

“PREVALENCE OF FALL RISK AND VESTIBULAR DYSFUNCTION IN MALE VETERAN WRESTLERS WITH CAULIFLOWER EAR USING THE DYNAMIC GAIT INDEX AND DIX HALLPIKE TEST.”

A Randomised control trial

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Abstract:

Background: Wrestling is a combat sport involving grappling type techniques such as clinch fighting, throws and takedowns, joint locks, pins and other holds. Wrestling bout is a physical competition between two competitors to attempt to gain and maintain superior position. When these wrestlers retire there are wide range of changes which take place concerning joint pain and balance which are inevitable because of their rigorous training schedule and activity. Balance is fundamental in any sport, especially in combat sports. Although balance can improve with practice, it is highly affected by vestibular disorders. One of the most evident structural change taking place in the wrestlers is the cauliflower ear, which is an acquired deformity of the outer ear caused by blunt trauma or grappling techniques used in the sport. It is an irreversible condition that occurs when the external portion of the ear is hit continuously and develops a blood clot or other collection of fluid under the perichondrium. A fibrous tissue is formed overlying the skin, which results in the outer ear becoming swollen and deformed, resembling a cauliflower.^{8} This acquired deformity can cause long term functional complications in hearing which may further lead to hearing loss or impairment. It is an irreversible condition that occurs when the external portion of the ear is hit continuously and develops a blood clot, this can lead permanent or temporary hearing loss. Apart from the affection of hearing, there are many changes in the musculoskeletal system taking place after the wrestler retires such knee pain and chronic low back pain. Thus, all these factors cumulatively affect the person's balance and resulting in the increased fall risk.

Methodology: A Randomised control trial was done in which 60 wrestlers in the age group 40- 70 years having cauliflower ear in Pune were recruited for this study and were selected by Random sampling method. Wrestlers having recent fractures, surgeries and females were excluded from the study. Consent was taken from the subjects for participation. Balance was analysed using dynamic gait index and vestibular dysfunction was analysed by dix hallpike test. Data was collected, a statistical analysis was performed and results were obtained.

Results: The study was conducted on 68 participants. Results: As a whole and also by dividing the population into subgroups according to age. For the balance, 27 participants showed positive for increased fall risk. In the subgroups, 40-50 years 8% , in 51-60 years 34% whereas in 61-70 years 58% showed increased fall risk. For vestibular dysfunction, out of 60 , 13 were positive for the vestibular dysfunction. In the subgroups analysis, in 40-50 years 8%, 51-60 years 15%, whereas 61-70 years 77% showed positive results.

Conclusion: The study shows that clinically there is a prevalence of fall risk and vestibular dysfunction using dynamic gait index and dix hall pike test but, statistically it does not show prevalence for fall risk and vestibular dysfunction.

Keywords- Wrestlers, Cauliflower ear, Balance impairment, Vestibular dysfunction, Dynamic gait index, Dix hallpike test.

INTRODUCTION:

Wrestling is a combat sport involving grappling type techniques such as clinch fighting, throws and takedowns, joint locks, pins and other holds.^{1} A wrestling bout is a physical competition between two competitors to attempt to gain and maintain superior position.^{1} Combining raw power with agility and technique to create a fascinating spectacle, wrestling as a sport, has grown in popularity in India over the past decade or so.^{2} When these wrestlers retire there are wide range of changes which take place concerning joint pain and balance which are inevitable because of their rigorous training schedule and activity. Balance is fundamental in any sport, especially in combat sports. Although balance can improve with practice, it is highly affected by vestibular disorders.^{3}

One of the most evident structural change taking place in the wrestlers is the cauliflower ear, which is an acquired deformity of the outer ear caused by blunt trauma or grappling techniques used in the sport.^{{4}{8}{9}} It is an irreversible condition that occurs when

the external portion of the ear is hit continuously and develops a blood clot or other collection of fluid under the perichondrium.^{4} A fibrous tissue is formed overlying the skin, which results in the outer ear becoming swollen and deformed, resembling a cauliflower.^{8} This acquired deformity can cause long term functional complications in hearing which may further lead to hearing loss or impairment.^{{5}{8}{9}}



Apart from the affection of hearing, there are many changes in the musculoskeletal system taking place after the wrestler retires. Exercise is critical to health and well-being of skeletal tissues. The natural pull of the contracting muscles is what maintains the bone's mineral density.^{4} Inactivity robs the bone of the critical stimulus for the osteoblastic activity. This leads to early degeneration of the bone compared to other adults.^{4} Collagen tissue, a connective tissue which is responsible for attaching the muscle to the bone and the connective tissue within and around the muscles. Number of collagen crosslinks also increases with age which in turn results in decreased range of motion and stiffness. Along with this the wrestlers are predominantly affected by chronic low back pain and knee pain.^{7} Thus, all these factors cumulatively affect the person's balance and resulting in the increased fall risk.

NEED OF STUDY

The veteran wrestlers are vulnerable to hearing loss due to acquired cauliflower deformity, along with-it other factors acting against them are chronic low back pain and knee pain, reduced strength, reduced endurance, reduced torque, increased body weight and early osteoarthritic changes. These changes are pre-requisites for impairment in balance (static and dynamic), thus increasing the risk of fall among the veteran wrestlers. A study on vestibular dysfunction in wrestlers with cauliflower ear could provide valuable information on the long -term effects of repeated trauma on balance proprioception. The vestibular system which plays a major role in maintaining balance, spatial orientation and postural control ^{{1}{14}}. Wrestling is a sport that involves repeated impacts to the head and body, which may increase the risk vestibular dysfunction in wrestlers ^{{2}{3}}. The effect of all these factors on the risk fall in the veteran wrestlers is still a fertile area for research. This study will help in finding out the veteran wrestler's fall risk and vestibular dysfunction, thus will be helpful in planning intervention which will help in reducing the fall risk in these veterans.

AIM OF STUDY

The aim of the study is to investigate the prevalence of fall risk using dynamic gait index and vestibular dysfunction using dix hall pike test in veteran wrestlers.

OBJECTIVES

1. To assess fall risk using the dynamic gait index
2. To assess the vestibular dysfunction using the dix hall pike test.

METHODOLOGY

Type of study: Observational
 Sample method: Simple random sampling
 Sample size: 63 veteran wrestlers with cauliflower ear
 Study area: Pune
 Study duration: 6 months

MATERIALS USED

Couch
 Dynamic Gait Index Questionnaire
 Pen
 Recording sheet

INCLUSION CRITERIA

Male Wrestlers
Age Group of 40 – 70 years
Group 1: aged 41 -50 years
Group 2: aged 51- 60 years
Group 3: aged 61 -70 years
Mud Field Wrestlers
Wrestlers With Cauliflower Ear

EXCLUSION CRITERIA

Females
Recent Surgery
Recent Fracture
Chronic Progressive Diseases
Spine Fractures

OUTCOME MEASURES

1. Dynamic gait index for fall risk assessment ^{6}
2. Dix hall pike test for vestibular dysfunction ^{7}

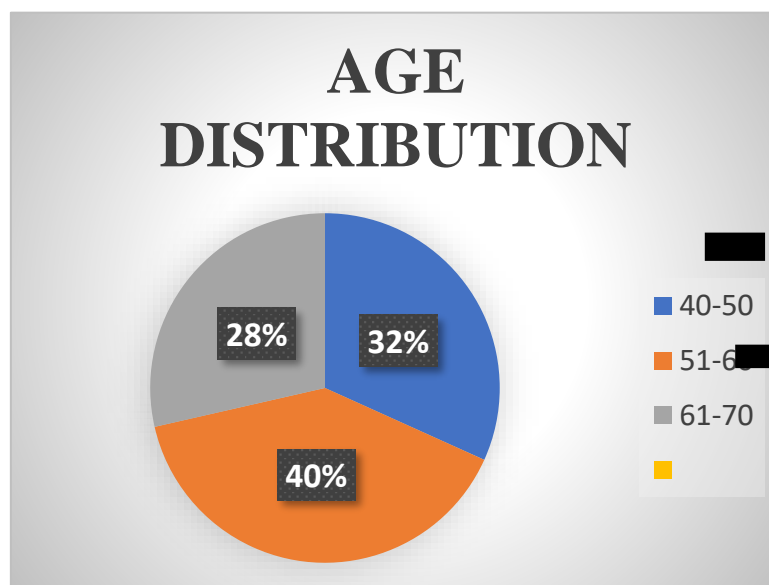
PROCEDURE

Ethical committee clearance was obtained and permission was taken from the department. Written consent was taken from the subjects who fulfill the inclusion criteria and who were willing to volunteer to participate. After filling the form, the participant's demographic data was taken. Dynamic gait index was done for checking the dynamic balance, the scores for which will be noted. For assessing the vestibular impairment, the Dix Hallpike test was done. The data and analysis were done after the tests were done. The results were analyzed and documented according to age groups

Group 1: aged 41 to 50

Group 2: aged 51 to 60

Group 3: aged 61 to 70

DATA ANALYSIS AND RESULTS

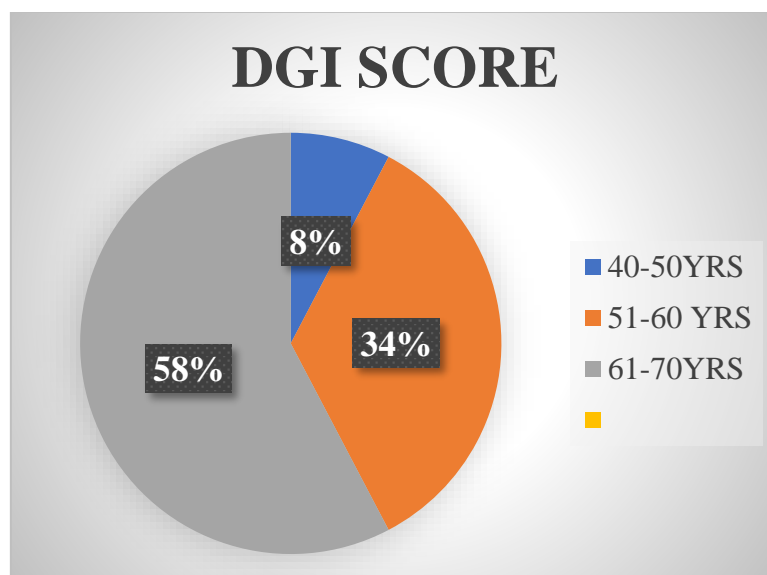
GRAPH NO 1

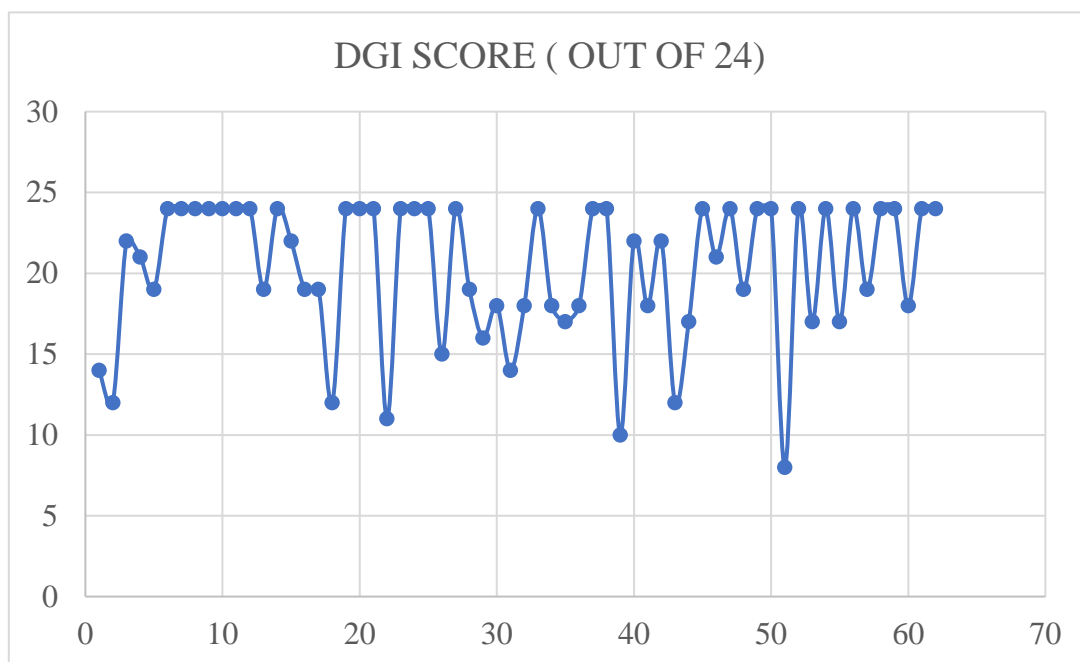
Age distribution of participants

AGE GROUP	DISTRIBUTION
40-50 YRS	20(32%)
51-60 YRS	25(40%)
61-70 YRS	18(28%)

TABLE NO 1

Interpretation: graph1 show the age distribution of participants included in the study. The graph shows that in the age group 40-50 years there were 20 participants (32%). In the age group 51-60 years there were 25 participants (40%) whereas in the age group 61-70 years there were 18 participants (28%).





GRAPH NO 2

GRAPH NO 3

AGE GROUP	DGI SCORE OF 19 OR BELOW
40-50 YRS	8%
51-60 YRS	34%
61-70 YRS	58%

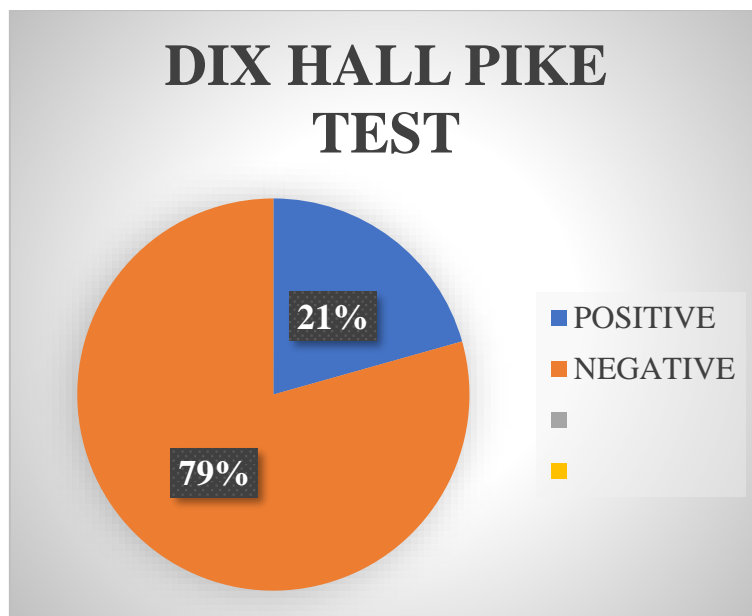
TABLE NO 2

Interpretation: the graph no 2 shows the results for dynamic gait index which shows that the age group 40-50 years shows 8% of participants having fall risk, in the age group 51-60 years age group 34% are having fall risk and in the age group 61-70 years age group 58% are having fall risk.

DGI SCORE OF 19 OR BELOW	DGI SCORE ABOVE 19
27 PARTICIPANTS 42.8%	36 PARTICIPANTS 57.2%

TABLE NO. 3

INTERPRETATION: This graph represents DGI scoring of participants in this study wherein 42.8% showed positive results and 57.2% were not at risk at increased fall risk.

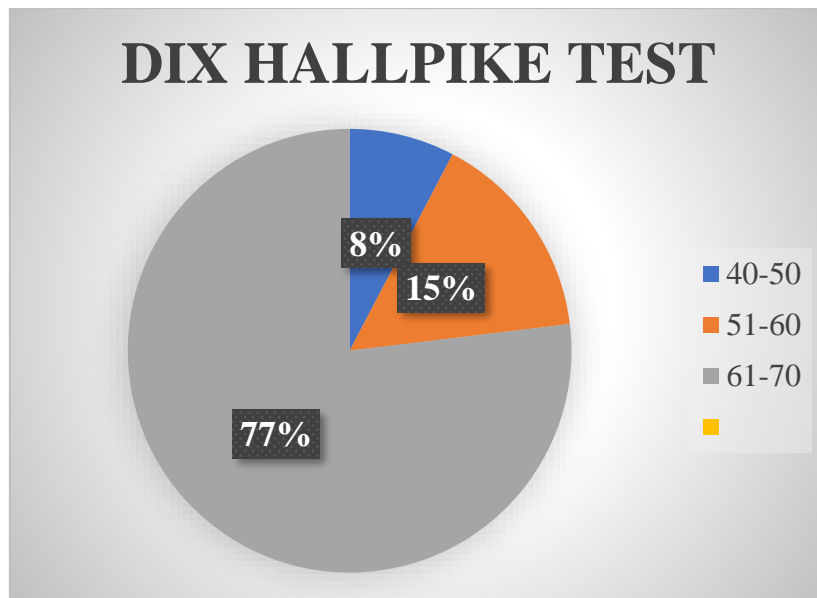


GRAPH NO 4

DIX HALLPIKE TEST +VE	DIX HALLPIKE TEST -VE
20.6% (13)	79%(50)

TABLE NO 4

INTERPRETATION: The graph no 4 represents the results for dix hallpIke test wherein 20.6% having positive test and 79% having negative test results.



GRAPH NO 5

AGE GROUP	DIX HALLPIKE TEST (+VE)
40-50 YRS	1 (8%)
51-60 YRS	2 (15%)
61-70 YRS	10 (77%)

TABLE NO. 5

INTERPRETATION: the graph represents results of Dix Hallpike test according to age groups wherein 40-50 yrs. show 8%, 51-60 shows 15% and 61-70 showing 77% positive results for test.

DISCUSSION

The study aimed to determine the prevalence of fall risk which checks the dynamic balance of person using the dynamic gait index and the vestibular dysfunction by performing dix hall-pike test. The population selected for the study was according to the inclusion and exclusion criteria. The population was 63 participants having cauliflower ear amongst which 20 were between 40 -50 years of age , 25 were 51-60 years of age and 18 were between 61-70 years of age .The prevalence of increased fall risk was analyzed by using dynamic gait index⁽¹⁵⁾⁽¹⁶⁾. The results were grouped into 3 subgroups according to age as the results obtained may vary with respect to age due degenerative changes occurring with advancing age. So, dividing the sample would help us analyze data better. For analyzing the balance, dynamic gait index was used which is scored out 24 wherein the score of 19 or below is considered as a risk for fall. In the age group 40-50 years, 8 % population showed increased fall risk. Whereas in the age group 51-60, 34% showed increased fall risk.

The group 61-70 showed 58% showed fall risk .The overall data collected showed 42.8% population prevalent to increased fall risk whereas 57.2% were not prone to increased fall risk. The age group 61-70 showed significantly increased fall risk as along with cauliflower deformity, impairment of balance can be attributed to age related degenerative changes.⁽⁶⁾The positive prevalence of fall risk can be attributed to the study that postural stability which is related to hearing organ’s correct functioning. Apart from this inactivity robs the patient of the muscle mass and decreased bone density which in inevitably affects the balance. Vestibular dysfunction is assessed here by performing the dix hall-pike test. The population showed 20.6 % of total population prevalent to vestibular dysfunction. Among the groups, 61-70 years age group showed 70% participants with vestibular dysfunction, whereas 51-60 years age group showed 15% participants positive for test and for 40-50 years age group 8% were positive for vestibular dysfunction. In cauliflower the external ear is damaged who’s main function is transforming and augmenting acoustic signals which may be the reason for prevalence of vestibular dysfunction.⁽¹⁴⁾This prevalence was also apparent as cauliflower ear may cause complications such as disruption of normal hearing mechanism of wax transport from the ear canal and increased risk of otitis externa which can subsequently lead to vestibular problems.⁽³⁾

There was a similar study done on the hearing levels and balance affection in Iran wherein it was found that the wrestlers with cauliflower ear have affected hearing levels and balance. This study will help us further analyse the results in the Indian and Iranian wrestlers. There are considerable differences as well as similarities seen in the playing conditions of India and Iran. In terms of styles practised, Indian wrestling (kushti) and Iranian wrestling (zurkhaneh) both prioritise grappling and submission holds, with heavy influence on physical strength and endurance. However, there are some differences such as Indian wrestling is mostly done on mud or dirt surface whereas Iranian wrestling is done on mat. Apart from this wrestling is a national sport in Iran so a significant amount of money is allocated for the facilities, equipments, and resources.

The negative prevalence can be attributed to the difference in the degree of cauliflower ear deformity wherein the participants having complete occlusion may have more affection in degree of vestibular affection as compared to those having minimal deformity.

CONCLUSION

The study shows that clinically there is a prevalence of fall risk and vestibular dysfunction using dynamic gait index and dix hall pike test but, statistically it does not show prevalence for fall risk and vestibular dysfunction.

LIMITATIONS OF THE STUDY

1. Area selected of the population was small.
1. Co-morbid conditions like age related degenerative changes were not considered.
2. Parameter such as DGI is not sufficient for indication of fall risk.

CLINICAL IMPLICATIONS AND FUTURE SCOPE OF STUDY

- This can help in preventing further worsening of balance issues by starting balance training early on.^{{11}{12}}
- Highlighting the importance of use of headgears for protection.^{12}
- Awareness about immediate treatment of ear after injury^{{18}{19}}.
- Study can be done on younger population between age group 25 to 45 to eliminate the chance of age-related changes.

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