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RESEARCH ARTICLE

STUDY OF ASSOCIATION OF OCCUPATION (CIVIL CONSTRUCTION WORKERS) AND *JANU SANDHI*

Kanchan P. Pachpor[1] and Priti R Desai [2]

Department of Rachana Sharir Mahatma Gandhi Ayurvedic College Hospital & Research Centre Salod (H) Wardha, Maharashtra, India

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ABSTRACT

The present study was planned to evaluate the association of occupation of civil construction workers with that of *Janu Sandi*. Although a wide variety of different occupations and activities have been investigated the proposed mechanisms for including biomechanical forces across the knee joint. Therefore it may be appropriate to synthesis the relevant research to see if the construction working population would get benefit from a reduction in such risks. This study is a humble effort to assess the structural and functional anatomical changes in *Janu Sandi* of construction workers with various work categories performing various occupational activities. For this 50 construction site workers of various work categories, age between 20 to 50 years were recruted. A purposive sampling strategy was used to satisfy the specific needs of the study and recruit the population of interest. All participants were evaluated on various parameters viz. Pain, Swelling, Stiffness, Deformity, Synovial thickening, Joint line tenderness, Crepitus and knee joint movements along with X ray findings of patients.

INTRODUCTION

All human beings wish to lead a healthy life but this is only possible with a healthy body and peaceful mind. There are several such conditions which curtail one from leading a happy, healthy and active life. One of the conditions that have a huge impact upon healthy life is pathologies related to joints and the knee joint *(Janu Sandhi)* has the commonest involvement. Amongst all of joints the *Janu Sandhi* is one of the largest, complex and most often injured, complicated joint in the human body. Incidences of knee joint disorders are rising by increasing average age of general population, weight, trauma to the knee joint due to repetitive movement and heavy occupation. Clinically the conditions are characterized by joint pain, tenderness, limitation of movements, crepitus and variable degree of local inflammation. Prevalence of knee problems in the general population ranges from 10% to 60% depending upon age, occupation, religions.[1]

According to *Ayurveda, Dhatukshaya* is the prime factor for this condition. The gradual degeneration of *Dhatus* leads to aggravation of *Vata* and this aggravated *Vata* gets localized *(sthansanshrit)* in the *Sandhi* causing pain and other deformity. This is what exactly is known as per the *karyakaranbhava* which is reflected in the form of functional impairment like *kashtasandhigati.* (Impaired movements) [2]

Knee disorders are influenced by various factors including social, economical and physiological parameters. Instead of all that, occupational risk factors may also be considered as an influencing factor for knee problems. Mechanism lining occupation to knee problems are believed to be biomechanical. Forces across the knee can be measured in many activities found in strenuous job. Occupational activities that are consistently associated with the kneeling, squatting, lifting/carrying heavy weight and heavy standing work lead to internal derangement of the knee. However these activities increase the risk of knee disorders including arthritis, menisci and patellar injuries.[3]

Therefore the aim of the study is to assess the effects of occupational activities of construction workers on *Janusandhi.*

Aim

Assessment of association of occupation (civil construction workers) with *Janu Sandhi.*

Objectives

1. To observe signs and symptoms related to *Janu Sandhi* in civil construction workers.
2. To assess the functional changes in *Janu Sandhi* in civil construction workers.
3. To study the structural changes in *Janu Sandhi* in civil construction workers.

4. To associate the structural and fuctional changes in *Janu Sandhi* in civil construction workers with their occupation.

METHODOLOGY

Ethics Committee Approval

This study was conducted after obtaining approval from IEC.

Study setting

The study was conducted in Department of Rachana Sharir and Department of kayachikitsa of our college and hospital to clinically assess the participants.

Study Design

This is a cross sectional observational study.

Duration of study

The study was conducted in 2 years.

Study Material

Literature: Ayurveda compendia like Charaka, Sushruta, Vagbhata and Sharangdhara with their commentaries and other text books related to the study. Modern text books and journals.

Subjects-50 participants from construction sites.

CRF: Case record form and supporting material used during clinical assessment of participants

Informed consent

All the participants were briefed about the study & objectives of the study were explained. Informed consent of all the participants was obtained before their participation in the study

Dissection

The dissection of knee joint was carried out to visualize the anatomy of knee joint.

Method of Collection of Data

Sampling method

Purposive sampling strategy was used for the recruitment of research participants.

Inclusion Criteria

1. Age group: 20to 50years
2. Sex: Male & Female
3. Working for more than 2 years on construction site.
4. Construction site workers of various category performing occupational activities.

Exclusion Criteria

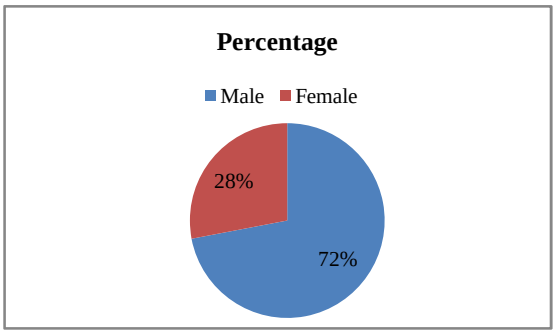
1. Supervisors at construction site.
2. Known cases of fracture & dislocation of knee joint.
3. Infective conditions of knee joint.
4. Post operated cases of knee disorders.
5. Post Menopausal Women
6. Sport & Accidental injuries related to knee joints.

Assessment Criteria

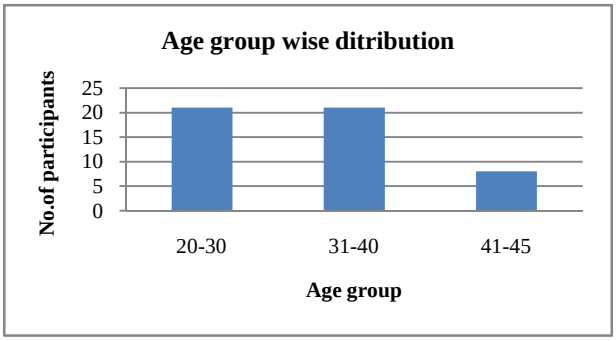
Pain, swelling, stiffness, deformity, synovial thickness, crepitus on movement, joint line tenderness, effusion, range of motion, medial stress test, lateral stress test, exterior drawer test, posterior drawer test, x- ray.

Observation and Result

In our study 50 construction site workers of various categories are taken. All participants were evaluated on various parameter as per assessment criteria. The data was statistically analyzed to draw the results.

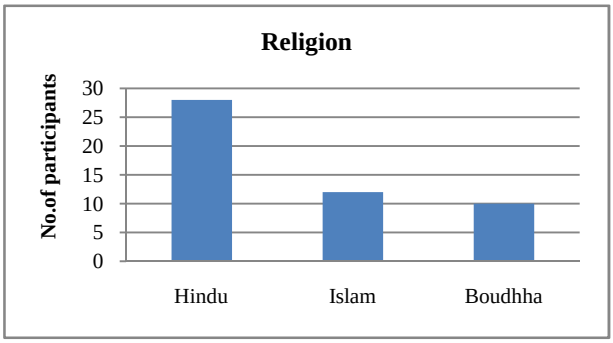


Graph 1 Gender Wise Distribution of Participant of civil construction workers



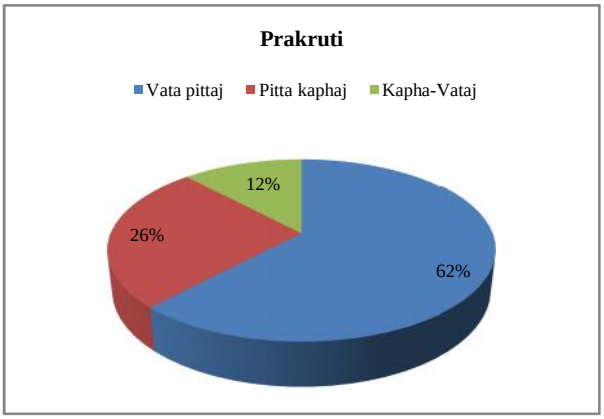
Graph 2 Age Wise Distribution of Participant of Civil construction workers

As per inclusion criteria, participants were selected having age between 20 years to 50 years and distributed it in three-sub age groups. Out of 50 participants 21 participants [42%] were in age group of 20-30 years , same number i.e 21 cases were in age group of 31 to 40 years while 8 [16%] were image group of 41 to 50 years.

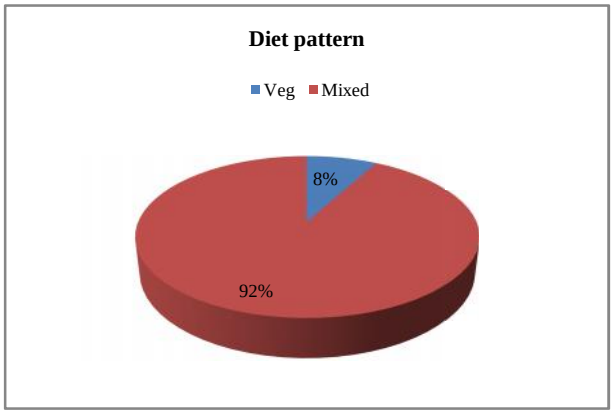


Graph 3 Religion wise distribution of Participants

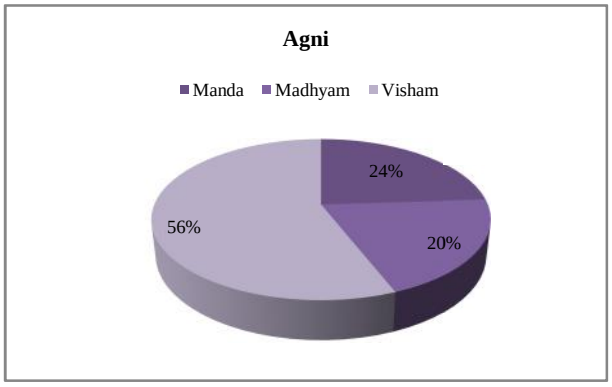
Out of 50 participants in the study, maximum number of participants i.e 28[56%], belonged to Hindu religion, followed by 12 [24%], from Muslim religion and 10 [20%] were from Boudhha religion. It may due to population distribution.



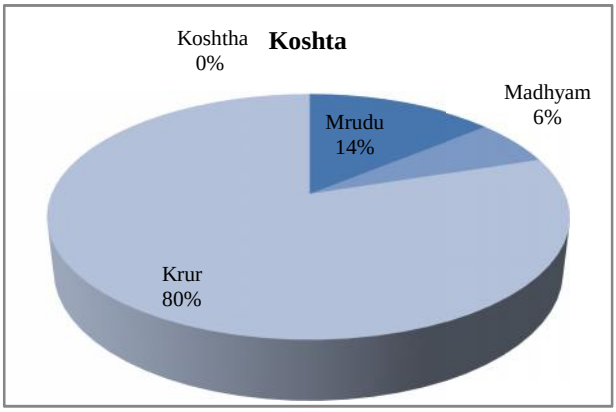
Graph 4 *Prakruti* Wise Distribution of Participants of Civil construction workers



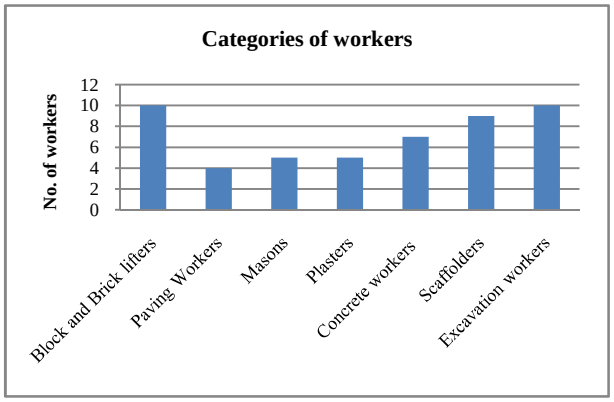
Graph 5 Dietary Habits Wise Distribution of Participants of Civil construction workers



Graph 6 *Agni* Wise Distribution of Participants of Civil construction workers

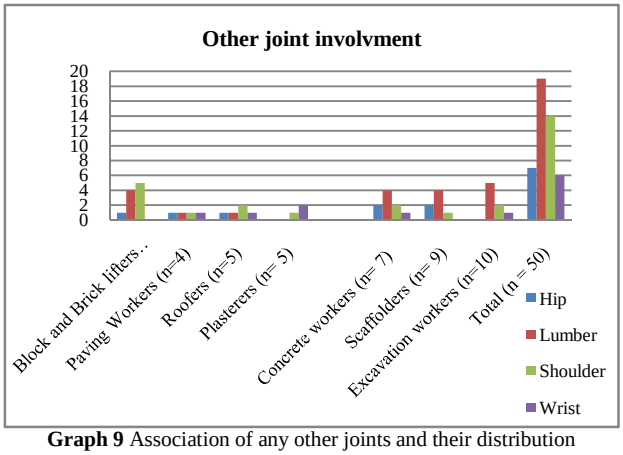


Graph 7 *Koshtha* Wise Distribution of Participants of Civil construction workers



Graph 8 Category wise Distribution of construction Workers

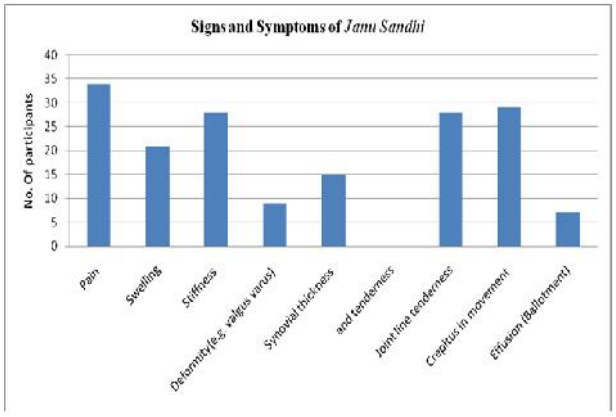
Amongst the 50 participants, 10 [20%] were block and brick lifters, 04 [8%] were paving workers, 5[10%] were roofers, 5[10%] were plasterers, 7[14%] were concrete workers, 9[18%] were scaffolders, 10[20%] excavation workers.



Graph 9 Association of any other joints and their distribution

All the participants who were subjected to knee joint assessment, were also interrogated about the pain in other joints. Amongst them 7 participants [14%] reported pain in hip joint, 19(38%) reported for pain in lumber joint, 14 (28%) participants reported for shoulder joint pain and 6(12%) reported for pain in wrist joint.

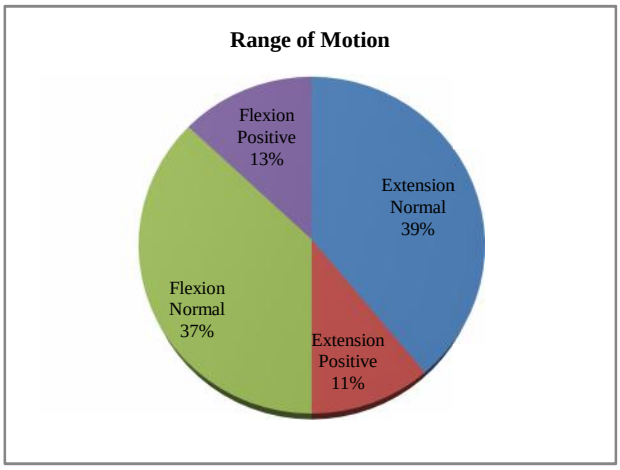
Observation on Assessment criteria



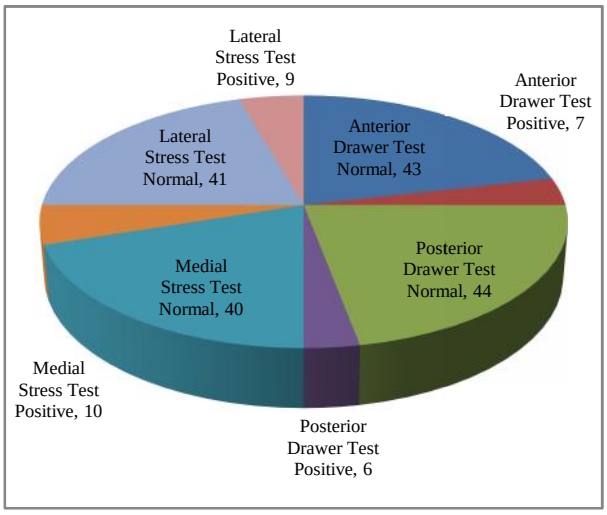
Graph 10 Distribution of participants with Signs & Symptoms of *Janusandhi*

In this study particularly pain was present in 34 [68%] patients, swelling was observed in 21[42%] cases, stiffness was present in 28[56%]. Deformity was observed in 9[18%]

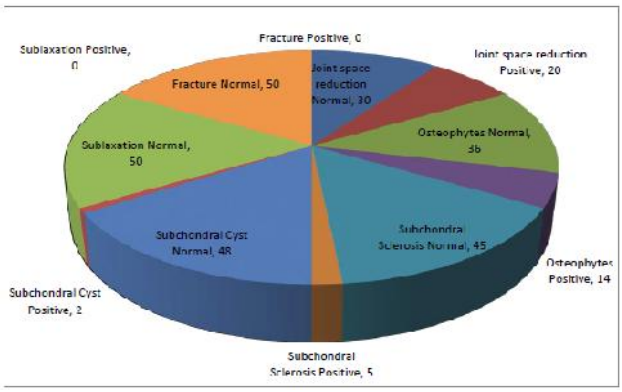
cases. Synovial thickness and tenderness seen in 15[30%], Crepitus in movement seen in 29[58%] followed by Effusion (Ballotment) in 7[14%] cases. Statistically it was observed that row and column are associated as p value obtained is <0.0001.



Graph 11 Distribution of participants with normal and positive range of motion



Graph 12 Distribution of participants withnormal and positivetests for the Injury/damage to the ligaments



Graph 13 Distribution of participants with normal and positive X-ray findings of knee Joint

DISCUSSION

Daily activities at construction sites tend to put strain on particular portions of a worker's body. For example, a worker might be expected to walk up and down while carrying heavy materials. The worker's knee might seem to be able to handle that activity with little damage. But when the activity is repeated over and over, day after day, the activity can begin to cause microscopic tears in the muscle tissue in the knee. Over time, the injury can be compound, causing chronic pain and mobility problems. Similar injuries can occur in almost any part of the body, but injuries to the knee, shoulder, wrist and back are the most common when it comes to construction workers. Repetitive stress injuries are one of the leading causes of disrupted work in the construction industry, and they are particularly problematic because they tend to take a long time to heal.[3,4,5]

The study entitled as "Assessment of association of occupation (civil construction workers) with *Janusandhi*." 50 participants with different working category were randomly selected from construction site for the assessment mentioned as per methodology. The CRF was prepared on the basis of general examination and present complaints as well as clinical assessment of *Janusandhi* in participants. All patients were evaluated on various subjective and objective parameters viz. Swelling, Stiffness, Deformity, Synovial thickening, Joint line tenderness, Crepitus and knee joint movements along with X ray findings of participants.

In this study, total 36 [72%] participants were male and 14 [28%] were female. The inclusion of more males in this study it may be due to majority of male workers in this occupation, and may also be due to random selection of participants or willingness of participants. As per inclusion criteria, participants were selected between age group of 20 years to 50 years and distributed it in three-sub age groups. Out of 50 participants 21 [42%] participants were found in age group 20-30, 21 [42%] in 31 to 40 yrs while 8 [16%] in 41 to 50 years of age group. Age group between 21 to 40 seems to be more potential for such weight lifting and handling occupation.

Maximum number of participants i.e. 28[56%] were found from Hindu religion, were 12 [24%] were from Muslim religion, 10 [20%] were from Boudhha religion. It may due to population distribution. Amongst 50 participants, 46 [92%] were having mixed type diet and 08[16%] purely vegetarian. The need of the occupation i.e. heavy laborious work can be fulfilled by mixed type of diet.

In *ayurvedic* point of view Out of 50 participants, 31[62%] were of *Vatapittaj*prakriti; 13[26%] were of *Pitta kaphajprakruti* followed by 06[12%] participants having kapha-*vattajprakruti*. Civil construction work is associated with handling of weighted materials and required amount of calories to generate the energy. It results in damage of body tissues, ultimately resulting in less amount of muscle and fat bulk. Hence the predominance of *vata pitta prakriti* in the study is justified.

Most of the 28 [56%] participants were having *vishamagni*, 12(24%) participants were having *Mandaagni*, and 10 (20%) participants were having *madhyamagni*. While 07(14%) were having *mrudukoshta* and 40(80%) were having *krur*type of *koshtha* and 3 (6 %) having *madhyamkoshta*. Most of the participants were having *vishmagni* and *krurkoshta*. From this observation it can be said that due to the *vishmagni* and *krurkoshtauttarottardhatu* formation get hampered and there by *sarata* of *asthidhatu* also get affected due to improper metabolism of *rasa dhatu* in construction workers.

Category wise Distribution of construction workers

Out of 50 participants, brick and block lifters were 10 (20%), paving workers were 4(8%), Masons were 5(10%), Plumbers were 5(10%), concrete workers were7(14%), Scaffolders 9(%) and Excavation workers were 10(20%). This distribution owes to the random selection of participants which were engaged in various categories of work.

Association of any other Joints

Though the study was focused on knee joint, the participants were interrogated for pain in other joints. Out of participants 50 participants, pain in hip joint was observed in 7(14%) out of which maximum were from category of scaffolders and concrete workers (2 each). This was due to the stress on their hip joint which involved the erection of scaffolders for construction purpose.

Lumber pain was found in 19(38%) participants which was the highest associated region for pain. This predominantly includes the block and brick lifters, concrete workers, scaffolders and excavation workers. This may be due to excessive bending and heavy load lifting activity which gives pressure on the lumber muscles and vertebral column which play a major role in the distribution of load.

Shoulder pain was observed in 14 (28%) amongst which maximum were block and brick lifters. The overhead lifting of the construction materials may be the cause of shoulder pain.

The least pain association was found in wrist joint i.e. only in 6(12%) participants which involved two participants from plastering work. This might be because of continuous adduction and abduction of the wrist.

Signs and symptoms of Janu sandhi in civil workers

In this study particularly pain was present in 34 [68%] patients, swelling was observed in 21[42%] cases, stiffness was present in 28[56%]. Deformity was observed in 9[18%] cases. Synovial thickness and tenderness seen in 15[30%], Crepitus in movement seen in 29[58%} followed by Effusion (Ballotment) in 7[14%] cases. Statistically it was observed that row and column are associated as p value obtained is <0.0001.

Our observations are fortified by various literature and observational studies which state that, all this symptoms and signs observed in our studies are due to repetitive stress produced during kneeling, squatting, lifting and carrying heavy weight and produced standing and climbing up and down stairs and slopes. Repetitive motion disorders develop because of microscopic tears in the tissue. When the body is unable to repair the tears in the tissue as fast as they are being made, inflammation occurs, leading to the sensation of pain. Some observational studies shows that the increase in risk associated with kneeling or squatting appeared to be more marked in subjects whose jobs entailed heavy lifting, but the size of the study did not permit precise delineation of any such interaction. The data of these studies suggest that prolonged or repeated knee movement, loading, bending are a risk factors for knee joint degenerative disorders, and that risk may be higher in construction workers which entail both knee bending and mechanical loading. [5][7]

Assessment of Knee Joint Movements in civil workers

Range of motion of knee joint assessed by a standard long-arm goniometer. It was observed in study that regarding knee joint movement, extension of knee joint was normal in 39[78%] patients while positive in 11[22%] patients, flexion was normal in 37[74%] patients, while positive in 13[26%] patients. Statistically it was revealed that there is no association observed in rows and column as p value obtained is >0.005.

The extensions which were reported positive that were in variation with a negligible difference from that of the neutral (completely straight knee joint- 0 degree extension). In flexion which was reported positive that were slight less than the normal flexion angle (fully bent knee joint- 135 degree of flexion).

The non significance can be justified by the fact that irrespective of minor problem with movement of extension and flexion (ROM) the participants did not face any problem in their regular working nature. If the range of motion had been hampered to a great degree, it would have not been possible for the workers to be engaged in their occupational activity.

Tests for the injury/damage to the ligaments

It was observed in regarding to Tests for the injury/damage to the ligaments of knee joint that Anterior Drawer Test was normal in 43[86%] patients while positive in 7[14%] patients, Posterior Drawer Test was found normal in 44[88%] patients, while positive in 6[12%] patients. Medial Stress Test was noted normal in 40[80%] patients while positive in 10[20%] patents. Lateral Stress Test was noted normal in 41[82%] patients while positive in 9[18%] patents. Statistically it was revealed that there is no association observed in rows and column as p value obtained is >0.005.

The drawer test is used in the initial clinical assessment of suspected rupture of the cruciate ligaments in the knee. Anterior cruciate ligament injury occurs when the biomechanical limits of the ligament are exceeded (over-stretched). The anterior cruciate ligament (ACL) is an important internal stabilizer of the knee joint. The primary function of the ACL is to prevent hyperextension; its secondary function is to restrain tibial rotation and varus/valgus stress. The function of the PCL is to prevent the femur from sliding off the anterior edge of the tibia and to prevent the tibia from displacing posterior to the femur. Common causes of PCL injuries are direct blows to the flexed knee, such as the knee hitting the dashboard in a car accident or falling hard on the knee, both instances displacing the tibia posterior to the femur. The medial collateral ligament is one of the most commonly injured ligaments of the knee. Most injuries result from a valgus force on the knee from direct contact or with cutting maneuvers when an athlete plants his/her foot and then forcefully shifts directions.[18]

This study already excluded sport and accidental injury and known cases of fracture and dislocation. Hence above mentioned four tests performed to rule out the damage or injury to the ligaments were not significant.

X-ray findings of knee Joint

In regard to the X-ray findings of knee Joint it was observed that - Joint space reduction was seen in 20[40%] of participant. Osteophytes were observed in X ray of 14[28%] participants. Subchondral Sclerosis was observed in 5[10%] participants. Subchondral Cyst was found in 02[04%]. No subluxation and fractures were observed in any of the participant. Statistically it was observed that row and column are not associated as p value obtained is >0.0001.

Joint space reduction was seen in 20 (40%) of participants. It was due to degenerative changes. Because of repetitive stress that causes friction between the articulating surfaces. The result of which is said to be the progressive stage. Subchondral cyst and sclerosis was observed in very less number of participants. No incidences of sublaxation and fracture were observed in the radiographs and this is depicted by the recruitment of participants from the construction site were in active working phase. Had there been no subluxation or fracture, the workers would not have been in the working condition.

CONCLUSION

The study was conducted with an objective to assess the structural and functional changes in *janusandhi* in civil construction workers and associate these with their occupation. On assessment of 50 construction workers of various categories for structural and functional aspect of *janusandhi* it was detected that on the basis of signs and symptoms observed in the *janusandhi*, there exixts an association between *janusandhi* and their occupation of construction which was statistically significant. On the basis of radiological examination joint space reduction and osteophytes were observed in some cases. On the basis of this observation we conclude that there is an association between *janusandhi* and occupation (civil construction workers). These data suggest that prolonged or repeated knee movements, loading and bending are the a risk factor for knee degeneration and that risk may be higher in jobs which entail both knee bending and mechanical loading such as civil construction workers. These workers mostly have mild to moderate pain, crepitus, stiffness and joint line tenderness. Their knee joints are prone to nonuniform joint space loss, osteophyte formation, subchondral sclerosis. If the condition progresses, subchondral cystic changes and subluxations can occur.

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