

ROLE OF LATISSIMUS DORSI IN CHRONIC MECHANICAL LOW BACK PAIN DUE TO THORACO-LUMBAR DYSFUNCTION

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INTRODUCTION

Back pain is a primary reason to seek medical advice. Considering 80% of people suffering with back pain we can say it is a universal epidemic requiring attention. Sources of back pain are numerous, usually sought in as lesions of disc or facet joints at L4-L5 and L5-S1 levels¹.

Robert Maigne described thoraco-lumbar dysfunction (TLD) as pain originating in thoraco-lumbar region, but reported by patients in either the low back or upper buttock. These pains are mostly chronic in nature & constitute 30% of all low back pain^{2,18}.

Thoraco-lumbar fascia is used to load transfer³. The superficial lamina get tensed by contraction of various muscle, such as the latissimusdorsi ,gluteus maximus& erectors muscles³.

Many rehabilitation techniques for LBP are proposed. Several researchers have used different stabilization exercises , strengthening the muscles of trunk and back emphasizing the correct timing and co-contraction⁴⁻⁸. Their aims are short time pain decrease, muscular strengthening, and increased hip and lumbar spine mobility, increased lumbar and pelvic proprioceptive sensibility⁹.

Core strengthening has become a major trend in rehabilitation. It is in essence a description of the muscular control required around the lumbar spine to maintain functional stability¹⁰.

The patients we cater to in our physiotherapy clinic are from rural area, where compliance to institution based treatment by patients is poor. We wanted to design a home based self perform exercise program that can be reviewed periodically.

The study was designed to

- (a). Identify the cases of low back pain with TLD
- (b). Ascertain whether lumbo-pelvic stabilization exercises are alone effective in low back pain with TLD
- (c). Analyze the association between latissimusdorsi & low back pain due to TLD.

MATERIALS AND METHODS

The study was approved by the college ethical committee. All subjects were informed of procedure and informed consent was obtained. Subjects who reported to physiotherapy clinic with complaint of low back pain were clinically assessed for signs of TLD. Patients with TLD were identified by the:

- 1) Positive 'iliac crest point' test,
- 2) Positive skin roll test ,
- 3) Localized tenderness over spinous process at the thoraco-lumbar junction(T11 to L2), and
- 4) Tenderness over involved apophyseal joint at the throaco-lumbar junction¹.

Subjects with positive signs of TLD were included in the study. Those with associated lumbar radiculopathy, sacroiliac joint dysfunction or history of trauma or surgery to lumbar spine were excluded. Radiculopathy was



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clinically assessed by lasseque's test. Sacroiliac joint dysfunction was confirmed by striding tests. Latissimusdorsi muscle strength was tested using manual muscle testing as described by Kendall and colleagues¹². All the subjects identified for the study were evaluated using back pain disability score (Aberdeen low back pain disability score) intensity (visual analogue score) and general health score (SF-36), 100 subjects in the age group of 25 to 40 with low back pain were assessed for clinical signs of TLD. 18 (18%) subjects tested positive for lumbar radiculopathy, and 10 (10%) subjects had sacroiliac joint dysfunction (2 subjects had associated signs of lumbar radiculopathy). Following the exclusion criteria, 72 (72%) subjects were then evaluated for TLD of which 30 (42%) tested positive.

These 30 subjects included 12 (40%) females and 18 (60%) males. They were randomly assigned to two groups. Group-A received only core muscle stabilization exercises in supine and quadrupod positions. Group-B received latissimusdorsi muscle strengthening exercises using a band along with core muscle contractions. Subjects with muscle spasm were given moist heat therapy before exercises.

To ensure that the subjects do not go wrong with the required muscle contractions, they were instructed to attend hospital based treatment for 1-week. Later they continued the exercises at home for 1-month. SF-36, Aberdeen low back pain disability score and VAS score were then re-evaluated. Follow-up assessment was done at a 3-month & 6-month interval using all the three outcomes measures.

RESULTS

Mean age of Group-A subjects was 33.73 ± 12.6 & of Group-B was 34.4 ± 7.058 . All subjects (100%) presented with complaints of pain in anterior and lateral part of thigh. 56.6% (n=30) complained upper glutei and 86.6% (n=30) reported lower lumbar pain. Only 46.6% of all subjects reported with pain in throaco-lumbar region (fig-1). Latissimus dorsi muscle strength was found to be < 4 in 88% (n=30) subjects (fig-2).

The different outcome measures were analyzed using unpaired students t-test. Following the 1-month exercises, highly significant improvement in general health ($t=3.4695, p<0.0001$), very significant reduction in back pain related disability ($t=5.1999, p=0.0017$), and significant reduction in pain ($t=2.1767$), stabilization exercises (Table-1).

Follow-up assessment at 3-month interval was witnessed with no change in scores of either SF-36, Back pain disability or VAS. After 6-month interval, the average SF-36 scores alone increased by 5% but individuals reported better social and family relations and less frequency of pains.

DISCUSSION

Thoraco-lumbar dysfunction as a cause of back pain in 42% of subjects with low back pain suggestive of the need to regularly check its presence in all cases of low back pains. The patients may have radiological evidence of lumbar pathology. Also the thoraco-lumbar junction may/may not have radiological signs of involvements, but the importance of clinical assessment of the thoraco-lumbar junction cannot be underestimated. Posterior layer of throaco-lumbar fascia has two laminae. The superficial lamina is formed by the aponeurosis of latissimus dorsi¹³. Tensile transmission across the thoraco-lumbar fascia (TLF) serves as an important element for back stability¹⁴. The thoraco-lumbar muscle controls the dynamic and postural stability of the lower spine¹³. Both superficial and deep laminae of the posterior layer are most extensive superiorly. Contraction of latissimus dorsi produces a superior and lateral directed tension on the superior aspect of thoraco-lumbar fascia. This is likely to have implication on the stability of thoraco-lumbar junction.


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to tightening the guys of a tent to unload the centre pole¹⁶.

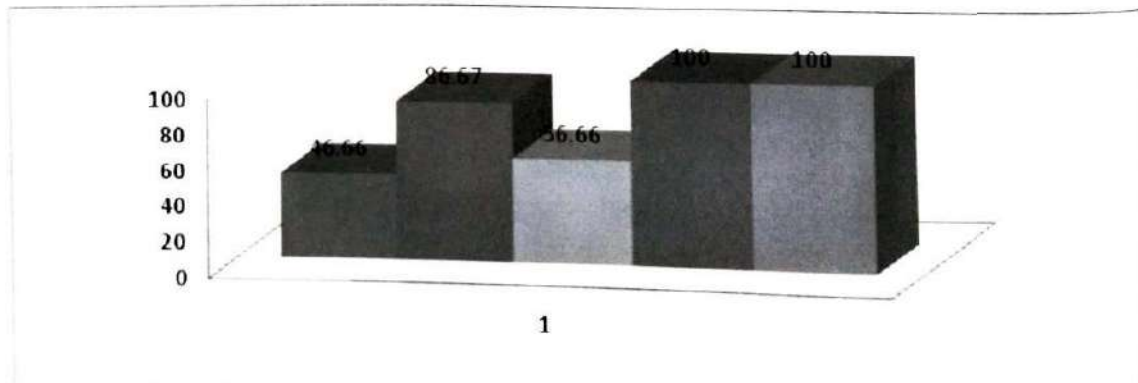
Table 1:- Unpaired t-test analysis of the improvement of the different parameters between two groups

In one of the research studies ,lumbo-pelvic stabilization exercises were found to be non- effective in

	% of change in SF-36 scores		% of change in Aberdeen back pain Related disability score		Difference in VAS score	
	GROUP-A	GROUP-B	GROUP-A	GROUP-B	GROUP-A	GROUP-B
Mean and SD	42.5± 19.005	72.62 ±27.74	65.52 ± 16.43	90.151±8.156	56.16 ±9.69	65.18 ±11.90
t-value	3.4695		5.1999		2.2737	
Df	28		28		28	
p-value	<0.0001		=0.0017		=0.0309	
	Highly significant		Very significant		significant	

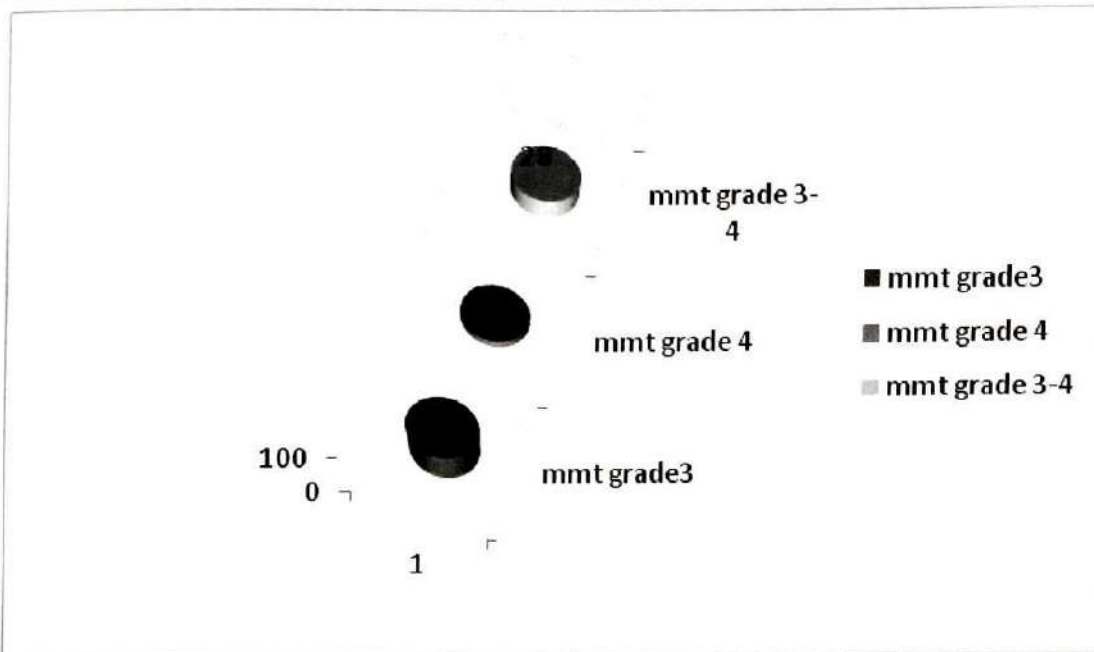
abdominal or back activity and pain or functional disability indices¹⁷. We feel that the subjects with latissimusdorsi muscle weakness in the presence of throaco-lumber dysfunction will not respond positively to lumbo-pelvic stabilization exercises alone. The core stabilization exercise increase tension in the throaco-lumber fascia ,more in its inferior part. If the subjects have latissimusdorsi muscle weakness ,the there will be slackness in the superior portion of the fascia . thesalckness is adjusted by thoracic kyphosis and instability at the throaco-lumber junction. The concept also seems to be the basis of resolving the sacroiliac pain in fixation of throaco-lumbo junction joint manipulations¹⁸.

FIG-1 :- graph showing the distraction of pain in 30 subjects with thoracolumber dysfunction(TLD)



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The posterior rami of T-12 & L-1 nerve roots innervates the superior gluteal regions and the inferior subcutaneous tissue. The anterior rami innervates the inferior abdomen and groin. A lateral cutaneous brach innervates the trochanteric region. Our observation of 100% subjects reporting with anterior thigh pain can be explained well with this. Concentric contraction of latissimus dorsi & core stabilization exercises together will reduce the compression forces over the facet joints of T10 to L1 levels. This will reduce the irritation to the posterior anterior and lateral primary rami of T12 and L1 nerve root

The importance of examining the thoraco-lumbar region even in the presence of the clinically evident lumbar pathology cannot be under estimated. Core stabilization exercises alone are ineffective in cases where low back pain associated with thoraco-lumbar dysfunction. Concentric strengthening of the latissimus dorsi and core stabilization exercises together are very effective in relief of back pain. Also, it produces and improvement of general health, improve social and family relation. The effects were lasting ever after 6 month of supervised care.

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Fatigue-A guide for patients' prognosis in musculoskeletal and neurological disorders

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Background - Fatigue is a common feature of physical and neurological disease as well as psychological disorder. This fatigue relates to difficulty in performing voluntary tasks. Fatigue accumulation if not resolved leads to chronic fatigue syndrome(CFS), over training syndrome, immunity dysfunction and many threats to human health. Acute fatigue can be quickly relieved by rest or life style change. Increased fatigue hampers the normal daily healthy life and create disturbance like neurological, muscular and cardiovascular disorders and many pathological conditions. CFS causes central nervous system and immune system disturbance, orthostatic intolerance. The prognosis and the treatment hampers due to fatigue in neurological and musculoskeletal conditions. When a working person of age 34 comes to the dept for his treatment related to musculoskeletal condition, in the same phase the person is also having stress and work load from his office, which leads to both physical and mental fatigue which affects the treatment prognosis. To measure this kind of fatigue various scales has been developed which measure nature, severity and impact of fatigue in a range of clinical population and in the field of physiotherapy practitioners and interns of physiotherapy. The Fatigue Assessment Scale(FAS) is a 10-item scale evaluating symptoms of chronic fatigue. Another scale is the Functional Independence Measure(FIM) is a 18-item scale measuring individuals' physical, psychological and social functions.

Objective- To show a relation between fatigue and prognosis of patient with musculoskeletal and neurological disorders.

Method- Data collection of 200 patients of OPD of IHS by using Functional Independence Measure (FIM) and Fatigue Assessment Scale (FAS).

Design- This is a self report, paper and pencil measure with some questionnaires requires approximately 2-3 minutes for administration.

Conclusion- To find out the relevance between fatigue hampering prognosis of patients treatment.



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Shared decision making: It's relevance in patients' treatment outcome

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Background- Shared decision making involves two way communications between the therapist and the patient which helps to make a health related decision after having the discussion about the pros and cons, benefit and risk of each treatment. It requires skills to make a decision considering the values, preferences and circumstances of the patient, shared decision making is an integration to good clinical practice as it improves patient satisfaction as well as better health outcomes. Therapist should prepare for collaboration by communicating that decisions need to be made. They should exchange information about goals and treatment options. Mutual understanding and congruence with patient priority and goals should be planned and summarized in order to get better benefits.

Objective- To examine the implementation status of shared decision making and physiotherapeutic treatment outcome and how it affects in a better prognosis of patients than normal clinical decision making.

Design- This will be a survey on the consultant physiotherapists and BPT interns.

Methods- Total 100 consultation records will be analyzed using the Observing Patient Involvement (OPTION) instrument. This was developed by Elwyn and colleagues to measure patients involvement in general practice. The instrument contains 12 items which are focus on the entire process of shared decision making. Each item is rated from 0-4 which represents increasing levels of therapist behaviour concerning shared decision making. The patient and therapist should complete the Control Preference Scale (CPS) before consultation. In this the questionnaire items are same for patient and therapist. Thus, patients will mark the most preferred level where as therapists will be asked to mark most preferred level.

Conclusion- The therapists should avoid paternalistic approach to a treatment protocol. They should involve the patients and seek opinion from them to get faster and better health benefits as well as the patient satisfaction.



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**KEY NOTES
ON
THERAPEUTIC
CURRENT**



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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 country 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


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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 in front of computers to attend your classes	Gender	Do u have any pain
N	Valid	172	86	172
	Missing	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
	Yes	114	66.3	100.0
	Total	172	100.0	100.0



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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				


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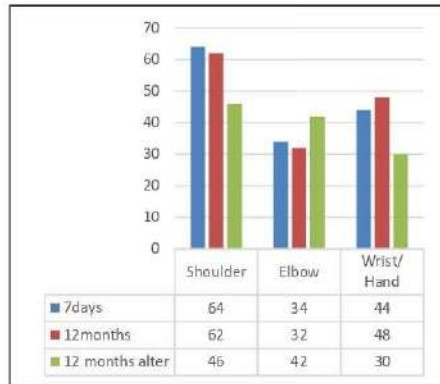


Figure 1: Relationship between upper extremity, duration and activities alteration in 12 months.

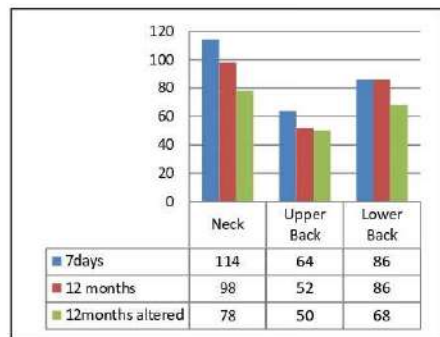


Figure 2: Relationship between spine, duration and activities alteration in 12 months.

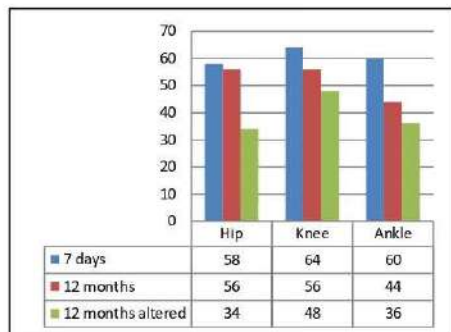


Figure 3: Relationship between lower extremity, duration and activities alteration in 12 months.

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.


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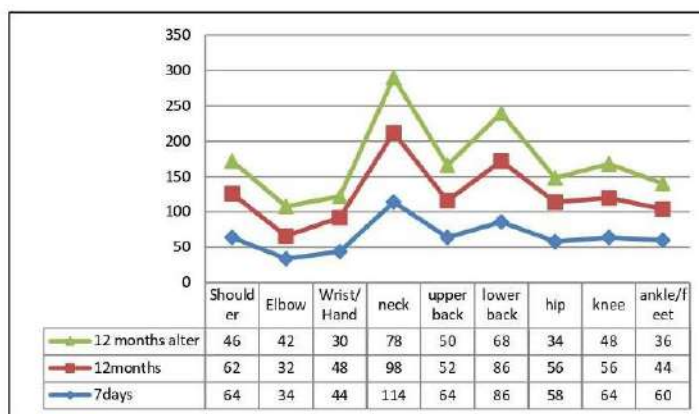


Figure 3: Relationship between all nine areas of pain/discomfort /numbness due to timed exposure.

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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INTEGRATING PLACEBO IN CONVENTIONAL HEARING AID PRESCRIPTION PRACTICES FOR BETTER ACCEPTANCE

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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.


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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 effects 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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Improving Verbal Working Memory through Visuospatial Stimulation with Future Theoretical Implication in Down's Syndrome

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Improving Verbal Working Memory through Visuospatial Stimulation with Future Theoretical Implication in Down's Syndrome

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Abstract: Working memory is made up of three components, the central executive, the phonological loop, the visuo-spatial scratch-pad. Working memory can be strengthened by working on any of these individually or in coherence. This longitudinal study was conducted to access the impact of visuospatial stimulation through the use of jigsaw puzzle on verbal working memory as reflected by digit span. 32 adults with minimum ability to recognise numbers, divided in two groups, 20 - 25 years as young adults in group I and above 60 years older adults in group II. Digit forward span and backward span was examined pre and post visuo-spatial stimulation in each group, and the results revealed that practice of visuo-spatial stimulation has improvement in verbal working memory. There was significant difference between pre-evaluation and post-evaluation after some amount of visuo-spatial stimulation practice in digit forward and backward verbal working memory span in both groups. As people with Down's syndrome have a specific impairment in short-term memory for verbal information the study proposes that this domain can be improved by working on the visuo-spatial domain which is already a stronger suit for people with Down's syndrome.

Keywords: Working memory, Verbal working memory, Visuo-spatial working memory, Digit forward span, Digit backward span

1. Introduction

Memory is a sequential process of encoding, storing and retrieving information. Encoding occurs when information from the outside world reaches our senses in the forms of chemical and physical stimuli. In this first stage the information is changed so that memory can start encoding process. The second stage of memory is storage. This requires that we sustain information over periods of time. Finally, the third process is the retrieval of information that was stored. The information must be located and returned to the consciousness.

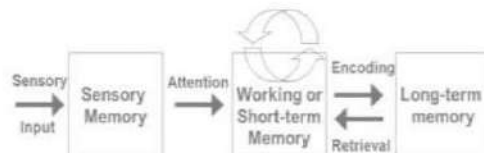


Figure 1: Working Memory Model

Working memory is the system that actively holds multiple pieces of transitory information in the mind, where they can be manipulated. Working memory is commonly used synonymously with short term memory, but this depends on how the two systems of memory are defined^[1]. Working memory includes subsystems that store and operate on visual images or verbal data, as well as a central executive that coordinates the subsystems. It includes visual representation of the possible moves, and awareness of the flow of information into and out of memory, all stored for a limited amount of time^[2]. The cognitive processes needed to achieve this include the executive and attention control of short-term memory, which permits temporary integration, processing, removal, and retrieval of information. These

related changes: working memory is associated with cognitive development, and research shows that its capacity recedes with old age.

Working memory is one of the cognitive components which is the most sensitive to decline as age increases.^{[3], [4]} Several explanations have been offered for this decline in psychology.

Working memory is made up of three components (see Figure 2):

- 1) The central executive - the part of the system responsible for processing information
- 2) The phonological loop - responsible for the temporary storage of verbal information.
- 3) The visuo-spatial scratch-pad - accountable for the brief storage of visual and spatial information.



Figure 2: Working Memory Model^[5]

Working memory can be strengthened by working on any of these individually or in coherence.

To test this, a longitudinal study was conducted to access the impact of visuospatial stimulation through the use of jigsaw puzzle on verbal working memory as reflected by digit span.


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2. Method and Procedure

The sample comprised of 32 adults with minimum ability to recognise numbers, cleaved in two groups, and are able to follow basic instruction with the age range of 20 - 25 yrs (M=23, SD=1.6) as young adults in group I and above 60 (M=64, SD=3.6) older adults in group II. Each groups had equal number of participants (n = 15). Participants scoring more than or equal to 25 on the HMSE were included in this study. The participants were asked to verbally repeat a set of digits in same sequence as the examiner in DFS task, and in reverse order for DBS task. Test begins from a set of 2 digits continuing to a maximum set of 7 digits. Each set was tried thrice. Digits were presented at a rate of a single digit per second. VWM span was calculated as a set of maximum digits, where two out of three trials were repeated correctly.

The digit span task was performed before the stimulation of jigsaw puzzles practice as pre - evaluation of verbal working memory, then the post evaluation was also obtained a period of 9 session practice as post evaluation with practice of jigsaw puzzles and then again after 10 days digit span task was performed to check the sustainability of changes occurred in digit span as changes in verbal working memory.

3. Results and Discussion

Mean (fig 3) and standard deviation (SD) of verbal Working memory span (Digit forward span & Digit backward span) pre training evaluation, immediate post training evaluation and latency of 10 days post training are shown in Table 1 and Table 2 for both the groups. Group I digit span was higher than Group II digit span across both age groups and Digit forward span for immediate post training scores was higher than Digit forward span for pre training scores and Digit forward span latency of 10 days post training scores also Digit backward span for immediate post training scores was higher than Digit backward span for pre training scores and Digit backward span latency of 10 days post training. In both the groups though it was found that mean of period of sustained recovery was less than the mean of post training but still slightly better scores was observed of period of sustained recovery from the pre training evaluation in Digit forward span and Digit backward span as shown in fig 3 (table 1 & 2).

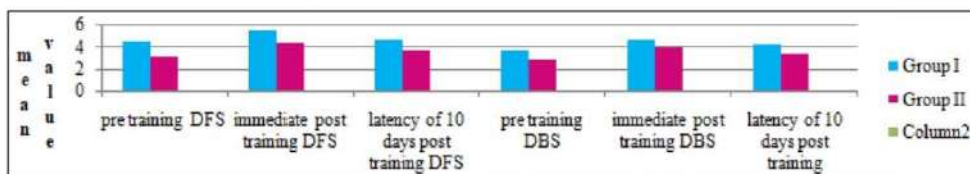


Figure 3: Mean value of verbal working memory in both groups

Table 1: Mean and Standard Deviation of pre training evaluation, immediate post training evaluation and latency of 10 days post training for forward span in both groups

	Mean	Sd
Group I pre training DFS	4.5000	.51640
Group II pre training DFS	3.1875	.83417
Group I immediate post training DFS	5.5625	.51235
Group II immediate post training DFS	4.4375	.62915
Group I latency of 10 days post training DFS	4.6875	.60208
Group II latency of 10 days post training DFS	3.7500	.68313

Table 2: Mean and Standard Deviation of pre training evaluation, immediate post training evaluation and latency of 10 days post training for backward span in both groups

	Mean	Sd
Group I pre training DBS	3.6875	.60208
Group II pre training DBS	2.8750	.61914
Group I immediate post training DBS	4.7500	.57735
Group II immediate post training DBS	3.9375	.44253
Group I latency of 10 days post training DBS	4.2500	.77460
Group II latency of 10 days post training DBS	3.4375	.51235

Paired sample 't' test was performed to compare the significance difference with in the both groups, and found pre training scores vs immediate post training scores, post training scores vs latency of 10 days post training scores for Digit forward span and Digit backward span in both groups as shown in table 4, p value 0.000 for group I pre training scores Digit forward span vs group I immediate post training

scores Digit forward span, p value.000 for group I immediate post training scores Digit forward span vs group I latency of 10 days post training scores Digit forward span, p value.000 for group I pre training scores Digit backward span vs group I immediate post training scores Digit backward span, p value.002 for group I immediate post training scores vs group I latency of 10 days post training scores Digit backward span, p value .000 for group II pre training scores Digit forward span vs group II immediate post training scores Digit forward span, p value.000 for group II immediate post training scores Digit forward span vs group II latency of 10 days post training scores Digit forward span, p value.000for group II pre training scores Digit backward span vs group II immediate post training scores Digit backward span and p value.002 for group II immediate post training scores vs group II latency of 10 days post training scores Digit backward span. These all pair of analysis show significant difference as p value is <0.05 as show in table 3.

Table 3: Paired 't' test for pre, immediate post and latency of 10 days post training scores within the both Groups

Pairs	Mean	Sd	T	Stg (p)
G - I pre DFS vs G - I immediate post DFS	-1.06250	.25000	-17.000	.000
G - I immediate post DFS vs G - I latency of 10 days post training DFS	.87500	.34157	10.247	.000
G - I pre - DBS vs G - I immediate post DBS	1.06250	.25000	-17.000	.000

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G - I immediate post DBS vs G - I latency of 10 days post training DBS	.50000	.51640	3.873	.002
G - II pre DFS vs G - II immediate post DFS	-1.25000	.57735	-8.660	.000
G - II immediate post DFS vs G - II latency of 10 days post training DFS	.68750	.60208	4.568	.000
G - II pre - DBS vs G - II immediate post DBS	-1.06250	.44253	-9.604	.000
G - II immediate post DBS vs G - II latency of 10 days post training DBS	.50000	.51640	3.873	.002

*p < 0.05 = significant difference; **p<0.01 = highly significant difference.

ANOVA was performed to compare pre training and immediate post training evaluation for Digit forward span and Digit backward span across the two groups respectively which yielded a p value of 0.000 for pre training Digit forward span and a p value of 0.001 for pre training Digit backward span and a p value of 0.000 for immediate post training Digit forward span, a p value of 0.000 for immediate post training Digit backward span which shows significant difference as the p value is <0.05, as shown in table 4.

Table 4: ANOVA for pre training (Digit forward span and Digit backward span) and immediate post training (Digit forward span and Digit backward span) in both groups

Groups	F	Sig.
Pre training DFS for group I and group II	28.636	.000
Pre training DBS for group I and group II	14.162	.001
Immediate post training DFS for group I and group II	30.759	.000
Immediate post training DBS for group I and group II	19.961	.000

*p < 0.05 = significant difference; **p<0.01 = highly significant difference.

4. Conclusion

The results of this study present some important evidences. Normal aging affect both the aspects of verbal working memory i.e., forward and backward in relation to young adults. Both domains of verbal working memory (forward and backward span) declines in aged population when compared to young adults. Also note practice of visuo - spatial stimulation has improvement in verbal working memory. There was significant difference between pre - evaluation and post evaluation after some amount of practice in digit forward and backward verbal Working Memory span in both groups. Also, there was significant difference between post evaluation and sustenance after 10th day evaluation in digit forward and backward verbal Working Memory span in both groups.

5. Potential usage in the field of Intellectual disabilities

Theoretically this can be used to rehabilitate children with Down syndrome, as they have a specific impairment in short - term memory for verbal information (i. e., the phonological loop) and this will make processing verbal information and, therefore, learning from listening, specifically difficult for them. Their visual - spatial short - term memory is ahead

than verbal memory, making the ability to learn from visual information a relative strength. This can (and should) be used to support weaker verbal processing abilities. [6] Developing working memory skills for children with Down syndrome).

6. Author Contribution

Ms. Ritika Singh came up with the idea of the research the data collection was done equally by both the authors, Mr. Bhowmick Kandpal wrote the initial draft of the paper.

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Effectiveness of Multimodal Intervention on Audiological and Psycho-Social Profile of Meniere's Disease: A Case Study

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Abstract

Meniere's disease (MD) is a chronic disorder of the inner ear that is characterized by intermittent attacks of loud tinnitus, a sense of pressure in the ear, vertigo and progressive permanent hearing loss in one or both ears. Anxiety and dizziness occur as co-morbid symptoms in a larger percentage of patients than would be expected from chance alone. The individual profile of Meniere's disease in different patients makes it difficult to diagnose on the basis of symptomatology alone. The impact of Meniere's disease on quality of life has highlighted the importance of an additional approach to support the diagnosis and intervention of Meniere's disease. In this study, we discussed about the interface between Meniere's disease, its audiological manifestations and psycho-social factors influencing the Quality of life. The two conditions are linked by overlapping neural circuits that include monoaminergic pathways and the parabrachial nucleus network, and they are functionally related via both somatopsychic and psychosomatic mechanisms. A unique strategy for patient management is discussed in this paper. The results confirmed that vertigo can be the most debilitating symptom in Meniere's disease. Correlating the clinical features of subject with Audiologic, Vestibular, Yogic and Psychological evaluation highlighted the clinical value of an interdisciplinary team approach for diagnosis and intervention.

Effective patient management requires a better understanding of the physiological and psychological nature of the disease, as well the relationship that exists between the factors. The development of a generally acceptable plan for diagnosis and treatment poses a challenge for clinicians involved in the care of this condition. Therefore, we must constantly update our knowledge through interdisciplinary teamwork and research for the benefit of our patients with the help of increased understanding of the pathophysiology and psychophysiology of MD patient, management may become more effective.

Keywords: Meniere's Disease; Multimodal Intervention; Hearing Rehabilitation; Pharmacological Treatment; Yogic Rehabilitation

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Abbreviations

MD: Meniere's Disease; VHI: Vertigo Handicap Inventory; DHI: Dizziness Handicap Inventory; QoL: Quality of Life; SCAT: Sinha's Comprehensive Anxiety Test; PTA: Pure Tone Audiometry; SD: Speech Discrimination; OAEs: Oto-acoustic Emissions; VNG: Videonystagmography; EcoG: Electrocochleography; VSS: Vertigo Symptom Scale; VOR: Vestibulo-ocular Reflex; vHIT: Video Head Impulse Test; PMR: Progressive muscle Relaxation

Introduction

Meniere's disease is a disorder of the inner ear characterized by recurrent attacks of vertigo, fluctuating sensorineural hearing loss, and tinnitus [1] with an incidence of 15 - 50 people per population of 100,000 people [2]. These individuals often exhibit high levels of anxiety on initial presentation compared with patients with hearing loss, tinnitus, otalgia, or dizziness due to other causes. Associated traits may include a fear of spontaneous vertiginous attacks, preoccupation with the details of symptoms, and sensitivity to stress-related events making patients unable to participate in activities of daily life and to interact with their social environment, such as work and education. Although vertigo spells frequently prevent patients from performing planned daily activities and may be more disabling in some patients depending on vocational and coping factors, the threat of vertigo attacks may also affect activities and create a sense of despair [3].

Clinical studies indicate that a stressful lifestyle, as well as the stress-modulating hormone vasopressin, are associated with inner ear fluid homeostasis disorder and subsequent inner ear hydrops [1]. Another factor is that Meniere's patients' mental health issues may make it difficult for them to communicate effectively with their doctors [4]. Mental health care is considered to play an important role in good therapeutic results.

In our study, the diagnosis of MD is based on the History, Clinical picture, medical investigations, Psychological and Audio-vestibular examinations. An audiological test battery included the following tests: Pure Tone Audiometry (PTA), Speech discrimination, Oto-acoustic emissions (OAEs), Videonystagmography (VNG), Electrocochleography (EcochG), General, Symptom specific (Vertigo Handicap Inventory) and Self-reported (Dizziness Handicap Inventory) questionnaires.

The psychosomatic investigations involved an interview and the psychological state was evaluated clinically by the use of ques-

tionnaires to evaluate quality of life (QoL). As personality measure, we used (i) The Mental Status Examination developed by David R. Norris, Molly S. Clark, Sonya Shipley which measures patient's psychological functioning at a given point in time, under the domains of appearance, attitude, behavior, mood, and affect, speech, thought process, thought content, perception, cognition, insight, and judgment and (ii) Manual for Sinha's Comprehensive Anxiety Test- SCAT.

Pharmacological treatment, Dietary intervention, Audiological, Psychological and Yogic Rehabilitation were scheduled and planned accordingly.

Clinical history

Patient complained of Ringing sensation of perceived high frequency in Right ear for 2 years without any vertigo episodes. Episodes of vertigo attacks started 6 months ago. No fluctuations in tinnitus perceived in pitch and intensity even after any vertigo episodes. The tinnitus is constant and is not bothersome during the day, but is disturbing during the night as reported. Slight heaviness and Reduced hearing sensitivity in the Right ear since last 8 months. His vertigo was defined as active as the patient had experienced at least one episode of severe vertigo within 3 months of the psychological battery as he suffered persistent disequilibrium.

Non-auditory impact

Frequency of vertigo: Before medications: Daily lasting 5 seconds; During medications: No vertigo attacks as reported; After medication discontinued: Every second day lasting 3 - 5 seconds.

Commencement, nature, duration of the attack:

- First episode: 2nd May, 2020. He was at his workplace (manages a shop). He was unsteady, Rotational vertigo, nausea was reported. No jerky movement/Head thrust.
- Worst episode: 10th October, 2020. Blackout, vomiting, heaviness in the head, Rotational vertigo, sudden jerk of head and movement on the left side.
- Last episode: 6th December, 2020. Blackout, Rotational vertigo, 5 secs.

Frequency and number of attacks: Since last 6 months, he is having vertigo attacks, sometimes daily & sometimes in every alternate day. No. of attacks per day: 1 - 2.

Auditory impact:

- Hearing loss in right ear.
- Tinnitus: High frequency tinnitus.
- Neurological symptoms: No history of headache, loss of consciousness, diplopia, dysarthria, facial numbness. Fall-Once.
- Autonomous symptoms: Heart palpitations increases during the episode. BP remains normal as reported.
- Aggravating/mitigating factors including medications: During medications, vertigo attack reduced drastically. Post discontinuation, vertigo relapsed.
- Current medications: No.

Emotional impact

Apart from the incapacitating effects of the physical manifestations, He is emotionally disturbed. He feels a sense of loss of control over his life and this leads to a certain degree of uncertainty and instability in his psychological well-being. Interference in sleep pattern (evaluated through sleep calendar) change in social contact and performance at work has led to significant anxiety and depression.

Problem statement and rationale

Review of literature on Meniere's Disease revealed that the diversified and individual course that MD takes in different patients makes it difficult for medical clinicians to identify the disease on the basis of symptomatology alone. It may take some time before the diagnosis is confirmed and too many patients live with chronic symptoms without knowing the diagnosis. The mean interval between the age at onset and the age at definite diagnosis is three years. The disease itself is unpleasant, but it may be even more stressful for the patient to have no explanation for the symptom. This increases the patient's stress level, lowering his or her quality of life even further.

The impact of MD on quality of life has highlighted the significance of quantitative physiological tests as an additional tool to support MD diagnosis. There is to date no single diagnostic protocol on which a definite diagnosis of MD can be based, and therefore it is important to establish the diagnostic value of different Multimodal tests that enable clinicians to compile effective test batteries. Insight into multi-disciplinary approach will allow clinicians to arrive at the critical diagnosis more rapidly, resulting in more effective treatment regimen.

Study design

Experimental Single Case Study using Audio-vestibular, QoL, Psychological, and social life instruments administered over 18 months in patient undergoing multi-modal treatment for Meniere's disease.

Materials and Methods

A 32-year-old male adult patient with Meniere's disease visited the Department of Audio-vestibular Sciences, Institute of Health Sciences, Odisha, India. The study protocol was approved by local institutional review boards. Patient gave informed consent. The study was conducted in compliance with the protocol, Good Clinical Practices, and applicable regulatory requirements. The diagnosis of Meniere's Disease was established by:

1. Comprehensive clinical history.
2. Physical examination: Otoscopy, blood pressure, pulse rate, orthostatic hypotension, etc.
3. Diagnostic testing which included a battery of audio-vestibular and psychological tests.

Audiological evaluation: Recent areas of interest in diagnosis of MD have focused on auditory and vestibular test results and relating them to the pathophysiology of the disease:

- **Pure tone audiometry (PTA)** (air- and bone conduction), Speech discrimination (SD) scores, Oto-acoustic emissions (OAEs) and Videonystagmography (VNG). Specific tests for detection of endolymphatic hydrops included Electrocochleography (EcoG) and dehydrating agents such as Glycerol in combination with audiological tests. Dehydrating drugs were used to lower endolymphatic pressure in the inner ear and cause a detectable effect, such as an increase in pure tone thresholds (PTTs).
- **PTA:** The air conduction PT audiometry was performed using the MAICO Audiometer GmbH MA52 and MAICO TDH-39 headphones. The above-mentioned audiometer was used in conjunction with the Radioear B-71 bone conduction receiver to perform bone conduction PT audiometry. Hearing function was assessed using a pure tone audiometer and the four-tone average $(a + b + c + d)/4$ (a, b, c, and d are hearing levels at 0.25, 0.5, 1, and 2 kHz, respectively) according to the modified AAOHNS criteria of 1995.

- **OAE analyzer:** The MAICO ERO•SCAN was used to perform DPOAE and TEOAE testing.
- **VNG:** Videonystagmography was undertaken using the device (Balance Eye®). Balance Eye is a binocular VNG system which is class 2A European CE certified. It has the provision for eye movement recording with vision allowed and denied. Oculo-motor activities like saccades, smooth pursuit, gaze with and without fixation and responses to horizontal high frequency headshake, hyperventilation, lateral canal head impulse test, and positional tests were used to evaluate vestibular function.
- **EcochG:** The BIO-LOGIC Evoked Potential program system (Version 5.00 Model) was used to evoke electrocochleographic responses. Omni-Prep surgical scrub and gauze pads were used to prepare the subject's skin before the electrodes were applied. Ten20 conductive EEG paste was used on the two surface electrodes. A tympanic membrane electrode with FCG electrode gel was used to record EcoG results.
- **Dizziness handicap inventory:** (DHI; Jacobson and Newman, 1990) is one of the most widely used self-reported measures for evaluating vestibular disorders. This measure provides an understanding of the self-perceived disability imposed by vestibular system disease. DHI is a 25-item scale with 3-point rating system (i.e., No=0; Sometimes=2; Yes=4). This questionnaire has three sub-scales (i.e. physical, emotional, and functional). The scores can range from 0 to 100 and higher scores indicate more disability (e.g. 16 - 34 points = mild; 36- 52 points = moderate; and 54+ points = severe).
- **Vertigo symptom scale:** (VSS) focuses on symptoms associated with vertigo and to measure the relationship between vertigo, anxiety, and emotional distress in clinical population (Yardley, *et al.* 1992). VSS is a 28-item self-report questionnaire that is broken down into 3 subscales: functional, ambulatory, and instrumental. The functional subscale assesses a person's perception of basic self-care tasks, the ambulatory subscale assesses mobility-related skills, and the instrumental subscale assesses self-perception in higher-level, more socially sophisticated tasks. The questionnaire requires individuals to rate their self-perceived disability level on a scale that ranges from 1 (independent) to 10 (too difficult, no longer performed).
- **Vertigo handicap questionnaire (VHQ):** Yardley and Putnam (1999) developed the Vertigo Handicap Questionnaire (VHQ). This questionnaire investigates factors inducing handicap associated to dizziness. The VHQ includes 22 items reproducing the incapacitating results of vertigo, adding restrictions of vertigo on physical and routine activities to impacts on social life and time-out. However, the main limitation of this measure is that the psychometric properties need to be confirmed.

Psychological evaluation:

- To assess the degree to which psychological factors operate in Meniere's disease, two objective personality instruments were administered in a supervised test environment:
- Both the Mental Status Examination and the Sinha's Comprehensive Anxiety Test (SCAT) show a clear picture of the patient having active vestibular symptoms along with High Anxiety Level in his day-to-day life.
- Changes in vertigo over time was maintained by Symptom diary with the help of Excel Spreadsheet.

A datasheet (Appendix A) was compiled to organize the: Case history, Audiological reports, psychological test results and Symptom Diary as documented in the Dept. of Audio-vestibular Sciences and Dept. of Psychology Records.

Clinical findings and interpretation

1. In PT audiometry results: PTA: Left Ear- 15dBHL; Right Ear- 68.75dBHL, Provisional Diagnosis: Left Ear: Hearing sensitivity within normal limits and Right Ear: Moderately-severe Sensorineural hearing loss.
2. Speech Audiometry: SRT scores were Left Ear- 20dBHL and Right Ear- 75dBHL. SDS- Left Ear: 90% and Right Ear: 30%. SD was low as the hearing thresholds deteriorate, there is progressive decline in the patient's ability to discriminate words.
3. Glycerol test: Patient was given glycerol of 114 ml. with equal amount of water (1.5 ml/Kg). Audiogram and Speech discrimination scores were recorded before and 1.5 hrs. Post Glycerol Ingestion. The test result was Positive. Improvement in threshold minimum of 15 dB in three consecutive octave frequencies with more than 10% improvement in SDS score in right ear (SDS-50%) was recorded.

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4. Immittance audiometry: B/LA type tympanogram with acoustic reflex absent in Right ear.
5. SISI test: Rt ear: Score 85% Positive SISI (suggestive of Cochlear Pathology), Lt ear: Score 10% Suggestive of intact state of Cochlea and associated parts.
6. OAE: OAEs are an objective, non-invasive and quantitative measure of sensory cell function in the cochlea. It provides information regarding outer hair cell activity, and is regarded as a reliable test for determining the structural basis of a hearing problem, particularly if it involves the outer hair cell system. Results of DP OAE: Right ear: Refer, Left ear: Pass; TOAE: Right ear: Refer, Left ear: Pass. In DPOAEs test, "DP-gram" in which DPOAE amplitudes for a single primary intensity are plotted as a function of frequency of the primary tones were recorded. DPAOEs are sensitive to cochlear pathology such as MD and our result has indicated that DPOAE amplitudes are reduced in the presence of elevated behavioral thresholds indicating affected OHC. Changes in the activity of OHC following glycerol ingestion can also be verified with DPOAE measurements. Concerning monitoring of cochlear function in the glycerol test, it was observed that DPOAE amplitudes increased with hearing improvement following glycerol ingestion supporting the diagnosis.
7. During VNG, A test for vestibular function was carried out as MD was suspected, Video-oculographic recording of eye movements showed normal VOR in vHIT.
8. EchoG: SP/AP ratio was found to be 0.46 (Click stimulus was used in alternative polarity), suggestive of confirmed MD.
9. Quality of life instruments: The QoL questionnaires were completed at baseline, 2 months, 4 months, 6 months, 12 months and 18 months. In Symptom Diary, Vertigo symptoms were rated daily on the symptom diary using a Likert scale from 0, "no vertigo," to 10, "worst vertigo attack ever". Vertigo rated 2 or greater represented a "counting" vertigo attack, an attack lasting more than 20 minutes. A categorical score was assigned to the patient depending on the level of vertigo improvement during the 2 months of follow-up regardless of treatment assignment. The vertigo control categories served as a representation of severity of patient during the 18-month study.
10. Vertigo handicap questionnaire (VHQ): A score of 75% was obtained during baseline assessment.

11. The Sinha's comprehensive anxiety test (SCAT) Obtained score was 28 suggestive of moderate to severe anxiety

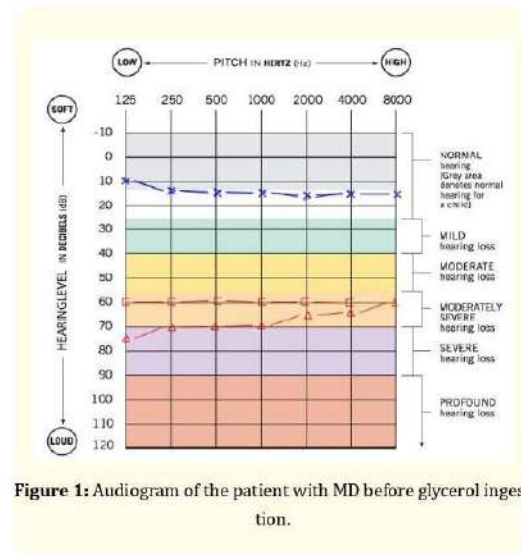


Figure 1: Audiogram of the patient with MD before glycerol ingestion.

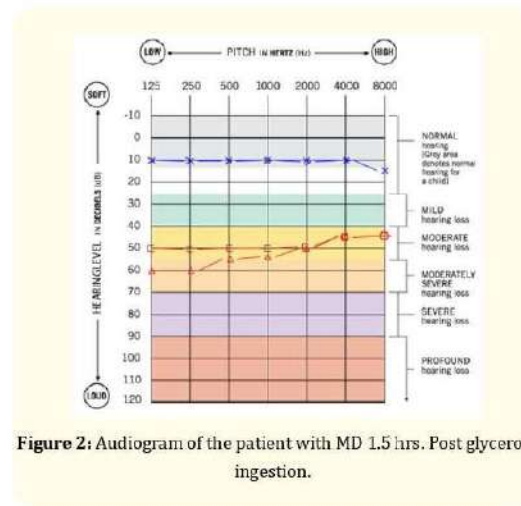


Figure 2: Audiogram of the patient with MD 1.5 hrs. Post glycerol ingestion.

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PTA Thresholds		125Hz	250Hz	500 Hz	1KHz	2KHz	4KHz	8KHz	SDS
Baseline	Lt	10dBHL	15dBHL	15dBHL	15dBHL	15dBHL	15dBHL	15dBHL	90%
	Rt	75dBHL	70dBHL	70dBHL	70dBHL	65dBHL	65dBHL	60dBHL	30%
1.5hrs. Post glycerol ingestion	Lt	10dBHL	10dBHL	10dBHL	10dBHL	10dBHL	10dBHL	15dBHL	95%
	Rt	60dBHL	60dBHL	55dBHL	55dBHL	50dBHL	45dBHL	45dBHL	50%

Table 1: Glycerol test.

Multimodal intervention of MD

- Medication as a symptomatic treatment:** Medication was used to relieve symptoms such as nausea, vomiting and vertigo, but also to prevent further attacks of MD. The anti-vertiginous drugs were prescribed by the ENT.
- Dietary modification:** Low Salt Diet and Diuretics were recommended to the patient. According to Schessel, *et al.* 1998, Diuretics, anti-vertiginous, antiemetics, sedatives, antidepressants, or herbal medicines may be used to treat allergies, reduce fluid retention, or enhance blood circulation in the inner ear, alleviating the patient's symptoms.
- Dietary changes:** The patient was recommended to eliminate caffeine, alcohol, refined sugars and salt which may help to reduce the frequency and intensity of symptoms. Dietary changes and modifications have proven successful in controlling vertigo.
- Behavioural therapy:** Therapy helping to reduce stress may lessen the severity of the disease symptoms. Counselling forms an important part of treatment in the patient with MD. Medical professionals involved in the treatment of these patients (general practitioners, neurologists, ENTs, psychologists and audiologists) should attempt to break the vicious circle of stress. Such a process started by allocating the necessary time to listen to the patient's complaints, examining the patient's hearing and balance function thoroughly, and explaining to the patient the exact nature of MD. The natural history of the disease was discussed with the patient and their family.
- Jacobson's progressive muscle relaxation:** Progressive muscle relaxation (PMR) is a deep relaxation technique that has been shown to be beneficial in reducing stress and anxiety, as well as relieving insomnia. It is based on the simple principle of tensing (tightening) one muscle group at a time, then relaxing and releasing the tension. PMR is also an excellent tool to help learn about the body and the signals it may be telling you. With practice and time, patient can learn to accurately identify and diminish the signs and signals of stress and tension in your body. This technique was recommended to the patient once a day.
- Hearing rehabilitation:** Hearing rehabilitation with the use of hearing aids forms an important part of the treatment of a patient with MD. Widex Unique 330 Fusion, which is a receiver in the ear canal style of hearing aid was prescribed with acclimatization function active (Acclimatization function initially provides a lower level of gain in comparison to actual target gain required as per the initial programming, then automatically the gain is increased to next level after a certain period of time, which is set during programming, so that the patient can get acclimatized to the extra gain gradually, which is very helpful in fluctuating hearing loss. Finally, the target gain is achieved and given automatically after a fixed period of time eliminating the need for reprogramming the hearing aid again and again), Zen program was active so as to continue the tinnitus retraining therapy. The role of the audiologist becomes that of assessing the handicapping effects of hearing impairment in terms of communicative efficiency and evaluating the success of aural rehabilitative procedures in reducing these handicapping effects. The purpose of rehabilitative intervention is to maximize the reception of speech, reduce the impact of psychosocial factors and imparting information about hearing loss, use of hearing aids and communications strategies. When it comes to fitting hearing aids for people who have been diagnosed with MD, there are some main challenges that professionals face. The crucial challenge is the presence of a fluctuating hearing loss (Barber, 1983). Therefore, Follow-up audiograms were recorded. As the hearing loss stabilized in course of 4 months, a hearing aid was fitted successfully. Due to decreased dynamic area for comfortable speech and SD ability was affected with the narrowed dynamic range of sound tolerance, proper testing was done along with counselling these problems. The use of hearing aids also showed the advantage of reducing the inconvenience of tinnitus.

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7. **Yogic rehabilitation for Meniere's disease:** Since yoga helps in increasing the body's overall balance it is also a recommended alternative treatment for ear problems like Meniere's disease. Yoga not only stimulates the neural system, but it also strengthens the labyrinth, commonly known as the inner ear, which is in charge of controlling the body's sense of balance. Certain yoga asanas aid in the smooth and steady movement of fluid through the inner ear canals, which helps to activate the ear's sensors. Malasana (Garland posture) and Ardha Matsyendrasana (Half spinal twist) are two of the most recommended yoga asanas for Meniere's disease. These asanas are highly efficient at restoring inner ear balance. The patient was recommended to stay in this position for at least 30 - 60 seconds.

Results

The emotional climate was found to have been less cooperative in the family of the patient. Relations between parents were bad more often. Psychic stresses were found also to intensify the symptoms (tinnitus, vertigo and nausea). On the basis of the results, it can be stated that psychological stress resulted from the disease symptoms and may play a role in their precipitation.

While depression is rarely fully addressed in the initial evaluation of otologic symptoms, our results support further investigation and management of the individuals with MD. Psychological assessment, consultation, and the use of antidepressant medications was proved beneficial to the overall wellbeing of the patient and provide an adjunctive treatment for Meniere's disease.

Some noteworthy observation during initial stages were as follows: Re-experiencing Distress/Impairment in social, occupational or other areas of functioning, Intense fear, helplessness, horror Arousal causing sleeping problems, Arousal causing irritability, concentration difficulties, hypervigilance, Avoidance behavior, reduced interest/participation in activities, feeling detached from others, Sense of foreshortened future etc.

Our results showed that pharmacological treatment, Dietary change and modification helped in symptomatic intervention, Audio-vestibular Rehabilitation played a major role in taking care of Hearing Loss and Tinnitus with the help of accurate prescription of hearing aids with fine tuning according to the need of the patient significantly improving vertigo and hearing ability in patients, Yogic Rehabilitation with psychological counselling played a major role in patient's life in maintaining positive attitude in life along with healthy habits and schedule.

Discussion

Physicians treating patients with Meniere's disease are struck by the magnitude of the psychological effect that the disease has on those who are afflicted [3]. Only Objective measures including Videonystagmography, Audiometry, or electrocochleography may have been used to assess the effectiveness of a particular intervention for Meniere's disease.

The extreme variability in the symptoms of Meniere's disease coupled with patient variables such as coping skills, family support and vocational requirements may cause a tolerable amount of vertigo in one patient to become disabling in another patient. This effect is best measured through QoL measures.

The functionality levels assessed by the general questionnaires on QOL are helpful but do not go far enough at assessing the life impact of the disease. The functionality levels require generalization with regard to activity levels, necessity of changing planned activities, and disability status over a period of time [5]. A single vertigo spell may be disabling for an airline pilot but may have less life impact for a pilot who has already retired. Even the most steadfast patient experiences emotional tiredness and intolerance as the episodes become more frequent.

The gold standard for assessing the success or failure of a treatment for Meniere's disease is the frequency and severity of vertigo as recorded on a daily symptom report card. The frequency and severity of vertigo spells are associated to tinnitus, HL, auditory fullness, and QoL. Evaluating the basis for the interrelationship between a patient's vestibular and psychiatric symptoms and providing the patient with an adequate explanation for their MD is a cornerstone in managing such patients. Furthermore, prompt vestibular rehabilitation therapy appears to be critical in managing individuals who report with both dizziness and anxiety [6]. Better management of the psychological problems of people with MD has the potential to improve quality of life when physical symptoms cannot be controlled, and to prevent the development of psychological disorders [7]. Reducing psychological distress may also help to relieve physical symptoms, since there is evidence that anxiety and avoidance behavior may augment and prolong vestibular-related symptoms.

Conclusion

Physicians should consider multimodal treatment strategies for Meniere's disease patients. In light of the results from this case

study, there are two points that we should keep in mind when we treat patients with Meniere's disease. First, we should assess the patient with Meniere's Disease in a Multi-disciplinary approach having teamwork and regular meetings to discuss progress.

Secondly, we should consider various treatment strategies ranging from drug administration to Yogic Rehabilitation, before Meniere's patients with a long duration of disease develop mental illness.

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Conflict of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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