic
Attitude of limb-Feet-inverted and plantar flexed

On examination:

Muscle tone: Upper limb-grade 1
Lower limb-grade 2
*according to Ashworth scale
Breathing pattern-Thoraco abdominal
Clonus-++
Sensory examination intact

Motor examination

MMT- upper limb-4/5 and lower limb-3/5
*according to MRC grading

Girth measurement

Girth was measured using inch tape and were as follows :

Site /side	Left	Right
Quadriceps	36cm	35.5cm
Calf	20cm	19.1cm

Range of motion

Rom was measured with goniometer in supine lying. The active pain free ranges available were as follows:

Range of motion	Right	Left
Hip flexion	0-40	0-120
Hip extension	10-35	10-40
Knee flexion	10-100	0-110
Knee extension	100-10	110-0
Ankle Dosiflexion	0	0-15
Ankle Plantar flexion	0-15	0-35
Ankle Inversion	0-10	0-30
Ankle Eversion	0	0-15
Shoulder flexion	0-160	0-170
Shoulder extension	0-60	0-60
Shoulder abduction	0-170	0-180
Elbow flexion	0-110	0-110
Elbow extension	0-10	0-10

End feel

Right hip- harsh –suggest a bony block -*myositis ossificans

Physiotherapeutic Intervention

Goals:

1. To normalize muscle tone
2. To improve muscle strength
3. To increase range of motion
4. To improve respiratory functions
5. Teaching and training proper transfer activities
6. Enable symmetrical sitting, sit to stand ,symmetrical standing and gait
7. To make the patient ambulatory with or without help from care giver
8. To achieve functional level of independence

Day 1-day7

- Cryo therapy (quick icing) with sustained stretching to normalize muscle tone
- Active assisted ROM exercises performed for both upper and lower limb for repetition of 45 (3sets-15 repetition with rest of 2 min between each set)
- Stretching of muscle of foot-sustained stretching in prone lying with weight of 2 kg on each ankle
- Placement of pillows for foot correction
- Symmetrical sitting is taught with weight transfer technique

Day 8-day 15

- All above exercise continued
- Focused strengthening of knee, hip and abdominals
- Pelvic bridging exercise
- Modified plank
- Hand exerciser table used with minimal weight to improve hand function
- Functional electrical stimulation for dorsi flexor

Day 16-28

- AROM's exercise of both upper and lower limb
- Stretching continued
- Strengthening with use of theraband initiated
- Bridging on one leg(repetition 10-10-10 with 2 mi rest between each set and slowly increased)
- Swiss ball exercises-reach out activities
- Standing with walker support
- Weight transfer through one leg
- Mat exercises
- Weight shifting quadripod position(one leg raising to strengthen multifidus)
- Balance exercises in wobble board
- Coordination exercises for both upper and lower limb
- Tilt table in supine lying
- Walking in parallel bar with mirror input
- Walking with walker

Outcome measures used:

Slno	Outcome measures	At start of treatment at our centre	At the end of treatment at our centre
1.	ASIA	C	D
2.	Walking index for SCI	0	9
3.	Fatigue severity scale	42\63	14/63

Discussion

This case report talks about how a well curated goal oriented treatment plan helps in better prognosis of a of SCI in a young adult. It further shows the Importance of level and extent of injury playing a pivotal role in fastening the recovery process. Few studies have been reported of patients with this level of injury being able to work with independence. Studies have shown wheelchair ambulation as the outcome in such patient but our patient showed significant functional gains over the treatment period as he was provided with early and goal oriented comprehensive therapy. [2, 13] Patient got early ,goal oriented focused management focusing on few key points like i.e positioning, transfer technique, respiratory care which was given my using some therapies like mirror ,constrained induced approach, FES, titlt table, swiss ball received early rigorous acute spinal cord management including positioning, bed mobility & electrical modality.

The outcome measures used showed a good improvement like The ASIA scale score was improved from grade C to grade D after treatment. Recovery of motor and function was because of a goal oriented activity and early intervention which led to spontaneous plasticity. [1, 5] this plasticity after a SCI comes with structural changes in both damaged and undamaged neuron projecting to and from brain .Axonal sprouting of neurons of brain and in spared intersegment neurons accompanied with creation of new synapses and remodeling of synapses are found [1]. Task specific practice is thought to be imperative to the development of skilled movements. Repetition of movements is the key o relearn a motor pattern.[5] Research study by CM etal showed task oriented training leads to a positive effect on sitting and standing balance.[17] goal oriented specific training was provided given to patient such as activity dependent upper limb and lower limb training, gait training using parallel bar with mirror feedback and functional stimulation showed changes in score of Walking Index Scale from level 0 to level 9 which denotes that a goal oriented task basing on activities of daily living gives positive effect. Locomotion represents the interaction between the innate pattern and an appropriate modulation of leg muscles activation which has to continuously adapt to the present requirements. Bio Feedback plays a vital role as it provides with various feeds like visual, sound etc . The sensory feedback and context specific requirements of motor tasks determine the mode of organization of muscle synergies. [18] Activity dependent plasticity occurs in response to afferent input. Sensory input

from the periphery, typically arising from repetitive limb activity, causes adaptive neuronal changes. As activity dependent plasticity is task specific, the performance of that activity was enhanced and will not generalize to others [1]. Repetition and intensity are both critical for driving plasticity and learning.[19] This also helped in improving endurance and reducing fatigue caused improvement of score of Fatigue Severity Scale from 46/63 to 14/63. Goal oriented training was the key component of the protocol which focused on giving variation and repetition which resulted in a good prognosis may b\e because of remyelination or development of new neuronal connections.[5] psychological boosting of both the patient family plays a vital role in prognosis. The care giver was advised to perform the activities even at home which may have led to continuous firing leading to learning of motor pattern sooner. The patient was taught with various activities of daily living and was performed with or without help after acquiring the correct pattern, which helped him to regain his functional independence in some activities of self care.

Combination of neuroprotective, neuroregenerative and neurorehab strategies are most likely to be effective moving forward given the multifaceted nature of injury. [20]

Conclusion

The prognosis of spinal cord injury patient's depends on variety of factors among which extent and level of injury and goal oriented therapy and long term implication. Designing effective neuro rehabilitation after International Journal of Neurologic Physical Therapy 2018; 4(2): 34-39 39 spinal cord injuries depends on having knowledge about neuronal mechanism, interaction between central programs, afferent feedback and neural control of locomotion. Specific multi-programmed neuro rehabilitation approaches will pave the way for more effective strategies to improve motor function and functional performance in patients with spinal cord injury. Hence it was concluded that specific early interventions with goal oriented therapy which were intentionally selected helped in functional recovery of the patient. The transition of patient from being functionally dependent to being able to walk with assistance and walker and becoming functionally independent was attributed to task specific training, early intervention and neuroplasticity.

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Efficacy of Body weight support treadmill as an accompaniment to conventional gait training Program in chronic stroke patients: An Experimental Study

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Efficacy of Body weight support treadmill as an accompaniment to conventional gait training Program in chronic stroke patients: An Experimental Study

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ABSTRACT

Background: Stroke has been defined as an acute onset of neurological condition due to improper cerebral circulation. Stroke is synonymously termed as “cerebral vascular accident”, “brain attack” or “apoplexy”. According to the Indian Council of Research among the non-communicable disease, stroke contributes for 41% of death and 72% of disability. People surviving acute stroke won’t be able to walk and require prolonged period of rehabilitation to attain functional level of ambulation. Restoration of gait forms the major goal of stroke rehabilitation, requiring usage of various methods and demanding considerable assistance from therapist to aid patient’s support their body weight and control balance.
Methods: A simple randomized sampling was done and Pretest and Posttest experimental method was used giving one group with conventional training and other group with Body weight support treadmill training .
Results: Group given with body weight tread mill training showed significant improvement than the group receiving conventional treatment in spatiotemporal gait parameters, walking speed, endurance, and mobility.
Conclusions: The study demonstrates that 6 weeks of body weight support treadmill training along with conventional physiotherapy is superior to conventional therapy alone in improving functional ambulation and gait parameters.

Keywords: Stroke, BWTT, Rehabilitation

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INTRODUCTION

Stroke has been defined as an acute onset of neurological condition due to improper cerebral circulation which results in various clinical features that corresponds to involvement of focal area lasting more than 24hours. Stroke is synonymously termed as "cerebral vascular accident", "brain attack" or "apoplexy". According to the Indian Council of Research among the non-communicable disease, stroke contributes for 41% of death and 72% of disability. People surviving acute stroke won't be able to walk and require prolonged period of rehabilitation to attain functional level of ambulation. Restoration of gait forms the major goal of stroke rehabilitation, requiring usage of various methods and demanding considerable assistance from therapist to aid patient's support their body weight and control balance.

Ischemia and hemorrhage are two main causes of brain damage in a stroke patient .80 % of all stroke are ischemic type that is insufficient blood supply to the brain neurons leading to rapid effect due to inability to store glucose and going for an anabolic metabolism. Intra cerebral hemorrhagic are a resultant of disruption in connecting pathways and localized pressure injuries of brain tissues.

Even after advent of new technologies still stroke continues to be one of the major cause of death and permanent disability .Out of every three stroke survivor two of them undergoes functional limitations such like gait impairment and need intensive rehabilitation to make them back to their normal life's. In hemiplegic variety of stroke the gait abnormalities seen are reduction in gait speed, distance and there by leading to altered walking ability of the patient with various asymmetrical gaits. The associated reflective problems are asymmetry of step length, stance phase, swing phase duration, double and single support time.

Independent and safe walking or going back to near normalcy is the main goal for a post stroke patient .Motor and gait characteristics should go in symmetry keeping an eye on the stage of recovery of a patient therefore the exercise regimen should be appropriately made. With the evolution many electromechanical devices such as treadmills, body weight support systems, and robot assisted gait trainers has been a great help in the rehabilitation process for restoring gait in combination with traditional method of Physiotherapeutic management.

The evolutionary BWSTT uses the rationale which is based on active engagement in task oriented activities leading to neuroplasticity which is supported by motor learning principles. It allows task oriented practice with a defined intensity and time further many studies have shown improvement at bodily function and structure.

METHODS

A structured Pre-test & post test experimental study was carried out in Physiotherapy department of IHS, Bhubaneswar, Odisha. A total of 50 subjects were taken using simple random sampling method from those who suffered with stroke (6months) and were in the Physiotherapy department.

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Inclusion Criteria

I. Age -40-65 year
II. History of first stroke (more than 6 month)
III. Supratentorial stroke (ischaemic / haemorrhagic stroke)
IV. Mini mental state examination(more than 24)/ out of 30
V. Functional ambulatory category – 2 or more than 2
VI. Both sex group (male and female)

Exclusion Criteria's-

I. Uncontrolled hypertension/any severe cardiac disease
II. Recurrent stroke
III. Any Cerebellar sign and symptom
IV. Any movement disorder
V. Pulmonary or renal failure.
VI. Unstable angina.
VII. Severe aphasia.
VIII. Myocardial infarction
IX. Cognitive disorder
X. History of epilepsy/seizure less 6 month

SAMPLING METHOD

The patients were randomized using a simple random sampling method. And then they were randomly allocated in to 2 group named as group 1 (BWSTT) and group 2 (CGGT) with the group 1 were taken first then group 2 in a random manner.

VARIABLES

INDEPENDENT VARIABLES-

1-Body weight support treadmill (BWST)

2-Conventional treatment

i. Ladder walking
ii. Affected side weight bearing
iii. Step climbing
iv. Sit to stand
v. Over ground gait training

DEPENDENT VARIABLES –

1-Functional Ambulatory Category (FAC)

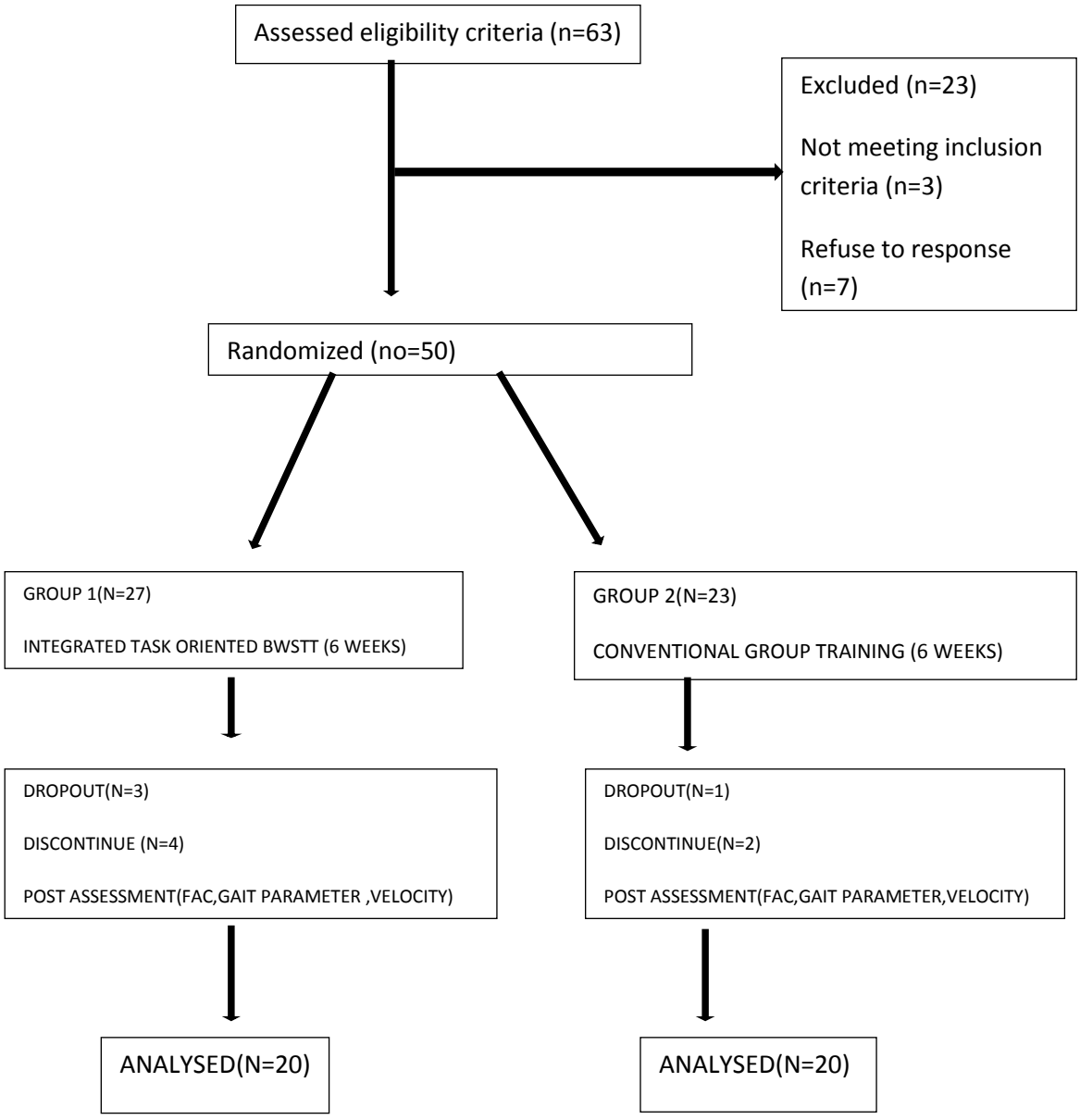
2-speed (10 meter walk test)

3-Step length

INSTRUMENTATION

- Sitting stool
- Measurement inch tape
- Magnet(a part of treadmill)
- Chalk
- Stop watch(mobile)

CONSORT FLOW CHART



PROTOCOL

Consisted of subject's recruitment, pre training evaluation and post training evaluation. All the stroke patients who were willing to participate, and the subjects who met the inclusion and exclusion criteria were met to sign an informed consent. The subjects were asked to pick up one of the 40 paper chit and were randomly allotted into two groups. The groups were as follows:

Group 1: Experimental Group (BWSTT)

Group 2: Conventional Group (CGGT)

1- All patients underwent an initial baseline assessment to FAC, gait velocity and gait parameter.
2- Control group performed conventional exercises for 30 minutes a day, 5 days per week for 6 weeks.
3- The experimental group performed Body weight supported treadmill training for 30 minutes, for 5 days per week for 6 weeks, along with the conventional therapy exercises.

Conventional Training Exercises included the following –

I. Step climbing
II. Paretic side weight bearing
III. Sit to stand
IV. Over ground gait training

Experimental Group Training included the following:

It is a **Prime fitness (UZMA)** body weight support treadmill training for 30 minutes each session along with all conventional group training exercises. And weight supported was 40% maximum and a speed ranges between 0.1mile/hr to 1 mile/hr. After 6 weeks all participants received follow up assessment. And for new subjects there was rest period in every 10 minutes during only 1st week.

DATA COLLECTION

I. Measurements were taken prior to the beginning of the treatment (1st week) and were repeated finally after the completion of treatment protocol (6th week).
II. Subjects were tested on the dependent variables.
III. Data collected were transcribed onto a data sheet for each subject separately.

First reading at before beginning of session at 1st week

After end of 6 weeks

DATA ANALYSIS

The dependent variables were analyzed using 2 ways ANOVA. The factors analyzed were a factor (group) with two levels (groups: Experimental and conventional group) and done within the factor (time) with two levels (time: pre and post). All pair wise post – hoc comparison were analyzed using a 0.05 level of significance. Post hoc analysis was done to find out where the lay. Analysis was performed using IBM SPSS version 23 .

RESULTS

A total 40 subjects were taken, and then divided in to 2 group namely BWSTT (experimental) and CGGT (control) with each group having 20 subjects

FUNCTIONAL AMBULATORY CATEGORY (FAC)

Graph-1 showed the experimental group showed improvement significantly where as in control group it showed improvement but not significantly. As per post hoc analysis only the group 1(experimental) showed significant improvement which is significantly more than group 2 (control).

STEP LENGTH (non - PARETIC LIMB)

Graph-2 showed that there is improvement in both group with more improvement in experimental group than control group. As per post hoc analysis only the group1 (experimental) showed significant improvement which is significantly more than control.

STEP LENGTH (PARETIC LIMB)

Graph-3 showed that the paretic limb of the control group has shown slight decrease in length.

SPEED TEST (10 – METER WALK TEST)

Graph-4 showed there was an improvement of speed in both group from pre and post intervention. The BWSTT showed improvement in pre to post more than CGGT for 6 weeks after post intervention.

DISCUSSION

The overall results of the study showed that the experimental group i.e. BWSTT had a significant improvement in Functional ambulatory category. Further the parameter i.e. non-paretic step length showed a significant difference than the control group after the 6 weeks of therapy sessions. Whereas Paretic step length and 10 meter walk test showed no significant improvement in both the experimental group (BWSTT) and the control group (CGGT) at the end 6-weeks.

FUNCTIONAL AMBULAORY CATEGORY

The result showed that there was significant improvement in functional ambulatory category in the experimental group (BWSTT) than the control group (CGGT) and it was statistically significant.

In group 1 (experimental) intervention, the subjects walked on the treadmill with the body weight supported through harness attached with the device, and the intervention session was done for 30 minutes for 5 days/week for 6 weeks. And in this group the mean value was increased from 2.15 (pre) to 2.95 (post) for FAC.

In group 2 (control) intervention included ladder walking, affected limb weight bearing, sit to stand, step climbing and gait training for 30 minutes for 5days/week for 6 weeks in which the mean value increased from 2.55 (pre) to 2.65 (post).

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In group 1 (experimental) the increase in the FAC could be due to support of the body weight through harness that could have helped the subject to bear more weight on the paretic limb and move the lower extremity in much better and freely without any fear of falling that increased the subject's confidence level. Weight bearing on the paretic side could help in correction /change in the center of gravity and also improve the two point's base of support. Responding to signals in proprioceptive and skin afferents, the spinal inter neuronal networks modify the locomotors pattern in cooperation with descending signals from the brainstem structures and the cerebral cortex (Kaoru Takakusaki et. all).

The independency of gait in experimental group could be due to the effort of subject to bear weight on bilateral lower limbs as both the surface and subject are in dynamic state due to which muscle activity was more.

In group 2 (control group) intervention included ladder walking, affected limb weight bearing, sit to stand, step climbing and gait training for 30 minutes for 5days/week for 6 weeks in which the mean value increased from 2.55 (pre) to 2.65 (post) and it was not significant.

Group 2 (control group) result could be due to fear of fall which could have bounded the subjects to bear weight on sound side for the purpose of maintaining themselves from fall.

The result was not significant because it could be due to inconsistency during the therapy session, the subjects would like to either discontinue or take rest/break during intervention programme.

And also here in group 2 (control group) the subject was moving on static surface which suggested that the subject was only to control themselves. May be 6 weeks time was not sufficient to reach the significant level.

GAIT PARAMETER

Non-paretic STEP LENGTH

The step length showed that the non-paretic extremity showed significant improvement in experimental group (BWSTT) than the control group (CGGT) whereas the paretic step length showed no significant improvement in both the experimental group (BWSTT) and the control group (CGGT) after the completion of 6 weeks therapy session.

Group 1 showed that the non-paretic limb improvement for experimental group was significant with a mean of 14.31meter in the baseline to the 18.83 meter after 6 weeks of therapy session.

This improvement could be due to increased time in paretic limb single stance period, and the percentage of double stance period was prolonged. Studies indicated that these latter parameters, which describe the asymmetrical pattern of the hemiplegic gait, are particularly resistant to treatment. Therefore, it is of major significance that in contrast to gait training on a stationary surface, treadmill training increased the single stance period of the paretic leg.

There are indications that the positive effect may stem from the activation of a spinal stepping generator. Such activation requires in primates intact reticulospinal motor pathways in the ventral section of the spinal cord, a condition that is met in hemiparetic subjects.

In a kinematic comparison of over-ground and treadmill walking of healthy individuals, it was demonstrated that treadmill walking is characterized by greater maximal hip flexion

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and cadence. It could be due to maximizing the non-paretic hip flexion with the help of the paretic limb weight bearing followed by the forward stepping of the non-paretic limb. This supported weight enables the subject to maintain themselves and put more weight and could take more time to and then step forward of the non-paretic limb in the experimental group which might have added the advantage. The improvement in the BWSTT (experimental group) can be because of the repeated training pattern. The BWS system used in training process provided an absolute platform for repeated training pattern with bearing more weight on the paretic side could help to put the non-paretic side more longer than the paretic side. The platform of the treadmill which was constantly moving and the body weight support provide a safe environment for the subject and allowed appropriate weight bearing.

Group 2(control group) for non-paretic group showed no significant improvement and the and the mean was 20.42meter in pre to 21.59meter in post after 6 weeks of the therapy session.

In over ground therapy session they could feel unsafely environment, lack of consistency in the control group. In a kinematic comparison of treadmill walking of healthy individuals, it was demonstrated that treadmill walking is characterized by greater maximal hip flexion and cadence and by a significant decrease in stance time which was not developed properly here in the control group.

PARETIC STEP LENGTH

The paretic limb step length showed no significant improvement in both BWSTT and CGGT but there is increase in the BWSTT mean from 23.86 meter to 27.06 meter where as in CGGT it was from 30.31meter to 29.69meter but it was not statistically significant.

The result could be due to lack of pelvic motion which might have been a barrier to not increased the paretic limb step length, according to Motor learning literature suggests that training needs to be specific to the task that the person needs to do. A study by S.Kartikbabu on involving the analysis of trunk kinematics during walking found that pelvic movements were unstable and asymmetrical in patients with stroke. Consequently, there may be a possibility exists that selective trunk muscle exercises training may enhance symmetrical pelvic movements, thus better weight shifting towards the hemiplegic limb during walking. But in our study the protocol was not specifically designed for trunk control in both groups.

It could be due to lack of knee flexion which could not allow moving due to the contracture of soleus along with the lack of iliopsoas muscle to move the paretic limb in front. And also it could be due the lack of the pelvic rhythm which was fixed during the stance period which allows the whole body a pivot type of motion due to compensatory mechanism of trunk.

The result showed that there was improvement but not significant and if the subject in number were increased which was 20 and the duration were increased which was 6 weeks than it might have reached significant level.

The studies mentioned below described the role of selective trunk exercises on paretic limb movement and balance.

Rajrupinderkaur Rai stated that trunk exercises were effective at enhancing trunk control and balance but gait (step and stride length) also improved significantly. A study by Kartikbabu S (2011) supports present study. He studied the role of trunk rehabilitation on trunk control, balance and gait in patients with chronic stroke.

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The study indicated the importance of the trunk exercises in the rehabilitation of stroke patients. Improvement in balance and gait (step and stride) occurred because both the trunk rehabilitation programme and balance training consist of the use of lower limb muscles which account in change of balance and gait.

SPEED TEST(10 meter walk test)

The result showed no significant improvement in both group 1 (experimental group) and group 2(control group) after the completion of the 6 weeks intervention.

Group 1 showed no significant improvement whereas the mean was increased from 48.65 second to 37.4 second and group 2 showed no significant improvement, but the mean was increased from 41.05 second to 34.9 second post.

In 10meter walk test first, measure and mark a 10meter walkway and then add a mark at 2-meters and another at 8 meter and then advised to walk as speed as possible and the therapist begin the stop watch at 2meter and stop it at 8meter mark level. Again during post-intervention the same method were taken.

The result could be due to increased in the paretic limb weight bearing period which followed by correction of COM to move towards the affected side could took more time so that it could be a disadvantage for speed.

It could be due to lack of proximal(trunk) misalignment because according to Motor control literature also it suggested that if an improved level of proximal trunk gains were attained, a better distal limb control might be expected during balance and functional mobility.

And also it could be due to the lack of the paretic upper extremity which is an essential component during the gait to maintain the speed and also for the purpose of preventing from fear of fall.

It could be to duration which was 8.75month of stroke because at first 3 months the fastest recovery has occurred and after the first 3 months of stroke recovery, the brain's plasticity starts to slow down. As a result, improvements may slow down as well. This is called the plateau effect after stroke and it can overcome the slow-down by adding variety to your rehabilitation regimen. Although there was improvement in walking speed but it was not enough to reach significant level in 6 weeks of interventions.

In a study by Suputtitada A, et al., in a randomized control trial were taken Forty-eight chronic stroke patients were randomized into either the experimental group that received PB WSTT (n=24) or the control group that received floor walking training (n=24). To compare the effect of Partial Body Weight Support Treadmill Training (PBWSTT) technique and floor walking training, on floor walking velocities and functional balance in chronic stroke patients. Treatment outcomes were assessed on floor walking velocities and functional balance by Berg Balance Scale. It concluded that the efficacy of PBWSTT in chronic stroke patients was not statistically different to the efficacy of floor walking training in floor walking velocities.

It could be due to increased spatiotemporal adaption in which there is increase in stride width for the purpose to prevent from fall to increase the stability which allow more stability and also due to the double limb stance support.

It could be due to lack the dorsiflexion activity of ankle during the late swing which could not allowed for proper initial contact after that it

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required more duration to maintain the balance for the purpose of compensating foot flat and loading response.

And it could be also due to the limited hip extension and ankle dorsiflexion with failure to progress body mass forward over the foot - contracture of soleus and due to lack of the lumbopelvic rhythm and excessive lateral pelvic shift - decreased ability to activate stance hip abductors and control hip and knee extensors.

In a study by Combs-Miller SA et all, Single-blind, pilot randomized controlled trial with three-month follow-up with the purpose to compare the effects of body weight-supported treadmill training and over ground walking training when matched for task and dose (duration/frequency/intensity) on improving walking function, activity, and participation after stroke. A convenience sample of participants (N = 20) at least six months post-stroke and able to walk independently were recruited. Thirty-minute walking interventions (body weight-supported treadmill training or over ground walking training) were administered five times a week for two weeks. Intensity was monitored with the Borg Rating of Perceived Exertion Scale at five-minute increments to maintain a moderate training intensity. Walking speed (comfortable/fast 10-meter walk), walking endurance (6-minute walk), spatiotemporal symmetry, and the ICF Measure of Participation and activity were assessed before, immediately after, and three months following the intervention. The over ground walking training group demonstrated significantly greater improvements in comfortable walking speed compared with the body weight-supported treadmill training group immediately. Over ground walking training was more beneficial than body weight-supported treadmill training at improving self-selected walking speed for the participants in this study. But however it is neither supporting and nor contrary to this study but if the subject in number were increased which was 20 and the duration were increased which was 6 weeks than it might have shown improvement.

CONCLUSION

The study demonstrates that 6 weeks of body weight support treadmill training along with conventional physiotherapy is superior to conventional therapy in improving functional ambulation and gait parameters

LIMITATIONS AND SUGGESTIONS

I. Small sample size
II. As the present study is for 6 weeks duration, long term followed up studies are required.
III. In this study the pelvic rhythm was not addressed further studies are needed to evaluate the relation between the gait and pelvic rhythm in stroke patients.

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TABLES

Table:1 - Demographic characteristics of subjects.

Subject information

GROUP	NO. OF SUBJECTS	MEAN AGE
EXPERIMENTAL	20	54.45±5.13
COTROL	20	54.85±6.46
TOTAL	40	54.65±5.76

Table-2: mean, standard deviation (SD), standard error of means (SEM) values of Functional Ambulatory category

FAC (before and after intervention):

Group	0 week		6^{th} week	
	Mean ± SD	SEM	Mean ± SD	SEM
Experimental	2.15±0.36	0.08	2.95±0.22	0.05
Control	2.55±0.51	0.51	2.65±0.48	0.10

Table-3 :Anova for functional ambulatory category Within-Subjects Contrasts (FAC)

Tests of Within-Subjects Contrasts (FAC)

Source	time	Type III Sum of Squares	Df	Mean Square	F	Sig.
Time	Linear	4.050	1	4.050	61.560	.000
time * group	Linear	2.450	1	2.450	37.240	.000
Error(time)	Linear	2.500	38	.066		

Table- 4 :Anova for FAC

Tests of Between-Subjects Effects (FAC)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Intercept	530.450	1	530.450	1919.724	.000
Group	.050	1	.050	.181	.673
Error	10.500	38	.276		

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Table- 5: post Hoc for the functional ambulatory category.

	GROUP-1 PRE(MEAN)	GROUP-1 POST(MEAN)	GROUP-2 PRE(MEAN)	GROUP-2 POST(MEAN)
Group-1 Pre(Mean)	0	0.8	0.4	0.5
Group-1 Post(Mean)	0.8	0	0.4	0.3
Group-2 Pre(Mean)	0.4	0.4	0	0.1
Group-2 Post(Mean)	0.5	0.3	0.1	0

Table – 6 : Step length (Non-paretic step length):mean, standard deviation (SD), standard error of means (SEM) values of Step length(non-paretic side)

Group	0 week		6^{th} week	
	Mean ± SD	SEM	Mean ± SD	SEM
Experimental	14.31±6.77	1.51	18.83±5.77	1.29
Control	20.42±12.60	2.81	21.59±11.29	2.52

Table-7 :Anova for step length (non-paretic side):-

Tests of Within-Subjects Contrasts

Source	Time	Type III Sum of Squares	Df	Mean Square	F	Sig.
Time	Linear	161.568	1	161.568	19.478	.000
time * group	Linear	56.230	1	56.230	6.779	.013
Error(time)	Linear	315.200	38	8.295		

Table – 8 :Anova for step length (non-paretic side):

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	28250.765	1	28250.765	161.890	.000
Group	394.405	1	394.405	2.260	.141
Error	6631.208	38	174.505		

Table-9 : POST HOC FOR NON-PARETIC STEP LENGTH

	GROUP-1 PRE(MEAN)	GROUP-1 POST(MEAN)	GROUP-2 PRE(MEAN)	GROUP-2 POST(MEAN)
GROUP-1 PRE(MEAN)	0	4.51	6.11	7.28
GROUP-1 POST(MEAN)	4.51	0	1.59	2.76
GROUP-2 PRE(MEAN)	6.11	1.59	0	1.16
GROUP-2 POST(MEAN)	7.28	2.76	1.16	0

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Figures

A comparative effectiveness of PNF technique and Theraband exercises with PNF pattern on upper limb functions in patients with Diabetic Neuropathy

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A COMPARATIVE EFFECTIVENESS OF PNF TECHNIQUE AND THERABAND EXERCISES WITH PNF PATTERN ON UPPER LIMB FUNCTIONS IN PATIENTS WITH DIABETIC NEUROPATHY

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ABSTRACT

BACKGROUND: Diabetes mellitus is one of the commonest metabolic disorder in the world which is also responsible for manifesting other diseases. It has a deleterious effect on the nerves resulting in diabetic neuropathy. Patients with diabetic neuropathy have reported to be more disabled in self-care tasks and housework. But the general therapeutic measures pays less attention to the upper limb problems. Proprioceptive Neuromuscular Facilitation (PNF) is a rehabilitation approach to the disability associated with diabetic neuropathy that is widely used by physiotherapists in many countries. Theraband exercises with PNF pattern on the other hand can be an alternative to the conventional PNF technique in the management of subjects with diabetic neuropathy. So this study was done with an objective of comparing the effectiveness of the PNF technique and the Theraband exercises with PNF pattern along with conventional exercises common to both groups on the upper limb functions in patients with diabetic neuropathy.

METHODS: A simple randomized sampling was done and pre-test and post-test experimental method was used, treating one group with PNF technique and other group with Theraband exercises with PNF pattern for a period of 4 weeks (3 sessions per week on alternative days).

RESULTS: Both the groups showed statistically significant improvement from the baseline. But the group treated with Theraband exercises with PNF pattern on upper limb functions showed improvement as compared to PNF technique on upper limb functions in patients with diabetic neuropathy.

CONCLUSIONS: After 4 week of intervention it has been observed that Theraband exercises with PNF pattern on upper limb functions showed better improvement as compared to PNF technique on upper limb functions in patients with diabetic neuropathy.

KEYWORDS: Diabetic Mellitus, Diabetic Neuropathy, Proprioceptive Neuromuscular Facilitation, Theraband, Michigan Neuropathy Screening Instrument, Upper Extremity Functional Index

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INTRODUCTION

Diabetes mellitus (DM) represents a group of metabolic diseases characterized by chronic high glycemic levels resulting either from defects in insulin production, body tissue response to the insulin, or both. Such abnormalities in the metabolism of carbohydrates, lipids, and proteins result from the paucity of insulin as an anabolic hormone in the cells of the body (Kharroubi and Darwish 2015). There are around 537 million adults around the world with diabetes as per an estimation by the International Diabetes Federation out of which approximately 77 million individuals reside in India, having a higher prevalence (4.3%) as compared with the west (1%-2%) (International Diabetes Federation 2022) (Pradeepa and Mohan 2021) (Bansal et al. 2006).

Diabetic neuropathy (DN) is a common complication of DM with a prevalence in the Indian population ranging from 21% to 31% (Pradeepa et al. 2008). It can have a symmetrical presentation as in diabetic polyneuropathy, painful autonomic neuropathy, painful distal neuropathy, insulin neuritis, and polyneuropathy with glucose impairment; or asymmetrical presentation as in radiculoplexoneuropathies, mononeuropathies, and cranial neuropathy in patients with DM. Distal symmetrical polyneuropathy accounts for 75% of all DN making it the commonest type of DN (Bansal et al. 2006).

The exact pathogenesis of DN though remains unknown but hyperglycemia-induced direct damage to nerve cells and the hyperglycemia-induced decrease in the neurovascular flow resulting in neuronal ischaemia are the most accepted possible causes of DN in patients with DM. These rheological changes brought about by the hyperglycemia result in abnormality in the neuronal, axonal and Schwann cell metabolism, impairing axonal transportation (Edwards 2008).

In common acknowledgement, DN starts from the lower extremities but as the disease progresses, it also affects the upper limbs with advancement from the distal to the proximal, particularly in mononeuropathies. Patients with DN demonstrate a significant reduction in myelinated nerve fibres and endoneurial vascular densities in the upper limbs. These factors may also explain the higher prevalence of compressive neuropathy in patients with DM as its delayed complications (Thomsen et al. 2011). To date, a very small number of studies have investigated the prevalence of clinical and subclinical presentation of DN in the major nerves of the upper limbs including median and ulnar nerves, which may range between 58% to 93% (Bertora et al. 1998) (Yang et al. 2018).

Symptoms include sensory deficits such as loss of tactile sensation, impaired proprioceptive feedback, and painful limb. More importantly, they also include motor deficits such as a decrease in muscle strength, and impaired gross and fine motor skills involving hands. Motor symptoms tend to develop later in the course of the disease All these factors lead to patients reporting of being more disabled in self-care tasks and performing housework, requiring the primary attention of caregivers, physicians as well physiotherapists (Ziegler et al. 1992).

Symptomatic muscle weakness predominantly is responsible for the acquired disability in performing tasks in patients with DN, thus the management protocol must include majors addressing the prevention of any further complications and improvement of muscle strength. One of the physiotherapeutic techniques commonly utilized by therapists to improve muscle strength and restore functional range of motion (ROM) is proprioceptive neuromuscular facilitation (PNF). It is a rehabilitation approach and concept developed by Dr Herman Kabat and Margaret (Maggie) Knot, based on the works of Sir Charles

Sherrington in 1947. Since then it is being practised by physiotherapists and is also a part of the physiotherapy curriculum. Under this therapeutic procedure, the therapist uses the stretch reflex to initiate muscle contraction against the applied resistance, where the tactile stimulation and auditory stimulation from the therapist direct the movement of the patient (Adler et al. 2014).

Instruments such as resistance training machines and free weights are commonly used for resistance exercises to improve muscle strength. These are relatively more expensive and space-occupying than the resistance band that can be used as an alternative to them. Its deformation curve is associated with the increasing tension within it, i.e. the more the band is stretched, the greater the resistance one feel towards its further elongation (Iversen et al. 2016). As shown in a few of the studies, resistance bands or Theraband provide muscle activation to the exercises, similar to that of the other instruments (Aboodarda et al. 2016). Compared to the conventional PNF exercise program with manual resistance whose force may vary throughout the ROM, Theraband exercises in PNF patterns thus can be a better alternative.

Seeing the increasing number of patients with DN in a developing country like India, the demand for a well-accepted physiotherapeutic protocol addressing the upper limbs functional disability is the need of the moment. Many studies have been done testing the effectiveness of the PNF technique and Theraband exercises with PNF pattern individually as a treatment in improving upper limb functional disabilities (Candace et al. 2017) (Kaur 2010). But there is a lack of studies comparing both with respect to the upper limb functions in patients with DN. Therefore, this study was done to compare the effectiveness of PNF techniques versus Theraband exercises with PNF patterns on upper limb functions in patients with DN.

MATERIAL & METHODS

STUDY DESIGN

This structured comparative experimental study was carried out in the Department of Physiotherapy, Sun Valley Hospital, Guwahati, Assam within a period of 6 months. Approval of the Institute Ethical Committee (IEC), College of Physiotherapy and Medical Sciences as per the ethical guidelines for biomedical research on human subjects was taken before starting the study.

SUBJECTS

A total of 62 subjects diagnosed with chronic type 1 and type 2 DM were assessed for DN using detailed motor and sensory assessment and the Michigan neuropathy screening instrument (MNSI) Score. MNSI is a reliable and valid rapid tool consisting of two sections, 'section A' including 15 self-administered questions about neuropathic symptoms and 'section B' including neurological assessment and examination of the lower extremity (Moghtaderi et al. 2006). In the context of this study, only section A was considered. Individuals with impaired sensory and motor findings along with an MNSI score ≥ 10 were considered to be suffering from DN.

Of all, 32 subjects were identified to have DN. They were approached with the proposal of the study and were evaluated for the inclusion and exclusion criteria. 5 individuals were excluded and 3 were not willing to participate (Figure-01). Both male and female subjects, within the age group between 30-60 years, diagnosed with DN with a history of DM for the last 10-20 years and upper limb muscle strength between 3-4 as per manual muscle testing were included. The subjects with non-diabetic neuropathy (vitamin deficiencies, uraemia, thyroid disease, etc. induced), lumbar or cervical radiculopathy, history of cerebrovascular accident, history of upper limb injury, other neurological disorders, and mentally unstable subjects were excluded.

RANDOMIZATION

24 subjects who met the inclusion criteria and agreed to participate were explained in detail about the study and written informed consent was taken in their preferred language before their enrolment in the study. The enrolled subjects were randomized into two groups by simple random sampling. "Group-A" consisted of 12 subjects, who were treated with PNF exercises including dynamic reversal and rhythmic stabilization in both D1 and D2 patterns, whereas "Group-B" consisting of 12 subjects were treated with resistance exercises using the Theraband in PNF D1 and D2 pattern along with conventional exercises including generalised mild stretching

and active ROM exercises that were common to both the groups.

INTERVENTIONS

All the subjects in both groups were treated for a period of 3 sessions alternatively per week for 4 weeks. Each treatment session in both groups started with conventional exercises that were common to both groups, followed by the assigned treatment. The duration of each treatment session was of 45 minutes. The exercises were given on alternative days with each exercise being repeated 8-10 times and 1-2 minutes of rest in between.

In "Group-A" the subjects were treated with the subject in supine lying (Figure-02) and the subjects in "Group-B" were exercised with the Theraband in the sitting posture (Figure-03). The progression was made by increasing the resistance by subsequently using the next-in-line Theraband based on the resistance offered by it, once the subject achieves easiness with the current Theraband. In the beginning, the participants used the yellow band, and progressively the red band, followed by the green and blue were used. In this way, the exercise intensity gradually increased.

MATERIALS USED

The non-latex resistance bands of the company 'Theraband' were used, which were colour coded based on the maximum resistance offered by it. They were in the order of yellow, red, green, and blue where yellow being with least resistance and blue with the maximum.

OUTCOME MEASURE

The Upper Extremity Functional Index (UEFI) was used as the outcome measure. It is a patient-reported questionnaire used to assess upper limb functionality in individuals with upper limb dysfunction. It consists of 20 questions on a 5-point rating scale assessing the level of difficulty in performing activities of daily living using the upper limbs including household and work activities, hobbies, etc. Each item score ranges from 0-4, where 0 represents extreme difficulty and 4 represents no difficulty in performing the task with a cumulative total score maximum of 80 indicating the highest functional status and a minimum score of 0 indicating the lowest functional status. Subjects were asked to circle the number that best describes their level of difficulty in response to each item prior to any intervention and the end of 4 weeks of treatment. UEFI measures show both acceptable reliability and validity with the ICC value = 0.94 (Chesworth et al. 2014).

DATA ANALYSIS

Statistical analysis was performed using Statistical Package for Social Science (SPSS) version 28. The Kolmogorov-Smirnov test was used to test the normality of the data. The Chi-Square test was used to analyse the categorical data and the Independent Sample T-test was used to analyse the continuous data. For outcome measure, within-group analysis was done using the Paired Sample T-test and between-group analysis at baseline as well as following treatment was done using the Independent Sample T-test. The tests were applied at a confidence interval of 95%. For the level of significance p-value set to below 0.05 was considered a significant difference.

RESULTS

The pre- and post-intervention data for both limbs were normally distributed. The groups were homogenous preceding the interventions considering the demographic characteristics and baseline variables as there was a statistically non-significant difference ($p > 0.05$) between the two groups, in the way depicted in Table-01. Following 12 sessions of interventions, the intra-group comparison was suggestive of a statistically significant difference in both Group-A and Group-B concerning the UEFI score for both right and left side upper limbs. This represents that both treatments were effective in improving upper limb functions in subjects with DN. Whereas inter-group comparison was indicative of Group-B showing a statistically significant improvement over Group-A in UEFI score ($p < 0.05$) for the right as well as left upper limbs following treatment (Table-02). This shows that Theraband exercises with the PNF pattern were more effective than the PNF techniques on upper limb functions in patients with DN.

DISCUSSION

This study demonstrated that a 4-week therapeutic treatment program of PNF techniques and Theraband exercises with PNF patterns could improve the functionality of both

right and left upper limbs as measured using the UEFI score. The improvement however in the Theraband exercises with the PNF pattern group was more significant compared to the PNF techniques group.

The within-group development following exercises in both groups can be explained by the betterment in glucose control as induced by the exercises, which progressively slow down or stops the further progression of DN. Even though the therapeutic techniques do not prove to reverse pathogenesis and progression but they help with the control of the aetiology that is DM (Richter et al. 1981).

Previous literature reported that treatment with PNF techniques helps with increasing muscle strength (Hindle et al. 2012) (Nelson et al. 1986); and improving muscle endurance (Kofotolis and Kellis 2006), power output (Klein et al. 2002), and generalised functionality (Kaur 2010), which are mostly related to the increase in the cross-sectional areas and mass of the muscles following PNF training (Kofotolis et al. 2006). Moreover, when treated with PNF techniques also enhances proprioception firing, sensory-motor function, and muscle stabilization (Mathivathani 2018). On top of that, the manual contact and the tailor-made resistance offered by the therapist also played their role by inducing tactile feedback and making the treatment more subject-specific (Candace et al. 2017). All these factors may explain the observed within-group improvement in both upper limbs' functionality as assessed by UEFI seen in Group-A.

Conventionally PNF is a manual interaction technique, whereas the traditional Theraband exercises are practised in the non-PNF pattern. But as an alternative in this study, the resistance exercises were practised with the PNF patterns. However, there is a limited study exploring the therapeutic benefits of resistance exercises with PNF patterns. The use of a Theraband induces muscle activity that progressively increases from the beginning till the end of the range, mirroring the increasing resistance offered by the Theraband with its elongation. This gives an upper hand over the use of free weights as the muscle activation varies throughout the range (Bergquist et al. 2018). The goal of such an approach was to improve overall muscle strength, flexibility, and movement coordination of the upper limbs. When the resistance exercises were reinforced with repeated PNF patterns, it seems to increase coordination, promote joint stability, and improve neuromuscular control (Saliba et al. 1993). It also involves mass movement patterns that are diagonal and spiral in nature crossing the midline of the body, thus making it possible for the patients to learn the desired motor action and incorporate those responses into their daily functional activities. As most of our daily activities involve such types of movement patterns (Adler et al. 2014) (Saliba et al. 1993). The within-group improvement in both upper limbs' functionality seen in Group-B might be explicated by these considerations.

As aforementioned, this study aimed to find out which of the following therapeutic exercises, PNF technique and Theraband exercises with PNF pattern shows better results considering the function of the upper limb as determined by UEFI score among subjects with DN. The result of the study demonstrated that the UEFI score improved in both groups for the right and left upper limbs. But the between-group analysis implicated that the subjects in Group-B, who were treated with Theraband exercises with PNF pattern showed significantly better improvement in the upper limbs' functionality as compared to the PNF techniques group.

The muscle activation was proved to be greatest with the Theraband exercises with PNF pattern as compared to the conventional PNF techniques (Rhyu et al. 2015). The conventional PNF techniques lag behind in terms of the progressive nature of the treatment with the improvement in function, which was archived in Group-B by using different colour-coded Theraband. This might have acted on the psychological aspect of the intervention, offering subjects the feeling of accomplishment and motivating them to continue with the therapeutic program. All these differences between the groups possibly described the outcome variation following interventions.

The small sample size, targeting subjects with both type-I and type-II DM being subjected to a short duration of intervention without any follow-up may have contributed to the potential bias in the study. Hence future studies targeting subjects with either type-I or type-II DM, with large sample size and with longer treatment

duration along with long-term effects analysis is warranted to have greater clarity on the results.

CONCLUSION

Comparable improvement in upper limbs' function as assessed by the UEFI in subjects with DN was demonstrated in both groups. However, with better results gained subjectively in the Theraband exercises with PNF pattern group compared to the PNF technique group, the current findings suggest the use of Theraband exercises with PNF pattern as a better alternative to the PNF technique for the patients with DN.

ABBREVIATIONS

DM- Diabetes Mellitus

DN- Diabetic Neuropathy

MNSI- Michigan Neuropathy Screening Instrument

UEFI- The Upper Extremity Functional Index

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TABLES

Table-01: Demographics & Pre-Intervention Data

Variables	Group-A	Group-B	t-Value	P-Value
Age (Years)	51.41 ± 1.62	52.91 ± 2.84	-1.589	0.126
Male/Female*	05:07	04:08		0.673
Rt PreUEFI	42.92 ± 2.19	43.67 ± 2.19	-0.839	0.411
Lt PreUEFI	42.42 ± 1.88	43.25 ± 1.96	-1.063	0.299

- Rt PreUEFI= Right Upper Extremity Functional Index score at pre-intervention.
- Lt PreUEFI= Left Upper Extremity Functional Index score at pre-intervention.
- Quantitative variables are presented as mean ± SD and categorical variables (*) as the number

Table-02: Intra-Group & Inter-Group Comparison

	Group-A			Group-B			INTER-GROUP
	Pre-intervention	**Post-intervention**	**p-Value**	**Pre-intervention**	**Post-intervention**	**p-Value**	**p-Value**
Rt UEFI	42.92 ± 2.19	61.83 ± 1.08	0.000	43.67 ± 2.19	70.91 ± 2.27	0.000	0.000*
Lt UEFI	42.42 ± 1.88	61.08 ± 1.08	0.000	43.25 ± 1.96	71.67 ± 2.34	0.000	0.000*

- Rt UEFI= Right Upper Extremity Functional Index score.
- Lt UEFI= Left Upper Extremity Functional Index score.
- Quantitative variables are presented as mean ± SD.
- (*) = p-value < 0.05, Group-B statistically significant over Group-A

FIGURES

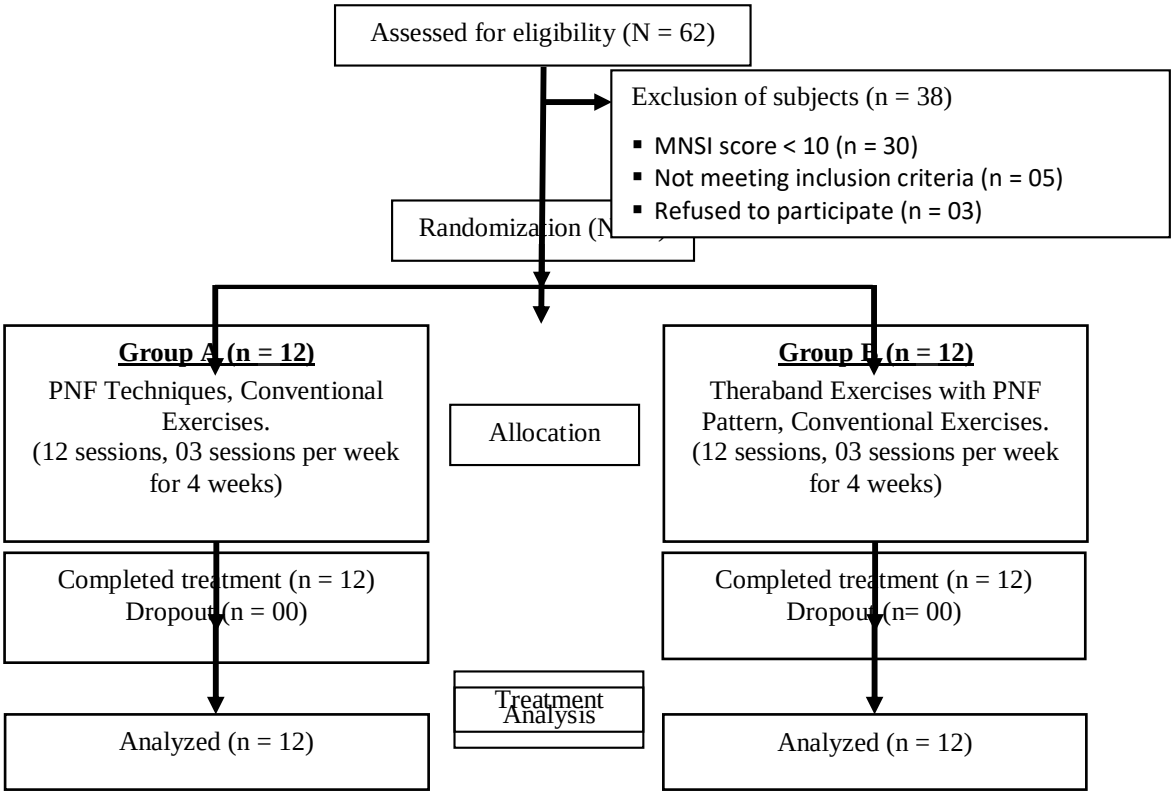

Figure-01: Consort Flow Diagram

Figure-02: PNF Techniques: (A) Dynamic Reversal; (B) Rhythmic Stabilization;

Figure-03: Theraband Exercises With PNF Patterns (Clockwise): (A) D_1 Flexion; (B) D_1 Extension; (C) D_2 Extension; (D) D_2 Flexion

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Role of Blended Teaching in Enhancing Effectiveness of Quality of Teaching-Learning Process: An Empirical Study

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Abstract

Advancement and usage of Information and Communication Technology has brought significant transformation in the education system. Online learning system has facilitated learning experience and teaching with development in technologies and different communication channels. Talking about blended teaching and learning is a mixed paradigm of education, and it offers the promise of addressing various challenges faced by traditional learnings system with the introduction of a constructive approach to blended learning and education. Blended learning and teaching is an innovative concept that provides the benefit of the traditional teaching of the classroom along with ICT-supported learning. Blended learning is a combination of face-to-face learning along with online methods of delivering education that influences perceptions of students regarding the learning environment and teacher's experience of teaching; it also influences the learning outcomes. Today majority of teachers are making use of developed engagement strategies in the classroom and online teaching. Blended learning is helping in improving the quality of education. A sample of 200 respondents was collected from respondents through a "standard questionnaire," which was created on a five-point interval scale.

Keywords: Blended Learning, online learning, virtual classroom, hybrid learning, institutional approach, student engagement, teaching practice

Introduction

Regardless of teachers' opposition to making use of technology in education, a rapid increase in blended education can be seen, and that is driven by its benefits over traditional and online teaching. Many types of research have been conducted to find out the advantages and disadvantages of blended teaching and learning. Interviews were conducted with teachers who were using a blended system of teaching and learning and asked them about the reasons why they are using this system. Teachers were highly valuing the classroom components as compared to online. Such attitude is heavily driven by the contemplation that a particular function of learning was suited in the best way to a particular format. The effectiveness of blended learning and how it enhances the effectiveness of the teaching-learning process can be derived by observing how such courses are influencing students as these courses offer a great range of advantages and resources to students that would enhance their experience of learning that is beyond either online or face-to-face modes alone. In blended learning, it provides the mode of teaching that removes the hindrances like a place, time, and other situational obstacles, and at the same time enables best quality coordination between teachers and their students. There are various methods to judge the

effectiveness of classroom teaching practices and online teaching systems. The most common method is to check the learning of students. The least common way of evaluating a blended system is the evaluation of courses against a set of principles of pedagogic. By using recognized criteria, a benefit of evaluating courses is the elimination of the third variable problem that comes in the picture when learner's learning results are used as the method of measurement. There are a lot of factors other than the effectiveness of teaching that impacts the learnings of students. Evaluating classroom directly and online components against established criteria is a direct method of quality of blended learning and teaching **(Jeffrey et al. 2014).** Blended learning has earned a lot of popularity in the last two decades, after which many teachers and educators claim that it has a lot of potentials to go hand-in-hand with the philosophy of open and distance learning in many fields. The reasons of using a blended learning system is based on the reality that this strategy owns the potential of offering a lot of opportunities of teaching and learning that are included in face-to-face teaching enabling learners who are frequently absent from regular classes and they would be able to improve their grades by watching online lectures and by using other recorded lectures and materials at their home **(Muthuraman, 2018).**

The academic performances of learners have improved with the blended learning system through its being useful, easy, clear, flexible, and other feasible tools. The participation, engagement, interaction, collaboration, and communication skills of students have improved and increased in the comfortable environment of blended teaching and learning. Learners have also become friendly, self-dependent, confident and more self-regulated. Furthermore, it has enabled them to develop strong associations with their teachers, instructors and other students. A significant level of satisfaction has been observed among students who are using blended learning tools as it enables them to record sessions to view it later, it is clear and motivates their long-term learning **(Mohamed, 2022).**

Literature Review

Atef & Medhat (2015) stated that the system of blended teaching and learning has been using for some time now and it has already built good practices for the benefit of students. Teachers who are adopting different methods of teaching are able to offer a more rewarding and successful experience of learning to their students. When a teacher understands how in the best way the e-learning can be blended with the existing program of learning, then more usage of technology can be done. The combination of different methods of learning in the same classroom is no longer unusual. With the use of well-established learning methods, the blended courses are designed by experts like self-paced e-learning, face-to-face learning and teaching, and other learning resources in virtual classes.

Poon (2013) studied that different approaches of learning and teaching have been found to be directly influencing and enhancing the learning experiences of students. Blended learning is a combination of physically teaching and online method of delivery, and it has the capability of influencing perceptions of learners as well as the learning environment and the result of teaching along with academic achievements. For teachers who are planning to use a blended teaching system in future are recommended to keep it simple, but the individual must be ready to be experimental. Distinct courses and modules are needed to suit the course and the requirement of learners in a blended form of teaching, and flexibility is essential.

Lalima & Dangwal (2017) explained that right attitude, rigorous efforts, encouraged teachers and learners, and good budget is needed for the successful implementation of blended learning and teaching. Evaluation of traditional methods of teaching and ICT-supported methods have been found with some advantages and disadvantages. Both the systems satisfy different requirements, demands, and expectations of both teachers and learners from the educational system. The solution for this is to design and provide a system that is based on an integrated approach and have all the features of traditional and ICT-based learning and teaching. The demand of teachers and students these days is to have a system that provides the benefits of both kinds of system, and a blended system of education is found to be the right one.

Kintu, Zhu, & Kagambe (2017) explained that to undertake innovative pedagogical approaches effective system of blended teaching and learning is essential with the inclusion of technology in education. Analyses of features, the background of students, design features, and the result of learning as an element for effectiveness would assist in informing the designing of an effective environment of learning that includes online teaching along with face-to-face sessions. Most of the characteristics of learners and design features of blended learning found in the study are essential elements of blended teaching and learning effectiveness. Constituting considerable predictors of results in blended learning would assist in informing the planners of that learning environment so that they can put in place the essential groundwork to design an innovative blended learning program with pedagogical approaches.

Khader (2016) found that the blended method of teaching and learning is an invented technique as it provides a new way of teaching with the usage of information technology and communication system and without making a radical change in traditional methods. A blended system does not rely on traditional methods, but it improves it with the integration of technology and other electronic methods. The computerized lessons are prepared with certain patterns and mechanism by recalling the previous experience of new lessons, it also include presentations and activities are prepared by the instructors. and they make learners to work with them and solve queries.

Ayyagari & Aryasri (2018) revealed that in blended technology of teaching and learning, students all over the world are taught by the best teachers with high quality, where teaching is personalized as per the learning capacity and ability of students. At present, the technology of blended learning is an incredible platform of teaching and learning that provides personalized results from learning and is truly scalable. It has extensively integrated artificial intelligence, virtual reality (VR), Internet of things (IoT) in their education to assist students with the customized and unique mock tests that help them in preparing for the competitive examinations. Instructors are making use of the latest gadgets such as smart boards to write notes that are assessable by learners anytime and anywhere from their devices.

Shivam & Singh (2015) stated that there is no doubt that the blended method of teaching n learning is enhancing the effectiveness and quality of education. It has increased the collaboration between teachers and their students. Information sharing can be done with the use of technology not just within the campus but across the globe. It motivates students to complete their tasks and learn on time. Learners of the current generation are digital natives and are born with the internet network and are transforming themselves from old to new web-based system of learning, which is making them more cooperative, combined, and have also increased their participation.

Shukla, Dosaya, Nirban, & Vavilala (2020) found that the online courses that are included in the blended learning system provides access to learners who are from remote areas and marginalized sections of the world. Blended system of learning help students in the development of their critical thinking and also increase learning capacity of learners, which is essential in 21st century. Blended teaching and learning method is a shift from traditional method to electronic method. Online learning system develops potential space of learning for learners by using technology that enhances the effectiveness of the process of teaching as well as learning. More research must be conducted by educational technologists and researchers from distance education fields.

Masadeh (2021) found that the attitude and perception of students and teachers would be changed towards education with the positive and comfortable system of blended learning and teaching because it provides the flexibility of time and place. The benefits that a blended system of education provides would be helpful for teachers who want to adopt the system and motive others as well. The study shows that there must be a balance between the goals of the administration, the requirements of learners and the limits of faculty. At the same time, it also highlights the need of proper structure and dialogue in a functional environment of teaching. Regardless, the blended teaching system has been proved as a successful method of teaching in the past few decades as it has made a positive influence on students and have helped them achieve their goals.

Dwiyogo & Radjah (2019) explained that the educational environment and technique that includes traditional systems along with the usage of technology and various other academic sources and modes is called a blended teaching and learning system. The exercise of blended learning based on adaptive physical education material of teaching has the potential of improving the learning of learners and its results as well includes attractiveness, efficiency, and effectiveness. The quality of teaching and knowledge is always associated with the methods of learning that are essential for the achievement of academic goals but under certain conditions. Thus, to obtain high quality of education, teachers must adopt the blended system of teaching and learning.

Zavaraki & Schneider (2019) revealed about some of the opportunities for students that can be received through blended learning system are the availability of various resources, facility of information delivery, increased motivation, self-esteem, increased confidence, independence, increased educational activities, the collaboration of classroom teachers and special instructors, empowerment of learners with disabilities, personal development of teachers and students, developed educational curriculum.

Bhadri & Patil (2022) explained and suggested to students that with the assistance of blended teaching and learning system will improve their learning and change their attitude towards education with the combination of Asynchronous and synchronous modes of learning and it would give them the opportunity to learn independently and flexibly. The task of designers of the system and teachers has become critical and they must work together to develop a good and effective system for learners. Simultaneously, educational designers can bring improvement and develop user-friendly approaches of blended learning and make it easy for learners and teachers to adopt the system.

Study's Objectives

1. To measure the various Role of Blended Teaching in Enhancing the Effectiveness of the Quality of Teaching-Learning Process.
2. To ascertain the significance of Role of Blended Teaching in Enhancing Effectiveness of Quality of Teaching-Learning Process.

Methodology

The study is empirical in nature. 200 respondents participated in the study. The data was collected from them through a structured questionnaire. Mean and t-test application was done to identify the results. The method of sampling was convenience sampling.

Finding of the study

Table 1 displays the gender, showing male respondent as 53.50%, and female respondent as 46.50%. Looking at the Age of the Respondents, those who are of 18 to 22 years are 35.50%, those between 22 to 25 years are 30.00%, and those who are 25 years and above are 34.50%. With reference to the Usage level, Schools are 25.00%, Colleges / University are 41.50%, and Professionals are 33.50. Looking at the Regions, Urban regions are 59.50%, and rural regions are 40.50%.

Table1 Details of the Respondents

Variable	**No. of respondents**	**Percentage %**
Gender		
Males	107	53.50%
Females	93	46.50%
Total	**200**	**100%**
Age		

18 to 22 years	71	35.50%
22 to 25 years	60	30.00%
25 years & above	69	34.50%
Total	**200**	**100%**
Usage level		
Schools	50	25.00%
Colleges / University	83	41.50%
Professionals	67	33.50%
Total	**200**	**100%**
Regions		
Urban region	119	59.50%
Rural region	81	40.50%
Total	**200**	**100%**

Table2 Various Role and the Significance of Blended Teaching in Enhancing Effectiveness of Quality of Teaching-Learning Process

Serial No.	Statement of Survey	Mean Value	t-Value	Sig.
1.	Blended teaching improves education quality and sharing of information that makes teaching more efficient, and effective.	4.33	19.140	0.000
2.	A blended system of learning allow students to work at their own pace, which ensures that they are fully understanding new concepts without going through the pressure of moving to the next topic.	4.27	18.392	0.000
3.	This system assists learners in exploring new technologies and using different instrument and techniques for learning.	4.22	17.949	0.000
4.	Instructors motivate learners to interact with other students with the help of Discussion Forums, chat rooms, and other Online interactive tools.	4.19	17.155	0.000

5.	Blended learning style promotes various effective methods for teachers and learners to become more engaged with each other.	4.00	14.652	0.000
6.	Methods of Blended learning enable learners to explore information or guidance online that is accessible any time and at any place.	4.03	14.838	0.000
7.	Blended learning has eased the access to the huge course materials as per the requirement of students.	3.47	6.835	0.000
8.	Educators who are adopting this classroom-style are easily receiving the advantages of having their traditional modes enhanced.	3.79	11.539	0.000
9.	Technology is used to support learning that is self-directed and involves the use of interactive and collaborative learning activities.	4.10	15.874	0.000
10.	Blended learning is very popularly and helping learners in their professional development	3.83	12.187	0.000

Table2 displays the Mean values for statement for the study done to know the "Various Role and the Significance of Blended Teaching in Enhancing Effectiveness of Quality of Teaching-Learning Process" the first statement is about the quality and knowledge sharing "Blended teaching improves education quality and sharing of information that makes teaching more efficient, and effective" with the mean score of 4.33. Statement "Blended system of learning allow students to work at their own pace, which ensures that they are fully understanding new concepts without going through the pressure of moving to next topic" has the mean value of 4.27, next statement is about students exploring new technologies, "This system assists learners in exploring new technologies and using different instrument and techniques for learning" with the mean score of 4.22. Forth statement is about the interaction "Instructors motivating learners to interact with other students with the help of Discussion Forums, chat rooms, and other Online interactive tools" the mean value is 4.19, next statement says that blended learning promotes new methods of teaching, "Blended learning style promotes various effective methods for teachers and learners to become more engaged with each other" has scored the mean value of 4.00, next statement is "Methods of Blended learning enable learners to explore information or guidance online that is accessible any time and at any place" the value is 4.03. Seventh one is about access to huge course material "Blended learning has eased the access to the huge course materials as per the requirement of students" the mean value is 3.47, next statement is "Educators who are adopting this classroom-style are easily receiving the advantages of having their traditional modes enhanced" the mean value is 3.79, the last two statements are "Technology is used to support learning that is self-directed and involves the use of interactive and collaborative learning activities" and "Blended learning is

very popularly and helping learners in their professional development" with the mean value of 4.10 and 3.83 respectively. T-value of every statement in the context of Various Role and the Significance of Blended Teaching in Enhancing Effectiveness of Quality of Teaching-Learning Process is significant because t-value statements are found to be positive and significance value also less than 0.05.

Conclusion

Blended learning is an educational approach that combines the traditional method of teaching with the technology of e-learning. With the involvement of digital instruments, classroom teaching is enhanced. However, despite its popularity, it is still essential to ask and evaluate if blended learning is actually effective? Yes, all thanks to its popularity and effectiveness and the benefits that it provides to teachers and students that have made it popular and attractive to adopt. When learners who were studied through traditional methods of learning given access to online learning had improved their performances. One of the major reasons behind their success is they get motivated to use multiple styles of learning and get access to huge learning materials, and it also offers flexibility in terms of availability. In other words, while enjoying the benefits of face-to-face learning students can access material that is available online from anywhere and at any time. Accessing global level study material improves knowledge of students and increase their interest as well. Benefit of self-pacing for students who are slow or quick in learning reduces the level of stress, increase their level of satisfaction, and retention of information. It also increases the level of interaction between learners and their teachers through e-mails, chat rooms, and discussion boards. T-test has been done to find out the outcome of the research, all the statements are found to be significant as the significant values for all statements is less than 0.05.

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Original Research Article

Relationship between timed online exposure and musculoskeletal health during COVID pandemic in allied health science students

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ABSTRACT

Background: Musculoskeletal issues have persistently growing for students of allied health sciences with the online classes during the coronavirus disease (COVID) pandemic. To find out the relationship between timed online exposure and musculoskeletal health of allied health sciences students even though having mere basic knowledge about the cause and its prevention.
Methods: Students who attended online classes in allied health science colleges were given with online questionnaire and those who volunteered to participate were included. The standardized Nordic questionnaire was used with a demographic section and no of hour's exposure to online classes.
Results: The Nordic questionnaire for cervical spine and upper extremity in 7 days exposure was found to be significant statistically and the positive response for pain was 66.3%.
Conclusions: Musculoskeletal problems increased with the increase in time in front of computers /mobile phones for long hours for their classes. Further initial exposure itself causes it.

Keywords: Musculoskeletal pain, Nordic questionnaire, Pain

INTRODUCTION

SAR-COV first came into existence at the end of December 2019 thereafter the spread of the virus caused various serious illnesses in different countries got evident at the starting of 2020 and was officially announced as a pandemic by World Health Organization (WHO).[1] India being a developing county and being highly populated was been hit hard by the virus. The second wave came in March 2021 with a high impact on lives. With the increase in the rate of people being affected, different states were forced to impose wide restrictions again in the public and private lives of the people. A set of guidelines were made a mandate to be followed by each individual like social distancing, sanitization, and wearing of mask when in public to control the transmission and prevent the spread. The regulations introduced covered all areas of life such as social life and included the education system.[2] The start of online classes was first during the first outbreak but with the second wave impact, it played havoc with individuals' psychology and physical attributes of life, the uncertainties about examination raised with a rise in duration of online teaching. Online education is a platform where there is more use of digital content imbibing both audio and video lessons.[3] During this online education change, the use of computers and mobile phones as online education tools gained more importance than during the traditional education system.

The changes in education came with a sudden drift with the demand of the situation which was when living was with various uncertainties having a great impact on the physical and psychosocial well-being of a student's.[4,5] Few studies have been found on studying the impact of online classes

and their impact on musculoskeletal health. Musculoskeletal discomfort creates a negative impact and decreases their efficacy to grasp the subjects and even alters performance during activities of daily living.[6] As a result of exposure to different form of stress such as physical, mental and environmental, workers are more prone to various musculoskeletal pain.[7,8] Allied health sciences students are more aware about the anatomy and physiology behind pain as it is a part of their curriculum and are also exposed to physical and psychological factors, both in the academic setting and when in the work setting, which triggers the occurrence of musculoskeletal pain.[9] The new change in the education system has increased the duration of computer exposure which is accompanied by an improper chair and sitting area leading to stress overload on various musculoskeletal structures.[10] To enrich their knowledge and for recreation, they use laptops and cell phones frequently, during which they attend faulty posture leading to pain and various alteration in musculoskeletal areas especially in the spine and upper extremity.[11] The increase in musculoskeletal issues with increased timed exposure to gadgets is interfering with their overall health and well-being. Therefore, the aim of the study was to find out the relationship between timed online exposure and musculoskeletal health of allied health sciences students even though having mere basic knowledge about the cause and its prevention.

METHODS

A cross-sectional study was carried out in allied health science students randomly in Bhubaneswar, Odisha. A total of 200 students were sent with the questionnaire out of which only 172 responses were recorded. The sample size was calculated using 95% confidence interval with 5% margin of error, therefore it was necessary to get a response of 132 number of students as participant in the survey.

Inclusion criteria

Students enrolled under Utkal University in allied health science course in which only two courses were included BASLP and BPT. The students who had online classes during the COVID pandemic conducted by Institutes located at Bhubaneswar (that is, between 20th March to 11th May 2021 and April 2021 to 10th May 2021). To respond to all of the questions included in the evaluation survey and who provided their consent to participate in this survey.

The data collection was carried out in online mode during the months of April and May 2021, using Google forms which had two sections, Section A comprising of socio-demographic information like age, gender, duration of online education, pain before pandemic(COVID) and duration of daily use of computers and other technological devices and attention to body alignment. Section B consisted of the standardized Nordic Questionnaire (SNQ), The SNQ is divided into two parts, the general, and the specific. The part used asked focused 27 questions with Yes/No answers about any musculoskeletal symptoms experienced during the previous 12 months or the previous seven days in regards to the impact on activities during the 12 months. All of the questions were focused on nine areas: neck, shoulders, elbows, wrists/hands, the upper part of the back, the lower part of the back, hips/thighs, knees, and ankles/feet.[12,13]

The statistical analysis was done using IBM Statistical package for social sciences (SPSS) 20. A descriptive analysis of section A variables was done by calculating average values (to determine the central tendency) and standard deviation (as a measure of dispersion). The 2 way ANOVA test was done to find out the impact of musculoskeletal pain in the nine areas with duration of exposure of altered posture, each segment was analyzed for.

RESULTS

This study showed out of 172 responded 88 were women i.e., 52% (Table 1). A descriptive statistics showed the female population had a more exposure and consistency in attending classes.

Table 1: Descriptive statistics of sample.

		Age of participants	How long do you seat infront of computers to attend your classes	Gender	Do u have any pain
N	Valid	172	172	86	172
	Missing	0	0	88	0
Mean		20.35	4.02	1.49	1.66
Median		20.50	3.00	1.00	2.00
Std. Deviation		2.068	1.402	0.503	0.474
Variance		4.275	1.964	0.253	0.225

Table 2: Prevalence of pain in students due to online classes.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	NO	58	33.7	33.7	33.7
	Yes	114	66.3	66.3	100.0
	Total	172	100.0	100.0	

Table 3: Timed exposure of both gender for online classes.

		How long do you seat in front of computers to attend your classes		Total
		1-3	4-6	Total
Gender	Female	38	50	88
	Male	34	50	84
Total		72	100	172

Table 4: A two way ANOVA analysis of upper extremity pain in 7 days and 12 months/alteration in activities in relation to duration of exposure.

ANOVA: two-factor with replication						
Source of variation	SS	df	MS	F	P value	F crit
Duration	0.744186	2	0.37209302	1.96976242	0.139842	3.001571
Areas of impact	4.3875969	2	2.19379845	11.6133909	0.000010	3.001571
Interaction	1.751938	4	0.4379845	2.31857451	0.05509	2.37771
Within	290.72093	1539	0.18890249			
Total	297.60465	1547				

Table 5: A two way ANOVA analysis of spine pain/alteration in activities in relation to duration of exposure.

ANOVA: two-factor with replication						
Source of variation	SS	df	MS	F	P value	F crit
Duration	4.52713	2	2.2636	9.62	0.000071	3.002
Areas of impact	15.0853	2	7.5426	32	0.000000	3.002
Interaction	1.17829	4	0.2946	1.25	0.287231	2.378
Within	362.279	1539	0.2354			
Total	383.07	1547				

Table 6: A two way ANOVA analysis of lower extremity pain/alteration in activities in relation to duration of exposure.

ANOVA: two-factor with replication						
Source of variation	SS	df	MS	F	P value	F crit
Duration	4.0155039	2	2.007752	9.7682	0.000061	3.001571
Areas of Impact	0.8062016	2	0.403101	1.9612	0.141043	3.001571
Interaction	0.5271318	4	0.131783	0.6412	0.633186	2.37771
Within	316.32558	1539	0.20554			
Total	321.67442	1547				

Table 7: A two way ANOVA analysis of 9 areas of pain in 7 days and 12months/alteration in activities in relation to duration of exposure.

ANOVA: two-factor with replication						
Source of variation	SS	df	MS	F	P value	F crit
Duration	5442.667	2	2721.333333	11.99804	0.000488	3.554557
Areas of impact	1394.667	2	697.3333333	3.074461	0.051019	3.554557
Interaction	202.6667	4	50.66666667	0.223383	0.921813	2.927744
Within	4082.667	18	226.8148148			
Total	11122.67	26				

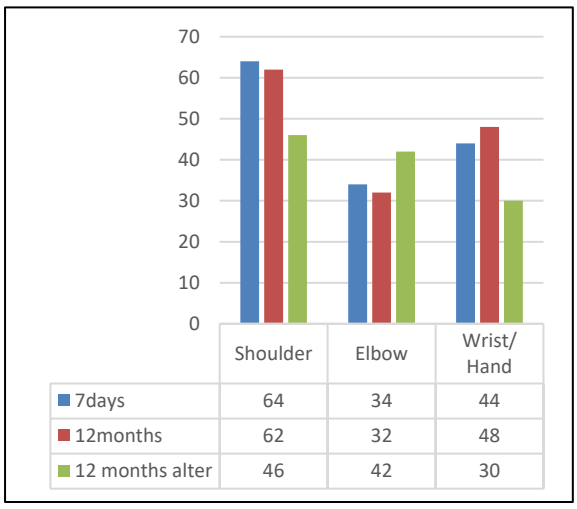


Figure 1: Relationship between upper extremity, duration and activities alteration in 12 months.

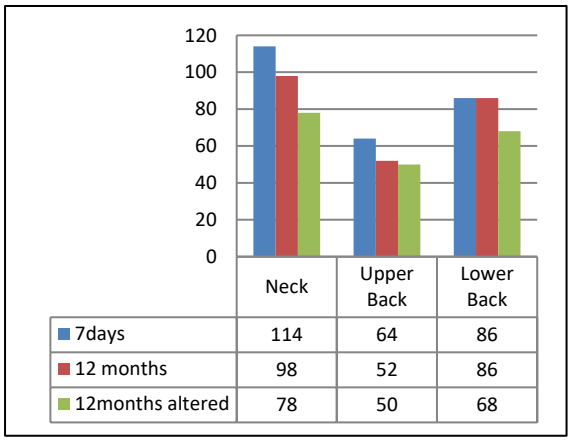


Figure 2: Relationship between spine, duration and activities alteration in 12 months.

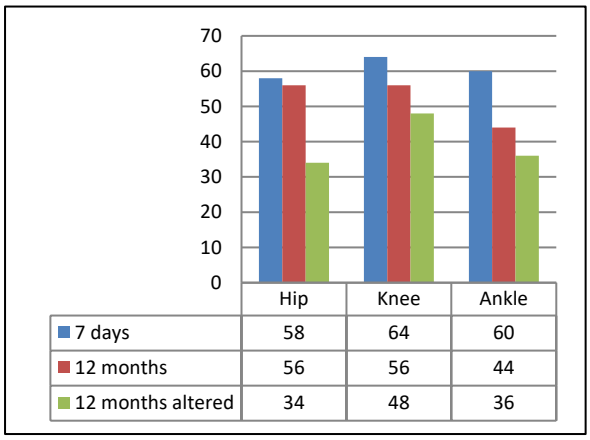


Figure 3: Relationship between lower extremity, duration and activities alteration in 12 months.

Difference between timed exposure and pain was found to be significant i.e., students exposed to more than 4 hrs had a high prevalence rate of musculoskeletal pain (Table 2, 3).

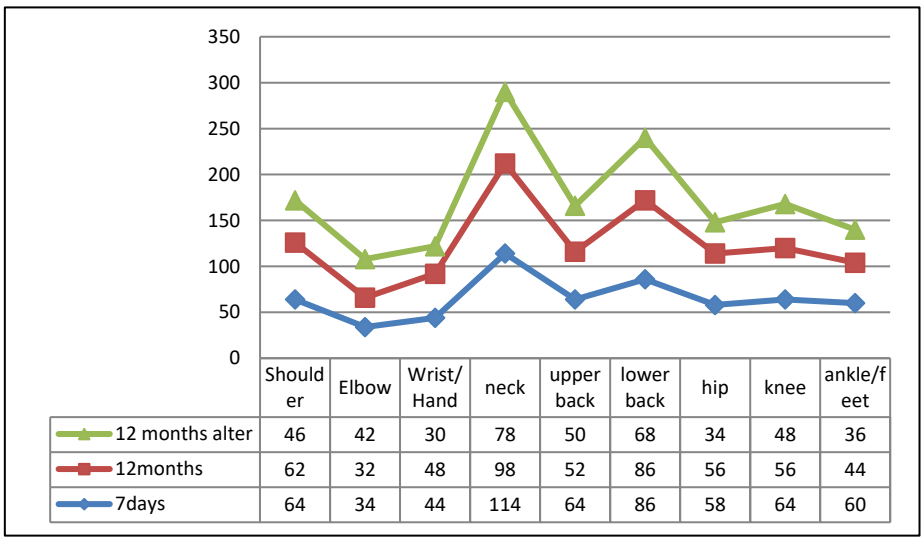
Two way ANOVA analyses were carried out to find out impact in different areas and its chronicity. Pain areas showed consistency from 7 days to 12 months with neck, shoulder and wrist showing higher significance and no significance was found in alteration of activities during last 12 months. With increase in duration (12 months) showed a consistent result for upper extremity but for lower spine and extremity showed increase in incidence.

DISCUSSION

The COVID pandemic has taken a toll on every individual life's making him inactive staying at home due to guidelines given by government leading to alteration in balance, and with advent of online classes students are exposed to phones/laptops for long in faulty ergonomic and unfamiliar environment leading to poor musculoskeletal health.

This research study intended to find out prevalence of musculoskeletal issues in allied health science students with advent of online classes as a need of the hour with one year of lockdown and shutdown in a on and off phase .These students are aware of the faulty postures and its resultant effect on various soft tissues but then also showed a significant musculoskeletal issues .This study wanted to state even with awareness there is lack of self realization for maintenance of once health. Health being on stake during COVID a focus by all students to inoculate good habits and proper ergonomic care during online classes or online exposure for other purposes should be watched carefully. The nine areas of musculoskeletal pain analyzed indicates that both the gender suffered from areas (cervical spine and upper extremity) of pain, both in 7 days and 12 months; although both gender didn't predict any significant loss in activities for the same.

Various research studies have found out relationship of faulty ergonomics, timed exposure more in female and male but this study depicts both gender are in similar risk for musculoskeletal pain.[14,15] Research studies have showed relationship between timed exposure and musculoskeletal health but the relation in first and second decade of life is yet to be researched upon where as lumbar spine pain had been found out to be frequent complain and persistent complain in young women.[16,17] Further to the increase in prevalence of pain in neck, shoulder and wrist, earlier researches had found a correlation between have correlated with long time exposure in mobile phones /laptops, with elevated pain in the mentioned areas.[18-21] Proper ergonomic adjustments like adjustment of keyboard height at or below elbow level, arm support for supports to be elaborate chair and environmental modification can decrease the risk of musculoskeletal issues.[22] The change of teaching platform to online exposing students to electronic devices without any proper ergonomic correction and stretches /break further lack of self-realization.



	Shoulder	Elbow	Wrist/ Hand	neck	upper back	lower back	hip	knee	ankle/feet
12 months alter	46	42	30	78	50	68	34	48	36
12months	62	32	48	98	52	86	56	56	44
7days	64	34	44	114	64	86	58	64	60

Figure 3: Relationship between all nine areas of pain/discomfort /numbness due to timed exposure.

Finally, the population being studied belong exclusively to allied health science students and the population been less is a limitation of the study. Although there is minor limitation, there are significant strengths. This is a wide-ranging relational study representing the young health care workers of India and shows both gender are at risk with prolonged exposure for a day for classes.

CONCLUSION

With COVID new strains and variant the phase of lockdown shutdown has been a part of our lives and education being an integral part has changed its methodologies and platform of teaching. Musculoskeletal problems increased with the increase in time in front of computers /mobile phones for long hours for their classes as a change of platform teaching as the need of the hour. Further initial exposure itself causes it which this research study depicts. With focused approach of teaching, continuous self realization and academic professionals inputs it can be kept at bay this study wants to make the allied health professionals to be aware. Further health institution should implement various measures for health regulations, for the promotion of good health and to improve the quality-of-life of the allied health care students.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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Efficacy of vibratory shaking technique in improving the vitals in post COVID ICU patients

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***Abstract*---**Background: SARS-CoV-2 virus lead to the start of pandemic in 2019. With the variation in COVID 19 symptom involving lungs its need for intensive treatment in a hospital setting is emerging. Even after recovery the patients need to be stabilized for their oxygen saturation and other vitals for which they need invasive mechanical ventilation and chest physiotherapy. Vibratory shaking technique is a form of physiotherapeutic maneuver which helps in stabilizing the vitals and maintaining spo2 when delivered by a trained therapist. Objectives: To find out the efficacy of vibratory shaking technique to improve Oxygen saturation and vitals in post COVID, ICU patients. Methods: The patients admitted in ICU after post COVID recovery were given with vibratory shaking technique to improve their oxygen saturation and respiratory rate. The pre and post test value showed significance. Result: Vibratory shaking technique was found to be effective in improving the vitals in post COVID, ICU patient. Conclusion: For post COVID patient's chest physiotherapy i.e. vibratory shaking technique should play an important part for improving the vitals of patient who are still on ventilator.

***Keywords*---**vibratory shaking technique, improving vitals, post COVID ICU, patients.

Introduction

SARS-CoV-2 virus lead to the start of pandemic in 2019. As the virus had varied symptoms in individuals which was manageged with a multimodal and experimental approach .With the COVID 19 symptoms focusing on lungs came the need of better therapeutic approaches for maintaining oxygen saturation and other vitals even after post COVID 19 recovery .The stay in hospitals and the need

for intensive integrated treatment for various conditions with low tidal volume and plateau pressure raised. Even after recovery the patients need to be stabilized for their oxygen saturation and other vitals for which they need invasive mechanical ventilation and chest physiotherapy

Chest physiotherapy performed by the use of a technique termed vibratory shaking technique which helped in airway clearance and in stabilizing the oxygen saturation level.This technique included rhythmic oscillatory action which composed combination of both coarse and fine movement. Vibratory shaking technique involves the therapist hands to be placed placing the hands on the patient's chest wall and applying an oscillatory action in the direction of the normal movement of the ribs during expiration, using the physiotherapist's body weight.1 This is thought to lead to production of phasic energy waves, which are transmitted to the airways during expiration and may augment expiratory flow.

Procedure and Methods

A randomized study was conducted and 86 patients were selected those who were mechanically ventilated after COVID recovery aged between 40-60 years of age. The patients were selected from ICU SUM & IMS hospital, SOA Deemed to be university during the period of March to June 2021. The patient received chest physiotherapy i.e. vibratory shaking technique& positioning. The patients were given 2 session a day for the first three days of ICU admission with each session lasting for 30 minutes .The technique consisted of alternate coarse and fine movements for 5 minutes each for three cycles followed by positioning or postural drainage by elevating the head end to 30-45 degrees .The vitals of the patient's were constantly monitored (ECG, heart rate, Respiratory rate,Spo2).

Inclusion criteria: Patients mechanically ventilated during post COVID recovery phase and aged between 40-60 years of age.
Exclusion criteria: Patients with co morbid conditions like acute pulmonary edema, untreated pneumothorax and open heart surgeries, admission with tracheotomy

Statistical analysis

Statistical analysis was performed using IBM SPSS version 20.test used to compare the pre and post test mean values of respiratory rate and spo2 was student T test. The level of significance for all statistical tests was set at $p < 0.05$.

Results

There were an increase in spo2 and normalizing of respiratory rate.

Discussion

This study was conducted to evaluate the effect of vibratory shaking techniques on spo2 and respiratory rate. There were an increase in spo2 and decrease (normalizing) in respiratory rate. Zeyu *et al.* [10] investigated the clinical effect of the chest physiotherapy for the postoperative sputum excretion. After chest

physiotherapy, the increase of pao2 was significant higher than before after three days.

Farahat et al.,[11] investigated the response of mechanically ventilated to chest physical therapy, there was significant increase in pao2 after chest physical therapy (positioning, percussion, vibration and suction.) in the study group · *Zeng et al.* [12] concluded that chest physical therapy decrease the incidence of ventilator associated pneumonia and increase in pao2 in his study group who received comprehensive chest physical therapy. Chen *et al.* [13] found that sao2 was significantly increased after chest physical ventilated to chest physical therapy, there was significant increase in sao2 after chest physical therapy (positioning, percussion, vibration and suction.) in the study group.

Paratz*et al.* [14] demonstrated that there was a decrease in pao2 after manual hyperinflation in patient with acute intrapulmonary lung injuries. This may be as results of the candidates were having acute intrapulmonary lung injuries that were excluded from this study, besides applying manual hyperinflation only. Berny et al. [15] demonstrated that a slight decrease in partial pressure of arterial oxygen was observed in his study group following mobilization in ICU, this result may differs from this current study used a comprehensive chest physical therapy program was added including percussion, vibration, manual hyperinflation and positioning besides, limb exercises.

Monica *et al.* [16] demonstrated no increase in sao2 in a prospective, interventional study a respiratory physiotherapy was initiated, twice a day, to a randomized group of mechanical ventilated patients this disagreement resulted from smaller sample size than used in this current study. This study wanted to analyze the efficacy of Vibratory Shaking technique and intended to prove its importance as a method of use in chest physiotherapy Maneuver .No study has been conducted yet on the efficacy of Vibratory shaking technique as a chest physiotherapy measure playing vital role in Post COVID 19 ICU patient and looking into the incidence of disease severity it should be done in wider population.

Conclusion

The results support the importance of adding chest physiotherapy program to early post COVID recovery phase patients for stabilizing their vitals and decreasing complications, duration, costs & psychological disorders in patients with ICU.

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Electromyographic biofeedback-assisted pelvic floor muscle training on Stress Urinary Incontinence following Central & Peripheral Nervous System Vasculitis: a case study

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ELECTROMYOGRAPHIC BIOFEEDBACK-ASSISTED PELVIC FLOOR MUSCLE TRAINING ON STRESS URINARY INCONTINENCE FOLLOWING CENTRAL & PERIPHERAL NERVOUS SYSTEM VASCULITIS: A CASE STUDY

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Abstract

Background and purpose: This case report describes interventions involving pelvic floor muscle training (PFMT) with electromyographic biofeedback (EMG-BFB) for a 52-year-old man with stress urinary incontinence (SUI) following CNS and PNS vasculitis.

Summary: Diagnosed with CNS and PNS vasculitis 5 years back, the patient gradually developed stress urinary incontinence. He was treated with PFMT in adjunct with EMG-BFB for 20 sessions and the pelvic floor muscle strength and the effect of SUI on the quality of life were assessed.

Outcome: Improvements were seen in the pelvic floor muscle strength as measured by the modified oxford grading system; severity of SUI as measured by the International Consultation Incontinence Questionnaire-Short Form; and the Incontinence-Quality of Life that measures the quality of the life following incontinence. A possible cause of improvement in the symptoms following intervention may be due to both the physical as well as the behavioral effect of EMG-BFB when used as an adjunct to the PFMT.

Keywords: Vasculitis, Stress urinary incontinence, PFMT, EMG-BFB

Introduction

Vasculitis is a diversified clinicopathologic disorder that is histopathologically characterized by the inflammation of the blood vessels including veins, arteries, and capillaries that can cause problems in any organ system, including the central (CNS) and peripheral (PNS) nervous systems which are characterized by secondary narrowing of the blood vessels that nourish the brain, spinal cord, or peripheral nerves caused by the presence of inflammatory cells in and around blood vessels [1].

Out of all assorted symptoms associated with CNS or PNS vasculitis or both together, urinary incontinence is one that often has an early onset. Few studies have reported the association of urinary incontinence, especially stress urinary incontinence (SUI) with CNS and PNS vasculitis but they lack to establish the direct link between the two and determine the exact cause [2][3].

SUI is described as "the complaint of involuntary leakage on effort or exertion, or on sneezing or coughing due to the weakness of the sphincter following neurological damage" [4]. Regarding the different therapeutic methods for SUI treatment, biofeedback is considered within the conservative measures as an instrumental technique for pelvic floor muscle training (PFMT) that can be of two types: manometric and

electromyography-biofeedback (EMG-BFB). EMG-BFB is the most used one, based on its efficacy in the treatment of SUI has been proven [5].

Although there is a sufficient number of literature reviews available on the effect of EMG-BFB in populations with SUI, there is very little evidence that can show the effectiveness of PFMT along with EMG-BFB in a male patient with SUI following CNS and PNS Vasculitis. Thus our case study aims to determine the effectiveness of the PFMT protocol with EMG-BFB in a 52-year-old male patient, with stress urinary incontinence due to flaccid bladder following CNS and PNS Vasculitis as well as to determine the potential effect of the treatment on the quality of life of an incontinent male.

Case Description

The subject was a 52 years old male with a chief complaint of difficulty in walking and involuntary micturition and defecation for the last 5 years. He had a clinical history of sudden onset of urine obstruction and abdomen distension on June 23rd, 2016. Within 12 hours he developed weakness in the distal lower limb muscles that gradually progressed proximally within 36 hours. Since then all the symptoms have worsened with time. Based on the clinical findings, investigatory reports, and radiological findings he was later diagnosed with CNS and PNS vasculitis.

On examination, the superficial, deep, and combined cortical sensation was found to be impaired at L_4, L_5, S_1, S_2, S_3, S_4, and S_5 dermatomes. Goniometric evaluation of lower extremity revealed full active and passive hip, knee, and ankle joint range of motion except for hip and knee extension and ankle dorsiflexion which showed tightness of bilateral hamstrings, iliopsoas, adductor group of muscle, and contracture of bilateral gastrocnemius and soleus. He was having increased muscle tone of hip flexors and knee flexors with spasticity of grade 3 and 1+ respectively as per Modified Ashworth Scale. There was moderately impaired coordination with non-equilibrium tests in lower extremities such as heel-knee-shin maneuver, alternate heel to knee, and heel to toe maneuvers. The patient was able to sit without assistance and was able to stand with the support of assistance. He was also able to walk a few steps with the help of a walker.

On bladder and bowel assessment the patient was having impaired sensation at S_3, S_4, and S_5 dermatome and had impaired sensation of filling and subsequently control of bladder and bowel. The patient was on a CIC catheter. The patient was able to hold urine for a few minutes (~ 3 mins) but urinate with any activity involving an increase in abdominal pressure.

Outcome Measures

Modified Oxford Grading System (MOGS) by Laycock to grade the pelvic floor muscles strength; International Consultation Incontinence Questionnaire-Short Form (ICIQ-SF) to measure the severity and impact of urinary incontinence; Incontinence-Quality of Life (I-QOL) to measure the quality of life were used as outcome measures. All assessments were carried out by the same physiotherapist before the start of the intervention and after 20 sessions of treatment.

Modified Oxford Grading System

MOGS is widely used by physiotherapists to evaluate the strength of the pelvic floor muscles by using anal digital palpation. It consists of a six-point scale: 0 = no contraction, 1 = flicker, 2 = weak, 3 = moderate, 4 = good (with lift), and 5 = strong. The MOGS scale demonstrates variable reliability with kappa and correlation values ranging from fair to good [6][7].

For digital palpation, the gloved and lubricated index finger of the examiner was introduced into the anus with the patient put in the left lateral position and was commanded to ‘‘lift’’ and ‘‘squeeze’’ the pelvic floor muscles. The felt contraction was graded accordingly. Palpation was performed with one finger because two fingers may stretch the pelvic floor muscles and thereby influence the ability to contract.

International Consultation Incontinence Questionnaire-Short Form

The ICIQ-SF is a brief questionnaire that allows for detecting urinary incontinence as well as its severity, type, and impact on life. It is an objective scale consisting of 4 questions to be answered and graded differently and the total score ranges from 0 to 21; higher scores indicate greater severity. It is one of the most used questionnaires in persons with urinary incontinence with a high test-retest reliability [8].

Incontinence-Quality of Life

The I-QOL specifically measures the quality of life in persons with urinary incontinence. It consists of 22 items, all of which have a value ranging from 1 (extremely) to 5 (not at all). Three subscales can be identified: Limiting behavior consisting of 8 items; Psychosocial impacts with 9 items and Social embarrassment, consisting of 5 items. Although the maximum value is 110, it is transformed into a 0- to 100- point scale for

a better interpretation; a higher score indicates better QOL. I-QOL is a reliable, valid, and responsive measure of the incontinence-related quality of living [9].

Intervention

The intervention protocol consisted of 20 sessions of PFMT with EMG-BFB, which were supervised by a trained physiotherapist and performed 5 days a week for a total of 4 weeks. Each treatment session lasted 30 minutes.

The used equipment was Myomed gymnast, which allows performing EMG-BFB with four channels and delivering both audio and visual signals through a connected laptop, that was subsequently connected to a larger display screen for a comfortable and easy viewing experience of the patient.

At every treatment session, the patient was in a supine position with the lower limbs semi-flexed, facing toward the larger display screen for both visual and auditory feedback. Two self-adhesive electrodes were placed around the anal canal at 3 and 9 hours to record the electrical activity of the pelvic floor muscles and another two self-adhesive electrodes on the rectus abdominis muscle and another indifferent electrode (ground electrode) were placed in the pelvic area distant from the working area. The ground electrode channel was used to avoid the contraction of the nearby musculatures (gluteus and adductors), thus isolating the exclusive work of the pelvic floor musculature [10]. The signal of the muscle activity as recorded, acted as a stimulant for motor learning. The patient performed 105 work/rest cycles of pelvic muscles per session of which the first 5 work/rest cycles were averaged, the mean value in micro-volt (μV) was determined and added with not more than 25μV to set the target to be achieved on that very session. Work lasted 7 seconds and then rest for 4 seconds.

Results

The results have been presented in tabular form for visual analysis which is as follows after 2 sessions of intervention.

According to the modified oxford grading scale, the digital anal palpation was scored as “2” which states ‘weak muscle activity without a circular contraction’ before the intervention, and was subsequently graded as “3” implying ‘moderate muscle contraction’ post-intervention. This shows an improvement in the pelvic floor muscle contraction (Table 01).

Urinary incontinence ICIQ-SF also showed improvement with a total score of 19 pre-intervention to 15 post-intervention suggesting of decrease in the severity of the incontinence (Table 01). Though the amount of urine leakage decreased and its interference with everyday life also improved; there was no change in the frequency of the leakage after 20 sessions of intervention.

The quality of life of the subject also got better following the intervention as measured by the I-QOL. The subscale scores of limiting behavior; psychological impacts and social embarrassment rose from 37.5, 33.3, and 23.3 to 42.5, 46.7, and 46.7 respectively after 20 sessions while the total scale score rose from 33.6 to 47.3 (Table 01).

Discussion

Several interesting findings have emerged from this case study. There occurred a significant decrease in symptoms along with improvement in muscle strength as well as an increase in the standard of the quality of life, according to the Modified oxford grading scale, ICIQ-SF, and I-QOL suggesting that this behavior-based treatment of PFMT with EMG-BFB has a significant role in the management of stress urinary incontinence.

The application of PFMT with EMG-BFB has been extensively studied in the case of females with genuine stress incontinence [11] and in the case of males with stress incontinence following prostatectomy and incomplete spinal cord injury [12]. In most of those, it is well documented that the effect of PFMT with EMG-BFB is effective in the treatment of SUI and regaining of the continence [13]. In accordance with those studies, the result of this case study also demonstrated the effectiveness of PFMT with EMG-BFB in the treatment of SUI and in improving the quality of life following CNS and PNS vasculitis.

A few other studies involving treatment of incontinence with PFMT assisted by EMG-BFB also disprove its utility and contradict the result as that of ours showing a non-significant effect in the reduction of the symptoms and in the improvement of the quality of life [14].

A possible cause of such improvement in the pelvic floor muscle strength and the effect of incontinence on the quality of life could be that biofeedback provided a mechanism for the client to identify the appropriate muscle to concentrate the contraction at, as well as a sense of accomplishment as he increased his contraction scores over the predecided EMG score. Moreover, this PFMT technique facilitates learning and creates a sense of strong motivation that helps with clinical improvement [15].

This study had a pre-determined protocol of EMG-BFB-assisted PFMT for the management of stress incontinence in CNS and PNS vasculitis which resulted in a significant improvement in signs and symptoms for 20 consecutive sessions. But its effectiveness was not assessed in the follow-up, so future studies may focus on determining adequate treatment protocol to analyze the physical and behavioral treatment effect of the EMG-BFB when used as adjunctive therapy and should focus on ascertaining whether a significant differential effect occurs according to symptom severity.

Conclusion

This study, hence concludes that the stress incontinence associated with CNS and PNS vasculitis can be benefited by PFMT with the EMG-BFB management program alone or in adjunct with other treatments. A single case study is suitable for an in-depth investigation of the management of an individual subject thus it was chosen as the design of the study, so the results of such a study should not be generalized to the population as a whole.

Ethical Approval

Written consent was obtained from the patient.

Conflict of Interest

None declared.

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Table 01: Outcome measures before and after treatment sessions

Outcome Measures	At the start of the treatment sessions	At the end of the treatment sessions
MOGS	Grade 2	Grade 3
ICIQ-SF	19	15
I-QOL	33..6	47.3

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Original Article

A COMPARATIVE STUDY BETWEEN MCKENZIE EXTENSION VERSUS CYRIAX TECHNIQUE ALONG WITH HYDRATION IN PROLAPSED INTERVERTEBRAL DISC CONDITIONS

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ABSTRACT

Comparision between McKenzie extension Versus Cyriax technique along with hydration in prolapsed Intervertebral disc conditions.

BACKGROUND: Significant amount of disability and incapability is caused by low back pain which is one of the commonest pain causing health problem. And when considering the causes for ending up with low back pain, Lumbar disc prolapse accounts to be approximately 37% of all cases. According to McKenzie, centralization is the main predictor of evaluation which represents positive outcomes of conservative care. James Cyriax popularised lumbar traction treatment for disc protrusions. Lactic acid accumulation in the muscle surroundings is prevented by Water. Water loss causes the disc to thin, hardening of inner nucleus pulposus. Drink 8 ounces of glasses of water or 1 to 1.5 litres of water each and every day to prevent low back pain and disc protrusions.

Methodology: Thirty subjects (attending Physiotherapy out-patient departments at KGH and VAPMS College of Physiotherapy), with acute or subacute low back pain, were included in this study. During this study, two groups were taken under two treatment groups.

Group A - McKenzie listing correction was done and followed by repeated

extension exercises. (2weeks i.e. 5 days / week).

Group B - Cyriax listing correction was done and followed by traction (2

weeks i.e 5 days / week) along with hydration i.e drink 1 – 1.5

litres of water throughout the day.

Results: The results are showing that there is an effect of Cyriax traction along with hydration in treating low back pain in prolapsed intervertebral disc conditions.

Conclusion: This study concludes that individually both McKenzie extension and Cyriax traction along with hydration are effective in controlling pain. Cyriax traction along with hydration not only for pain relief, but improve function that compared to McKenzie extension exercise. There is a significant effect of Cyriax traction along with hydration on prolapsed intervertebral disc related pain.

KEYWORDS: Low Back Pain, Prolapsed Intervertebral Disc, McKenzie Technique & Cyriax Concept with Hydration

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Cognizance Of School Teachers Toward Communication Disorder In School Going Children Of Twin City, Odisha

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ABSTRACT:

Background: Regular school teachers have awareness regarding different types of communication disorder in school going children.
Methodology: Total 312 regular school teachers (156 primary and 156 secondary) had participated in the study, and they were given a questionnaire based on features of different types of selected communication disorder seen in school going children.
Aim and Objectives: The study was aimed to investigate Cognizance as well as the awareness of primary and secondary school teachers regarding the occurrence of various communication disorders in school going children.
Result: Mean ± SD and percentile score for common features of selected communication disorder was calculated. A two-way ANOVA along with post hoc analysis using unpaired t test was used from statistical point of view. The result indicated that $p<.0001$, a statistically significant difference between primary and secondary school teacher.
Discussion: All the teachers participated, had cognizance, and had observed the features belonging to selected communication disorders but no cent percent result could obtain, which state that they were not aware of all of them as well as of various other communication disorders prevailing in school going children, hence it was concluded that, there is limited awareness and cognizance related to communication disorders in children among regular school teachers i.e. both primary and secondary.
Conclusion: So, it could be suggested that more survey like the present study can be considered to carry out among more numbers of regular school teachers belonging to different geographical part of our country where programs can be organized in order to sensitize them regarding communication disorders in school going children.

INTRODUCTION:

Communication disorder is a broad umbrella term which covers different types of disorders under it, (Ruscello, Louis & Mason, 1991) which can be noticed at the level of comprehension or production of speech sounds (i.e. consonants and vowels), words, phrases, or sentences (ASHA, 2006). The spectrum of communication disorders

include problems in speaking, hearing and thinking such as voice disorders, phonological and articulation disorders, fluency disorders (Stuttering & Cluttering), language disorders, delayed and/or arrested speech and language development due to hearing impairment, behavioral disorders like attention deficit disorders (ADD), Autistic spectrum disorders (ASD); mental retardation and other problems (Paul, 2009), which are reported to be found majorly in school going children.

Parents, primary caregivers, and teachers are critical for rich stimulation of children's communication as well as play an important role in the early identification of communication disorders by observing the primary school going children, which if not identified and treated early, it may also pursue in secondary school age children. Hence, it is important to acknowledge how much regular school teachers (both primary and secondary) are aware about the same, as a lack of awareness regarding communication disorders in children may lead to delay in their management. However, the statistical information which can estimates the magnitude of awareness of communication disorders in children among primary and secondary school teachers in twin city of Odisha i.e. Bhubaneswar and Cuttack are scarce.

AIMS AND OBJECTIVES:

To investigate and compare the primary and secondary school teachers' cognizance as well as the awareness regarding the occurrence of various communication disorders in school going children.

MATERIALS AND METHODS

A cross sectional study was conducted among 312 regular school teachers were divided into two groups i.e. group-I consist of 156 primary school teachers (PST) and group II with 156 secondary school teachers (SST) from both English and Odia medium schools of Bhubaneswar and Cuttack, Odisha. Hence forth all the primary school teachers or group-I will be viz PST and secondary school teachers or group-II as SST for rest of the article. All the school teachers having teaching experience of minimum 10years andteaching different subjects were included. Less than 10years experienced teachers for both the groups were excluded.

An ethical approval consent was taken from the higher authority of selected schools for primary and secondary education with prior permission. A survey was done by visiting the selected primary and secondary schools(government and private), in order to make an approach for the participants to participate in the survey. All the teachers who were interested in the survey, were introduced with the aims and the objectives of this study and a written consent and permission were sought from them for their approval.

Based on primary features of the selected communication disorders like hearing impairment, articulation disorder or speech sound error, fluency disorder/stuttering, Learning Disorder including reading, writing and mathematics difficulty, Attention and Behavioral problems related to autism and ADHD, occurring very commonly among school going children, a close ended structured questionnaire was constructed initially in English by investigators and validated by 5 experienced ASLPs. The questionnaire was further translated into Odia language by native speakers and then back translated along with proofread to ensure that the meaning of the content remains the same.

The features of each selected disorder in the close ended questionnaire were explained to the teachers participated in the study and they were asked if they had experienced or observed any of these features present in any children in their teaching career. They were instructed to put atick "√" mark to the correct response given as the

either 'yes' or 'no'.The duly filled questionnaires were collected and the responses were noted down which were further compiled for statistical analysis.

The recorded data were documented in Microsoft excel 2018 and analyzed using Statistical Package for Social Sciences (SPSS) version 18.0.0. In order to summarize the overall score of both the groups, Mean ± SD and percentile score for each factor under every selected parameters were calculated.

To determine the effects of the communication disorders as well as combined effect of primary and secondary school teachers, two-way ANOVA was applied along with post hoc analysis using unpaired t test in order to check the difference between subgroups.

RESULTS:

The information was collected from 156 primary school teachers (PST) in group I and 156 secondary school teachers (SST) in group II. The details of participants were given in Table.1

Table-1: Depicts details of teachers (Number and Mean Age Range)

Group	Male	Female	Total	Mean Age Range (Years)
PST (Group- I)	72	84	156	39.6
SST (Group- II)	76	80	156	46.3

The descriptive statistics associated with awareness of communication disorders prevailing in children across the two groups of teachers i.e. primary and secondary, were reported in Table.2.

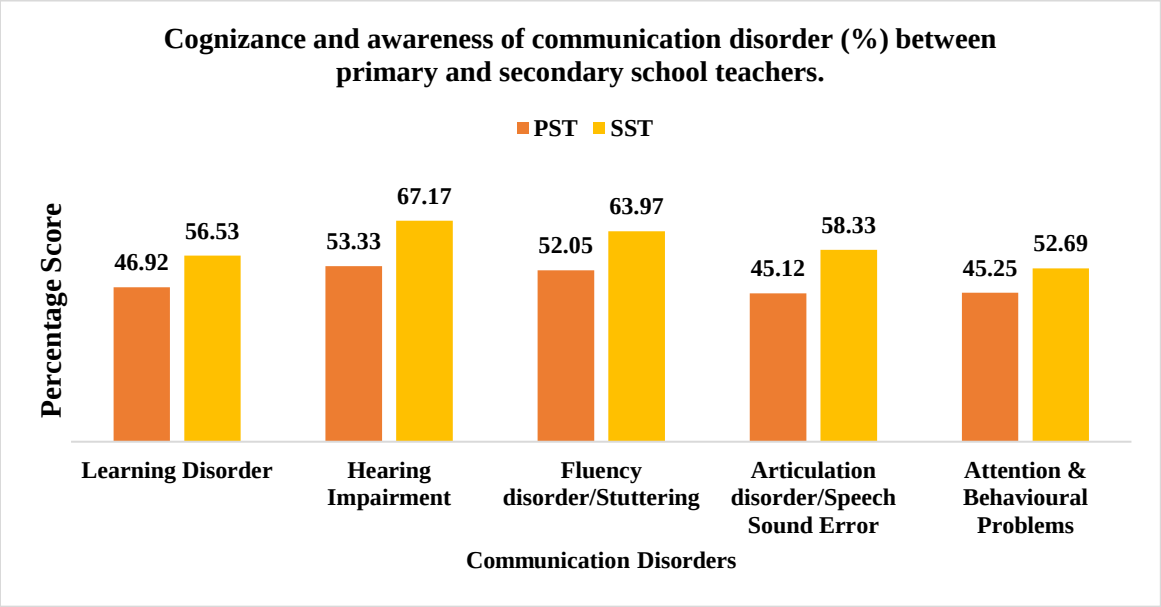
Table-2: Depicts descriptive statistics of selected communication disorder awareness between two groups of teachers.

Communication Disorders in children	Schoolteachers	Mean	Standard Deviation	Standard Error
Learning Disorder (Reading, writing & mathematics difficulty)	PST	2.3462	0.5407	0.0433
	SST	2.8269	0.8437	0.0675
Hearing Impairment	PST	2.6667	0.6256	0.0501
	SST	3.359	0.5322	0.0426

Fluency disorder/Stuttering	PST	2.6026	0.5976	0.0478
	SST	3.1987	0.5839	0.0467
Articulation disorder/Speech sound error	PST	2.2564	0.6104	0.0489
	SST	2.9167	0.4814	0.0385
Attention & Behavioural problems	PST	2.2628	0.7371	0.059
	SST	2.6346	0.8657	0.0693

The study results regarding the awareness of each communication disorders among teachers were presented in terms of percentile score as given in graph 1where more than 50% of the SST, participated in the study were aware of communication disorders in school going children. Both primary (PST) and secondary (SST) school teachers were more aware of features related to hearing impairment and fluency disorder/stuttering, as a reason behind communication problems in children.

Graph-1: Depicts percentage of awareness of communication disorders in primary and secondary school teachers.



It is well surprising fact that PST and SST were aware of learning disability causing communication disorder and helps in identifying the same. They were somewhere aware of the term dyslexia and dyscalculia. Regarding attention and behavioral problem in children,

features related to autism and attention deficit disorder were recognized by the teachers. They had experienced with children having features like less and/or no eye contact, not answering the question, cannot sit at a place, not paying attention to teachers talk or activities going in the class.However, both PST and SST could not adequately differentiate between ADHD and autism. In case of speech sound disorder, primary school teachers as well as secondary school teachers had addressed their input suggesting that they have seen these features in children studying during third to sixth standard.

During the interaction with teachers of both groups, one interesting information regarding delayed language development in the children, yield an impact result where more than half of the total teachers have a positive firm regarding the same for more children with hearing impairment and attention and behavioral problems. However, it was also documented that the overall, teachers had observed the prevalence of delay language in rest of the communication disorders.

However, no cent percent SST and PST could display cognizance toward the features of selected communication disorders in school going children.

In order to determine the influence of two independent variables (PST & SST) on Cognizance and awareness of communication disorders i.e. Specific Learning Disorder, Hearing Impairment, Fluency Disorder, Articulation Disorder, Attention and Behavioural problem, a two-way analysis of variance was conducted where all the effects were statistically significant at the .05 significance level. The main effect for PST & SST yielded an F ratio of F (1, 1559) = 286.42, p=0.000, indicating a significant difference between Group I- PST with mean and standard deviation (±) were for Specific Learning Disorder: 2.34 (±0.54); for Hearing Impairment: 2.66 (±0.62), for Fluency Disorder: 2.60(±0.59), for Articulation Disorder: 2.25 (±0.61), for Attention and Behavioural problem: 2.26(±0.73); and Group II- SST for Specific Learning Disorder: 2.82 (±0.84), for Hearing Impairment: 3.35(±0.53), for Fluency Disorder: 3.19(±0.58), for Articulation Disorder: 2.91(±0.48), for Attention and Behavioural problem: 2.63 (±0.86)[Table 2]. The main effect for Cognizance and awareness of communication disorders yielded an F ratio of F (4, 1559) = 41.38, p=0.000, indicating a significant difference. The interaction effect was significant, F (4, 1559) = 3.21, p=0.012 [Table 3].

A post hoc analysis using unpaired t test with $p<0.0001$, suggested that the selected five parameters were significantly differing from each other along with a significant difference between PST & SST [Table 4]. At Bonferroni Correction p= 0.01. $p<0.01$ suggest that all the selected communication disorders were significantly different from each other in PST as well as in SST.

Table-3: Depicts of two-way ANOVA result regarding awareness of communication disorder between primary and secondary school teachers.

ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**p-value**	**F crit**
PST & SST	122.416	1	122.416	286.4267	0.000000000	3.847465
Communication Disorders	70.74744	4	17.68686	41.38338	0.000000000	2.377669
Interaction	5.503846	4	1.375962	3.219449	0.012122017	2.377669
Within	662.4551	1550	0.42739			

Total	861.1224	1559	

Table- 4: Depicts post hoc analysis using unpaired t test with applied Bonferroni correction for comparisons of communication disorders with each other in primary and secondary school teachers.

Communication disorders	Mean Difference		p- value	
	PST	SST	PST	SST
Learning Disorder- Hearing Impairment	-0.3205	-0.5321	<.0001	
Learning Disorder - Stuttering	-0.2564	-0.3718		
Hearing Impairment- Articulation Disorder	0.4103	0.4423		
Hearing Impairment- Attention & Behaviour	0.4038	0.7244		
Stuttering- Articulation Disorder	0.3462	0.2821		
Stuttering- Attention & Behaviour	0.3397	0.5641		
Articulation Disorder - Attention & Behaviour	-0.0064	0.2821	0.003	0.0002
Learning Disorder- Articulation Disorder	0.0897	-0.0897	0.001	0.003
Learning Disorder -Attention & Behaviour	0.0833	0.1923	<.0001	0.002
Hearing Impairment- Stuttering	0.0641	0.1603	0.002	0.005

DISCUSSION:

Any kind of limitation or breakdown in the process of learning communication skills can significantly hinder a child's development, specifically speech or language development, effecting the child's social and behavioral skills as well as the academic abilities, caused due to communication disorder [4,5]. Earlier mitigation of problem will further help the children in improving their social as well as academic (reading and writing) skills, in school [6,7,8].

The present study result is all about scoring the cognizance and awareness of various communication disorders among regular school teachers of primary and secondary school. On a closure look to the distribution of different types of communication disorder, we found more than half of the secondary school teachers (SST-56.53%) and primary school teachers (PST-46.92%) display knowledge toward the primary features of learning disorder. This result however differs from the study result of Lopes and Crenitte (2012) [9], where they had found that 78% teachers do not have knowledge on learning disorders, but with effective orientation and training marked alteration in data with 52% teachers started to classify and understand the manifestations as learning disorder, which is similar to present study result.

Another interesting finding of this study is that more than half of the teachers had reported that they had experience with students having similar features that of learning difficulty as given in the questionnaire, however they could not differentiate between learning disability, its type and slow learners, which was weigh up as one of the reasons to consider learning disorder instead

of accurate learning disability which needs to be diagnosed by professionals.

One of the interesting findings of this study is the highest percentile score for teacher's cognizance regarding the communication disorder was hearing impairment where both SST (67.17%) and PST (53.33%) had identified the features of hearing impairment present in students. However, it has also been observed that many of teachers have no information regarding the same. The result of the present study can be correlated with the study by Chishty et al., (2014) [10], who had observed that the peak prevalence of hearing loss was found at 8 years of age, again declining after that from 20.43 % to 5.38 % by 12 years of age, i.e. main school going age. According to another survey on attitudes of teachers on hearing impairment, 85% & 15% teachers were strongly agree & agree respectively that hearing loss occur with different degree whereas 72.2%, 22.2% & 5.5% of the teachers reported that they agree, somewhat agree & somewhat disagree agree with respective to "children with HI have variation in hearing loss levels [11].According to 76th round of The National Sample Survey (NSS) in 2018 [12], 28.45% hearing disability in children since birth had been documented in Odisha. Hence, it became crucial for teachers to be conscious regarding the occurrence of hidden disability like hearing impairment in children which can lead to early intervention if identified and reported early.

In the current study, cognizance of teachers toward the stuttering/fluency disorder is the second largest percentile score as one of the recognized communication disorders (SST - 63.97%; PST-52.05%). This could be due to visibility of speaker's fluency disturbance which hamper the communication skills. The present study results can be generalized with the primary school teacher's survey done in Mumbai and South African schools. A study in Mumbai, suggested that 72.4% primary teachers, had taught at least one or more children who stuttered, over their teaching career. 3.5% teachers had taught four or more children whereas 27.5% teachers had never taught a child with stuttering [13]. In South African Schools, Abrahams et al., set forth that 83.7% teachers reported that they personally knew someone who stutters while 25.6%teachers currently had someone in their class who stutters. It was also concluded that, majority of teachers had experience with stuttering, however, they indicated that they knew the least about stuttering [14].

Compiling both the studies along with present study reports, it can be concluded that teachers are aware of stuttering as a communication disorder, but they are still clueless about in depth of stuttering. Teachers participated in the present study have also added information like they become helpless when other students try to tease and/or imitate the student stuttering.

The present study result figure for speech sound error or articulation disorder clearly visualizes that SST (58.33%) and PST (45.12%) are aware of the facts related to the same. Speech sound error or articulation disorder is described as production of imprecise articulation affecting speech intelligibility of an individual. A Yazd-Iranian study found that 13.8% speech sound error prevails in primary school children[15]. It was also noticed that primary teachers were more concerned for children with speech sound error as being young children, they themselves were deprived of communicating with their peers due to poor intelligibility of speech. Secondary school teachers have also reported that students having articulation disorder being teased by their classmates. Hence, it became a challenge for teachers to handle such situation.

A study supporting this information has been tracked down which display those schools and teachers face challenges while promoting and supporting the educational development of children with speech sound disorders [16]. Both autism and ADHD are believed to have onset during early childhood, although diagnosis is typically determined in the school age years. The

last but not the least interesting finding of this study was awareness of attention and behavioral problems in school going children which constitute the features related to autism and ADHD. The results suggest that PST and SST were also aware of these features present in the children. Our study result is reconcilable with the international and national studies done separately for autism and ADHD.

Arif (2013)[17] conducted studies on primary school teachers of Karachi, Pakistan and concluded that 55% teachers knew about autism through the media and 9% through formal training. But the present study report results cannot be generalized with study done by Al-Sharbati et al.,[18] where it was observed that autism awareness was low among Osmani teachers and there are several misconceptions about autism among the teachers.As observed by Shetty and Rai (2014) [19], 62% teachers were aware of the term ADHD and their knowledge of ADHD ranged from poor to adequate with 9% of teachers had prior training. Only 29% of the teachers had a good understanding of ADHD.

One of the domains of this study was that there were differences in the rate of awareness of various communication disorders between secondary and primary school teachers. Reddy. Badam (2019) [20] found that primary school teachers were better aware of most of the communication disorders. But there is still scarcity of studies at far indicating the importance of regular secondary school teacher's knowledge and role toward communication disorders as there are children with communication disorder attending secondary and higher secondary education. Hence, it provided another need to study the cognizance of SST on communication disorder awareness.

To the best of authors knowledge, this is the first field survey carried out in Bhubaneswar and Cuttack like cities addressing the awareness of communication disorder between secondary and primary school teachers. The present study stipulate that SSTs are more aware of communication disorder with respect to PSTs with statistically highly significant difference. Hence, a proposal for special training program should be directed for all regular school teachers including primary and secondary with the aim to acknowledge them regarding various communication disorder in children. This can empower the school authorities and teachers for their role in early identification and guiding parents for further management of the child.

FUTURE OF THE STUDY:

The current study can be taken forward as another survey not only including the awareness part but also as a part of teacher's vision regarding the management of challenges faced by children with communication disorders in their academics. Secondly, more numbers of regular school teachers can be taken into consideration as a part of survey belonging to different geographical part of our country, providing a better outlook towards awareness of communication disorders in school going children. Programs can be organized for teachers to sensitize them regarding communication disorder.

CONCLUSION:

There is clear visibility of limited awareness and cognizance of various communication disorders in children among regular school teachers i.e. both primary and secondary. It is important for primary school teachers to acknowledge the occurrence of various communication disorder as the symptoms started to visible at early childhood when the child starts for primary school. This alertness in primary school teachers can be beneficent toward child's early identification of disorder and its management which can reduce future stumbling blocks, so that the child can achieve secondary educations.

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Original Research Article

A study on awareness of hearing health, risk factors, prevention, and intervention of hearing impairment-among pregnant women and mothers of newborn in urban area, Bhubaneswar

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ABSTRACT

Background: The study was aimed at investigating the knowledge of awareness of hearing health, risk factors causing hearing loss and preventive measures for hearing disability at natal stages and awareness regarding the intervention among the pregnant women and mothers of newborn in urban area i.e. in Bhubaneswar.
Methods: 53 pregnant women and 103 mothers of newborn had participated in the present study and were agreed to provide their awareness regarding the questionnaire related to selected parameters their responses were scored and documented for the statistics.
Results: Results indicates that mothers were more aware of the selected parameters like risk factors during natal stages, intervention as compared to pregnant women. Mothers (66.01%) and pregnant women (56.22%) were more aware of prenatal risk factors as compared to peri and postnatal. Almost 60% of total participants were aware of hearing health and intervention for hearing loss. Two-way ANOVA was computed. $p<0.0001$, indicates statistically significant difference between the selected parameters i.e. awareness of hearing health and intervention and awareness of risk factors and prevention for hearing impairment at natal stages. Post hoc analysis (using unpaired t test by applying Bonferroni correction) suggestive of statistically significant difference of selected parameters from each other among pregnant women and mothers with $p=0.0002$.
Conclusions: It is very much important to utilize the existing knowledge of the grass root level people like mothers and pregnant women by acquiring their ideas and information regarding the awareness of occurrence of hearing impairment in children which can be done only by spreading adequate information regarding hearing disability.

Keywords: Hearing health, Risk factors, Preventive measures, Hearing impairment, Natal stages, Pregnant women and mothers

INTRODUCTION

In human beings, hearing impairment is an invisible and highly stigmatizing chronic condition is considered to be one of the most frequent sensory deficits.[1] The prevalence of disabling hearing impairment is reported to be highest for both adults and children living in developing countries, specifically South Asia, Asia-Pacific and sub-Saharan-Africa which is 4 times higher as compared to high income regions.[2]

According to World Health Organization (WHO) data, worldwide 34 million children were identified with disabling hearing loss.[3] In developing countries,

incidence of permanent congenital or early onset hearing impairment is estimated to be six cases per 1000 live births, that is three times higher as compared to the developed countries.[4-5] The prevalence of sensorineural hearing loss is in 3 healthy neonates per 1,000 live births and 2-4 high-risk infants per 100 birth.[6,7]

In India, 18.9% hearing disability ranked as the second largest form of disability after locomotor disability.[8] The prevalence of hearing disability is more in urban (20.5%) as compared to the rural (18.2%) part of India. As per the Indian Census (2011), 23% of the hearing disabled children were lying in the age range of 0-6 years.[8] According to 76th round of The National Sample Survey (NSS) in 2018, 0.3% hearing disability out of total disability, is considered as the topmost sensory deficit. NSS also states that hearing disability is the second most common form of disability.[9]

Hence, the importance of intensifying action to prevent deafness and causes of hearing loss is considered as a mandatory way as in childhood, 60% of hearing loss is due to preventable causes like environmental factors (like prenatal, perinatal or postnatal factors) and the remaining 40% are due to genetic factors or unknown cause.[10-12]

Prenatal risk factors can be infection in pregnant women during the pregnancy term (rubella or cytomegalovirus) as well as usage of ototoxic medication during treatment.[10,12] Studies in Oman and Iran had reported the prevalence of consanguinity in hearing impaired population. 70% deaf children were born of consanguineous marriage.[10,13,14] Literature also supports the perinatal risk factors considered for hearing loss at the time of birth like premature delivery or the newborn suffering from lack of oxygen at the time of birth and/or any diseases like neonatal jaundice, mumps, meningitis or measles. Infant born with low birth weight and/or congenital malformations of the ear and the auditory nerve, also give rise to hearing impairment.[10,12] Ear diseases like too much of earwax (impacted cerumen) or fluid in the ear, usage of ototoxic medicines in the treatment of neonatal infections, malaria, drug-resistant tuberculosis and cancers are some postnatal risk factors leading to common childhood hearing problem.[10,15,16]

It is a well-known fact that most of these causative factors can be prevented, at least partially, by improving the primary prevention strategy.[12] An early and consistent awareness of risk factors contributing to hearing loss in infants during the natal (pre to postnatal) period can minimize the risk in fetus.[5]

As per 76th round of NSS, in Odisha, prevalence of hearing impairment is 0.4% in urban parts while 28.45% hearing disability was found to be since birth.[17] Some international and national survey-based studies have been attempted to provide insight into predicting mother's awareness regarding hearing impairment and intervention, however there is lack of documentation regarding the same in urban area of Khordha district i.e. Bhubaneswar, Odisha.[18-20] Hence, a small survey was planned in Bhubaneswar, in order to provide a record regarding awareness of causative risk factors during natal stages contributing to hearing impairment as well as steps taken for intervention or treatment in children with hearing loss, by mothers of newborn and pregnant women.

Aim and objective

The study was aimed at investigating the knowledge of awareness of hearing health, risk factors causing hearing loss and preventive measures for hearing disability at natal stages and awareness regarding the intervention among the pregnant women and mothers of newborn in urban area i.e. in Bhubaneswar.

METHODS

A cross sectional study was conducted among 156 participants comprising pregnant women and mothers of newborn living in urban area for 15 years or more, were collected from Bhubaneswar. All the considered participants had visited and being treated at govt. and private hospitals, maternity home, and nursing homes over a period of 8 months i.e., from August 2020 to February 2021. The participants were selected through purposive sampling. All the participants were divided into two groups consisting of 53 pregnant women considered as group I and group II consisting of 103 mothers of newborn. The inclusion criteria for pregnant women were considered to be the time period from conceived to 9 months while for mothers of new born was after delivery to 6months. Beyond this considered time period for both the group was regarded as an exclusion criterion.

An ethical approval consent was taken from the higher authority of selected hospitals and other setups with prior permission. A survey was done by visiting the selected hospitals (government and private), and maternity and nursing homes in order to collect the information regarding the pregnant women and mothers of newborn with the required inclusion criterion, who have visited them. An approach was made to all the participants to participate in the survey, once the required information was documented. All the participants interested in the survey, were introduced with the aims and the objectives of this study. A written consent and permission were sought from them for their approval.

A close ended questionnaire was used to obtain information from pregnant women and mothers of new born from different hospitals and maternity homes after the permission granted with ethical clearance from all the setups and a structured survey was considered as a data collection strategy.

The questionnaire comprised of questions based on the risk factors, prevention taken by pregnant women and

mothers of new born in all the natal stages (pre, peri and post) for hearing disorder in infants along with the awareness regarding the hearing health and intervention, was constructed initially in English by investigators and validated by 5 experienced ASLPs. The questionnaire was further translated into Odia language by native speakers and then back translated along with proofread in order to ensure that the meaning of the content remains the same. A survey was done by administering the questionnaire on pregnant women and mothers of newborn where the questionnaire was described verbally to all the participants, and they were instructed to put a "√" mark against the options (yes or no) which best described the nature of their information level. The duly filled questionnaires were collected and the responses were noted down which were further compiled for statistical analysis.

The recorded data were documented in Microsoft excel 2018 and analyzed using Statistical Package for Social Sciences (SPSS) version 18.0.0. Mean±SD were used to summarize the overall score along with calculation of percentile score for each factor under the parameters. Two-way ANOVA was used in order to determine the effects of selected parameters and the Post hoc analysis using unpaired t test was used to check the difference between selected parameters of the two groups.

RESULTS

The information was collected from 53 pregnant women (mean age 28.1years) in group I and 103 mothers of newborn (mean age range- 29.3years) in group II.

Figure 1 depicts the percentage of awareness of risk factors and prevention of hearing impairment at prenatal stage, among the pregnant women and mothers of newborn, living in urban area.

As a preventive measure, a good percent (81.55%) mothers of newborn infants were aware of vaccination as compared to pregnant women (67.92%), indicating that mothers were having good information regarding availability of vaccination and immunization for preventable diseases. 75.72% mothers familiar of genetics/ hereditary conditions as risk factors contributing to hearing loss of newborn which is also higher as compared to pregnant women (58.49%).

Figure 2 depicts the percentile score of awareness of risk factors and prevention of hearing impairment at perinatal stage, among the pregnant women and mothers of newborn of urban area.

Both the groups displayed poor knowledge regarding the perinatal risk factors like low birth weight, delayed cry, premature birth, caesarean complication and neonatal jaundice. Only half the mothers had idea that if their child suffers from jaundice, might loss his/her hearing sensitivity. Although, both the group members were aware of caesarean complication might lead to hearing loss.

Figure 3 depicts the percentile score of awareness of risk factors of hearing impairment at postnatal stage, among the pregnant women and mothers of newborn in urban area.

Table 1: Distribution of subject based on educational level.

Subjects	Up to secondary and other qualifications N (%)	Bachelor and higher degrees N (%)	Total (N)
Pregnant Women	17 (32.08)	36 (67.92)	53
Mothers of New Born	39 (37.86)	64 (62.14)	103

Table 2: Distribution of subjects by gross annual income.

Subjects	<1,00,000 P.A N (%)	1L-3L P.A N (%)	>5L P.A N (%)
Pregnant Women	11 (20.75)	23 (43.4)	19 (35.85)
Mothers of New Born	21 (20.39)	43 (4175)	39 (37.86)

Table 3: The descriptive statistics of the selected parameters in pregnant women and mothers of newborn in Bhubaneswar.

Area	Subjects	Awareness of the risk factors and prevention of hearing impairment in						Awareness of Hearing health and Intervention for hearing impaired	
		Prenatal stage		Perinatal stage		Postnatal stage			
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Urban area	Group B1 Pregnant women	2.81	0.76	2.05	0.94	2.49	0.98	2.75	0.82
	Group B2 Mothers of newborn	3.30	0.93	2.38	0.97	2.54	0.90	2.93	0.86

Half of the mothers and pregnant women were knowledgeable of the postnatal causative risk factors like childhood illness, infections in ear or ear discharge and ear injury. They knew if these factors were not treated well before time, it might lead to permanent hearing loss. Both mothers and pregnant women should be educated regarding all these, so an early identification with quick intervention can be achieved.

Figure 4 depicts the awareness of hearing health and intervention taken by both the pregnant women and mothers of newborn in urban area.

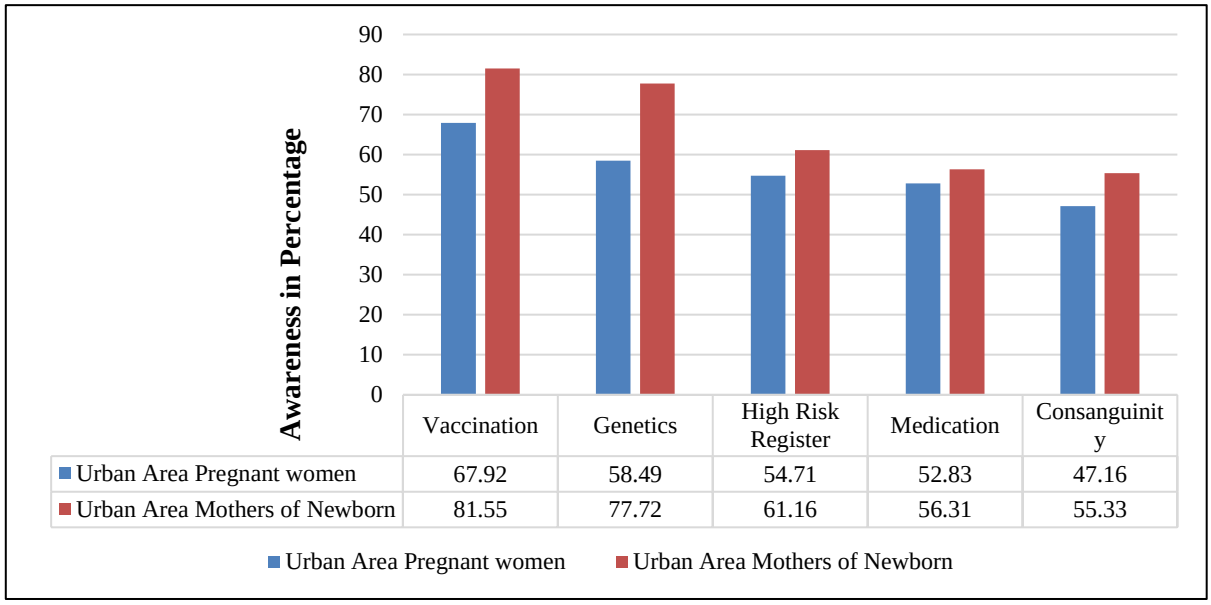

Figure 1: Awareness of risk factors and prevention measures for hearing impairment at perinatal stage among pregnant women and mothers of newborn in urban area.

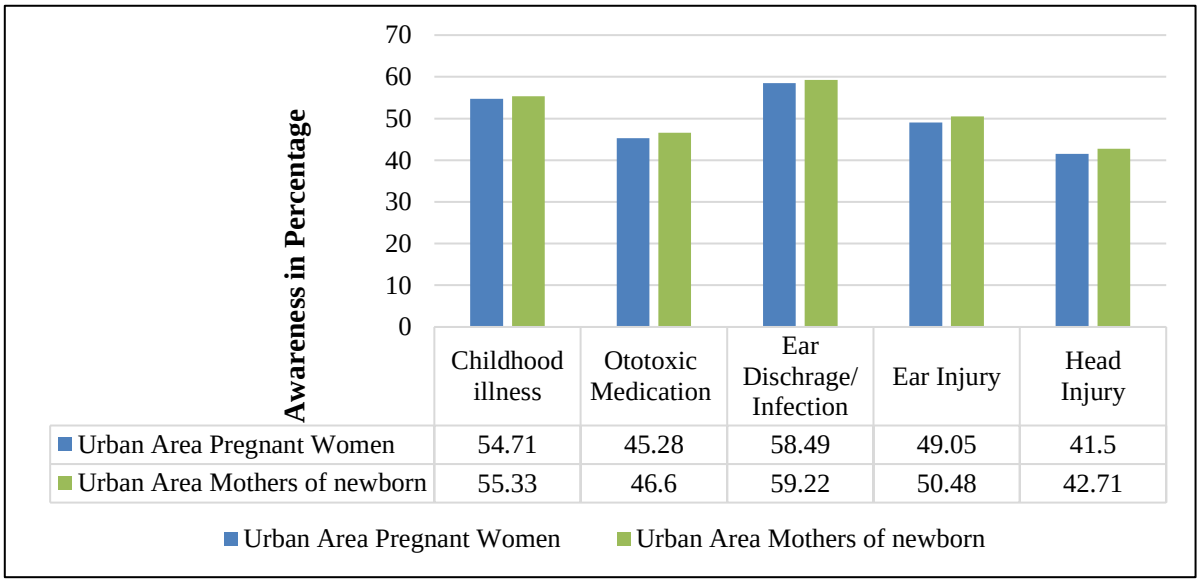

Figure 2: Awareness of risk factors causes for hearing impairment at postnatal stage among pregnant women and mothers of newborn in urban area.

Figure 5 depicts the overall comparison of awareness of risk factors and preventive measures for hearing impairment in all the natal stages and hearing health and its intervention among pregnant women and mothers of newborn in Urban area. More of than 60% of mothers of newborn (66.01%) as well as of pregnant women (62.26%) were aware of neonatal hearing loss but both the group members still use sharp objects and/or oil as a primary treatment for hearing problem. Half of the participants from both the groups were not acquainted

with newborn hearing screening, which suggests that an immediate implication of NHS scheme at every health care system is in need.

Mothers and pregnant women carry low level of information regarding causative risk factors during the perinatal stage as compared to postnatal factors. More than half of the participants in both the groups were aware of prenatal risk factors as well as of intervention and hearing health. But at the same time, mothers of newborn are display more knowledge regarding the hearing impairment as compared to pregnant women, but none of the groups could achieve 100 percent score for awareness regarding risk factors causing hearing loss as well as about the hearing health and intervention. This indicates the need of public awareness programs for hearing impairment.

p value obtained is 0.0024, suggesting significant difference between mean scores among pregnant women and mothers. With, $p<0.0001$, suggesting a significant difference between the selected parameters i.e. awareness of hearing health and intervention and awareness of risk factors and prevention for hearing impairment at natal stages. $p=0.0137$ suggestive of statistically significant interaction of the selected parameters among pregnant women and mothers of newborn.

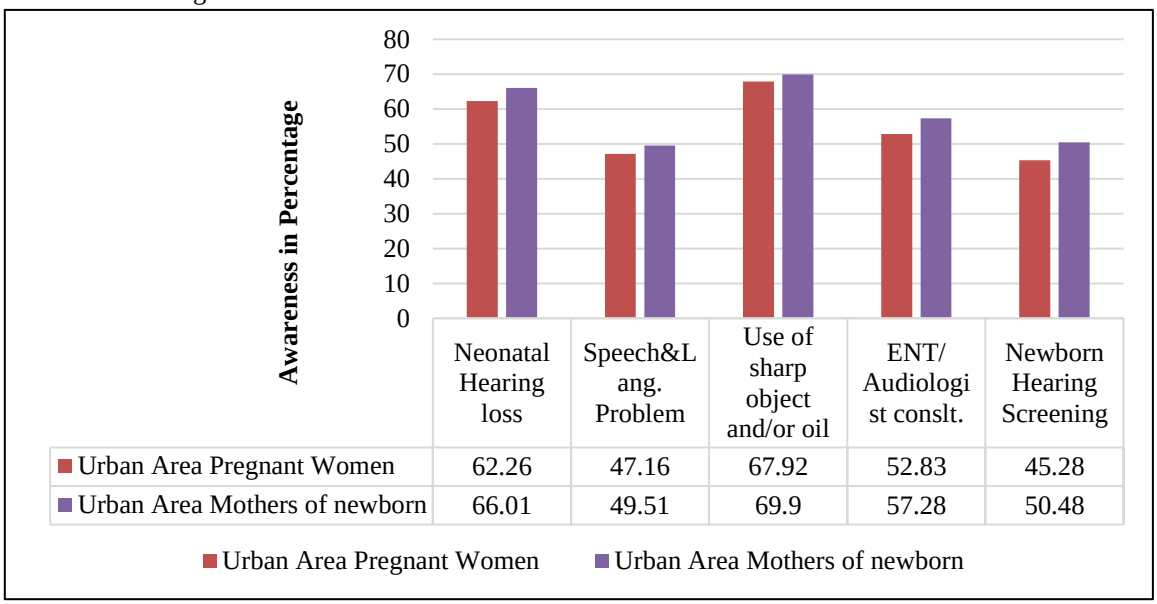

Figure 3: Awareness hearing health and intervention for hearing impairment among pregnant women and mothers of newborn of urban area.

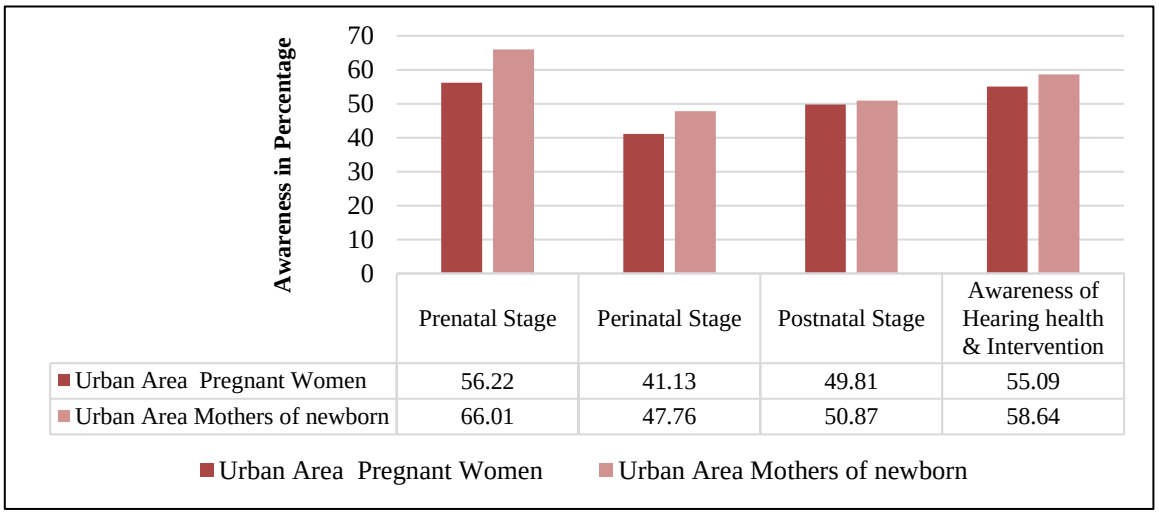

Figure 4: Awareness of causes and prevention measures for hearing impairment and hearing health and its intervention in all natal stages among pregnant women and mothers of newborn in urban area.

Table 4: Depicts results of two-way ANOVA regarding awareness of hearing health and intervention and awareness of risk factors and prevention for hearing impairment at natal stages among pregnant women and mothers of newborn in urban area.

Source	SS	df	MS	F	P
Pregnant women and Mothers	9.68	1	9.68	4.11	0.0024
Awareness of hearing health & intervention and Awareness of causes and prevention for hearing impairment at natal stages.	66.9	3	22.3	21.46	<.0001
Interaction	3.77	3	1.26	1.21	0.0137
Error	640.21	616	1.04		
Total	720.56	623			

Table 5: Post hoc analysis using unpaired t test with applied Bonferroni correction for comparisons of selected parameters with each other in pregnant women.

Selected parameter (in Urban Area)	Mean Difference		Obtained p value		Bonferroni correction
	Pregnant women	Mothers of new born	Pregnant Women	Mothers of new born	
Prenatal-perinatal	0.7547	0.9126	<0.0001	<0.0001	p=0.01
Prenatal-postnatal	0.3208	0.7573	0.004	<0.0001	
Prenatal- awareness of hearing health and intervention	0.0566	0.3689	0.003	0.001	
Perinatal- postnatal	-0.434	-0.1553	0.01	0.002	
Perinatal- awareness of hearing health and intervention	-0.6981	-0.5437	<0.0001	<0.0001	
Postnatal- awareness of hearing health and intervention	-0.2642	-0.3883	0.002	0.0001	

p<0.01 suggest that all the selected parameters are significantly different from each other in pregnant women. All the selected parameters are significantly differing from each other with p=0.01 in mothers of newborn.

A statistically significant difference of selected parameters from each other among group I and group II with p=0.0002.

DISCUSSION

In state like Odisha, peoples' thoughts and their beliefs are still deeply buried within their culture and old traditions despite of urbanization, so public awareness and attitude towards disabilities in childhood are generally poor and often aggravated by superstitious customs and beliefs. Due to poor socio-economic status, financial barriers, and geographical conditions, hearing impairment in children gets easily neglected. Hence, it is important to know the rate of awareness regarding hearing impairment in communities and basically from the grass root level people like pregnant women, mothers of newborn and immediate family members.

In terms of risk factors and prevention during prenatal stage, 75% mothers in the present study are aware of genetics/hereditary conditions, which can be held responsible for hearing impairment in infants. Swanepoel and Almic reported that 67% mothers recognized that hearing loss can be congenital, although 33% were uncertain or did not know.[21] However, above mentioned studies are different when compared with the study done by Govender et al where they have reported only 54% mothers are aware of hereditary conditions resulting in hearing loss in infants.[18] Authors have also reported that only 16% mothers were aware of infection or high-risk factors causing hearing loss in infants, however, it is contrasting with the present study results where 60% awareness is noticed in both the groups. Swanepoel et al had also concluded that there is a general awareness of important risk factors for hearing loss although some risk factors were poorly identified which also corelates with the present study in terms of both pregnant women and mothers of newborn, although it varies in scores.[21] In related to risk factors, in order to support the present study, a study in south India has stated that mothers exhibit good knowledge of risk factors for hearing loss.[20] With respect to consanguinity factor, family history and consanguinity has been the cause of 100% of infants with severe – profound impairment.[25] Better awareness in mothers regarding the consequences of consanguineous marriage display good maternal knowledge which is different from the present study result, as in state like Odisha, marriages between two family members who are second cousins or closer is considered to be unacceptable except in western and southern parts of Odisha.[22]

With respect to perinatal risk factors in terms of low birth weight, prematurity and jaundice, nearly three quarters i.e. 77% of the mothers were unaware of these conditions which could cause hearing loss in their infants.[18] A similar result has been found in an Indian study done by Dudda et al where they had concluded that, mothers were having relatively poor insight for natal causes such as delayed birth cry, neonatal jaundice which is similar to the result provided in the present study for both the groups.[22] Poor awareness of risk factors like medications, asphyxia, jaundice, measles and preterm/ low birthweight had also been studied and documented among Nigerian and South African mothers.[23]

Dudda et al also concluded that 78.4% mothers were aware of ototoxic medication (consumed by their child) while 81.37% mothers had idea about middle ear infections, causing hearing loss in infants.[22] This study is somehow, like the study of Swanepoel and Almic, where 79% mothers having information regarding ear discharge while 69% mothers were aware of drugs/medication as risk factors for infant hearing loss.[21] However, both studies are equally different from the present study result as 60% mothers had information of ear discharge while only 45% had knowledge regarding the effect of ototoxic medication, suggestive of comparatively low level of information in present study with respect to above mentioned studies.

In the present study, almost 60% mothers and pregnant women were aware of neonatal hearing loss however, more than 50% of them did not know about newborn hearing screening (NHS), which is somehow corelated with 62.5% Nigerian mothers who were not aware of NHS.[19] However, according to a study in Karnataka, 75% mothers were exhibiting knowledge of hearing loss treatment.[20] With respect to temporary solution for ear disease, mothers in an urban community in North India, are still using neem or garlic oil which is also prevailing in mothers of present study.[25]

The decision taken by mothers for neonatal hearing screening or routinely screening their children for hearing loss, or those taken after identifying a hearing loss, are important while such decisions are solely based on mothers' knowledge and attitude toward the risk factors and preventive measures for infant hearing loss as well as on the availability of treatment options.[21,23] So, both mothers and pregnant women should exhibit good amount of knowledge regarding hearing health, information related to the causative risk factors and preventive measures, which will help the hearing professional team to identify the hearing disability as early as possible with an immediate action towards the intervention and available rehabilitation.

Overall, mothers of newborn were comparatively more aware of hearing impairment with respect to pregnant women but none of them could achieve 100% awareness of risk factors and causes as well as regarding the treatment or early intervention for hearing impairment. It might be due to less exposure to public awareness programs and camps. There are both international and national studies based on mothers' knowledge regarding hearing impairment, but literature could not support any studies regarding the awareness of hearing impairment in pregnant women. Hence, a step was put forth to highlight the level of awareness and educate the pregnant women, so that they can also lend a helping hand in preventing the causes and pitch in an early identification and intervention care by supporting the neonatal hearing screening and further rehabilitation in case of their hearing impaired child.

In developing country like India, the task of leading a national fight against disabling hearing impairment must be approached with great care. In India, the major hindrances for establishing an effective screening program are the costs involved, the non-availability of equipment and human resources. Thus, educating mothers will support early detection and management of hearing loss. Hence, it is very important for every state wise regional health care and audiological professionals to widespread the systematic nationwide hearing screening programs like National Programme for the Prevention and Control of Deafness (NPPCD) and Rashtriya Bal Swasthya Karyakram (RBSK in the community and educating the mothers of newborn and pregnant women about the importance of hearing health, how to take precaution to prevent the causes and risk factors resulting in hearing loss in order to reduce the aggravation of post consequences of hearing impairment in infants.[26,27] It is the role of audiologist as well as health care professionals to promote and apprised the knowledge regarding the profession of audiology and the role of an audiologist, as well as the access to audiological services.

CONCLUSION

To focus and create appropriate awareness related to hearing impairment in the community and to make avail the governmental support and facilities available for hearing impaired was the prior objective of the study. To reduce the burden of hearing disability and to improve quality of life was the main motive behind the study. The result of this study suggested that mothers were more knowledgeable regarding the aspects of hearing loss with respect to pregnant women that however, there was also prevalence of misconceptions and lack of information regarding intervention of a hearing-impaired child. It is very much important to utilize the existing knowledge of the grass root level people like mothers and pregnant women by acquiring their ideas and information regarding the awareness of occurrence of hearing impairment in children which can be done only by spreading adequate information regarding hearing disability which can help in early identification and intervention in children with hearing loss while indirectly reducing the burden of hearing disability. The limitation of the present study is that it included a smaller number of

subjects and restricted to urban part of Bhubaneswar. Further it can be recommended that such similar study can be conducted using a greater number of subjects in both the group and including more parameters.

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INTEGRATING PLACEBO IN CONVENTIONAL HEARING AID PRESCRIPTION PRACTICES FOR BETTER ACCEPTANCE

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Keywords: *Placebo, Digital Hearing aid, NIDCD, APHAB, Shared Decision making,*

The placebo effect is the reduction of a symptom or a change in the psychological parameters when an inert treatment is administered to a subject who is told that it is an active therapy with specific properties.

The use of placebo is not equivalent to the absence of treatment, for example, placebo could be used in addition to standard care. In all cases, its use should be associated with measures to minimize exposure and avoid irreversible harm. (Placebo in clinical trials U. Gupta and M. Verma , 2013)

Placebo effect is not a novel concept as it has been around and has been used often in medical procedures and researches, though its efficacy, control, advantages and disadvantages are yet to be completely explored in other parallel fields.

Audiology is one such field where placebo effect has been explored upon, as prescription of appropriate amplification device is an important step in the rehabilitation of an individual, the major focus of the conducted researches was on exploring placebo in hearing aid trials.

P. Dawes , S. Powell, K. J. Munro 2011 investigated the influence of participant expectations on the outcome of a trial comparing two behind-the-ear hearing aids with identical electro-acoustic performance, one of which was called a "new" hearing aid and the other a "conventional" hearing aid. The new hearing aid performed better than the so called old hearing aid and slightly better test scores were observed, it was also consistently rated more highly on all sound quality ratings and this difference was statistically significant 75% participants expressed an overall personal preference for the new hearing aid with the remainder expressing no preference

P. Dawes , R. Hopkins, K. J. Munro 2013 the same experiment was carried out again and similar results were observed Participants had significantly better mean speech-in-noise performance and sound quality ratings for the "new" hearing aid. A significant proportion of participants expressed an overall preference for the "new" hearing aid.

All these studies concluded that, placebo effects reliably impact on hearing-aid trials. And it needs to be controlled, in hearing aid trials and to interpret cautiously any hearing aid trial that did not control for this effect.

It is however seen in certain medical researches that placebo can and should be used to optimize patient outcome, in clinical medicine placebo effects could be (and are) ethically utilized to optimize the outcome for patients (Turner et al, 1994; Thompson, 2000; Price et al, 2008)

In one survey, only three percent of U.S. physicians reported using actual sugar pills as placebos, but 41% used over-the-counter painkillers, 38% said they had used vitamins as placebos for their patients. 68% of physicians described the placebo as a potentially beneficial medicine, and roughly 66% of the doctors felt the practice was ethical J.C. Tilburt, E. J. Emanuel, T. J. Kaptchuk, F.A. Curlin, F. G. Miller.(2008)

Prescription of hearing aid and its appropriate use, is mostly the fundamental step in rehabilitation of any hearing impaired individual although, based on calculations by National Institute on Deafness and other Communication Disorders (NIDCD) Epidemiology and Statistics Program, among adults aged 70 and older with hearing loss who could benefit from

hearing aids, fewer than one in three (30 percent) has ever used them. Even fewer adults aged 20 to 69 (approximately 16 percent) who could benefit from wearing hearing aids have ever used them.

It is estimated that by 2050 over 700 million people – or one in every ten people – will have disabling hearing loss. (World Health Organization).

The NIDCD statistics coupled with the data from World Health Organization is not a good site for aural rehabilitation on the whole.

R. A. Bentler, D. P. Niebuhr, T. A. Johnson, and G. A. Flamme 2003 found that labeling similar hearing aids as digital v/s conventional had significant affects on Abbreviated Profile of Hearing Aid Benefit (APHAB), Reverberation and Background noise scales, the group of tests used in this study showed a significant labeling effect as a whole.

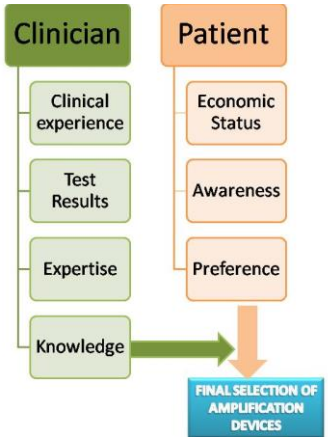
The APHAB is a 24-item self-assessment inventory in which patients report the amount of trouble they are having with communication or noises in various everyday situations. Benefit is calculated by comparing the patient's reported difficulty in the unaided condition with their amount of difficulty when using amplification.

It is evident that placebo effect is used and can positively affect the satisfaction of the person it is administered on, which will in turn aid the acceptance and usage of hearing aids and help in the process of rehabilitation.

Recently, there has been increased interest in interventions that optimize placebo effects to improve clinical outcomes in routine medical care. Given that expectancy interventions have been shown to improve symptoms, one could argue that there is an ethical obligation to encourage their widespread implementation and application. (P. Gruszka, C. Burger and M. P. Jensen 2019)

The concerns of unethical interference of placebo can be negated easily by a double blind method in an experiment or research however in the process of hearing aid selection in a clinical setup the implementation of a double blind strategy is not justifiable as it will be a time taking process for each and every client's trial.

The model of Shared decision making which is widely acceptable in the prescription of hearing aid, Shared decision making is a joint process in which a healthcare professional works together with a person to reach a decision about care.



It involves choosing tests and treatments based both on evidence and on the person's individual preferences, beliefs and values. It makes sure the person understands the risks, benefits and possible consequences of different options through discussion and information sharing. (National Institute for Health and Care Excellence)

Research indicates, that both the content and manner in which information is shared with the patient, and the patient's experience of being involved in the decision, can directly alter therapeutic outcomes via placebo responses. (H. Brody , L. Colloca, F. G. Miller 2012)

It is evident that the interference of placebo cannot be negated completely from a hearing aid trial and hence instead of trying to eliminate it we should try and use it to aid the process of aural rehabilitation.

To ethically minimize the effect of placebo the placebo about the amplification device can be introduced once the Shared decision making process has been completed, i.e. once the client has selected a hearing aid only then should the labeling placebo be introduced.

Placebo effect is and always will be a part of a hearing aid trial and hence we should accept it rather than avoid it, instead of looking at the negative effects of placebo it will be useful to accept the positives and use it in a proper manner and this can be an add-on to the standard procedure of hearing aid trial and fitting which will in turn increase hearing aid satisfaction.

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Research Article

A Qualitative Study on Awareness of Hearing Health, Hearing Impairment and Intervention among Pregnant Women and Mothers of Newborn in Rural Khordha District

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Abstract

Background & Objectives: The study was aimed to investigate the awareness regarding hearing health, causes and prevention measures for hearing disability at natal stages and awareness regarding the intervention among the pregnant women and mothers of newborn in rural areas. **Subjects & Methods:** Information from 51 pregnant women and 105 mothers of newborn living in rural areas were gathered *via* help of hospitals, nursing homes and maternity care. **Results:** Mothers of newborn were more aware with respect to the pregnant women however both the groups could not achieve 100% awareness in any of the selected parameters. Two-way ANOVA was suggesting p<.0001, a statistically significant difference between mothers of newborn and pregnant women for awareness of hearing health, causes and prevention of natal stages as well as for intervention. Post hoc analysis was done using unpaired t test by applying bonferroni correction in order to check which of the selected parameters are significantly differ from each other p<0.01. Suggesting a significant difference for all the selected parameters for mothers of newborn and pregnant women.The obtained p value is 0.0001, suggesting a significant difference of selected parameters among pregnant women and mothers of newborn. **Conclusion:** It's very much important to utilize the existing knowledge of the mothers and pregnant women by attempting to bridge the gaps in acquiring information regarding the awareness of hearing impairment in children which can be done only by creating the awareness and spreading adequate information regarding hearing disability.

Keywords: Hearing health; Hearing impairment; Newborn; Prevention; Natal stages; Intervention

Introduction

According to WHO, 5% of the world's population (466 million people) are having hearing disability out of which 34 million children are with disabling hearing loss. [1,2] Although it's not possible to prevent all cases of hearing loss in infants but early and consistent information regarding the awareness regarding hearing health, causes and prevention measures for hearing disability along with the intervention taken by pregnant women and mothers of newborn during the pre to postnatal stage, can be a leading source for reducing the occurrence of hearing impairment in newborn especially in rural as well as urban parts of low and middle-income countries.[3]

Incident of hearing impairment was found to be 0.6% in rural and 0.4% in urban parts of Odisha followed by 28.45% prevalence rate of hearing disability since birth. [4] However, there are less evidence regarding the awareness of hearing impairment in children among the mothers of newborn and pregnant women in Odisha and lack of literature and documents can lead to delay in early identification and intervention. Hence, a small planned survey in rural parts of Khordha district of Odisha was implemented to provide a record for awareness of hearing impairment in children amongst the mothers of newborn and pregnant women.

Aim and Objective

To determine the awareness of causes and prevention of hearing impairment, hearing health and intervention among pregnant women and mothers of newborn.

Materials and Methods

A cross sectional study was conducted among 156 sample comprising both the pregnant women and mothers of newborn residing in rural areas, collected from 5 panchayat (25 villages) of Khordha district of Odisha, who had visited and being

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treated at govt. and private hospitals, maternity home and nursing homes over a period of 6months *i.e*., from July 2019 to January 2020. Participants were selected through purposive sampling. All the participants were divided into two groups consisting 51 pregnant women considered as group I and group II consisting 105 mothers of newborn. The inclusion criteria for pregnantwomen were considered to be the time period from conceived to 9 months while for mothers of new born was after delivery to 6months. Beyond this considered time period for both the group was regarded as an exclusion criteria.

An ethical approval consent was taken from the higher authority of selected hospitals and other setups. A survey was done by visiting the hospitals and maternity homes to get information regarding the pregnant women and mothers of newborn, who have visited them. Once the information was documented, an approach was made to all the participants to participate in the survey. All the interested participants were introduced with the aims and the objectives of the study and a written consent and permission was sought from them.

A close ended questionnaire was used to obtain responses from pregnant women and mothers of newborn from different hospitals and maternity care homes after the due permission granted from the setup. A close ended questionnaire and a small survey was taken into consideration as strategy for data collection.

The questionnaire relevant to awareness regarding hearing health, causes and prevention of hearing disorder during prenatal, perinatal and postnatal stage and awareness for the intervention were considered in case of a hearing impaired child, was constructed by investigators and validated by 5 ASLPs. The questionnaire was initially developed in English which was further translated into Odia language by native Odia speaker and then back translated along with proofread in order to ensure that the meaning of the content remains the same. The duly filled questionnaire from the participants of the groups were collected and their responses were noted down which were further compiled for statistical analysis.

The recorded data were documented in Microsoft excel 2018 and analyzed using Statistical Package for Social Sciences (SPSS) version 18.0.0. Mean ± SD were used to summarize the overall score of both the groups. Each factor under every under selected parameters were calculated in the form of percentile score. In order to determine the effects of selected parameters,two-way ANOVA was applied andpost hoc analysis using unpaired t test was used to check the difference between subgroups.

Results

The information was collected from 51 pregnant women in group I and 105 mothers of newborn in group II. The mean age range of pregnant women wasfound to be 24.2 years. Mothers of newborn have an average age range of 26 years. The demographic details of subjects participated in the study were given in terms of educational qualification and gross annual income. More than 50% of the participants (both mothers of new born and pregnant women) surveyed were well educated,

Table 1: Distribution of subject based on educational level.

Subjects	Up to secondary and other qualifications n (%)	Bachelor and higher degrees n(%)	Total (n)
Pregnant women	29 (56.86%)	22 (43.13%)	51
Mothers of new born	57 (54.28%)	48 (45.71%)	105

Table 2: Distribution of subjects by gross annual income.

Subjects	<1,00,000 P.A n (%)	1L-3L P.A n (%)	>5L P.A n (%)
Pregnant women	24 (47.05%)	16(31.37%)	11(21.56%)
Mothers of new born	44(41.90%)	38(36.19%)	23(21.90%)

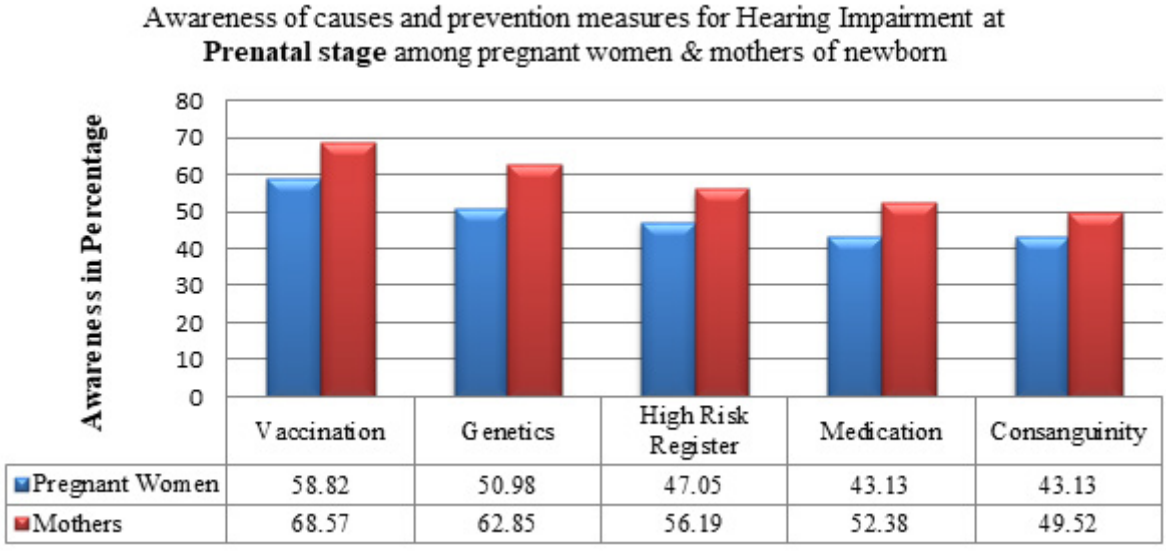


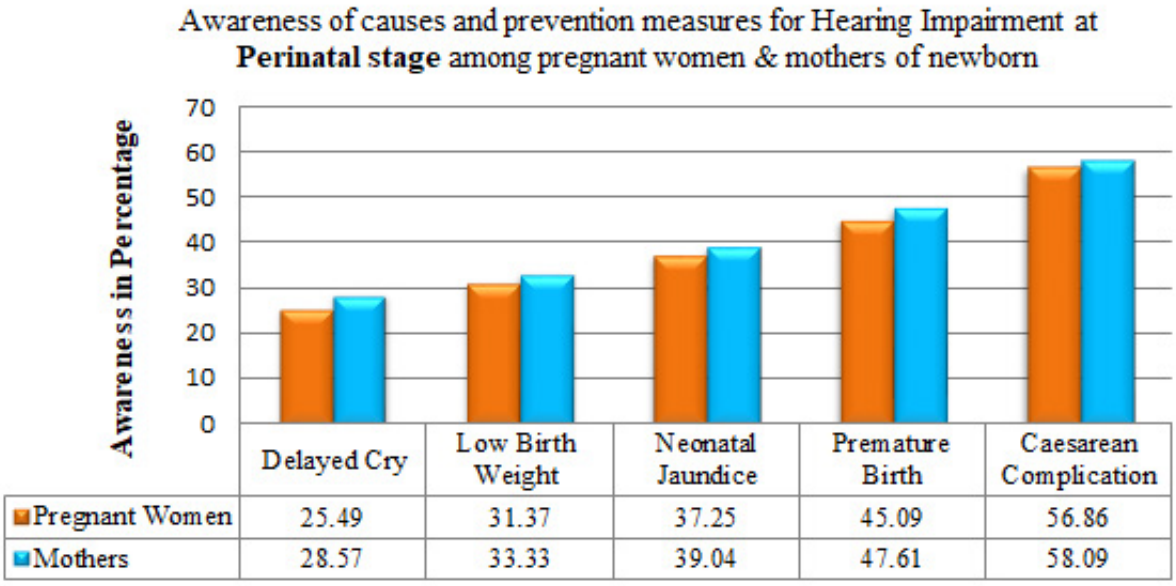
Figure 1: Depicts the percentage of awareness of causes and prevention of hearing impairment at prenatal stage, among the pregnant women and mothers of newborn.

with secondary and other qualifications [Table1]. More than 40% of the participant's gross annual income was less than lakh [Table 2].

Results of each single factor in selected parameters were depicted as percentile score in the form of graphs. Mothers of newborn were more aware of genetic (62.85%) and high risk register factors (56.19%) as prenatal causes with respect to pregnant women. However, 69% mothers of newborn and 59% pregnant women have knowledge regarding the vaccination, as a preventive measure at primary level of prevention for any future disorder in new born, especially hearing impairment [Figure 1]. In terms of causes and prevention in the perinatal stage, mothers of new born and pregnant women have scored less than 50% for each factor although participants in each group had more than 55%awareness regarding the complications during caesarean, which may lead to hearing loss in children. Nevertheless, 45% participants in both the groups have perception regarding premature birth as a risk factor [Figure 2].

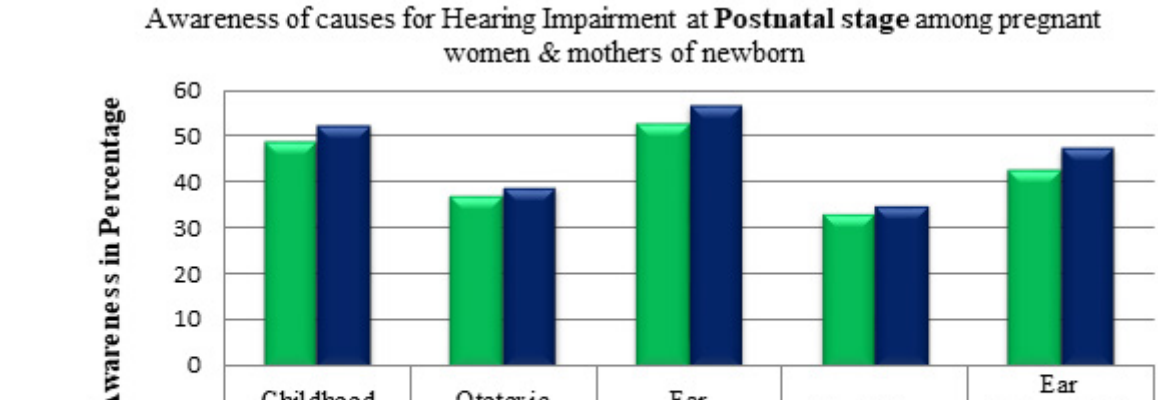
For postnatal period, more than half of mothers of newborn (57.14%) and pregnant women (52.94%) have an insight toward ear discharge and less than half of the total participants acknowledged that injury and/or infectioncan act as an active cause of hearing impairment in children [Figure 3]. Both the groups had scored above 50% regarding the awareness of neonatal hearing loss in infants although at the same time 50% mothers of newborn as well as pregnant women, use sharp objects and/or oil as an intervention part. However, more than one third of pregnant women (37.25%) and less than half of mothers of newborn (46.66%) were familiar with newborn hearing screening [Figure 4].

Mothers of new born and pregnant women are more acquainted



	Delayed Cry	Low Birth Weight	Neonatal Jaundice	Premature Birth	Caesarean Complication
Pregnant Women	25.49	31.37	37.25	45.09	56.86
Mothers	28.57	33.33	39.04	47.61	58.09

Figure 2: Depicts the percentile score of awareness of causes and prevention of hearing impairment at perinatal stage, among the pregnant women and mothers of newborn of rural areas.



	Childhood illness	Ototoxic Medication	Ear Discharge	Head Injury	Ear Injury/Infection
Pregnant Women	49.01	37.25	52.94	33.33	43.13
Mothers	52.38	39.04	57.14	35.23	47.61

Figure 3: Depicts the percentile score of awareness of causes of hearing impairment at postnatal stage, among the pregnant women and mothers of newborn in rural areas.

with prenatal causes, its prevention and awareness of hearing health and intervention followed by postnatal and perinatal stage. Mothers of newborn has overall higher percentile score in all selected factors and parameters with respect to pregnant women, although no 100% awareness score was recorded for any of the groups [Figure 5].

Descriptive statistics was done for responses of pregnant women and mothers of newborn in rural are as towards the selected parameters *i.e.* awareness of the causes and prevention of hearing impairment in prenatal stage, perinatal stage, postnatal stage and awareness of hearing health and intervention for hearing impaired [Table 3].

A two-way analysis of variance was conducted to determine the influence of two independent variables (pregnant women and mothers of newborn) on awareness of causes and prevention of hearing impairment, hearing health and intervention in rural areas. All the effects were statistically significant at the .05 significance level [Table 4]. The main effect for pregnant women and mothers yielded an F ratio of F (1,623)=12.84, p=0.0004, indicating a significant difference between Group I: Pregnant women with mean and standard deviation (±) were in prenatal stage: 2.43 (± 0.50); in perinatal stage: 1.96 (± 0.77), in postnatal stage: 2.15 (± 0.96); and for the awareness of hearing health and intervention for hearing impaired: 2.39 (± 0.60) and Group II-Mothers of newborn in prenatal stage: 2.89 (± 0.78); in perinatal stage: 2.06 (± 0.81); in postnatal stage: 2.31 (± 0.90) and for the awareness of hearing health and intervention for hearing impaired: 2.68 (± 0.62) [Table 3].The main effect for an awareness of hearing health & intervention and awareness of causes and prevention for hearing impairment at natal stages yielded an F ratio of F(3,623)=17.05, p<.0001, indicating a significant difference. The interaction effect was significant, F (3,623)=1.26, p=0.002 [Table 4].

In post hoc analysis using unpaired t test p<0.01, suggesting that the selected four parameters are significantly differing from each other along with a significant difference between pregnant women and mothers of newborn in rural area [Table 5].

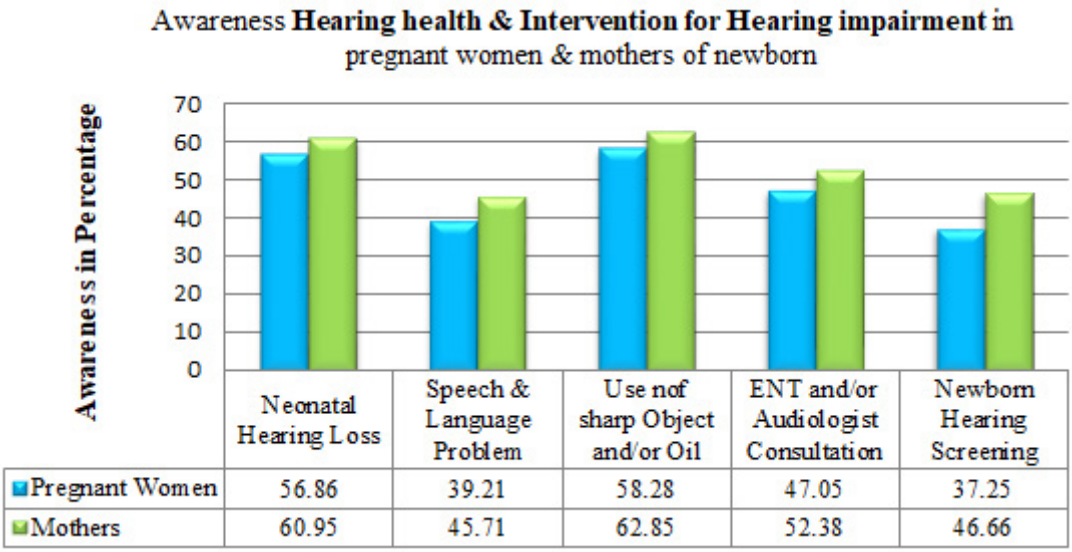


Figure 4: Depicts the awareness of hearing health and intervention taken by both the pregnant women and mothers of newborn in rural areas.

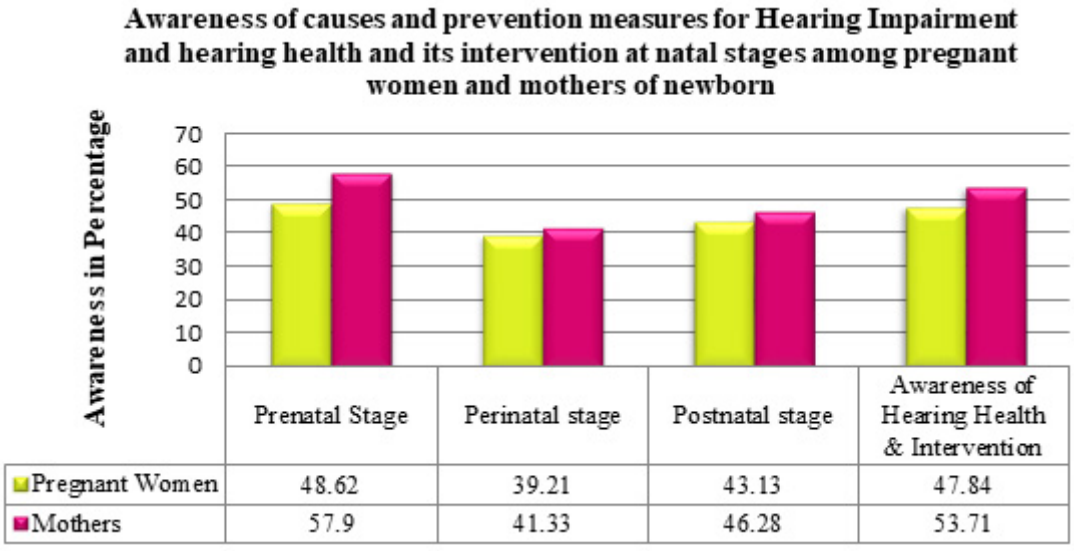


Figure 5: Depicts the overall comparison of awareness of causes and prevention measures for hearing impairment in all the natal stages and hearing health and its intervention among pregnant women and mothers of newborn in rural areas.

Table 3: Depicts descriptive statistics for responses of pregnant women and mothers of newborn in rural areas towards the selected parameters.

Area	Subjects	Awareness of the causes and prevention of hearing impairment in:						Awareness of hearing health and Intervention for hearing impaired	
		Prenatal stage		Perinatal stage		Postnatal stage			
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Rural area	Group I pregnant women	2.43	0.5	1.96	0.77	2.15	0.96	2.39	0.6
	Group II mothers of newborn	2.89	0.78	2.06	0.81	2.31	0.9	2.68	0.62

Table 4: Depicts results of two-way ANOVA regarding awareness of hearing health and intervention and awareness of causes and prevention for hearing impairment at natal stages among pregnant women and mothers of newborn in rural areas.

Source	SS	df	MS	F	p
Pregnant women and mothers	8.94	1	8.94	12.84	0.0004
Awareness of hearing health and intervention and Awareness of causes and prevention for hearing impairment at natal stages.	35.61	3	11.87	17.05	<.0001
Interaction	2.64	3	0.88	1.26	0.002
Error	428.97	616	0.7	-	-
Total	488.61	623	-	-	-

Table 5: Depicts post hoc analysis using unpaired t test with applied Bonferroni correction for comparisons of selected parameter for the pregnant women in rural area.

Selected parameter (in rural area)	Mean difference		Obtained p value		Bonferroni correction
	Pregnant women	Mothers of new born	Pregnant women	Mothers of new born	
Prenatal-perinatal	0.4706	0.8286	0.0002	<.0001	p= 0.01
Prenatal-postnatal	0.2745	0.581	0.0001	<.0001	
Prenatal- awareness of hearing health and intervention	0.0392	0.2095	0.0001	0.001	
Perinatal- postnatal	-0.1961	-0.2476	0.0002	0.0001	
Perinatal- awareness of hearing health andintervention	-0.4314	-0.619	0.001	0.0001	
Postnatal- awareness of hearing health and intervention	-0.2353	-0.3714	0.0005	0.002	

Discussion

Awareness in pregnant women and mothers towards the conditions that could occur either before, during or after birth *i.e.* all the natal stages, which may place their infant at risk for developing hearing loss, can be the best approach towards achieving early identification and intervention in case of infants with hearing impairment. The causes of hearing loss and deafness can be congenital or acquired. Approximately 50% of the cases are thought to be due to environmental factors (prenatal, perinatal or postnatal factors) and the remaining are due to genetic factors or unknown cause. [5]

Regarding causes and prevention during prenatal stage, WHO states that in prenatal stage, 31% childhood hearing loss are due to infection in mother during pregnancy (e.g. rubella or cytomegalovirus). [1] Govender et al., had reported that 54% mothers are aware of hereditary conditions resulting in hearing loss in infants which is congruent with the present study where both the groups have scored more than 50%. The study also indicated that only 16% of mothers were aware of infection or high-risk factors in them can lead to hearing loss in infant, which is contrasting with the present study results, where awareness in both groups is nearly 50%. [6]

Recent study suggest, less than 50% of mothers were aware regarding the risk factors in prenatal stage which may lead to hearing impairment in infants, however in the present study, 50% in both groups are aware of the risk factors in prenatal stage, which is also similar to the study done by Olusanya et al. in Nigeria, where 73% of mothers were aware of the risk factors. [6,7] 56% mothers were aware of ill effects of consanguinity while rest 44 mothers were either had wrong or no knowledge regarding the effect of consanguinity on hearing loss as studied by Dudda et al which is incongruent with the present study result for consanguinity. [8-10].

Regarding perinatal causes and risk factors, 33% of mothers were aware of prematurity birth whereas 50% mothers displayed poor knowledge regarding low birth weight which is similar with the present study results. [5] Korres et al., have also included non-elective caesarean delivery as an emerging risk factor which also included in the present study result. Although how this factor can be directly causing hearing loss is still under research. [8] Research regarding the nature and risk factors for hearing loss, also concluded that hyperbilirubinemia/ neonatal jaundice was the most prevalent risk factor along with low birth weight (<1500gms) which directly correlates with factors contributing to hearing loss considered as a part of the present study.

Regarding postnatal causes, as studied by Ravi et al., mothers

exhibited good knowledge of risk factors where 54.3% mothers were aware of ear discharge as a risk factor for hearing loss. [11] A Nigerian study on mother suggest50% mothers were aware that ototoxic drugs could affect hearing in infants. [7] Govender et al. had information that 58% of mothers have knowledge of head trauma or head injury, which can be a contributing factor for hearing loss. [6] Overall mothers are more aware regarding the ear infection and ear discharge as a cause for hearing loss in infants. The same result was documented in the present study.

Regarding the awareness of hearing health and intervention taken by mothers, study 89.2% of mothers were aware that hearing could be screened at birth which is different from the present study score. Only 45% mothers had idea that an audiologist provide services for rehabilitation of persons with hearing loss, however, more than 70% mothers were unaware that an audiologist can only be the professional to provide aural rehabilitation services including screening, assessing, diagnosing and managing hearing loss which correlates with the present study result. [6] The findings of the present study and review of literature suggests that this lack of knowledge exists in developing countries, and therefore should be addressed in all public awareness programmes on ear and hearing health.

However, no significant data regarding the awareness of hearing impairment in children among pregnant women could be obtained from literature, so the rationale behind this study found a strong motive to focus on the same and provide a record for the future.

With the aim of preventing avoidable hearing loss (primary prevention), early identification and treatment of ear problems, and rehabilitation of persons with hearing impairment, the Government of India initiated the National Programme for Prevention and Control of Deafness (NPPCD) and integrated it with National Rural Health Mission (NRHM) at the state and district levels. [12] Olusanya reported that in South-East Asia and Africa regions, where the burden of hearing impairment is highest, only India has established concrete steps towards nationwide hearing screening but still many rural parts of India are still away from achieving cent percent result. [13]

Conclusion

This study was carried out to gain insights into the knowledge and awareness regarding hearing health, causes and prevention for hearing loss along with intervention in mothers of newborn and pregnant women residing in a rural community.

The result of this study suggests that mothers as compared to pregnant women in rural community were more knowledgeable regarding the aspects of causes of hearing loss and prevention for the same, however, lack of information and misconceptions regarding intervention of a hearing impaired child were also prevalent. It is very much important to utilize the existing knowledge of the mothers and pregnant women by attempting to bridge the gaps in acquiring information regarding the awareness of hearing impairment in children which can be done only by creating the awareness and spreading adequate information regarding hearing disability. This can help in achieving the goals of early identification and early intervention for children with hearing loss while indirectly reducing the burden of hearing disability.

Recommendation

76th round of The National Sample Survey (NSS) had surveyed disability in Indian households and found that hearing disability was overall 0.3% out of 2.2% total disability, ranking 2nd most common cause of disability. Public health services in country can help in detecting such hearing health issues as early as possible and responds appropriately to avoid the development of hearing impairment. In an initial attempt for prevention of hearing loss in infants, it is important for pregnant women and mothers of newborn to follow a strategic primary prevention followed by secondary and tertiary during natal stages, which can effectively reduce the impact of deafness and hearing loss in an individual's life. Thiscan be considered as one of the crucial fact for improving and protecting community health and well-being, while emphasizing the prevention among large groups of people. Further it has been recommended that such type present study and/or survey can be conducted using a greater number of subjects in both the groups and including additional factors being considered for awareness of causes and prevention of hearing loss in infantswhile covering more districts.

Limitation of the study

The present studyincluded a smaller number of subjects and restricted to selected rural parts of Khordha district. Further, the subject were included only pregnant women and mothers of new born but no other family members or general population for their awareness regarding the hearing loss in infants. Limited numbers of factors were considered in each natal stage.

Relevance of the study

Various NGO and NRHM partnership are being utilized under the disease control programs, reproductive and child health, routine immunization and Special Immunization Activities (SIAs). The current study was conducted among pregnant women and mothers of new born in order to investigate their awareness level regarding second highest disability *i.e.* hearing impairment and its prevention in infants. The objective was to use the information obtained to create appropriate awareness related to hearing impairment which can be a boon to public health welfare, NGOs and NRHM to reduce the occurrence or severity of hearing impairment in individual's life and to make avail the governmental support and facility being available for hearing impaired individuals. In other words, to reduce the burden of hearing disability and to improve quality of life.

Author's Contribution

All authors have equally contributed for this study.

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Speech Perception Performance of Native Speakers of Marathi: Effect of Filtered Speech Stimulus and Degree of Hearing Impairment

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***Abstract*—The study investigated the effect of filtered speech stimulus on speech perception performance of native speakers of Marathi as a function of degree of hearing impairment. Speech identification score (SIS) testing was performed to measure speech perception on three groups (Group I, Group II, and Group III consisted of participants with moderate, moderately-severe, and severe sensorineural hearing impairment respectively). Speech stimuli comprised eight word-lists with each list consisting of 25 words in Marathi. The first seven word-lists (first to seven) were filtered at 500 Hz, 1000 Hz, 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, and 3500 Hz cut-off frequencies, respectively, while word list 8 was left unfiltered. Although, the SIS improved with increase in cut-off frequency, the improvement in SIS with increase in cut-off frequency of speech stimulus was noticed up to 3000 Hz, 2500 Hz, and 2000 Hz for participants of Group I, Group II, and Group III, respectively. In addition, the improvement in speech perception performance did not correspond to what would be anticipated with an increase in the cut-off frequency of speech stimulus for participants of Group II and Group III compared to participants of Group I. Although, there was a significant reduction in SIS as a function of the degree of hearing impairment for speech stimulus filtered at 1500 Hz, 2000 Hz, 2500 Hz, and 3000 Hz cut-off frequencies, there was no significant effect of degree of hearing impairment on SIS for speech stimulus filtered at 500 Hz and 1000 Hz cut-off frequencies.**

***Index Terms*—filtered speech stimulus, degree of hearing impairment, cut-off frequency, speech identification score, Marathi**

I. Introduction

Speech is one of the most important vehicles of human communication systems, and hearing is the building block upon which our complex communication system is designed. The perception of speech is most generally assessed in terms of an individual's auditory capability to recognize regular components of speech such as phonemes, words, and sentences (Winn, Won & Moon, 2016). There are several spectral and temporal variations in the speech which contribute to the perception of speech signals across languages (Avilala, Prabhu & Barman, 2010). Thus, speech perception is influenced by how psychophysical properties of speech, such as spectral and temporal features, are identified and distinguished, which is in turn influenced by a person's auditory capability (Win, Won & Moon, 2016). A systematic study is therefore required to determine the significance of spectral and/or temporal features of speech for speech perception. The significance of spectral or temporal features to speech perception can be explored by altering one parameter while leaving another unaltered. Thus, one can study the contribution of different spectral components of speech in speech perception by manipulating the spectral properties of speech, such as the use of filtered speech stimulus (Avilala, Prabhu & Barman, 2010). Similarly, the contribution of temporal components of speech in speech perception can be studied by manipulating the temporal characteristics of speech, such as time-compressed speech stimulus (Bhargavi, Prakash, Kumar & Sindhura, 2011).

Bornstein, Wilson & Cambron (1994) investigated the effect of filtered speech on speech identification performance of native speakers of English and observed that individuals with normal hearing obtained 70% SIS for speech stimuli

filtered at 1500 Hz cut-off frequency. The results of the studies on the English language cannot be generalized and applied to the Indian languages. Similarly, the research reports on the findings of one Indian language cannot be applied to another Indian language due to the differences in psychophysical characteristics of speech such as spectral energy across languages (Avilala, Prabhu & Barman, 2010; Kumar, Patil, Saxena, Bapuji & Chacko (2021). Subsequently, Avilala, Prabhu & Barman (2010) investigated the effect of filtered speech on speech identification performance of native speakers of Kannada (South Indian Dravidian language) and observed that individuals with normal hearing achieved 70% SIS for Kannada speech stimulus filtered at 1200 Hz cut-off frequency. Similarly, Kumar, Patil, Saxena, Bapuji & Chacko (2021) investigated the effect of spectrally modified speech on speech identification performance of native speakers of Marathi (Southern Indo-Aryan language) and reported that individuals with normal hearing achieved 90% SIS for Marathi speech stimulus filtered at 2500 Hz cut-off frequency. After conducting a retrospective analysis to compare with the findings of study on Kannada, it was observed that participants obtained 70% correct SIS for speech stimuli filtered at 1500 Hz cut-off frequency in Marathi compared to speech stimuli filtered at 1200 Hz in Kannada (Kumar, Patil, Saxena, Bapuji & Chacko, 2021). Because of the differences between Marathi and Kannada, the findings in one Indian language cannot be simply extrapolated and applied to other Indian languages.

Speech is a broadband signal with abundant spectral and temporal cues that are essential to the perception of speech signals (Turner, Souza & Forget, 1995; Fu, Shannon & Wang, 1998). The cochlea conducts an exquisite frequency analysis of a signal in normal hearing, breaking down its frequency components into a spatially distributed array of activity. A limited spectral resolution or little spectral information may be enough to understand speech in quiet listening environments (Shannon, Zeng, Kamath, Wygonski & Ekelid, 1995; Smith, Delgutte & Oxenham, 2002). Sensorineural hearing impairment occurs when the functioning of the cochlea is affected or when there is a dysfunction of the auditory nerve or higher centers in the auditory pathway. The auditory filters are often broader than normal, resulting in greater masking by background noises and echoes in reverberant environments and, in extreme conditions, even in silent anechoic environments (Summerfield, 1987). Consequently, a sensorineural hearing impairment encompasses not only the reduction in hearing sensitivity but also suprathreshold impairments such as poor spectral and temporal resolutions that degrade the perception of speech signals. Thus, reduction in the ability to resolve the frequency components of complex sounds (spectral resolution) and to process the temporal fine structure of sounds (temporal resolution) are some of the factors contributing to difficulty in understanding speech, especially under adverse listening conditions in individuals with sensorineural hearing impairment (Lorenzi, Gilbert, Carn, Garnier & Moore, 2006).

One of the most important aspects of hearing aid fitting for those with sensorineural hearing impairment is trying to match the acoustic signal to the residual auditory area in order to make as much of the speech signal is made audible as possible. Hence, the main goal of hearing aid fitting for individuals with hearing impairment is to provide audibility of a wide range of input levels from a broad frequency spectrum (Stelmachowicz, Pittman, Hoover & Lewis, 2004). However, while conventional hearing aids can offer satisfactory access in the low-to-mid frequencies of speech spectrum, they provide insufficient gain to the speech spectrum in the higher frequency range for those with severe hearing impairment and beyond (Boothroyd, 2008). Therefore, there is a tremendous need to understand the contribution of spectral energy to speech perception and to ascertain the effective cut-off frequency of speech needed for achieving maximum speech perception performance for individuals with sensorineural hearing impairment in their concerned language. The goal of this study was, therefore, to investigate the effect of filtered speech on speech perception performance of native speakers of Marathi as a function of the degree of hearing impairment. The findings of such studies would be valuable in developing better evaluation tools and management strategies for individuals with sensorineural hearing impairment.

II. Materials and Methods

The study constituted an analytical research design with a purposive sampling technique. The SIS testing was performed as a measure of speech perception using a filtered speech test on native speakers of Marathi to assess the effect of filtered speech stimulus on speech perception performance as a function of the degree of hearing impairment.

A. Participants

A total of 60 individuals with post-lingual bilateral symmetrical sensorineural hearing impairment served as participants in the present study. The participants were in the age range between 38 and 55 years (M=45.80; SD=$\pm$5.64). They were equally divided into three groups based on the degree of hearing impairment. Group I, Group II, and Group III consisted of participants with moderate, moderately-severe, severe sensorineural hearing impairment, respectively. All the participants had 'A' type tympanogram indicative of normal middle ear condition. All the participants were native speakers of Marathi (Southern Indo-Aryan language) belonging to different regions of Maharashtra, a state of west India.

B. Test Stimulus

The filtered speech test in Marathi developed by Kumar, Patil, Saxena, Bapuji & Chacko (2020) was applied as a stimulus to fulfill the aim of the study. The filtered speech test was established by adapting the conventional speech

identification test in Marathi developed by Kumar, Mohanty, Ujawane & Huzurbazar (2016). The filtered speech test consists of eight word-lists, each of which has 25 words in Marathi. The word lists 1, 2, 3, 4, 5, 6, and 7 filtered at cut-off frequencies of 500 Hz, 1000 Hz, 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, and 3500 Hz respectively, while word list 8 was left unfiltered (Kumar, Patil, Saxena, Bapuji & Chacko, 2020).

C. Procedure

All of the investigations have been carried out in a double-room suite that was air-conditioned and had ambient noise levels that were within permissible limits. The audiological assessments such as pure-tone audiometry and tympanometry were performed in order to confirm that the participants were suitable for the study. The SIS testing was performed as a measure of speech perception on three groups of participants using eight word-lists. The stimulus was delivered by TDH-39 headphones through a laptop that was routed through a calibrated digital diagnostic audiometer. All the participants were tested monaurally at the most comfortable level using eight word-lists. The selection of ears for performing SIS testing was made on a random basis. An open-set response in the form of an oral response was obtained. In order to familiarize the participants with test procedure, ten practice items were presented at first.

D. Scoring

A score of 1 was assigned to each correct response, while a score of 0 was assigned to each incorrect response. The SIS (%) is calculated by dividing the number of words correctly repeated divided by the total number of words presented, and then multiplying the value by 100. The SIS (%) was then determined for each participant separately for each word list for further evaluation.

E. Statistical Analysis

The mean and standard deviation SIS (%) values were calculated for eight word-lists obtained by the participants of three groups. One-way repeated measures ANOVA with LSD posthoc analysis was performed to determine whether there was a significant difference in mean SIS (%) between eight word-lists for each group and three groups for each word list.

III. RESULTS

A. Results

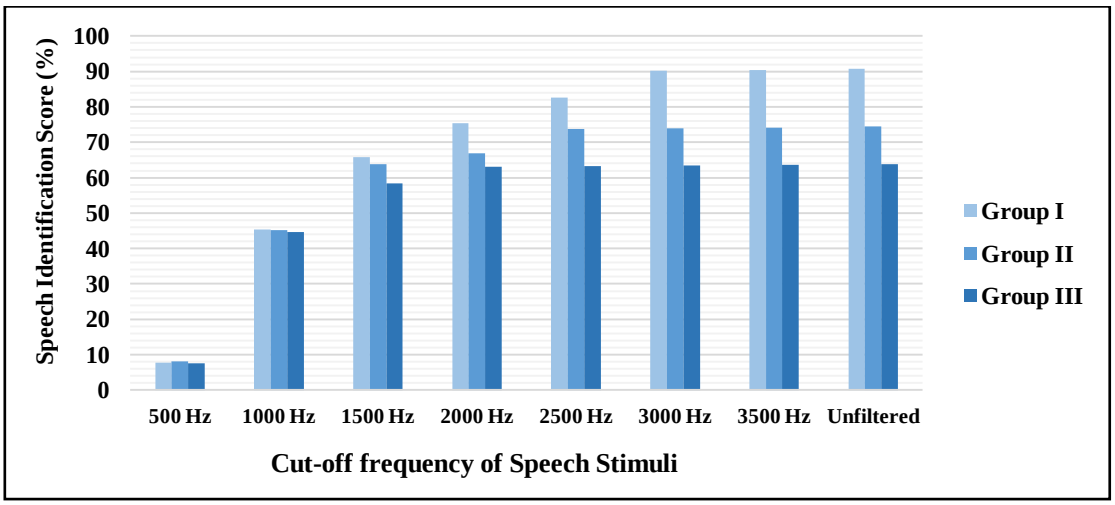

Figure 1. Comparison of mean SIS (%) between participants of three groups for each word list

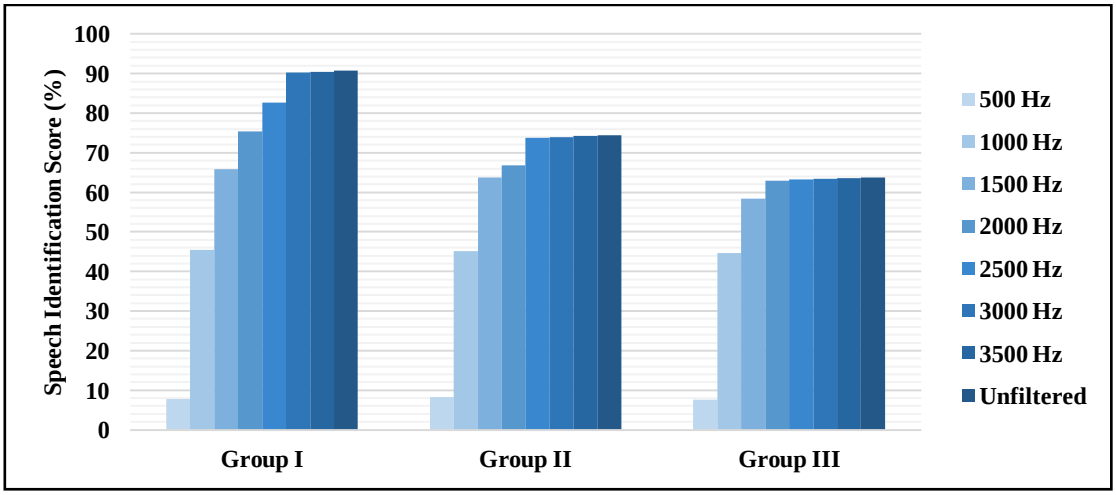

Figure 2. Comparison of mean SIS (%) between eight word-lists for participants of each group

Figures 1 and 2 show mean SIS (%) values between three groups for each word list and between eight word-lists for each group, respectively. One-way repeated measures of ANOVA revealed no statistically significant difference ($p>0.05$) in mean SIS (%) between and within groups for speech stimulus filtered at 500 Hz and 1000 Hz cut-off frequencies. However, there was a statistically significant difference ($p<0.05$) in mean SIS (%) between and within groups for speech stimulus filtered at 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz, and unfiltered speech stimulus (Table 1). Similarly, the difference in mean SIS (%) between and within eight word-lists for each group was statistically significant ($p<0.05$) (Table 2).

TABLE 1
ONE-WAY ANOVA RESULTS SHOWING THE COMPARISON OF MEAN SIS (%) BETWEEN AND WITHIN GROUPS FOR EACH SPEECH STIMULUS

Stimuli	Groups	Sum of Squares	df	Mean Square	F	Sig.
500 Hz	Between Groups	3.733000	2	1.86700	0.1520	0.859
	Within Groups	699.2000	57	12.2670		
	Total	702.9330	59			
1000 Hz	Between Groups	6.933000	2	3.46700	0.0870	0.916
	Within Groups	2260.800	57	39.6630		
	Total	2267.733	59			
1500 Hz	Between Groups	615.4400	2	307.720	5.4250	0.067
	Within Groups	3403.200	60	56.7200		
	Total	4018.640	62			
2000 Hz	Between Groups	1658.133	2	829.067	16.882	0.000
	Within Groups	2799.200	57	49.1090		
	Total	4457.333	59			
2500 Hz	Between Groups	3774.400	2	1887.20	52.239	0.000
	Within Groups	2059.200	57	36.1260		
	Total	5833.600	59			
3000 Hz	Between Groups	7286.933	2	3643.46	137.353	0.000
	Within Groups	1512.000	57	26.5260		
	Total	8798.933	59			
3500 Hz	Between Groups	7286.933	2	3643.46	151.722	0.000
	Within Groups	1368.800	57	24.0140		
	Total	8655.733	59			
Unfiltered	Between Groups	7402.133	2	3701.06	164.916	0.000
	Within Groups	1279.200	57	22.4420		
	Total	8681.333	59			

TABLE 2
ONE-WAY ANOVA RESULTS SHOWING THE COMPARISON OF MEAN SIS (%) BETWEEN AND WITHIN SPEECH STIMULI FOR EACH GROUP

Groups	Speech Stimuli	Sum of Squares	df	Mean Square	F	Sig.
Group I	Between Stimuli	118391.600	7	16913.086	926.077	0.000
	Within Stimuli	2776.000	152	18.263000		
	Total	121167.600	159			
Group II	Between Stimuli	75167.600	7	10738.229	252.508	0.000
	Within Stimuli	6464.000	152	42.526000		
	Total	81631.600	159			
Group III	Between Stimuli	56709.660	7	8101.3800	213.531	0.000
	Within Stimuli	6070.400	160	37.940000		
	Total	62780.060	167			

The data were further subjected to LSD post-hoc multiple comparisons and the results were discussed under the following headings: Comparison of mean SIS (%) between three groups for each filtered speech stimulus; Comparison of mean SIS (%) between different filtered speech stimuli for participants with moderate sensorineural hearing impairment (Group I); Comparison of mean SIS (%) between different filtered speech stimuli for participants with moderately-severe sensorineural hearing impairment (Group II); Comparison of mean SIS (%) between different filtered speech stimuli for participants with severe sensorineural hearing impairment (Group III).

1. Comparison of Mean SIS (%) between Three Groups for Each Filtered Speech Stimulus and Unfiltered Speech Stimulus

LSD post-hoc multiple comparison revealed no significant difference ($p>0.05$) in mean SIS (%) between participants with moderate hearing impairment (Group I) and moderately-severe hearing impairment (Group II), moderate hearing impairment (Group I) and severe hearing impairment (Group III), and moderately-severe hearing impairment (Group II) and severe hearing impairment (Group III) for speech stimuli filtered at 500 Hz and 1000 Hz cut-off frequencies. However, a statistically significant difference ($p<0.05$) in mean SIS (%) was noticed between participants with moderate hearing impairment (Group I) and moderately-severe hearing impairment (Group II), moderate hearing impairment (Group I) and severe hearing impairment (Group III), and moderately-severe hearing impairment (Group II) and severe hearing impairment (Group III) for speech stimuli filtered at 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus (Table 3).

TABLE 3
LSD POST-HOC MULTIPLE COMPARISON OF MEAN SIS (%) AMONG THREE GROUPS FOR EACH SPEECH STIMULUS

Stimuli	Groups		Mean Difference (I-J)	Standard Error	Sig.	95% CI	
	I	J				Lower	Upper
500 Hz	Group I	Group II	-0.400000	1.107550	0.719	-2.61783	1.817830
		Group III	0.200000	1.107550	0.857	-2.01783	2.417830
	Group II	Group III	0.600000	1.107550	0.590	-1.61783	2.817830
1000 Hz	Group I	Group II	0.200000	1.991561	0.920	-3.78803	4.188030
		Group III	0.800000	1.991561	0.689	-3.18803	4.788030
	Group II	Group III	0.600000	1.991561	0.764	-3.38803	4.588030
1500 Hz	Group I	Group II	2.000000*	2.324200	0.049	-2.64909	6.649090
		Group III	7.400000*	2.324200	0.002	2.750910	12.04909
	Group II	Group III	5.400000*	2.324200	0.024	0.750910	10.04909
2000 Hz	Group I	Group II	8.600000*	2.216050	0.000	4.162440	13.03756
		Group III	12.60000*	2.216050	0.000	8.162440	17.03756
	Group II	Group III	4.000000*	2.216050	0.046	-.437560	8.437560
2500 Hz	Group I	Group II	8.800000*	1.900692	0.000	4.993930	12.60607
		Group III	19.40000*	1.900692	0.000	15.59393	23.20607
	Group II	Group III	10.60000*	1.900692	0.000	6.793930	14.40607
3000 Hz	Group I	Group II	16.20000*	1.628690	0.000	12.93860	19.46140
		Group III	26.80000*	1.628690	0.000	23.53860	30.06140
	Group II	Group III	10.60000*	1.628690	0.000	7.338600	13.86140
3500 Hz	Group I	Group II	16.20000*	1.549646	0.000	13.09689	19.30311
		Group III	26.80000*	1.549646	0.000	23.69689	29.90311
	Group II	Group III	10.60000*	1.549646	0.000	7.496890	13.70311
Unfiltered	Group I	Group II	16.40000*	1.498069	0.000	13.40017	19.39983
		Group III	27.00000*	1.498069	0.000	24.00017	29.99983
	Group II	Group III	10.60000*	1.498069	0.000	7.600170	13.59983

* The mean difference is significant at the 0.05 level

2. Comparison of Mean SIS (%) between Different Filtered Speech Stimuli for Participants with Moderate Sensorineural Hearing Impairment (Group I)

LSD post-hoc multiple comparison in participants with moderate sensorineural hearing impairment (Group I) showed significant difference in mean SIS (%) between speech stimulus filtered at 500 Hz cut-off frequency and speech stimuli filtered at 1000 Hz, 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz, and unfiltered speech stimulus; speech stimulus filtered at 1000 Hz cut-off frequency and speech stimuli filtered at 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus; speech stimulus filtered at 1500 Hz cut-off frequency and speech stimuli filtered at 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus; speech stimulus filtered at 2000 Hz cut-off frequency and speech stimuli filtered at 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus; speech stimulus filtered at 2500 Hz cut-off frequency and speech stimuli filtered at 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus. However, there was no significant difference SIS (%) between speech stimulus filtered at 3000 Hz cut-off frequency and speech stimulus filtered at 3500 Hz cut-off frequency, and unfiltered speech stimulus; speech stimulus filtered at 3500 Hz cut-off frequency and unfiltered speech stimulus (Table 4).

TABLE 4
LSD POST-HOC MULTIPLE COMPARISON OF MEAN SIS (%) AMONG DIFFERENT SPEECH STIMULI FOR GROUP I

Speech Stimuli		Mean Difference (I-J)	Standard Error	Sig.	95% Confidence Interval	
I	J				Lower	Upper
500 Hz	1000 Hz	-37.600000*	1.351413	0.000	-40.26998	-34.93002
	1500 Hz	-58.000000*	1.351413	0.000	-60.66998	-55.33002
	2000 Hz	-67.600000*	1.351413	0.000	-70.26998	-64.93002
	2500 Hz	-74.800000*	1.351413	0.000	-77.46998	-72.13002
	3000 Hz	-82.400000*	1.351413	0.000	-85.06998	-79.73002
	3500 Hz	-82.600000*	1.351413	0.000	-85.26998	-79.93002
	Unfiltered	-83.000000*	1.351413	0.000	-85.66998	-80.33002
1000 Hz	1500 Hz	-20.400000*	1.351413	0.000	-23.06998	-17.73002
	2000 Hz	-30.000000*	1.351413	0.000	-32.66998	-27.33002
	2500 Hz	-37.200000*	1.351413	0.000	-39.86998	-34.53002
	3000 Hz	-44.800000*	1.351413	0.000	-47.46998	-42.13002
	3500 Hz	-45.000000*	1.351413	0.000	-47.66998	-42.33002
	Unfiltered	-45.400000*	1.351413	0.000	-48.06998	-42.73002
1500 Hz	2000 Hz	-9.600000*	1.351413	0.000	-12.26998	-6.93002
	2500 Hz	-16.800000*	1.351413	0.000	-19.46998	-14.13002
	3000 Hz	-24.400000*	1.351413	0.000	-27.06998	-21.73002
	3500 Hz	-24.600000*	1.351413	0.000	-27.26998	-21.93002
	Unfiltered	-25.000000*	1.351413	0.000	-27.66998	-22.33002
2000 Hz	2500 Hz	-7.200000*	1.351413	0.000	-9.86998	-4.53002
	3000 Hz	-14.800000*	1.351413	0.000	-17.46998	-12.13002
	3500 Hz	-15.000000*	1.351413	0.000	-17.66998	-12.33002
	Unfiltered	-15.400000*	1.351413	0.000	-18.06998	-12.73002
2500 Hz	3000 Hz	-7.600000*	1.351413	0.000	-10.26998	-4.930020
	3500 Hz	-7.800000*	1.351413	0.000	-10.46998	-5.130020
	Unfiltered	-8.200000*	1.351413	0.000	-10.86998	-5.530020
3000 Hz	3500 Hz	-.2000000	1.351413	0.883	-2.869980	2.469980
	Unfiltered	-.6000000	1.351413	0.658	-3.269980	2.069980
3500 Hz	Unfiltered	-.4000000	1.351413	0.768	-3.069980	2.269980

*The mean difference is significant at the 0.05 level

3. Comparison of Mean SIS (%) between Different Filtered Speech Stimuli for Participants with Moderately-Severe Sensorineural Hearing Impairment (Group II)

LSD post-hoc multiple comparison for participants with moderately-severe sensorineural hearing impairment (Group II) showed significant difference in SIS (%) between speech stimulus filtered at 500 Hz cut-off frequency and speech stimuli filtered at 1000 Hz, 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz, and unfiltered speech stimulus; speech stimulus filtered at 1000 Hz cut-off frequency and speech stimuli filtered at 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus; speech stimulus filtered at 1500 Hz cut-off frequency and speech stimuli filtered at 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus; speech stimulus filtered at 2000 Hz cut-off frequency and speech stimuli filtered at 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus. However, there was no significant difference in SIS (%) between speech stimulus filtered at 2500 Hz cut-off frequency and speech stimuli filtered at 3000 Hz, 3500 Hz cut-off frequency, and unfiltered speech stimulus; speech stimulus filtered at 3000 Hz cut-off frequency and speech stimuli filtered at 3500 Hz cut-off frequency, and unfiltered speech stimulus; speech stimulus filtered at 3500 Hz and unfiltered speech stimulus (Table 5).

TABLE 5
LSD POST-HOC MULTIPLE COMPARISON OF MEAN SIS (%) AMONG DIFFERENT SPEECH STIMULI FOR GROUP II

Speech Stimuli		Mean Difference (I-J)	Standard	Sig.	95% Confidence Interval	
I	J		Error		Lower	Upper
500 Hz	1000 Hz	-37.000000*	2.062191	0.000	-41.07426	-32.92574
	1500 Hz	-55.600000*	2.062191	0.000	-59.67426	-51.52574
	2000 Hz	-58.600000*	2.062191	0.000	-62.67426	-54.52574
	2500 Hz	-65.600000*	2.062191	0.000	-69.67426	-61.52574
	3000 Hz	-65.800000*	2.062191	0.000	-69.87426	-61.72574
	3500 Hz	-66.000000*	2.062191	0.000	-70.07426	-61.92574
	Unfiltered	-66.200000*	2.062191	0.000	-70.27426	-62.12574
1000 Hz	1500 Hz	-18.600000*	2.062191	0.000	-22.67426	-14.52574
	2000 Hz	-21.600000*	2.062191	0.000	-25.67426	-17.52574
	2500 Hz	-28.600000*	2.062191	0.000	-32.67426	-24.52574
	3000 Hz	-28.800000*	2.062191	0.000	-32.87426	-24.72574
	3500 Hz	-29.000000*	2.062191	0.000	-33.07426	-24.92574
	Unfiltered	-29.200000*	2.062191	0.000	-33.27426	-25.12574
1500 Hz	2000 Hz	-3.000000	2.062191	0.148	-7.07426	1.074260
	2500 Hz	-10.000000*	2.062191	0.000	-14.07426	-5.925740
	3000 Hz	-10.200000*	2.062191	0.000	-14.27426	-6.125740
	3500 Hz	-10.400000*	2.062191	0.000	-14.47426	-6.325740
	Unfiltered	-10.600000*	2.062191	0.000	-14.67426	-6.525740
2000 Hz	2500 Hz	-7.000000*	2.062191	0.001	-11.07426	-2.925740
	3000 Hz	-7.200000*	2.062191	0.001	-11.27426	-3.125740
	3500 Hz	-7.400000*	2.062191	0.000	-11.47426	-3.325740
	Unfiltered	-7.600000*	2.062191	0.000	-11.67426	-3.525740
2500 Hz	3000 Hz	-.2000000	2.062191	0.923	-4.274260	3.874260
	3500 Hz	-.4000000	2.062191	0.846	-4.474260	3.674260
	Unfiltered	-.6000000	2.062191	0.771	-4.674260	3.474260
3000 Hz	3500 Hz	-.2000000	2.062191	0.923	-4.274260	3.874260
	Unfiltered	-.4000000	2.062191	0.846	-4.474260	3.674260
3500 Hz	Unfiltered	-.2000000	2.062191	0.923	-4.274260	3.874260

* The mean difference is significant at the 0.05 level

4. Comparison of Mean SIS (%) between Different Filtered Speech Stimuli for Participants with Severe Sensorineural Hearing Impairment (Group III)

LSD post-hoc multiple comparison for participants with severe sensorineural hearing impairment (Group III) showed significant difference in SIS (%) between speech stimulus filtered at 500 Hz cut-off frequency and speech stimuli filtered at 1000 Hz, 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz, and unfiltered speech stimulus; speech stimulus filtered at 1000 Hz cut-off frequency and speech stimuli filtered at 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus; speech stimulus filtered at 1500 Hz cut-off frequency and speech stimuli filtered at 2000 Hz, 2500 Hz, 3000 Hz, 3500 Hz cut-off frequencies. However, there was no significant difference SIS (%) between speech stimulus filtered at 2000 Hz cut-off frequency and speech stimuli filtered at 2500 Hz, 3000 Hz, 3500 Hz, and unfiltered speech stimulus; speech stimulus filtered at 2500 Hz cut-off frequency and speech stimuli filtered at 3000 Hz, 3500 Hz cut-off frequencies, and unfiltered speech stimulus; speech stimulus filtered at 3000 Hz cut-off frequency and speech stimulus filtered at 3500 Hz cut-off frequency and unfiltered speech stimulus; speech stimulus filtered at 3500 Hz and unfiltered speech stimulus (Table 6).

TABLE 6
LSD POST-HOC MULTIPLE COMPARISON OF MEAN SIS (%) AMONG DIFFERENT SPEECH STIMULI FOR GROUP III

Speech Stimuli		Mean Difference (I-J)	Standard Error	Sig.	95% Confidence Interval	
I	J				Lower	Upper
500 Hz	1000 Hz	-37.000000*	1.900877	0.000	-40.75404	-33.24596
	1500 Hz	-50.800000*	1.900877	0.000	-54.55404	-47.04596
	2000 Hz	-55.400000*	1.900877	0.000	-59.15404	-51.64596
	2500 Hz	-55.600000*	1.900877	0.000	-59.35404	-51.84596
	3000 Hz	-55.800000*	1.900877	0.000	-59.55404	-52.04596
	3500 Hz	-56.000000*	1.900877	0.000	-59.75404	-52.24596
	Unfiltered	-56.200000*	1.900877	0.000	-59.95404	-52.44596
1000 Hz	1500 Hz	-13.800000*	1.900877	0.000	-17.55404	-10.04596
	2000 Hz	-18.400000*	1.900877	0.000	-22.15404	-14.64596
	2500 Hz	-18.600000*	1.900877	0.000	-22.35404	-14.84596
	3000 Hz	-18.800000*	1.900877	0.000	-22.55404	-15.04596
	3500 Hz	-19.000000*	1.900877	0.000	-22.75404	-15.24596
	Unfiltered	-19.200000*	1.900877	0.000	-22.95404	-15.44596
1500 Hz	2000 Hz	-4.600000*	1.900877	0.017	-8.35404	-.8459600
	2500 Hz	-4.800000*	1.900877	0.013	-8.55404	-1.045960
	3000 Hz	-5.000000*	1.900877	0.009	-8.75404	-1.245960
	3500 Hz	-5.200000*	1.900877	0.007	-8.95404	-1.445960
	Unfiltered	-5.400000*	1.900877	0.005	-9.15404	-1.645960
2000 Hz	2500 Hz	-.2000000	1.900877	0.916	-3.95404	3.554040
	3000 Hz	-.4000000	1.900877	0.834	-4.15404	3.354040
	3500 Hz	-.6000000	1.900877	0.753	-4.35404	3.154040
	Unfiltered	-.8000000	1.900877	0.674	-4.55404	2.954040
2500 Hz	3000 Hz	-.2000000	1.900877	0.916	-3.95404	3.554040
	3500 Hz	-.4000000	1.900877	0.834	-4.15404	3.354040
	Unfiltered	-.6000000	1.900877	0.753	-4.35404	3.154040
3000 Hz	3500 Hz	-.2000000	1.900877	0.916	-3.95404	3.554040
	Unfiltered	-.4000000	1.900877	0.834	-4.15404	3.354040
3500 Hz	Unfiltered	-.2000000	1.900877	0.916	-3.95404	3.554040

* The mean difference is significant at the 0.05 level

IV. DISCUSSION

The ultimate goal of fitting hearing aids for individuals with sensorineural hearing impairment is to provide appropriate amplification across wide range of frequencies in order to make as much of the speech signal audible as possible (Stelmachowicz, Pittman, Hoover & Lewis, 2004). However, according to studies, individuals who are provided audibility at frequencies where their hearing thresholds are severe and/or sloping do not demonstrate any improvement in speech perception due to the limited ability to utilize the amplified signal in that frequency region (Hogan & Turner, 1998; Ching, Dillon, Katsch & Byrne, 2001). On the other hand, few studies have reported that individuals with sloping sensorineural hearing loss have demonstrated improvements in speech understanding, especially in noisy environments when they are provided with high frequency amplification (Turner & Henry, 2002; Mackersie, Crocker & Davis, 2004). While most of the studies appear to support the general notion that high-frequency amplification may not always be beneficial, some studies reported otherwise. Therefore, a clearly established rule must be precluded that would distinguish individuals with hearing impairment who are likely to benefit from high-frequency amplification from those who are unlikely to benefit (Yadav, Kumar, Annapurna & Vinila, 2011). The present study was therefore aimed to determine the ability of an individual to derive maximum speech perception performance as a function of filtered speech stimulus with respect to degree of hearing impairment.

The results revealed that there was a significant effect of filtered speech stimulus on speech perception performance. The SIS significantly improved with increase in cut-off frequency of speech stimulus up to 3000 Hz, 2500 Hz, and 2000 Hz for participants moderate hearing impairment (Group I), moderately-severe hearing impairment (Group II), and severe hearing impairment (Group III) respectively and remained consistent at higher cut-off frequencies. The participants of Group I, Group II, and Group III achieved maximum SIS of 90.4%, 74.2%, and 63.6% for speech stimulus filtered at 3000 Hz, 2500 Hz, and 2000 Hz cut-off frequencies respectively. A loss of hearing sensitivity that increases with an increase in frequency is the most frequent type of sensorineural hearing impairment (Turner, Gantz, Lowder & Gfeller, 2005). The improvement in speech perception with additional high-frequency information does not approximate what would have been expected based on the increase in audible high frequency information when hearing loss in the high frequency region (about 2500 Hz and above) is more than 60 to 80 dB (Pavlovic, 1984; Hogan & Turner, 1998; Ching, Psarros, Hill, Dillon & Incerti, 2001). The lack of improvement in speech perception with added high frequency information has been attributed to the presence of non-functioning inner hair cells in the high frequency region of the cochlea known as dead regions (Moore, Glasberg & Baer, 1997; Vickers, Baer & Moore, 2001; Baer, Moore & Kluk, 2002). This limits the ability of an individual to access the speech spectrum in the higher frequency region. Hence, the participants with moderately severe and severe hearing impairment could extract spectral

information only up to 2500 Hz and 2000 Hz, respectively, as compared to participants with moderate hearing impairment who could extract spectral information up to 3000 Hz.

There was no significant effect of degree of hearing impairment on speech perception performance for speech stimulus filtered at 500 Hz and 1000 Hz cut-off frequencies. Although, the amount of speech information that can be extracted from an audible signal decrease as the degree of hearing impairment increases, the deterioration is less severe at lower frequencies than at higher frequencies (Ching, Psarros, Hill, Dillon & Incerti, 2001). This is because, the frequency resolution is relatively preserved in lower frequencies compared to higher frequencies, even when the degree of hearing loss is greater. This phenomenon is attributed to the physiology of the cochlea. It is a well-known fact that the apical end of the cochlea where lower frequencies are represented is broader and contains a greater number of rows of hair cells than the basal turn (von Bekesy, 1960; see Zemlin, 1998). This could be the reason that despite differences in the levels of residual hearing, the participants of three groups did not demonstrate significant difference in speech perception performance for speech stimulus filtered at 500 Hz and 1000 Hz cut-off frequencies. This is consistent with the research evidence that the degradation is less severe at the lower frequencies than at the higher frequencies although the amount of speech information that can be extracted from an audible signal decrease with increased hearing loss. On an average, an individual with a 100-dB hearing loss at 500 Hz can extract about half the information available to a normal-hearing individual from the same amount of audible signal (Ching, Psarros, Hill, Dillon & Incerti, 2001).

There was a significant effect of degree of hearing impairment on speech perception performance for speech stimuli filtered at 1500 Hz, 2000 Hz, 2500 Hz, 3000 Hz cut-off frequencies. The SIS significantly reduced as a function of the degree of hearing impairment for speech stimuli filtered at 1500 Hz, 2000 Hz, 2500 Hz, and 3000 Hz. In a typical sensorineural hearing impairment, the damage occurs primarily to the hair cells present in the cochlea. When the hearing impairment is less than severe, the outer hair cells are generally damaged and presumed to have sufficient existing inner hair cells and to accompany neural connections to allow amplified sounds to transmit speech information to the central auditory system (Turner, Gantz, Lowder & Gfeller, 2005). This could be the reason that the participants with moderate hearing impairment achieved mean SIS that was falling within the normal range. While the participants with moderately-severe and severe hearing impairment did not achieve SIS in the normal range, the participants with moderately-severe hearing impairment achieved significantly higher SIS as compared to participants with severe hearing impairment. As the degree of hearing loss increases, the damage to the hair cells affects not just the more vulnerable outer hair cells, but also the inner hair cells that are responsible to transmit signals to the central auditory system. Hence, the transmission pattern of basilar membrane vibrations in the cochlea to the central auditory system is problematic due to damaged inner hair cells in spite of having an intact auditory nerve (Turner, Gantz, Lowder & Gfeller, 2005). This could be the possible reason that the participants with moderately severe and severe hearing impairment demonstrated significantly lower SIS as compared to participants with moderate hearing impairment.

In summary, individuals with a severe degree and/or sloping type of hearing impairment are limited in their ability to access a wider range of speech spectrum. Consequently, they experience greater difficulties in perceiving speech sounds whose spectral energy is predominantly dominated in the higher frequency region. Besides, studies have reported negative consequences for speech perception among individuals who have difficulties in perceiving high-frequency speech information (Stelmachowicz et al. 2001; McCreery et al. 2013). The high frequency speech identification tests that are specifically designed to assess individuals who have difficulties in perceiving high frequency speech sounds would therefore be sensitive to identify their perceptual difficulties (Kumar, Varudhini & Ravichandran, 2016). Furthermore, due to the technical issue of integrating high power and high bandwidth in the same transducer, the output bandwidth of conventional hearing aids is insufficient to produce consistently audible high-frequency speech information. Therefore, audiologists must attempt trails using hearing aids with frequency lowering strategies that are intended to restore high-frequency speech cues that would otherwise be unavailable to individuals with sensorineural hearing impairment (Simpson, Hersbach & McDermott, 2005).

V. Conclusions

We investigated the effect of filtered speech stimulus on speech perception performance of native speakers of Marathi as a function of the degree of hearing impairment. While speech perception performance improved with an increase in cut-off frequency of speech stimulus, the improvement in speech perception did not correspond with what would be expected with an increase in cut-off frequency of speech stimulus for participants with moderately-severe and severe hearing impairment relative to participants with moderate hearing impairment. The reduction in hearing sensitivity as well as limited ability to access the broader speech spectrum might have reduced the audibility of acoustic cues among participants with moderately-severe and severe hearing impairment. On the other hand, the participants with moderate hearing impairment achieved SIS in the normal range due to less reduction in hearing sensitivity as well as greater ability to access the broader speech spectrum might have increased audibility of relevant acoustic cues. The findings of the present study highlight the need to include high frequency speech identification tests as part of speech perception assessment and attempt trails using hearing aids with frequency lowering strategies in the management of individuals with a greater degree of sensorineural hearing impairment.

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Burnout in Senior Secondary School Teachers: *"The act of personality characteristics"*

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ABSTRACT

Background: Burnout stress is characterized by feelings of alienation, indifference, a loss of interest in work, and an inability to perform day-to-day duties.

Objective: The present research investigated whether there is a relationship between personality types and burnout in the field of educational settings.

Method: Stratified random sampling method was employed for the purpose of data collection. Total 60 participants are tested through Maslach Burnout Inventory in order to determine participants' burnout levels and Eysenck's Personality Questionnaire-Revised for personality tests.

Results: Resultfound out that there is a significant and positive relationship of psychoticism with emotional exhaustion and depersonalization. The most significant contributor to personality in the present study is neuroticism. However, no significant differences between urban higher secondary teachers of males and females have been found on burnout and personality types, but the mean score of burnout found that males are comparatively higher than females.

Conclusion:It is understoodfrom analysis that increases the teachers' positive views about personal characteristics; their burnout levels decrease.

Keywords: Burnout, Teachers, School, Personality, Depersonalization

Introduction

Burnout as an individual negative experience occurring as a result of chronic work stress has become distinguished in teaching professional literature since the mid-1970s'. There is a general view that teacher burnout might have a negative impact on the teachers themselves leading, to emotional and physical illness, and on the students as burned-out teachers could also be comparatively impaired within the quality of teaching and commitment, might provide less info and fewer praise furthermore as move less with students. Job stress or occupational stress among teachers has become quite inevitable nowadays because of the assorted increase in job complexities and challenges. A general lack of administrative understanding and support, role ambiguity, role conflict, students' attributes are a number of the identified stressors. Task demands, physical demands, role demands, and interpersonal demands are the four areas from where job stress originates and results in the risk of developing job dissatisfaction that is directly associated with adjustment.

Emotional exhaustion is the feeling of overburdened exhausted emotionally felt by the individual because of his/her work. Defines the depletion of emotional resources and loss of energy and it is the foremost important indicator of burnout. Emotional exhaustion is the intrinsic aspect of burnout. This aspect refers to the state of physical and emotional exhaustion and is that the foremost necessary aspect of the core of burnout (Maslach and Jackson 1984; Cokluk, 2000). Depersonalization is a demonstration of negative, non-serious attitudes and behaviors against people served (not taking into the thought that they are individuals) by the individual. The person throughout this state of affairs displays behaviors that are innocent of feeling, unfeeling, dismissive, indifferent, exhausting and cynical (Maslach and Jackson 1984; Leiter and Maslach 1988). Personal accomplishment is defined as an individual's inability to beat problems successfully and perceive him/her inadequate. Individual's motivation regarding work declined. An individual feels a lack of control and desperate. It indicates the modification of worker's feelings of success and self-efficacy, or maybe indicates the sentiments of failure, inadequacy, and loss of dignity (Maslach and Jackson 1984; Cokluk, 2000).

Lack of support from administrators and co-workers and lack of involvement in decision making is also a significant causal factor of teacher burnout (Brissie et al., 1988; Sarros&Sarros, 1992). Empirical evidence has shown that teachers experiencing a lot of stress were burned out (Gansterand Schaubroeck, 1991, Kokkinos, 2007; Moore, 2001). The manifestation of burnout is a function of stressors engendered at each environmental organization and personal level. Kokkinos (2007) found that managing student misbehaviour, teachers' appraisal by students, workload, and time

constraints were predictors of burnout. Byrne & Hall, (1989) discovered that role conflict, work overload, classroom climate and decision making are all organizational factors that contributed to teachers stress and eventual burnout. In an exceedingly study by Lue, Chen, Wang, Cheng, and Chen (2010) found that job stress and work hours expected burnout among 1st postgraduate year residents. Moreover, researchers have found that job stress particularly role stress and different role-related issues were moderate to extremely correlated with burnout (Bakker, Demeroutiand Verbeke, 2004; Demerouti Bakker, Nachreinerand Schaufeli, 2001; Maslach et al. 2001; Schaufeli& Bakker, 2004).; Thomas and Jankau,2009). Therefore, it was expected that job stress will predict burnout.

Besides, of these characteristics, the teaching profession has been an occupation directly associated with human beings. Teachers ought to deal not only with their students' educational states but also students' issues and emotional states at the same time. This situation will increase the probability of experiencing burnout for teachers. Many studies on teacher burnout have been equating stress with burnout. Stress is a reality of teaching which may be useful or harmful depending on how an individual responds. For instance, an able challenging category will be stressful to teach. If efforts to satisfy student's desires lead to increased teacher growth and satisfaction, the consequences of stress are useful. If such efforts lead to emotional and physical sickness, the consequences of stress are harmful and will eventually cause burnout. A number of studies are making an attempt to clarify burnout by merely enumerating the numerous stresses teachers might encounter (Farber, 1982).

Burnout is seen commonly in professions like teaching and school administration, requiring intense human relationships, emotionally fraying nonetheless underappreciated (Kalker 1984; Maslach 1986). Within the educational space, studies of occupational stress and burnout have found data that stir concern and justify the need to continue research (Borg, Riding, &Falzon, 1991; Capel, 1991; Kyriacou, 2001). Indicating this is the high proportion of teachers (between 30% and 75%) who are alert to a moderate to high degree of stress in their work (Borg et al., 1991; Capel, 1991). Stress leads teachers to express in an exceedingly significant way the typical characteristics of disturbance (Maslach& Jackson, 1981, 1996) problems in personal accomplishment, emotional exhaustion, and depersonalization.

Teachers' reactions to their working conditions are established by individual characteristics like personality traits and demographic factors. These individual characteristics determine how teachers perceive and respond to their surroundings and if situational variables become an explanation for burnout or the premise for the development of effective coping strategies (Omdahland Fritz, 2006; Haberman, 2004; Lens and Neves, 1999).

Raj (2014) studies showed that participants demonstrated the highest participation relating to personality characteristics severally in conscientiousness, agreeableness, and openness to experience, extraversion, and emotional stability dimensions. Participants' emotional exhaustion levels were at the medium level, whereas reduced personal accomplishment and depersonalization levels were low. Similarly,Burisch (2002) found that neuroticism became relevant in emotional exhaustion; whereas extraversion in personal accomplishment; openness and neuroticism in depersonalization. Cano-Garcia et.al (2005) found the necessary role of temperament structure together with a number of the chosen contextual variables, each within the prediction of teacher burnout.

Rationale of the study

From the review of literature given above relating to studies on burnout, and personality among teachers, it may be the same that several studies have investigated different aspects of those variables in teaching further as alternative types of personality. The aim of this study is to check the prevalence and correlates of burnout among teachers within the Sikkim state of India. This study will address gender variations in prevalence and correlates of burnout in an effort to identify how these risk factors or behavior vary by gender across Sikkim. It is necessary to evaluate educational organizations differently than other organizations due to their being value-oriented organizations and particular characteristics of the teaching profession. In this context, the research was conducted in higher secondary schools.

Objectives

- To examine the relationship between different dimensions of burnout (i.e. emotional exhaustion, depersonalisation, personal accomplishment) and personality types (i.e. psychoticism, extraversion, neuroticism) in urban senior secondary school teachers.
- To identify the role of different dimensions of burnout (i.e. emotional exhaustion, depersonalisation, personal accomplishment) in determining personality types in urban senior secondary school teachers.
- To find out the significant difference between male and female senior secondary school teachers on different dimensions of burnout (i.e. emotional exhaustion, depersonalisation, personal accomplishment) and personality types.

Hypotheses

- There will be significant and positive correlation between different dimensions of burnout (i.e. emotional exhaustion, depersonalisation, personal accomplishment) and personality types (i.e. psychoticism, extraversion, neuroticism) in senior secondary school teachers.
- Different dimensions of personality types (i.e. psychoticism, extraversion, neuroticism) would significantly predict burnout (i.e. emotional exhaustion, depersonalisation, personal accomplishment) in senior secondary school teachers.
- There will be no significant difference between male and female senior secondary school teachers on different dimensions of burnout (i.e. emotional exhaustion, depersonalisation, personal accomplishment) and personality types (i.e. psychoticism, extraversion, neuroticism)

Method

Participants

This research study sample consisted of 60 urban senior secondary school teachers (30 males and 30 females) in the age group of 25-39 years (Mean = 31.08, and SD = 3.74) who were teaching in Sikkim Holly School. Stratified random sampling was employed for the purpose of data collection.

Inclusion criteria:

a. Private teachers

b. Males and females

c. Urban areas

d. All religions

e. Age group between 25 years to 39 years

f. Regular and ad-hoc teachers

Exclusion criteria:

a. Those teachers who did not agree to participate in study

b. Teachers diagnosed with any major psychiatric disorder/s

Tools used

Maslach Burnout Inventory: (MBI: - Maslach, Christina; Jackson, Susan E.; Leiter, P. Michael; Schaufeli, Wilmar B., 1996) used in order to determine participants' burnout levels. There are twenty-two items in the inventory and have three subscales which are evaluated between 0-4 points range for each item. Scoring is calculated separately for each subscale. Emotional exhaustion and depersonalization dimensions consist of negative items while reduced personal accomplishment dimension consists of positive items. Test-retest reliability scores within the few weeks range were the highest (0.60-0.82).

Eysenck's Personality Questionnaire-Revised (EPQ-R: Eysenck & Eysenck, 1985): Revised (EPQ-R: Eysenck & Eysenck, 1985): EPQ-R is 90 items assessing to live off 4 important dimensions such as psychoticism, extroversion, neuroticism, and lie-scale. An answer should be put into the 'Yes' or 'No'. P- Psychoticism or Tough-Mindedness, E-Extraversion, N-Neuroticism or emotionality and L-Lie. The high reliability of the scale has test-retest (0.89).

Procedure

In this research, the principal of schools, Gangtok (Sikkim) was consulted for getting permission to collect information from the sample. All participants gave written consent when the nature of the study was explained to them. Then information was collected individually according to their convenient time. It was created positive that the participants understood the instruction properly and after assurance, each of the questionnaires were handed out to the participants and no time limit was given. The subjects were assured of the confidentiality of the information. All questionnaires were collected upon completion.

Data analysis

In order to present information in additional intelligible and interpreted form, Statistical Package for social science (SPSS) Version 20 was used. Descriptive statistics like percentage mean and variance were conjointly used. Data was also calculated by using Pearson's coefficient correlation, regression, and t-test.

Results and discussion

The aim of the present study was to examine the variables of burnout on personality types of senior secondary school teachers from Sikkim. In order to prove the developed hypotheses, the obtained data have been calculated and tabulated that is being mentioned below:

Table 1: Pearson's correlation coefficient of burnout and personality of urban senior secondary school teachers (N=60)

Variables	Mean	SD	EE	D	AP	OS	P	E	N
Emotional Exhaustion	16.63	7.60	1						
Depersonalisation	7.67	5.43	.64**	1					
Personal Accomplishment	28.08	8.98	-.42**	-.52**	1				
Over all burnout	52.38	10.65	.69**	.53**	.29*	1			
Psychoticism	8.37	4.62	.33*	.36**	-.36**	.11	1		
Extraversion	13.68	3.85	-.17	-.10	.18	-.02	-.15	1	
Neuroticism	11.33	4.76	.38**	.32*	-.31	.17	.27*	.14	1
Over all personality types	33.38	8.40	.32*	.33**	-.29*	.15	.64**	.46**	.78**

*p<0.05; **p<0.01

The abbreviations used in above table such as EE (emotional exhaustion), D (depersonalisation), AP (personal accomplishment), OS (overall stress), P psychoticism), E (extraversion), N (neuroticism).

The obtained results in Table 1 indicates that overall personalities have positive and significant relationship with emotional exhaustion (.32*) that shows that the majority of the male and female teachers have totally different attitudes, adjustment power, so a positive and significant relationship with emotional exhaustion is within the expected direction. It also can be ascertained that there exists a positive and significant relationship between overall personalities with depersonalization (.33**) that is additionally within the expected direction. A negative and significant relationship also can be ascertained between overall personality and personal accomplishment (-.29*). Again there are exists significant and positive relationship of psychoticism with emotional exhaustion (0.33**) and depersonalization (0.36**) as well asa positive relationship between emotional exhaustion with neuroticism (.38**) among urban higher secondary school teachers have been found. Therefore, hypothesis 1 which states that "there will be a significant and positive correlation between the different dimensions of burnout (i.e. emotional exhaustion, depersonalization, and personal accomplishment) and personality types among urban higher secondary school teachers" are accepted.

Table 2: Summary of multiple regression analysis of burnout of urban senior secondary school teachers (N=60)

Variables	Std Beta	R	R^2	F
Emotional Exhaustion				
Psychoticism	0.21	0.48	0.02	5.536*
Extraversion	-0.18			
Neuroticism	.35			
Depersonalisation				
Psychoticism	0.27	0.44	0.19	4.411*
Extraversion	-0.097			
Neuroticism	0.261			
Personal Accomplishment				
Psychoticism	-0.26	0.46	0.21	5.000*
Extraversion	0.18			
Neuroticism	-0.27			

*p<0.05; **p<0.01

Table 2 puts forward a summary of the results obtained through the multiple correlation analysis described as criteria the three sides of burnout and as predictors, the three parts of personality structure. And additionally analysedmultiple correlation analysis of methodology was employed in order to check the hypothesis 2. Having an incomplete relationship with neuroticism, bearing a high level of neuroticism is the best predictors of high scores in emotional exhaustion. In the level of depersonalization constituted psychoticism is the best predictor of high scores in depersonalization and the level of personal accomplishment constituted neuroticism is that the best predictors of high scores in personal accomplishment.

The most significant contributor to personality during the present study is neuroticism. Therefore, hypothesis 2 which states that "different dimensions of personality would significantly predict burnout in higher secondary school teachers" was accepted.

Table 3: Mean, SD and t-values of different dimensions of burnout and personality types of urban senior secondary school teachers (N=60)

Dimensions	*Gender*	*N*	*Mean*	*SD*	*'T' Value*	*Significant /N.S.*
Emotional Exhaustion	Male	30	17.87	6.46		
	Female	30	15.40	8.52	1.26	NS
Depersonalisation	Male	30	8.53	5.26		
	Female	30	6.80	5.54	1.24	NS
Personal Accomplishment	Male	30	26.50	8.81		
	Female	30	29.67	9.02	-1.38	NS
Total Burnout	Male	30	52.90	10.91		
	Female	30	51.87	10.54	.37	NS
Psychoticism	Male	30	7.83	4.36		
	Female	30	8.90	4.88	-.89	NS
Extraversion	Male	30	13.93	3.39		
	Female	30	13.43	4.31	.50	NS
Neuroticism	Male	30	11.97	5.15	1.03	
	Female	30	10.70	4.32		NS
Total Personality Types	Male	30	33.73	7.67	.32	
	Female	30	33.03	9.20		NS

*p<0.05; **p<0.01

Results in table 3 reveal that there exists no significant difference between urban higher secondary teachers of males and females on burnout and personality types. However, no significant differences between urban higher secondary teachers of males and females were found on burnout and personality types. Hence, if we observe the mean score of various dimensions of burnout, it can be found that the mean scores of male teachers are comparatively higher than female on different dimensions of burnout except personal accomplishment.

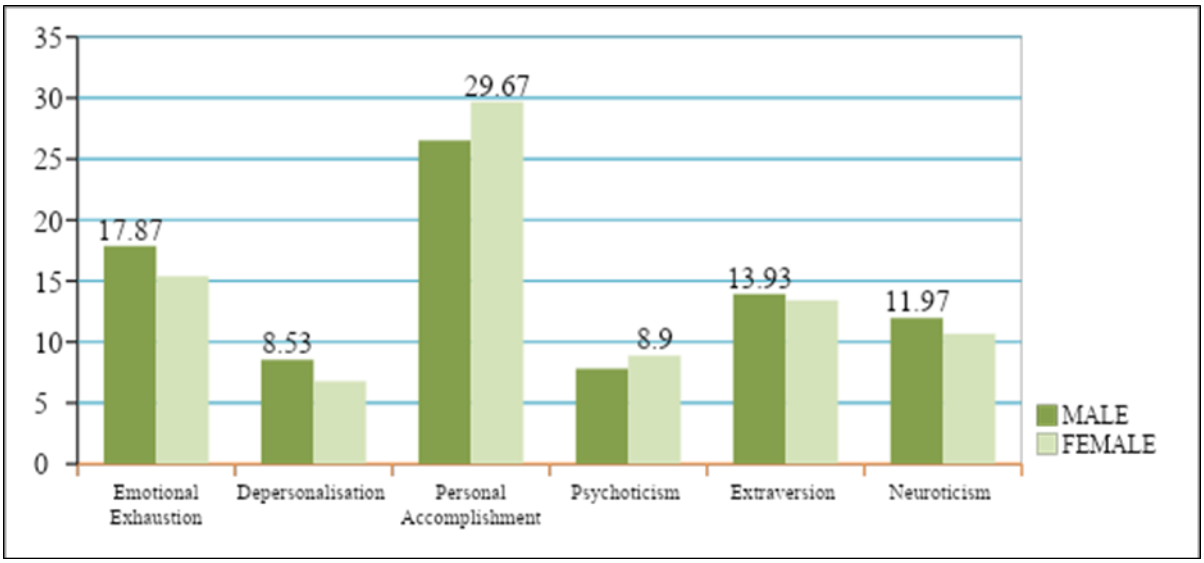

Figure of the mean score showing the differences between two variables.

Conclusion

The purpose of this research study has certainly not been to keep this report on the shelves, but to use it to understand the situation of the burnout among urban higher secondary school male and female teachers. Results from this study showed that personality and burnout were correlated with every dimension, therefore providing support for the burnout between male and female teachers in order to grasp the method. Thus overall personalities have positive and significant relationship with emotional exhaustion (.32*) that shows the majority of the male and female teachers have different attitudes, adjustment powers. Statistically significant middle to low-level negative correlations has found between teachers' personal characteristics and

burnout levels. Thus, it is analyzed that increases the teachers' positive views about personal characteristics; their burnout levels decrease (Raj, 2014).

The results also showed that, as hypothesized, personality characteristics were related to burnout dimensions. Similar study's results were in line with the findings of previous researchers who reported that emotional exhaustion and depersonalization were predicted by neuroticism and conscientiousness (Kokkinos, 2007; Lue et al., 2010).

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Conflict of interest

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Impact of Developmental Aggression on Self-Esteem in College Students

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Abstract

Adolescence is a sensitive period that is accompanied with a common problem of low self-esteem and high aggression. In the present research we tried to understand the difference and relationship between developmental aggression and self-esteem among college students. A total of 331 participants were chosen from different colleges and universities of Odisha, India. Rosenberg Self-Esteem and Buss & Press Aggression scales were used in this study for tapping the self-esteem and aggression among adolescences. The result found that in terms of college students' aggression and diligence, there was a significant difference between boys and girls. In the part of the relationship that is important in the findings, there was a partial significance relationship between developmental aggression and self-esteem. Moreover, in terms of level analysis, the finding suggest that, through most of the participants were at the average level of self-esteem and developmental aggression, and males seem to have more self-esteem associated with aggression than females. Our findings further suggest that factors of age and parent occupation that play a significant role in eruption of high developmental aggression and self-esteem in college students.

Keywords: adolescence, aggression, hostile, physical, self-esteem.

INTRODUCTION

Disruptive behaviours are common among college students, and in general, these types of behaviours are considered normative to some extent. Sometimes disruptive behaviour becomes problematic when it involves ego, and that often creates aggression in individuals. Early behavioural problems, such as antisocial, aggressive behaviour and substance use disorders, predict future developmental and functional impairment (Fergusson, Horwood, & Ridder, 2007). Continuous negative incidents have been associated with early aggressive behaviour among college students (Kaukinen, 2014). Each year, developed countries reported that physical acts of violence affected 5.5 million men and 7 million women (Whitaker et al. 2013). Many researchers said that the exact root of physical acts of violence was in adolescence and that women who are very physically aggressive at the adolescent age, have a greater risk of being victimized in college (Kaukinen, 2014). According to a well-known study (Whitaker et al. 2013) of college students from 16 different countries, nearly 29 percent of college students are involved in physical violence each year, which begins in adolescence and continues into adulthood. The most recent research says that low self-esteem is associated with an increased risk of aggressive behaviour in college students. Also, aggressive behaviour decreases with the increase of self-esteem in individuals (Yu, et al. 2020).

In human life, problems of emotional separation from parents and siblings arise in the period of adolescence. Friends become more important at

college age, and many pull away from their parents in a search for their own identity. One of the recent papers discussed regarding academic decimation and mental health, observed that perceived academic discrimination affects adolescents' behavioural adjustment and social competencies through self-esteem (Zhao & Ngai, 2022). Moreover, Gauthier and colleagues said that self-esteem has an indirect effect on the increased risk of delinquent behaviour in boys. And boys have lower levels of self-esteem than girls and are associated with an increased risk of delinquent behaviours (Gauthier, Herbet, & Blais 2021).

Empirical findings suggest that aggression has an impact on self-esteem, particularly among college students. As the growing stages pass by, aggressive behaviour affects self-esteem. Lower self-esteem in girls leads to more conformism than in boys, and that girls have significantly more negative attitudes towards themselves as compared to boys (Minev et al. 2018). One of the studies by Sharma and Agarwal (2015) found a significant difference between pre-intervention self-esteem and post intervention collective self-esteem among adolescents. Findings by Naganandini in 2017 showed that 55% of adolescents had normal levels of self-esteem, 6.67% of adolescents had high levels of self-esteem, and 8.33% of adolescents had low levels of self-esteem. On the other hand, literature says that men have higher self-esteem than women (Joshi & Shribastaba 2009, Mcclure et al. 2010). In addition, men are more aggressive in nature than women (Yavuzer, 2013). Self-esteem in adolescents is a predictor of physical and mental health (Mwanza & Menon, 2015) in relation to positivity in relational aggression and psychological well-being.

Moreover, adolescent aggression is positively and significantly affected by family violence and TV viewing behaviour of adolescents, Kumari & Kumar (2018). Singh (2016) found that a significant difference and a relationship existed between aggression and emotional maturity among college students. In the case of direct aggression, boys are more prone to hitting than girls (Kruti & Melonashi 2015). The dimension of physical aggression also represents a significant difference between males and females. Munoz et al. (2007) found that women tend to engage in verbal aggression while men engage in more severe physical aggression. Similarly, boys are more aggressive than girls, and girls have poorer self-esteem than boys and have significant mean differences with respect to aggression and self-esteem (Kaur, 2018 & Singh et al., 2017). It is also found through previous research that low self-esteem has a significant relationship with aggressive behaviours. Teng et al. (2015) found that female aggression is associated with lower self-esteem. Further, it indicates Wang et al. (2013) that if low self-esteem occurs in college students, then developmental aggression involvement triggers them to be more aggressive without consciousness. The research attempted to address a very common problem of developmental aggression along with self-esteem in Indian college students. Researchers also tried to see if there were any significant relationships between the variables of developmental aggression and self-esteem among boys and girls.

Objectives

- To understand the differences between developmental aggression and self-esteem in college students
- To explore the relationship between different factors of developmental aggression and self-esteem in college students

Hypotheses

- There would be gender differences in respect to the variable of aggression and self-esteem
- Different factors of developmental aggression would have positive association with self-esteem

Method

Participants

Through a stratified sampling method, a group of 331 participants (i.e., male = 151 and female = 180) with an age range of 16–31 years (M = 1.95 & SD = 0.53) were selected for the data collection from different colleges and universities in Odisha, India. For this study, it took approximately 6 months (i.e., November to March, 2020) to finish the data collection.

Materials

Rosenberg Self-Esteem Scale (RSES): The Rosenberg Self Esteem Scale (1965) was used for the assessment of self-esteem level. The scale takes approximately 10-15 minute to complete. It has five positive dimensions and five negative dimensions. It consists of 10 statements related to overall feeling of self-worth or self-acceptance, with higher scores indicating more positive self-regard. Each item was responded with 4 point Likert scale ranging from 0 to 3 which include 1, 3, 4, 7, 10 and other 2, 5, 6, 8, 9 scores are reversed which is 3 to 0.

Buss Perry Aggression Questionnaire (BPAQ): The Buss Perry Aggression Questionnaire (1992) has 29 questionnaires and a 5 point scale. This scale consists of 4 factors which are physical aggression (PA), verbal aggression (VA), anger (A), and hostility (H). The scores of factors are PA -9, VA-5, A-7, and H-8. The two items in the scale are reversed scores. Every time in the scale is denoted with the subject variable and the total of each sub factor. Total aggression score is calculated from the sum of each factor's score.

Procedure

In the first phase, before administering the scales, proper rapport was established with all the participants. Furthermore, they were asked to fill out the demographic scale after indicating their willingness to participate in the study. In the second phase, following that, they filled out both the aggression and self-esteem scales within approximately 16–22 minutes, after which the participants handed over the filled questionnaires. The collected data was analysed using the mean, standard deviation, correlation, and t-test.

Results & Discussion

This section conversed about the data analysis and interpretation of findings. Collected data were analysed through the statistical software of SPSS-22 version. Keeping in view the objectives, the data were analysed through t-test and correlation analysis.

Table 1: *Different types and numbers of demographic variables and percentage of college students (N=331)*

Variables	N (=331)	Percentage (%)
Gender		
Male	151	45.6%
Female	180	54.4%
Age		
16-19 years	52	15.7%
20-23 years	244	73.7%
24-27 year	33	10.0%
28-31 year	2	0. 6%
Education		
UG	204	64.4%
PG	127	36.6%
Area		
Rural	167	50.5%
Urban	164	49.5%
Parents Occupation		
Govt Job	87	26.3%
Private Job	57	17.2%
Famer	120	36.3%
Business	67	20.2%

The above table, represents the demographic variables of mean, standard deviation and the percentage of males and females. Most of participants fall in the age groups of 20-23 (73.7%) years according to the collected demographic data, and this particular age is a trigger point of developmental aggression. Most of the students are at undergraduate level (N=198 P=59.8%). It also needs to be pointed out that most of their parents' were farmers in terms of other occupations (N=120 P=36.3%), indicating that the students were from a farming family background.

Table 2: *Differences between different factors of developmental aggression and self-esteem of college students (N=302)*

Variables	Gender	N	Mean	Std. Deviation	t value
Physical Aggression	Male	151	19.39	4.66	1.83
	Female	151	18.51	3.57	
Verbal Aggression	Male	151	17.99	4.18	.001
	Female	151	17.99	3.35	
Anger	Male	151	27.06	5.55	**4.21****
	Female	151	24.61	4.51	
Hostility	Male	151	21.05	6.32	**-4.57****
	Female	151	24.07	5.14	
Total Aggression	Male	151	85.50	13.23	.12
	Female	151	85.33	10.57	
Self-esteem	Male	151	19.22	5.25	**3.65****
	Female	151	17.35	3.64	

Note: *significant at 0.05 level, **significant at 0.01 level

Obtained results show that there are some significant differences between male and female in the factor of aggression and self-esteem. In the sub factor of aggression such as anger and hostility, there are differences within males and females (t=4.21 anger & t=-4.57 hostile). It clearly shows that the factor of gender is a differentiating factor of aggression. The Mean, S.D, and t-value of hostile aggression scores found in males (M= 21.05 S.D= 6.32), and in females (M= 24.17, S.D=5.14) as well as t-value (4.57) which is more than tabulation value at 0.01 level. Also, part of self-esteem in both male and females, have highly significant differences (M=, 19.22 males, 17.35 females, SD= 5.25M, 3.64F & t=3.65) between them. It reveals that there is a highly significant mean difference in aggression as well as self-esteem of college students which is the expected direction. Moreover, the above results graphically represented below in Fig.1 which shows the mean value of males and females in respect to the variable of aggression and self-esteem.

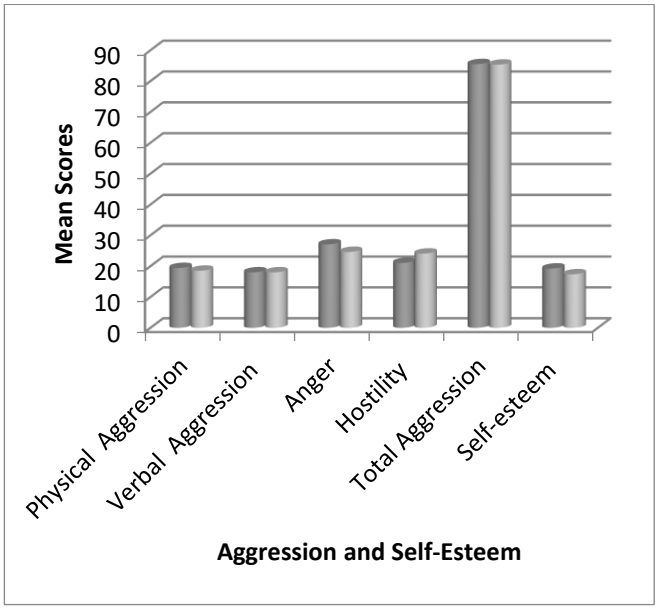

Fig.1. *Showing mean values in gender-wise with respect to aggression and self-esteem graph*

Table 3: *Relationship between different factors of developmental aggression and self-esteem of college students (N=331)*

Variables	Mean	SD	PA	VA	A	H	TA	SE
PA	18.99	4.12	**1**					
VA	18.11	3.72	**.31****	**1**				
A	25.81	5.24	**.35****	**.236****	**1**			
H	22.78	5.93	**.16****	**.12***	**.06**	**1**		
Total Aggression	85.83	11.88	**.67****	**.57****	**.64****	**.60****	**1**	
Self-esteem	18.24	4.56	**-0.2**	**-11***	**-.002**	**-.05**	**-.06**	**1**

Note: *significant at 0.05 level, **significant at 0.01 level

Table 3, represents the correlation between the variables. The abbreviations of the variables are PA- Physical Aggression, V-Verbal Aggression, A-Anger, & H-Hostility. There is no significant relationship between self-esteem with each components of aggression except the verbal

aggression (r=-.11*). It indicates that self-esteem and aggression are partially interrelated.

Table 4: *Level of developmental aggression and self-esteem of college students (331)*

Levels	Frequency	Percentage (%)
Aggression		
31-60 (Normal)	4	1.2%
61-90(Average)	213	64.4%
91-120 (High)	114	34.4%
Self-Esteem		
0-15 (Low)	88	26.6%
16-25(Normal)	219	66.2%
25 above (Average)	24	7.3%

Above, table 4 shows the level of developmental aggression of college students, in which maximum students fall into the category of average level (N = 213, P = 64.4%), followed by higher (N=213, 34.4%) level. In terms of self-esteem among college students, the majority (N = 219, P = 66.2%) fall into the normal category, while the minority (26.6%) fall into the low category.

The findings indicated significant differences in aggression and self-esteem issues in the male participants. The results also indicate that the males have higher self-esteem issues than the females, which may explain why males are more aggressive. This could be one of the reasons for the developmental aggression in males who suffer from many problems in their family, academic performance, and society. We all know that adolescence is a transition period for all human beings, and it is during this period that they need care, affirmation, achievement, independence, value, support, and autonomy. From the literature, it is found that men are almost always more physically aggressive than women, and also that women always act with verbal aggression and, in some cases, hostility (Frodi, 1977 & Elizabeth, 2014). This might be one of the reasons why women have significantly higher levels of control behaviour than men, which predicts physical aggression. Similarly, findings by Mokolapo & Dele (2014) suggest that gender has a significant influence on violent behaviour (Fareeda & Jahan 2014), and males are significantly higher on different dimensions of aggression such as physical, verbal, anger, and hostility in comparison to female students. Recent findings by Yodu (2018) suggest that male students are more likely to be physically aggressive while female students are more likely to be verbally aggressive.

In relationship measurement, it is shown that there is a partial significant relationship between aggression and self-esteem among college students, which is quite similar to the study of Zeigler-Hill, Enjaian, Holden, & Southard (2014), where self-esteem instability has a significant association with aggression level. Similarly, one of the most recent studies in China found that aggressive behaviour is negatively correlated with self-esteem in college students (Yu, et al. 2020). The levels of developmental aggression of college students' categories are average, followed by higher levels. Furthermore, it is seen that there is a partially significant relationship between anger and self-esteem among college students, which relates to the findings of David and Kistner (2000) on the factor of aggression, that there is no significant relationship. Also, research shows that males are more aggressive than females, and yet simultaneously, males have higher self-esteem than females. A lot of people have done research that backs up these findings, like Wani (2017), Veiskarami et al. (2015), Akhtar & Kushwaha (2015) and Talukdar and Deka (2014).

Conclusion

Our overall finding shows that self-esteem and aggression developed a partially significant relationship between males and females during adolescence. Furthermore, male adolescents are thought to be more aggressive than female adolescents. It might be that family and age play a crucial role in developing aggressive behaviour for males, which supports the study of Dukes et al. 2001. On the other hand, males have higher self-esteem than females. It might be one of the reasons that students may be in a

relationship, which gives them more strength to hike their self-esteem. Furthermore, it would be preferable to conduct research on current trends in relationship and psychological behaviour changes such as aggression and self-esteem. A much larger sample is also needed in the future to investigate socio-economic factors that lead to them aforementioned changes.

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