Prevalence of Ankle Instability in Professional Cyclists

An Observational Study

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***Abstract*- People are getting aware about the health benefits of cycling, and it has become very trendy now a days. The increasing popularity of cycling as a mode of transportation, recreation and sport has led to an increase in the incidence of musculoskeletal injuries related to its practice. Though professional cyclists have proper knowledge and do the pre-training exercises, but due to repetitive movements and a lot of jerky movements there are chances of injuries. Pain and discomfort can increase the incidence of instability and can cause reduce in performance. Studies have been done on the prevalence of knee injuries and Low back pain in cyclists, but not many studies are done on the prevalence of ankle instability in cyclists. Therefore, the aim of this study is to observe the prevalence of ankle instability in professional cyclists. To increase the awareness about the regular bike fitting so that ankle instability can be reduced and hence there will be increase in performance.**

Methodology- An Observational study was done on professional cyclist around Pune. Total 80 professional cyclist were selected by Convenient sampling. The study was completed in 6 months.

Result- Out off 80 cyclists, 72 had stable ankle and 8 had unstable ankle.

80 was the sample size, out of which 3 cyclists suffered from pain over the medial aspect of foot, 1 cyclist suffered from pain over the heel, 1 cyclist suffered from pain over posterior aspect of ankle, 1 cyclist had pain around ankle.

Conclusion- Prevalence of Ankle instability in Professional Cyclists is 10%.

INTRODUCTION

Bicycling is one of the most enjoyable aerobic exercises recommended for the promotion of an individual's health. Bicycling is a simple, affordable, and energy efficient means of transportation. Of all human-powered locomotion, it is the fastest and least energy-demanding. [1]

The health benefits of participating in regular physical activity are well established, and prescribing exercise to prevent and treat chronic disease is becoming more frequent. In addition, medical insurers and medical schemes use various incentive schemes to encourage their members to engage in regular physical activity and cycling is one of the most common form of physical exercise.

Professional cyclist are the one's who participate in the competitions and who is being paid to participate as a professional player. Mass participation in recreational and competitive cycling events is growing. It is therefore not surprising that patients presenting with injuries related to cycling have also increased. [2]

The causes of overuse injuries in cycling are similar to those in running. The causes encountered are overtraining, and muscle imbalance and inflexibility. Overtraining results from stressing the musculoskeletal system by attempting to do more than one's musculature and soft tissue can manage. Riding too many miles or tackling too many hills in too high gear, particularly at the start of the cycling season, will cause this stress. The powerful quadriceps muscle often dominates the hamstring in riders. Muscle inflexibility is also a contributing factor in riders, as tight muscles do not respond well to the stresses of cycling. Cyclists contact their bicycles at three areas: pedals, the seat and the handlebars. Each contact point is associated with particular cycling ailments. [3]

Riding pain or even discomfort can lead professional cyclist to lose athletic performance. [4]

Pedal forces effectiveness in cycling is usually measured by the ratio of force perpendicular to the crank (effective force) and total force applied to the pedal (resultant force). Most studies measuring pedal forces have been restricted to one leg but a few studies have reported bilateral asymmetry in pedal forces. Pedal force effectiveness is increased at higher power output and reduced at higher pedaling cadences. Changes in saddle position resulted in unclear effects in pedal force effectiveness, while lowering the upper body reduced pedal force effectiveness. Cycling experience and fatigue had unclear effects on pedal force effectiveness. [5]

Most studies measuring pedal forces have been restricted to one leg but a few studies have reported bilateral asymmetry in pedal forces. Pedal force effectiveness is increased at higher workload level and reduced at higher pedaling cadences. Changes in saddle position resulted in unclear effects in pedal force effectiveness, while lowering the upper body reduced pedal force effectiveness. Cycling experience and fatigue had unclear effects on pedal force effectiveness. Augmented feedback of pedal forces can improve pedal force effectiveness within a single training session and after multiple sessions for cyclists and non-cyclists.[6]

Bike fitting method involves: Saddle height measurement, crank length, saddle fore position, stack height of pedal/ shoes/ cleats.

Bike fitting, either static or dynamic, is a good way to assess cycling posture. It is defined as "the detailed process of evaluating the physical and performance requirements of the cyclist, and systematically adjusting the bicycle to meet the goals and needs". Bike fitters can use the fitting results to choose the appropriate size of bike and adjust its components (saddle height, saddle setback). After professional bike fitting, cyclists could reduce their level of fatigue and improve exercise performance. The process of static

fitting includes anthropometry and bike angle measurements, such as the leg length, the height of the inseam, saddle height, saddle setback, seat tube angle. Different static fitting parameters could change the level of discomfort, injury rate, muscle activation, muscle fatigue, and metabolic energy expenditure. [7]
Cycling overuse injury theory has been largely based around performance data, anecdotal evidence and clinical expertise. The relationship between many bike fit and biomechanical factors and cycling overuse injury, has never been empirically proven. As with any overuse, overload or training load error injury or pain, one must consider the capacity of the athlete generally, as well as the capacity of the tissue involved. Tissue and bone is constantly evolving through the process of mechano-transduction, with good loading having an anabolic effect and over-loading or under-loading a potentially catabolic effect. Hence, cumulative stress or load above the level of capacity of the tissue or bone can adapt to have a greater capacity to withstand load and similarly an entire kinetic chain or athlete can improve their capacity with the appropriate training. The cyclist's body needs enough load to adapt and improve, but not so much load that it is loaded beyond capacity, which becomes an issue of training load management. [8]
Abdullatif K. Althunyan had a study on Knee problems and its associated factors among active cyclists in Eastern Province, Saudi Arabia and concluded that, the overall prevalence of knee pain was 25.8%; 27.6% for amateur cyclists and 15.9% for professional cyclists.[9]
Rodrigo R Bini concluded that, Methods for determining optimal saddle height are varied and have not been comprehensively compared using experimental research studies. The range of 25–30-of knee flexion has been advocated to reduce the risk of knee injuries and minimize.VO2. Overuse knee joint injury is common in cyclists. [6]
Martin Schwellnus concluded that LBP was a common cycling injury . The correct bicycle set-up has been highlighted as an important factor in ensuring an optimum cycling position to reduce the strain on the lower back region. The significant adjustable parameters which most affect the upper body position of the cyclist are the reach and saddle angle. There is little evidence supporting existing pathomechanical hypotheses for the development of LBP in cyclists. [10]
Gabriel M. Streisfeld concluded that there are relationships between common risk factors that warrant further exploration. Spinal and core muscle activation imbalances in a prolonged flexed posture associated with cycling may lead to maladaptive spinal kinematics and increased spinal stresses contributing to LBP. [11]
Gloria,C.Cohen, studied that cycling injuries are a consequence of overuse. Proper frame fit and correct cycling technique will allow the cyclist a more enjoyable and injury-free riding experience. The key to sports medicine is prevention; and a knowledgeable physician is better able to provide information and care to the cyclist. [3]
With this study we will be seeing the prevalence of ankle instabilities in professional cyclists.

Objective -
To study the prevalence of ankle instability in professional cyclist using Ankle joint functional assessment tool (AJFAT).

Methodology-
An Observational study was done on professional cyclist around Pune. Total 80 professional cyclist were selected by Convenient sampling. The study was completed in 6 months.

Inclusion Criteria-
Professional cyclist (since 5-8 years)
Male gender
Age group – 18 to 25 years

Exclusion Criteria-
Recurrent ankle injury
Recent ankle pain
Cyclist who have undergone recent surgeries.
Cyclist with pre-existing musculoskeletal injuries (flat foot, high arch foot).

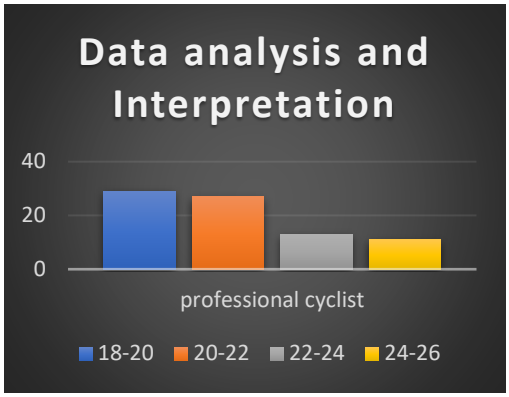
Outcome Measures-
Ankle joint functional assessment tool (AJFAT)
(Reliability – 0.94; Validity – 1.5)
To identify functional limitations. It is the scale completed by the patient. This questionnaire has been designed to give the therapist information as to how your ankle problems have affected your ability. [6] [10]
Total score is 48. (stable ankle 26 ≥ ; unstable ankle < 26)

Procedure-
Consent and approval from the ethical committee was taken.
Cyclists were chosen on basis of the inclusion and exclusion criteria.
Professional (competitive cyclist) were chosen.
The scale was taken and it was explained to the subjects. It's outcome will be calculated and it will be statistically explained.

Data analysis-
1.Data analysis and Interpretations

Table 1

Age	Professional Cyclist
18-20	*29*
20-22	*27*
22-24	*13*
24-26	*11*

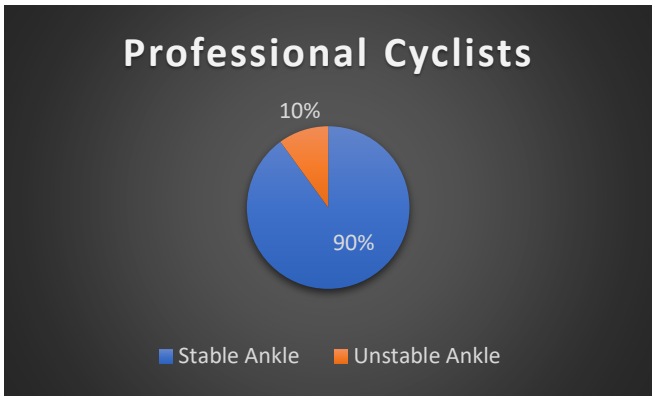


Graph 1

2.Ankle Joint Functional Assessment Tool

Table2

No. of cyclists	Stable Ankle	Unstable Ankle
80	*72*	*8*



Graph 2

RESULT

Out off 80 cyclists, 72 had stable ankle and 8 had unstable ankle.

80 was the sample size, out of which 3 cyclists suffered from pain over the medial aspect of foot, 1 cyclist suffered from pain over the heel, 1 cyclist suffered from pain over posterior aspect of ankle, 1 cyclist had pain around ankle.

Prevalence of Ankle instability in Professional Cyclists is 10%

DISCUSSION

This study is done to find out the Prevalence of ankle instability in professional cyclists. 80 professional cyclists were chosen for this study. Ankle Joint Functional Assessment Tool (AJFAT) was taken as outcome measure [8]

Ankle Joint Functional Assessment Tool (AJFAT) is used to identify functional limitations and how ankle injury have affected functional ability. [12] This scale has a checklist which asks about level of pain experienced, any swelling over ankle, ability of affected ankle to walk on uneven surface, overall feeling of stability, strength, ability to descend stairs, ability to jog, ability to cut or change direction when running, Overall activity level, ability to sense affect ankle while rolling over, ability to respond affected ankle at the beginning of roll over and how much time required for it. [16]

In graph 2 Recreational Cyclist 37% cyclist had stable ankle and 63% cyclist had unstable ankle.

We got the result which shows that 3 cyclists suffered from pain over the medial aspect of foot, 2 cyclists suffered from pain over the heel, 1 cyclist suffered from pain over posterior aspect of ankle, 1 cyclist had pain around ankle, 2 cyclists had fall from cycle (ligament tear, talus fracture), 71 cyclists had no complaints.

Professional Cyclists are trained properly about the pretraining warmup, stretching, proper saddle height measurements according to their height, also they wear proper shoes. Professional cyclists undergo a high-quality bike fitting on a regular basis and get trained under direct coach supervision, in which an emphasis is put on the correct technique necessary in preventing injuries and also the coaching techniques in preventing ankle injuries in cyclists, strength and stretching exercises reduced the incidence. Despite

this advantage, it has been shown that there is still a risk for the development of acute, traumatic injuries, as well as overuse injuries in cycling. [17]
Cycling postures that could improve performance or reduce injury risks but used various bike-fitting techniques. Bicycle ergonomic adjustment improves overall cycling comfort and reduces pain while riding. These effects could to some degree improve cycling performance.
Althunyan AK studied that, pedaling technique, based on effective pedal force application of trained cyclists, compared with recreational cyclists, may be more sensitive to changes in saddle height. The different pedaling technique could explain the differences in muscular recruitment patterns. Inter-individual differences in the ankle kinematics in cyclists, which modified the orientation of the forces on the pedals and can lead to changes in lower limb joint mechanical work. [9]
Changing the pedaling technique of trained cyclists by introducing an additional pull-up action during the upstroke or a greater dorsiflexion throughout the pedaling cycle would have immediately a negative impact on the gross efficiency. On the other hand, increasing the pushing force during the downstroke or the plantarflexion throughout the pedaling cycle would not alter the gross efficiency.
The foot/pedal connection is one of the most valuable aspect of any bike fit because a lot of rider's pain can originate in feet. Adjusting pedal and cleat is extremely important. First, adjust fore cleat position. Generaly the ball of your foot should be directly over the axle. If you feel any strain in your calf, have toe numbness or burning pain in the ball of the foot, try moving your cleat slightly forward. Also make sure you are not over tightening your shoe straps and your toes are not jammed into the end of your shoes will aid in comfort. Secondly, check side to side cleat position, also clinically called medial/ lateral cleat placement. Medial means towards the inside and lateral means towards the outside. One of the best ways to determine side to side cleat position is to look at knee over toe alignment. If the knee is over the outside of the foot, move the foot outward by pushing the cleat inward on the shoe, vise versa. Third, forefoot tilt and angle is very important and often overlooked. Finally, cleat rotation needs to be addressed. In general, the direction your feet point off the bike will be the same as when you are on the bike. A proper fit on your bicycle will result in increased comfort, more power, and better handling. [21]
All these factors help in understanding why ankle instability can occur in professional cyclists.

CONCLUSION

Prevalence of Ankle instability in Professional Cyclists is 10%.

FUTURE SCOPE OF STUDY

Intervention studies can be done.
Clinical implications can be done like giving precautionary treatment to cyclist for ankle injury.
Similar study can be done for recreational cyclists.

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