Science Arena Publications
Specialty Journal of Sport Sciences
ISSN: 2521-3156
Available online at www.sciarena.com
2018, Vol, 3 (1): 1-8

The Effect of Cauliflower Ears on Hearing Levels and Balance of the Wrestlers

R. Sharifatpour[1*], N. Rahnama[2], H. Ebadi Asl[3], H. Abbasi[4]

[1*]Ph.D. Student in Physical Education and Sport Sciences, Faculty of Sport Injury and Corrective Exercise, University of Tehran, Tehran, Iran.
[2]Professor, Department of Physical Education and Sport Sciences, Faculty of Sport Injury and Corrective Exercise, Esfahan University, Esfahan, Iran.
[3]M. Sc in Exercise Physiology, Department of physical education and sport sciences, University of Science and Arts of Yazd, Yazd, Iran.
[4]Assistant Professor, Department of physical education and sport sciences, Yazd University, Yazd, Iran.
***Corresponding Author**

Abstract: *Background: Cauliflower ear is one of the most common injuries that occur during training and competition wrestling. In the upper extremity injuries, more common among wrestlers have cauliflower ear and due to the possible effects on hearing ear fracture, the aim of this study was to evaluate the effect on hearing the wrestlers had cauliflower ears. Methods: Sixty professional wrestlers in Yazd province participated in this study. (The mean and standard deviation of age: 23.8 ± 2.2 years, height: 174 ± 5.8 cm, weighs: 69.3 ± 5.7 kg). Wrestlers did not have any record of such surgery and ear diseases. The samples were divided into three groups, 20 subjects had one cauliflower ear, and 20 subjects had both cauliflower ears and 20 subjects with healthy ears as control group. Hearing of the subjects was measured using audiometry test. Results: Results showed that the hearing level in one cauliflower ear wrestlers were 26.88 ± 4.22 dB, Wrestlers with cauliflower in both ears 28.83 ± 3.09 dB, while in control with healthy ear hearing was 2.42 ± 2.77 dB. The hearing in the cauliflower ears is significantly lower than healthy control group. Subjects with both cauliflower ears had more hearing lose than wrestlers with one cauliflower ear. It was more hearing loss in the higher frequencies, by increasing the frequency of hearing loss was increased. In statistic balance the subjects with CF ear/s had significant worse balance and in dynamic balance subjects with CF ear/s had less balance than peer groups ($P < 0.001$). Subjects with both CF ears had worse balance record especially in non-dominant leg ($P < 0.001$). Conclusion: The team's coaches and trainer should notice to these issues and also should revise the rules and using protection equipments for preventing this injury in wrestlers.*

Keywords: *Cauliflower Ear, Hearing, Wrestler, Balance*

INTRODUCTION

Wrestling is the national sport of Iran and it remains quite popular in this country. According to the National Wrestling Federation of Iran 232068 wrestlers were training wrestling in Iran in 2005 (NFSMI, 2005).

To our knowledge, there is no published data on the balance and hearing problems of wrestlers in Iran. In addition, data on health problems of wrestlers in other countries, except the United States of America, are scarce. There are a few studies about hearing but nothing in balance or balance and hearing in wrestlers. Investigation of sports medicine problems of wrestlers in Iran could be beneficial for the prevention of these problems among wrestlers both in Iran and internationally. A review of the literature has suggested that skin

infection has been a major health problem among wrestlers in the US which can cause a significant disruption of sporting activity in this group of athletes (Adams 2000; 2002; Lillegard et al., 1997; NCAA, 2003). Anecdotal data in Iran suggest that cauliflower ear is common among wrestlers in Iran and it can cause hearing loss.

Hearing loss associated with the cauliflower ear deformity:

The external ear consists of the pinna (auricle) and the external auditory canal. Its function is thought to be mainly protective, although its physical configuration may provide moderate passive augmentation of sounds (Yueh et al., 2003, Ballachanda, 1997). Complete occlusion of the ear canal dose cause conductive hearing loss (Isaacson and Vora, 2003). In some severe cauliflower ear cases, the deformity does extend to the external auditory canal (Yotsuyanagi et al., 2002) which might lead to obstruction in the external ear and cause hearing loss. Also cauliflower ear may cause functional complications, such as disruption of the normal mechanism of wax transport from the ear canal, and an increased risk of otitis externa (Macdonald et al. 2005). These complications might subsequently lead to hearing loss. Kordi et al., 2007 reported, Of the 15 to 35 years old men in Tehran province 1.4% had a perforated tympanic membrane and 1.4% had an infected discharge from their ears (MHME, 1992). These complications might have important roles in hearing loss in wrestlers in Tehran and require further investigation.

It is reported that 39% of high school wrestlers in US had a cauliflower ear (Schuller et al., 1989). According to the high school and collegiate wrestling rules in the USA, "a protective ear guard must be worn anytime wrestling takes place" (this includes both practice and competitions) (NCAA, 2005). Headgear may provide partial protection for ear injuries (Schuller et al., 1989). According to the international wrestling regulation, ear protectors are not obligatory for wrestlers except for cadet and junior women wrestlers (FILA, 2005). In Iran, wrestlers do not wear ear protectors. Wrestling has been a symbol of power and virility for the people in a number of countries such as Iran (FILA, 2003). Therefore, wrestlers refuse to treat their ear hematoma in order to develop a cauliflower ear (Reid, 1992). Cauliflower ear should be common among wrestlers in the Asian countries such as Iran not only because the wrestlers in these regions do not wear ear protectors but also because some wresters might refuse to have their ear hematoma treated. To our knowledge, there is no published data on the prevalence of cauliflower ear in these regions.

Balance and cauliflower

According to the scientific reports the postural stability is inseparably associated with hearing organ's correct functioning (Walicka-Cupryś et al. 2014).

The aim of the study was to evaluate the hearing loss of wrestlers with one or two cauliflower ears and balance reactions in this group to compare to their healthy peers.

Methods

Subjects.

Sixty wrestler age range 19-27 years old, in three groups, one ear cauliflower (n =20), both ears cauliflower (n = 20) and control group with healthy ears (n =20). Other characteristics of the subjects mention in Table 1.

Table 1. Characteristics of subjects (n = 60)

	Mean	SD
Age	23.8	2.2
Height (cm)	174.0	5.8
Weight (Kg)	69.3	5.7
Wrestling history (yr)	7.6	3

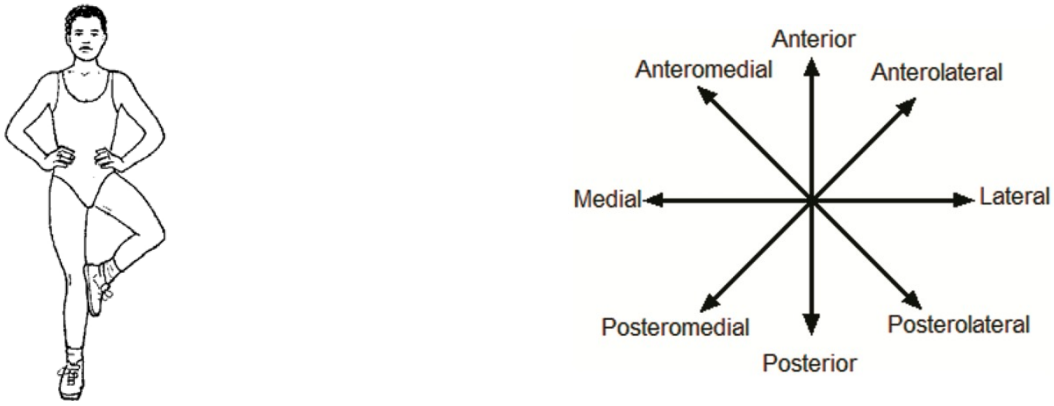
Procedure.

Firstly, hearing levels of subjects were measured in Shahid Sadoghi Hospital with audiometer (Intra Acoustic AC60, Denmark) at frequencies 250 KH, 500 KH, 1000 KH, 2000 KH, 4000 KH and 8000 KH respectively in acoustically treated sound proof room by an experienced audiologist. Then in other days, static and dynamic balances assessed in the gym.

Static and dynamic balance tests.

We achieved static balance conditions by asking subjects to stand on one leg (single-limb stance). The no supporting limb was flexed at the knee, with the foot's plantar surface stabilized on the knee of the supporting leg ("stork" balance). (Figure 1(A))

For assessment of dynamic balance, subjects performed multidirectional maximal single-leg reaches from a unilateral base of support (Star Excursion Balance Test). (Figure 1(B))



(A) (B)

Figure 1. (A) Static balance (stork test); (B) Top view of Star Excursion Balance Test grid. The grid displays directional terms for right leg dominance. Directional terms were mirrored for left leg dominance, and poses represent techniques for posterior and lateral directions

Results

Hearing.

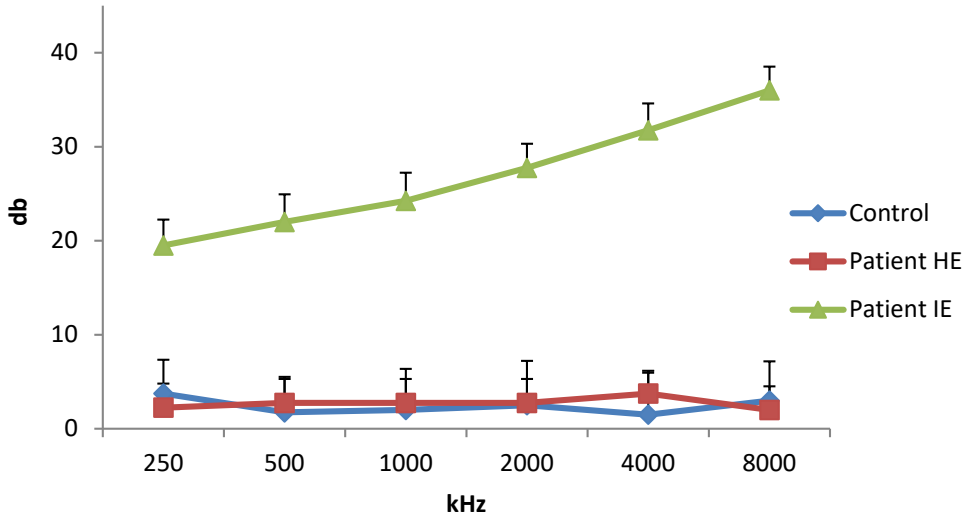


Figure 2. Hearing levels of control group and cauliflower group healthy ear and impairment ear

There were significant different on hearing of healthy ear and impairment ear in subjects with one ear cauliflower (t_{19} = 31.5, P < 0.001) but their healthy ear was not differ from control group. (Fig. 2)

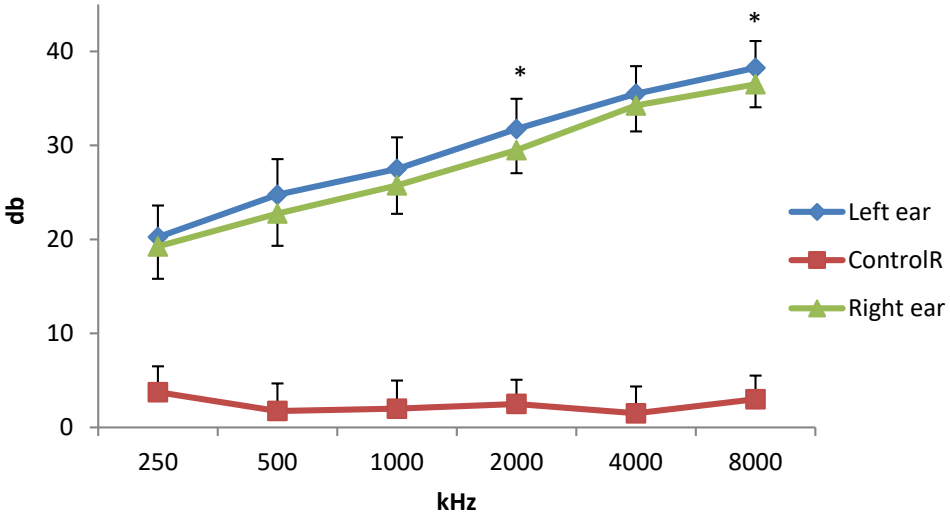


Figure 3. Hearing levels of control group and the group with both ears cauliflower

There were significant different on hearing of subjects with both ears cauliflower and control group (t_{19} = 31.5, P < 0.001). There was no different between two cauliflower ears. (Fig. 3)

Static balance.

Static balance with close eyes:

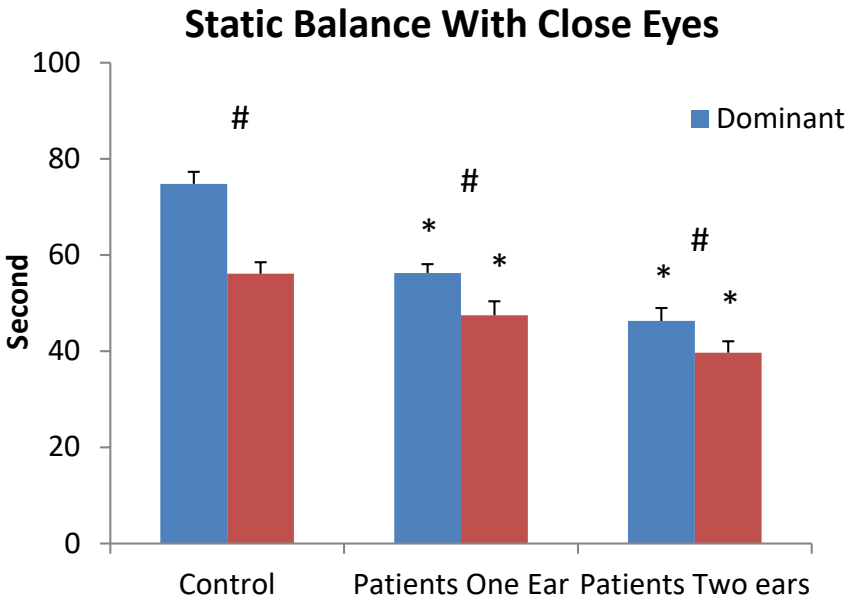


Figure 4. Static balance with closed eyes in dominant and non-dominant leg of healthy control group and patients with one and two Cauliflower ear.

*significant difference with control group

#significant difference between dominant and non-dominant leg

There were significant different between dominant and non-dominant leg in static balance with close eyes in all groups. In control group, static balance was significantly (t_{19} = 31.5, P < 0.001) longer in dominant leg (74.81 ± 2.0s) than non-dominant leg (56.12 ± 2.0s).
In subjects with one ear cauliflower static balance with closed eyes was also significantly (t_{19} = 20.3, P < 0.001) longer in dominant leg (56.26 ± 2.39s) than non-dominant leg (47.47 ± 2.92s).
And in subjects with two ears cauliflower static balance with closed eyes was also significantly (t_{19} = 15.8, P < 0.001) longer in dominant leg (46.31 ± 2.70s) than non-dominant leg (39.70 ± 2.38s).
Group differences: One-way ANOVA showed there were significant differences between the groups on dominant ($F_{2, 57}$ = 740.94, P < 0.001) and non-dominant legs ($F_{2, 57}$ = 203.30, P < 0.001).
In pairwise comparison for Post-hoc by using LSD, on dominant leg there was significant difference between control group and patients with one cauliflower ear (P < 0.001), and control group and patients with two cauliflower ear (P < 0.001), also between patients with one and two cauliflower ear (P < 0.001).
On non-dominant leg, there was significant difference between control group and patients with one cauliflower ear (P < 0.001), and control group and patients with two cauliflower ear (P < 0.001), also between patients with one and two cauliflower ear (P < 0.001).

Static balance with open eyes:

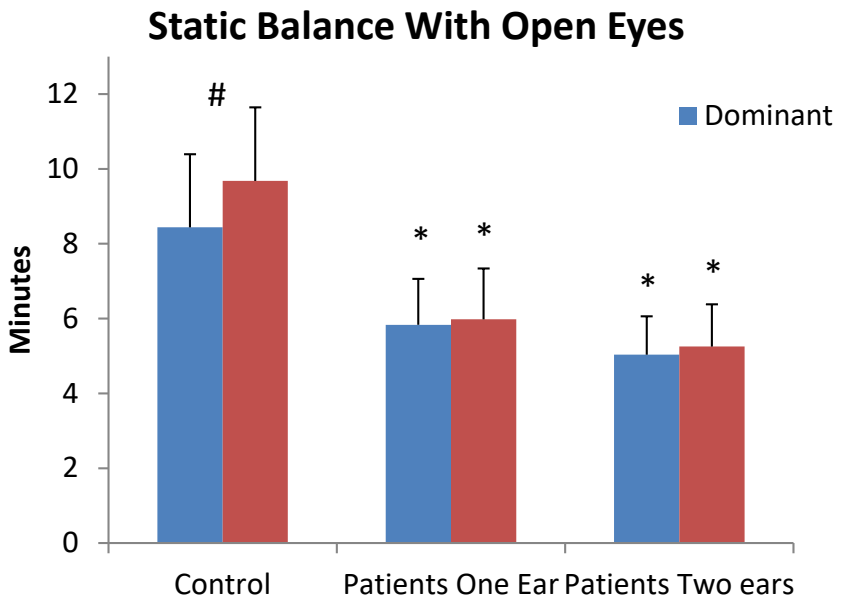


Figure 5. Static balance with opened eyes in dominant and non-dominant leg of healthy control group and patients with one and two Cauliflower ear.
*significant difference with control group
#significant difference between dominant and non-dominant leg

In control group, static balance with open eyes was significantly (t19 = 11.43, P < 0.001) shorter in dominant leg (8.44 ± 1.95min) than non-dominant leg (9.68 ± 2.0min).
Group differences: One-way ANOVA showed there were significant differences between the groups on dominant ($F_{2, 57}$ = 29.80, P < 0.001) and non-dominant legs ($F_{2, 57}$ = 48.39, P < 0.001).
In pairwise comparison for Post-hoc by using LSD, on dominant leg there was significant difference between control group and patients with one cauliflower ear (P < 0.001), and control group and patients with two cauliflower ear (P < 0.001), but between patients with one and two cauliflower ear it was border line not significant (P = 0.089).

On non-dominant leg, there was significant difference between control group and patients with one cauliflower ear ($P < 0.001$), and control group and patients with two cauliflower ear ($P < 0.001$), but between patients with one and two cauliflower ear it was not significant ($P = 0.3$).

Dynamic balance.

We used all of the 8 direction together as dynamic balance. As the graph (Fig. 6) show dynamic balance was lower in subjects with cauliflower ears.

There were significant different between dominant and non-dominant leg in dynamic balance in all groups. In control group, dynamic balance was significantly ($t_{19} = 8.63$, $P < 0.001$) longer in dominant leg (100.69 ± 1.80 cm) than non-dominant leg (98.77 ± 1.66 cm).

In subjects with one ear cauliflower dynamic balance was borderline nonsignificant ($t_{19} = 2.01$, $P = 0.059$) longer in dominant leg (98.49 ± 1.30 cm) than non-dominant leg (98.81 ± 1.18 cm).

And in subjects with two ears cauliflower static balance with closed eyes was also significantly ($t_{19} = 3.93$, $P = 0.001$) longer in dominant leg (97.51 ± 0.71 cm) than non-dominant leg (96.78 ± 0.94 cm).

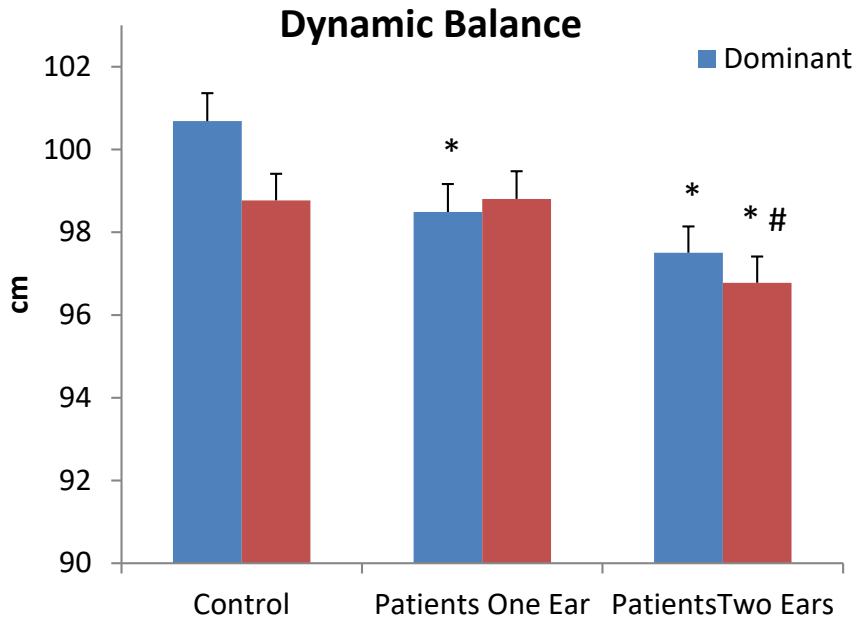


Figure 6. Dynamic balance in dominant and non-dominant leg of healthy control group and control with one and two Cauliflower ear.
*significant difference with control group
#significant difference with one CF ear group

In dynamic balance, one-way ANOVA showed there were significant differences between the groups on dominant ($F_{2, 477} = 6.06$, $P = 0.003$) and non-dominant legs ($F_{2, 477} = 3.20$, $P = 0.042$).

In pairwise comparison for Post-hoc by using LSD, on dominant leg there was significant difference between control group and patients with one cauliflower ear ($P = 0.019$), and control group and patients with two cauliflower ear ($P = 0.001$), but between patients with one and two cauliflower ear it was not significant ($P = 0.3$).

On non-dominant leg between control group and patients with one cauliflower ear there was not significant difference ($P = 0. 9$), but control group and patients with two cauliflower ear ($P = 0.030$), and between patients with one and two cauliflower ear also was significant deference ($P = 0.028$).

Discussion

Hearing.

Hearing level, dynamic and static balances were studied among in total 60 wrestlers with one or two cauliflower ears and compare with healthy wrestlers. Hearing level in both groups of subjects with cauliflowers ears were significantly lower than control group. In terms of balances, static balance was performed with two conditions of open and close eyes and the time in both were shorter than control group at dominant also at non-dominant legs. For dynamic balance, dominant leg in subjects with one or two cauliflower ears had less balance in compare with control group. In non-dominant side subjects with cauliflower in both ears had significant less balance than control group and also from dominant leg (Figure 6).

The wrestler with CF deformity lose their hearing on the impair ears. The wrestler which had one CF ear, hearing level was different between CF ear and the healthy one, the healthy ear were not differ from control group. Hearing lose was reported only in recent study (Noormohammadpour et al. 2015), cause of hearing lose might be deformity of ear and changing acoustic shape of ear. There is not enough information in the literature about lose of hearing related to ear shape.

Balance.

In statistic balance at both condition – open and close eyes- the subjects with CF ear/s had significant worse balance. Former studies report similar results on open eyes or close eyes.

Interesting part is the different in dominant and non-dominant side at close eyes condition, which dominant side sustain longer in balance whenever at open eyes condition there were as long as non-dominant side, may be visual feedback help to compensate balancing.

In dynamic balance subjects with CF ear/s had less balance than peer groups. Subjects with both CF ears had worse balance record especially in non-dominant leg.

References

1. Adams B. (2000) Transmission of cutaneous infections in athletes. British Journal of Sports Medicine 34, 413-14.
2. Adams B. (2002) Dermatologic disorders of the athlete. Sports Medicine 32, 309-21.
3. Ballachanda, B. B. (1997). Theoretical and applied external ear acoustics. Journal American academy of audiology, 8, 411-420.
4. FILA (the International Federation of Associated Wrestling Styles). (2003) Wrestling [online]. The International Federation of Associated Wrestling Styles, Available from URL: http://www.fila-wrestling.com [Accessed 3.9.2003].
5. FILA (the International Federation of Associated Wrestling Styles). (2005) International Wrestling Rules [online]. Lausanne: International Federation of Associated Wrestling Styles; Available from URL: http://www.fila-wrestling.com
6. Isaacson J.E., Vora N.M. (2003) Differential diagnosis and treatment of hearing loss. American Family Physician 68, 1125-1132.
7. Kordi R, Mansournia MA, Nourian RA, Wallace WA. (2007) Cauliflower ear and skin infections among wrestlers in Tehran. J Sports Sci Med. 2007 Oct 1; 6:39-44.
8. Lillegard W.A., Butcher J.D., Fields K.B. (1997) Dermatologic problems in athletes. Medical problems in athletes. Fields K.B., Fricker P.A., editors. Malden: Blackwell Science; 234-46.
9. Macdonald D.J.M., Calder N., Perrett G., McGuiness R.G. (2005) Case presentation: a novel way of treating acute cauliflower ear in a professional rugby player. British Journal of Sports Medicine 39, e29.
10. MHME (the Ministry of Health, Medical Education of Iran). (1992) Survey of Health and Disease in the Islamic Republic of Iran. The Ministry of Health and Medical Education of Iran, Tehran.

11. NCAA (The National Collegiate Athletic Association). (2003) 2003-04 NCAA sports medicine handbook. The National Collegiate Athletic Association; Available from URL:http://www.ncaa.org/library/sports_sciences/sports_med_handbook/ [Accessed 18.11.2003].
12. NCAA (The National Collegiate Athletic Association). (2005) Wrestling, 2005 rules and interpretations. The National Collegiate Athletic Association, Indiana.
13. NFSMI (The National Federation of Sports Medicine of Iran). (2005) National aAthletic insurance reports. The National Federation of Sports Medicine of Iran; Tehran.
14. Noormohammadpour, P., Rostami, M., Nourian, R., Mansournia, M. A., Farahani, S. S., Farahbakhsh F., and Kordi R. (2015). Association between hearing loss and cauliflower ear in wrestlers, a case control study employing hearing tests. Asian journal of sports medicine, 6(2).
15. Reid D.C. (1992) Sports injury assessment and rehabilitation. Churchill Livingstone, New York; Edinburgh.
16. Schuller D. E., Dankle S. K., Martin M., and Strauss R. H. (1989). Auricular injury and the use of headgear in wrestlers. Archives of Otolaryngology-Head & Neck Surgery, 115(6), 714-717.
17. Walicka-Cupryś, K., Przygoda, Ł., Czenczek, E., Truszczyńska, A., Drzał-Grabiec, J., Zbigniew, T., & Tarnowski, A. (2014). Balance assessment in hearing-impaired children. Research in developmental disabilities, 35(11), 2728-2734.
18. Yotsuyanagi T., Yamashita K., Urushidate S., Yokoi K., Sawada Y., Miyazaki S. (2002). Surgical correction of cauliflower ear. British Journal of Plastic Surgery 55, 380-386.
19. Yueh B., Shapiro N., Maclean C. H., Shekelle P.G. (2003). Screening and management of adult hearing loss in primary care: scientific review. Journal of the American Medical Association 289, 1976-1985.