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Incidence of Musculoskeletal Disorder in Rhythmic Gymnastics Players using Nordic Musculoskeletal Questionnaire

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Abstract: Rhythmic gymnastics is a female-dominant sport played across the world. The players perform various stunts that involves cartwheels, splits, somersaults, etc. these activities require a high level of flexibility and coordination. Gymnastics perform these stunts on daily basis for multiple times and such multiple session are scheduled every week. This kind of repetition of any activity multiple times in a day followed by weeks and months causes repetitive stress and strain on certain body parts. This kind of repetitive straining of any given body part can lead to musculoskeletal injuries. This study is conducted to understand the pattern of involvement of various joints due to repeated straining of a given body parts, in the population of rhythmic gymnastics players. Nordic musculoskeletal questionnaire that is a questionnaire having 4 different questions that involve 9 different body parts each is used to assess these players. **Results:** the results of the study stated that body parts such as upper back lower back and ankle were more involved whereas other body parts showed lesser involvement. **Conclusion:** it was concluded that there is presence of musculoskeletal disorders in rhythmic gymnastics players.

Key words: Rhythmic gymnastics players**,** Nordic Musculoskeletal Questionnaire, Musculoskeletal disorders

I. INTRODUCTION

Rhythmic gymnastics is a female only sports. The gymnasts perform on a floor with an apparatus such as hoop, ball, clubs, ribbons, or rope. The sport is a combination of elements such as gymnastics, dance, and calisthenics. A person practicing rhythmic gymnastics must be strong, flexible, agile, dexterous and coordinated.

Rhythmic Gymnastics is looked over by International Gymnastics Federation, the sport was given first recognition in the year 1963. Rhythmic gymnastics was then introduced as an individual all-round sport in Olympics 1984 and as a group all-individual sport in Olympics in 1996.

The gymnasts start their training at a very early age to become a skilled gymnast.[1][4] They undergo tedious training every day to maintain their body flexibility and muscle strength. Their training consists of many elements such as development of coordination, joint mobility, postural adaptation, strength, speed, rhythm, agility and dynamism.[2] During this training session all the activities include vigorous training exercises and stunts. These sessions are technically difficult and physically highly demanding.[1] The players are highly exposed to injuries and wear and tear of joints during these practice sessions.

The players start their training with warm up exercises such as full range of motion movements of shoulders, elbows, wrist, fingers, hip, knee, ankle, toes, neck and back with that they perform stretches for muscles of legs such as quadriceps, hamstring, calf, tibialis anterior and muscles of back, with this they perform spot marching, spot jogging, 5 rounds of a 200 meters ground by brisk walking, jogging and running. This warm up session is followed by tedious training of sets that are performed using various apparatus such as hoops, clubs, balls, ribbons or rope. These sets include stunts such as high jumps, splits, twirls on toes, bending, walking on toes, balancing, cartwheels, intrinsic use of wrist, dancing, throwing and catching. These sets are performed multiple times to attain perfection. The training session is terminated by a cool down session in which relaxed breathing, meditation, stretches and savasana.

All the techniques that are performed during the training sessions are such that they apply over pressure to various body parts such as toes, ankle joint, knee joint, hip joint, back, wrist joint, shoulder joint as there are periods in which extra pressure is applied on them during training. This extra pressure on the body structures can lead to injuries and other musculoskeletal problems such as sprain, strain, etc. and the conditions can become worse as the practice sessions are performed daily, which causes repeated trauma and worsen the injury. Certain areas are more prone to injury such as ankle joint, wrist joint, knee joint, thigh and back.[1][2][4] This research is based on understanding the incidence of musculoskeletal disorders among rhythmic gymnasts.

II. NEED FOR STUDY

This study is designed to observe and analysis the incidence of musculoskeletal disorders in a rhythmic gymnastics' players. The study will collect data on the basis of pain discomfort and other symptoms that were experienced by the players in a period of last one year time frame. This data further can be analyzed to obtain information about the area that is more prone to musculoskeletal injuries and this can help them by making appropriate changes in their training regime to alter their training regime to prevent any musculoskeletal disorder and further more and deformity.

AIM

To study the incidence of musculoskeletal disorders in rhythmic gymnastics players.

OBJECTIVE

1. To assess the rhythmic gymnastics players for the incidence of musculoskeletal disorders in them.
2. To analyse the involvement of a given area (out of nine test areas) that is more prone to incidence of musculoskeletal disorder.

III. METHODOLOGY

Study design: Cross Sectional Study

Sampling design: Convenience Sampling

Sample size: 60

Inclusion criteria:

1. Players of age group 7 to 18 years will be considered for the study.
2. Players practicing rhythmic gymnastics on regular basis.
3. Players practicing rhythmic gymnastics for a minimum duration of 2 hour per day.
4. Players practicing rhythmic gymnastics for at least 4 days per week.
5. Players practicing rhythmic gymnastics for a time period of at least 2 years.

Exclusion criteria:

1. Players performing any other form of gymnastics such as aerobic gymnastics, artistic gymnastics, aesthetic group gymnastics, etc.
2. Players who have not taken training since past 1 year.
3. Players with chronic ankle instability.
4. Players having history of fracture in past 12 months.

Outcome measure:

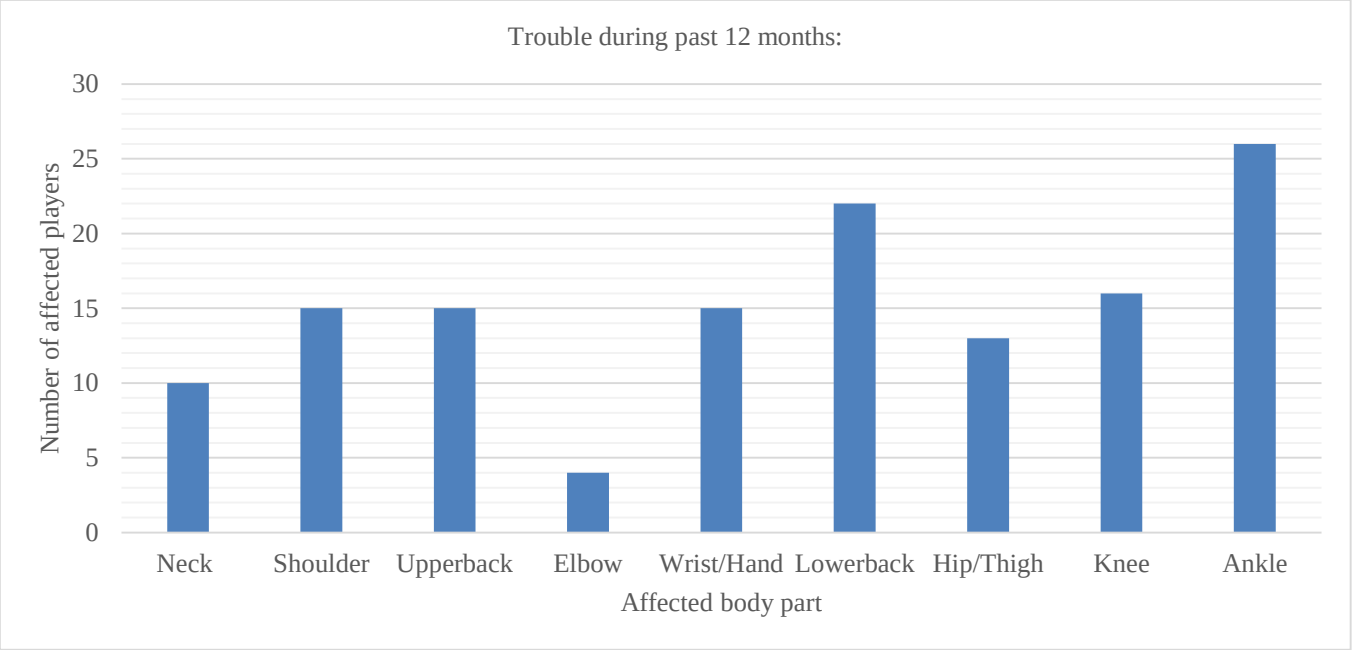
Nordic Musculoskeletal Questionnaire

IV. PROCEDURE

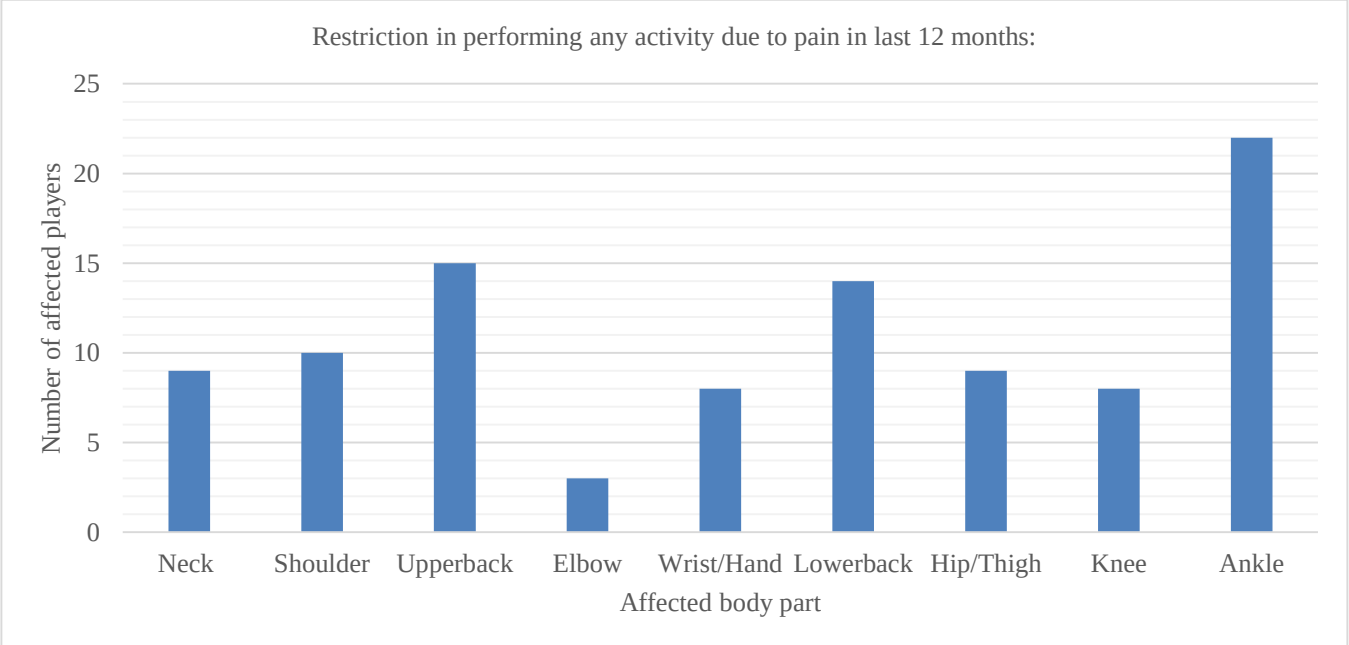
An ethical clearance will be obtained from the Institutional Ethics committee of TMV' Lokmanya Medical College of Physiotherapy, Kharghar. An official permission will be taken from the institute that is considered for research (Bombay Physical Culture Association's College of Physical Education, Wadala, Mumbai). The study will be a cross sectional study involving 60 participants, the girls will be selected according to the inclusion criteria. The purpose of the procedure and research will be clearly explained to the participants and the informed consent will be taken. The procedure will be explained to the participants, there coach and guardians or parents. The incidence of the musculoskeletal disorder will be noted in all the subjects using the Nordic musculoskeletal questionnaire. The players will be explained the "Nordic musculoskeletal questionnaire". The demographic data of all the subjects will be collected. Along with the demographic data the subjects will be analysed for the incidence of musculoskeletal disorders using the "Nordic Musculoskeletal Questionnaire". Each subject will be provided with a copy of "Nordic musculoskeletal questionnaire" to fill it subjectively. Later the data of each subjective scoring will be compiled and it will be used to calculate the incidence of musculoskeletal disorder.

V. DATA ANALYSIS AND RESULTS

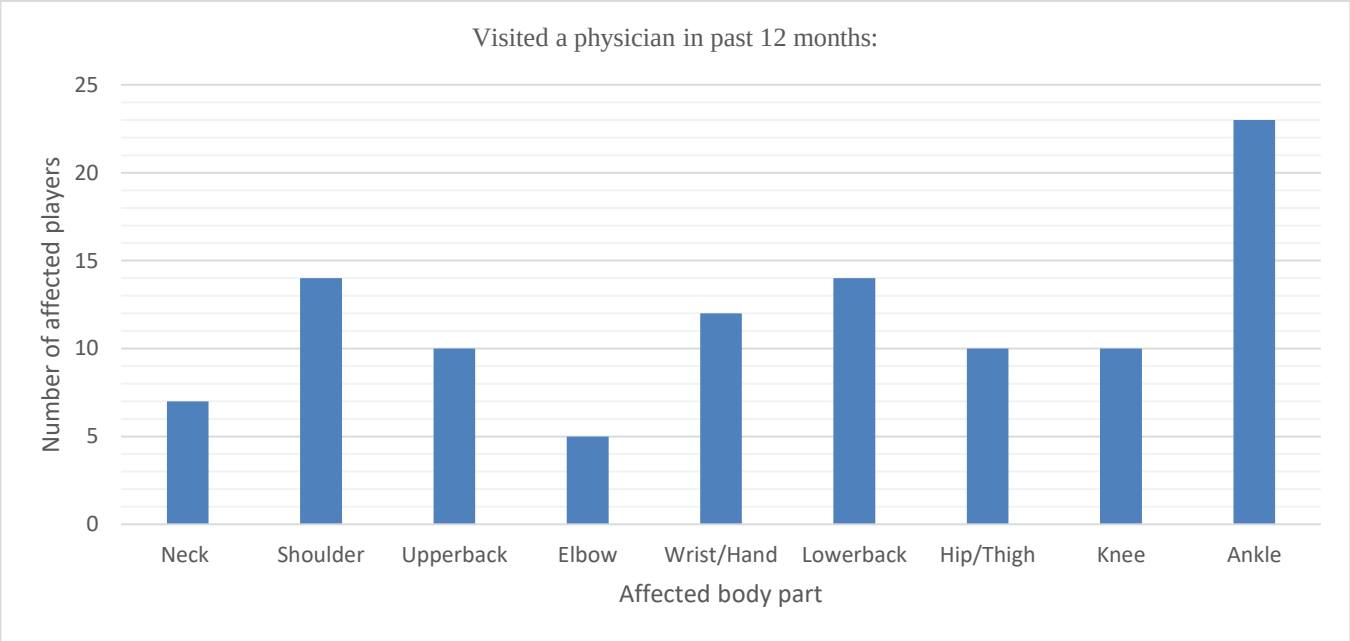
Graphical representation of the collected data according to questions in Nordic musculoskeletal Questionnaire:



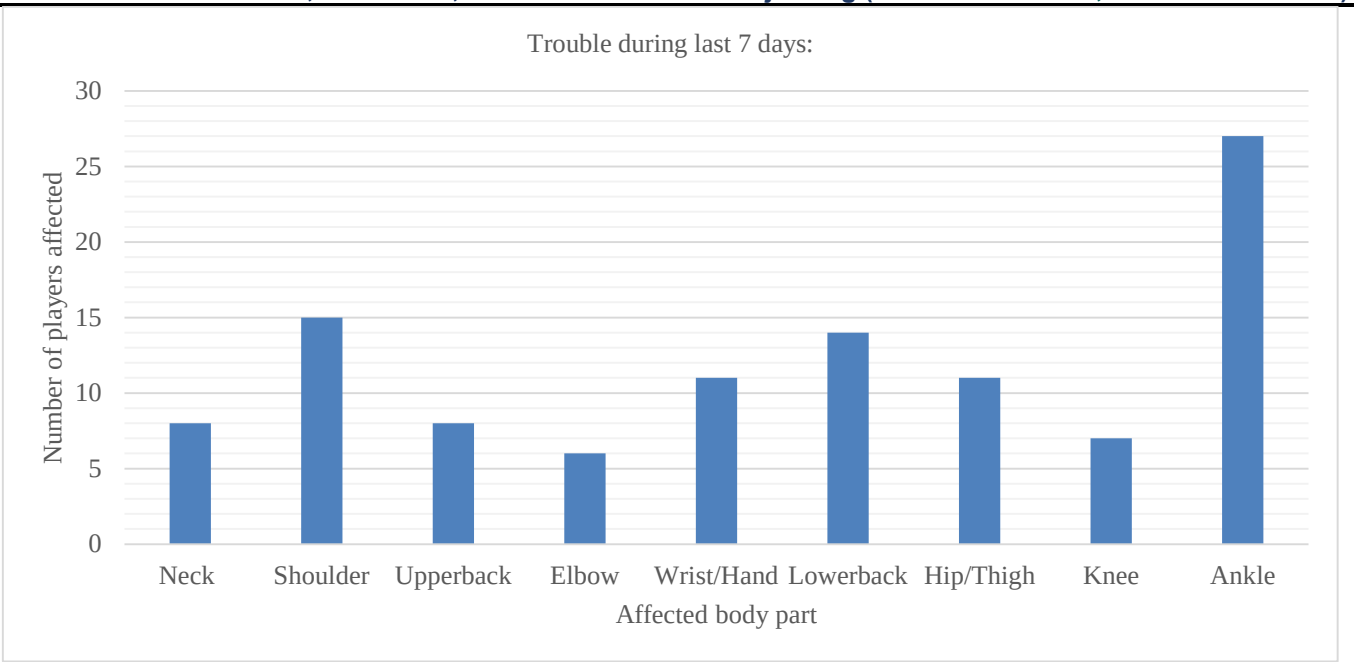
Body part	Number of participants affected	Percentage of population affected
Neck	10	18.52%
Shoulder	15	27.78%
Upper back	15	27.78%
Elbow	4	7.41%
Wrist/Hand	15	27.78%
Lower back	22	40.74%
Hip/Thigh	13	24.07%
Knee	16	29.63%
Ankle	26	48.15%



Body part	Number of participants affected	Percentage of population affected
Neck	9	16.67%
Shoulder	10	18.52%
Upper back	15	27.78%
Elbow	3	5.56%
Wrist/Hand	8	14.81%
Lower back	14	25.93%
Hip/Thigh	9	16.67%
Knee	8	14.81%
Ankle	22	40.74%

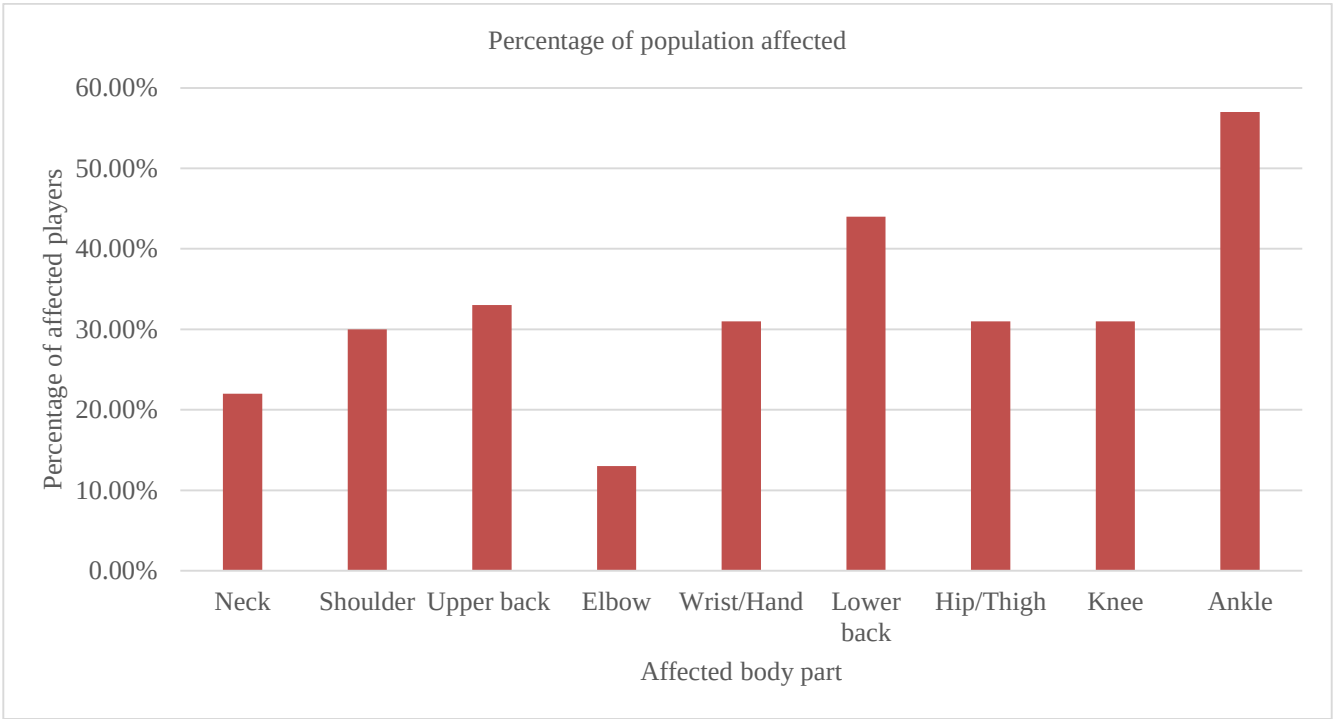


Body part	Number of participants affected	Percentage of population affected
Neck	7	12.96%
Shoulder	14	25.93%
Upper back	10	18.52%
Elbow	5	9.26%
Wrist/Hand	12	22.22%
Lower back	14	25.93%
Hip/Thigh	10	18.52%
Knee	10	18.52%
Ankle	23	42.59%



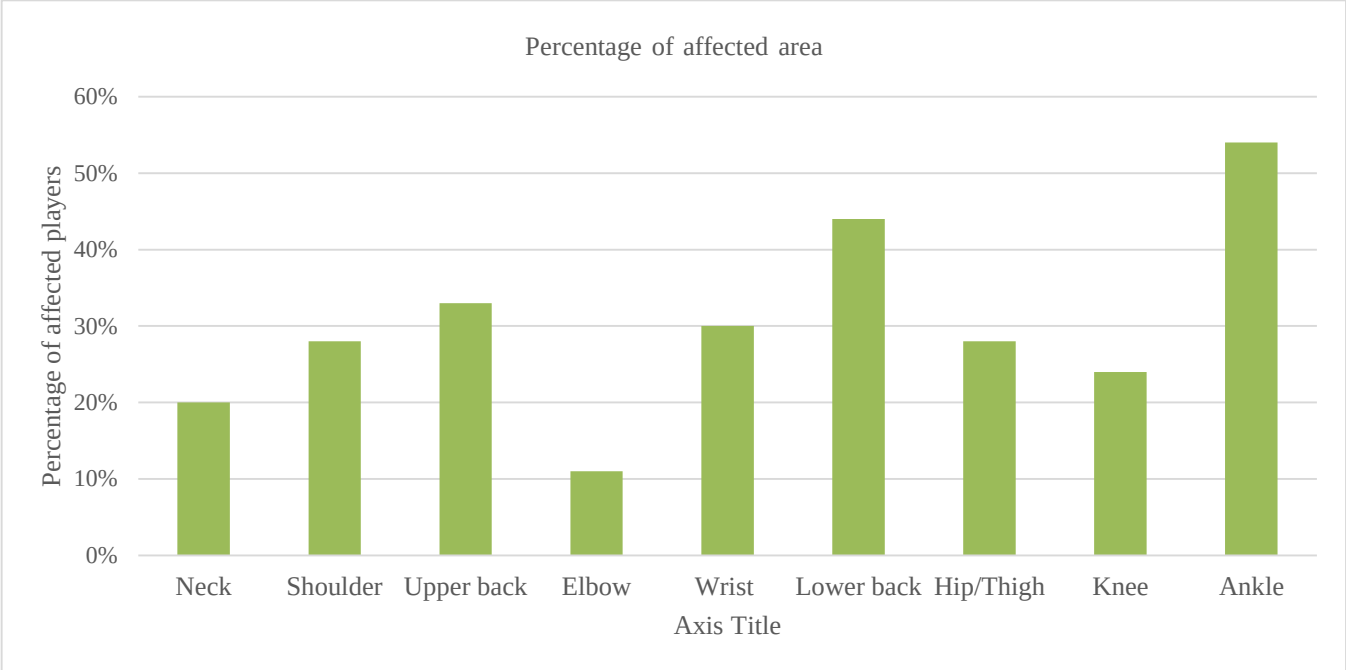
Body part	Number of participants affected	Percentage of population affected
Neck	8	14.81%
Shoulder	15	27.78%
Upper back	8	14.81%
Elbow	6	11.11%
Wrist/Hand	11	20.37%
Lower back	14	25.93%
Hip/Thigh	11	20.37%
Knee	7	12.96%
Ankle	27	50%

Master graph:



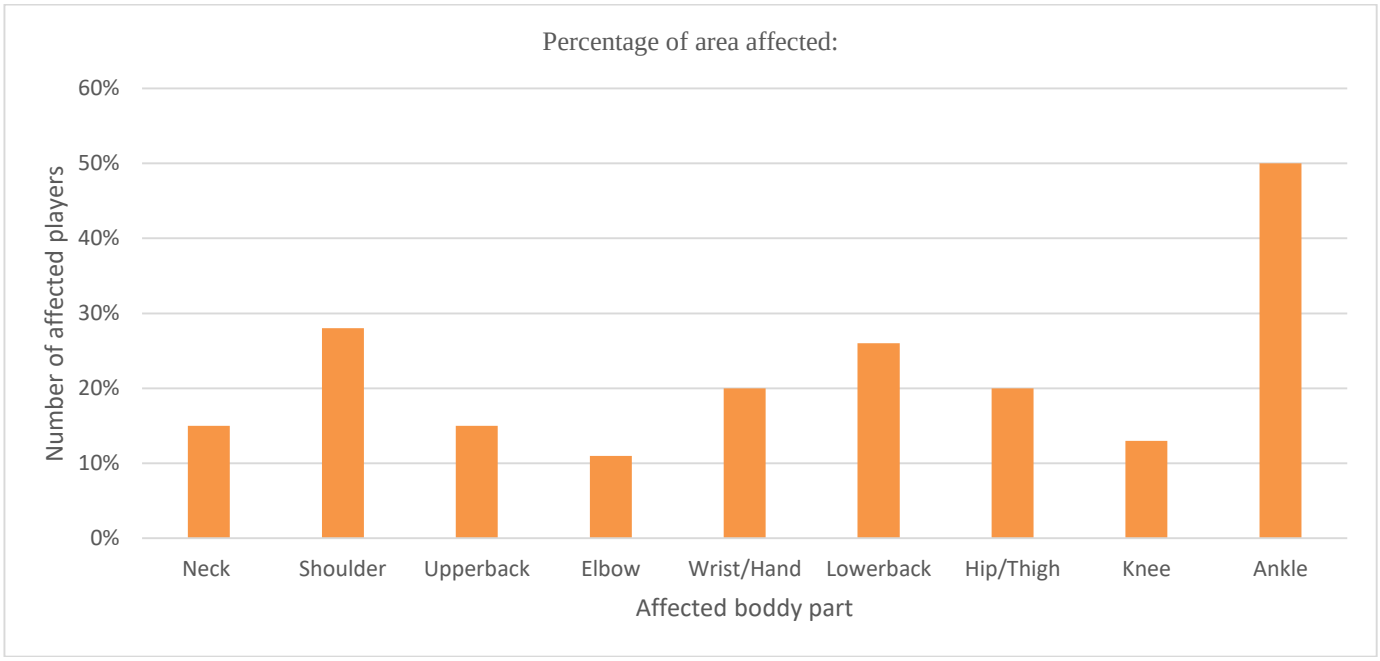
Body part	Number of participants affected	Percentage of population affected
Neck	12	22.22%
Shoulder	16	29.63%
Upper back	18	33.33%
Elbow	7	12.96%
Wrist/Hand	17	31.48%
Lower back	24	44.44%
Hip/Thigh	17	31.48%
Knee	17	31.48%
Ankle	31	57.40%

Chronic cases:



Neck: 20.37%; Shoulder: 27.778%; Upper back: 33.33%; Elbow: 11.11%; Wrist: 29.63%; Lower back: 44.44%; Hip/Thigh:27.78%; Knee: 24.074%; Ankle:53.704%

Acute cases:



Neck: 14.814%; Shoulder:27.778%; Upper back:14.814%; Elbow:11.11%; Wrist: 20.37%; Lower back:25.926%; Hip/Thigh:20.37; Knee: 12.963%; Ankle:50%

VI. DISCUSSION

Rhythmic gymnastics is an international sport played by females. The gymnasts start their training at a very early age to become a skilled gymnast.[1][4] They undergo tedious training every day to maintain their body flexibility and muscle strength. Their training consists of many elements such as development of coordination, joint mobility, postural adaptation, strength, speed, rhythm, agility and dynamism.[2] During this training session all the activities include vigorous training exercises and stunts.

The study is aimed to understand the incidence of musculoskeletal disorder in rhythmic gymnastics players due to repeated straining of various joint. During the sessions, which are technically difficult and physically highly demanding.[1] The players are highly exposed to injuries and wear and tear of joints during these practice sessions.

The research was conducted on players practicing rhythmic gymnastics, 60 participants were considered from Rhythmic gymnastics by Bombay Physical Culture Associations' of Physical Education (Wadala, Mumbai). The participants that were included in the study were practicing rhythmic gymnastics subsequently for a period of 2 years or more. Every participant was practicing rhythmic gymnastics for 4 days per week and about 2 hours or more per day.

In a study conducted on Greek elite gymnasts it was proven that gymnasts are high performance athlete with high prevalence to injuries and disorder.[2] The results stated that 62% of the study group reported injuries accounting to 108 injuries, which mainly included joints like ankle, wrist and shoulder. [2]

The results from this study also have a similar pattern as ankle being highly affected joint as ankle (57.40%), followed by lower back (44.44%) and upper back (33.33%). Besides ankle and back there is involvement of wrist (29.63%). Ankle joint as it transforms the weight of entire body to the foot and helps us to stand straight and maintain balance. As gymnasts has to perform stunts such as long jumps, splits, walking on toes, jumping and landing on toes, etc. there is high amount of pressure on ankle joint and at times miss landing or twisted ankle during landing can cause major ankle sprain or even dislocation of ankle joint this is the major reason of involving ankle joint during training. As the gymnasts have to carry heavy weights and also perform stunts involving weight bearing of the entire body on upper extremity during performance of stunts there is presence of musculoskeletal disorder in upper back, lower back and wrist. Wrist is also used in performing varies intricate movements such as performing with sets of clubs, ribbons, hopes etc.

The collected data also gives us the information of chronic cases joints such as ankles (53.7%), lower back (44.44%) and lower back (33.33%) are the areas that are major sites that have pain or discomfort since a prolonged period of time due to result of repeated stress on that particular area. Whereas the area such as shoulder (27.78%) and wrist (20.37%) apart from ankle (50%) and lower back (25.93%).

The lower extremity shows higher involvements as it is a site of tremendous weight bearing which is repeatedly triggered due to activities such as running, jumping, splits, landing from different heights etc. The involvement of back is also observed due to repeated movements that cause stress on back such as continuously maintaining an erect posture, performing flips, cartwheels, tumbling activities etc.

These results help us understand the involvement of anatomical area that are more prone to injury or pain which can be used to reduce the rate of involvement of the target part and it can also be used to further plan their training regimes whether to space out the sessions or to give breaks in between the sessions, or to train a particular joint for extra strength such as ankle.

VII. CONCLUSION

From this study that has been conducted on rhythmic gymnastics players, it can be concluded that there is presence of musculoskeletal disorders such as pain in rhythmic gymnastics players. These musculoskeletal disorders can be due to repeated straining of joints, while performing acts such as jumping, running, splits, cartwheels etc., during their training sessions. Which later increases in intensity as they perform those activity not just once in a day but multiple times in one session and such multiple sessions are performed throughout the week hence there is repeated strain to the joints that leads to pain and discomfort. Hence this study proves that there is incidence of musculoskeletal disorders in rhythmic gymnastics players.

VIII. LIMITATION

1. Male rhythmic gymnastics players were not considered.
2. Adult gymnasts were not considered during the study.
3. Other lifestyle activities were not considered during the study.

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