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*Full length Research Paper*

# Understanding traumatic injuries in walnut harvesting: Patterns and prevention strategies

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**Falls from trees and other tree related injuries are one of the most common causes of trauma in parts of rural Kashmir, particularly, during the harvest season. A one year review of all admissions for trauma, due to falling from trees, to the Accident and Emergency Department of Government Medical College Srinagar was carried out. The study revealed that walnut trees are the most commonly involved trees in such cases. It was the 4th most common cause of trauma related admissions during harvest season. There was only one female admitted with such trauma out of 106 patients. Forearm fractures were the most common injuries overall. Head and chest trauma were the commonest causes of death. There are many strategies for preventing such injuries; the most important being to stop small boys from climbing tall trees and also the more frequent use of grafted walnut trees. Such falls are a serious occupational hazard for many subsistence farmers.**

**Key words:** Injury, trees, fall, walnut tree.

## INTRODUCTION

In Kashmir, climbing trees is an important part of rural life. 80% of population is involved in farming and cultivation. Out of this, approximately 10 to 15% are involved with walnut tree harvesting during harvesting period. Adults and children climb to collect fruits from various trees, but often children climb trees while playing. We noted that many of our admissions for trauma were due to fall from trees or related injuries. Most commonly implicated in such injuries was the walnut tree.

Injuries due to falling from the walnut tree are not unusual in parts where it is grown. Known to mankind, since as early as 7000 B.C., the walnut tree grows in areas of temperate climate, being cultivated in more than 39 countries. China is the world's largest producer of walnuts, other major producers being USA, Iran, Turkey, and Ukraine. India ranks 5th in walnut production, a major portion of it being contributed by the Kashmir province where it is grown on an area of about 61.82 ha with a total produce of around 86.262 metric tonnes.

There are about 3.7 million trees in Kashmir, all of them are of seedling origin and these are known to grow to considerable heights, with an average adult tree achieving a height of about 30 m. The harvest season falls during the months of August and September. The traditional method of harvesting the walnut crop is by climbing the trees [usually barefooted] and striking at its branches with long sticks, the very length of which necessitates the use of both hands. Attempts are also made to dislodge the fruit by vigorous shaking of the branches. The fruit is harvested before it attains full maturity, and hence, at a stage when it tends to be attached more tenaciously to the tree which means that more force has to be exerted to detach it. With such practices, it is not uncommon for the farmers to lose their balance and due to lack of any support, fall to the ground and get injured. Moreover, these farmers are not formally trained or taught any technique of harvest.

We hereby report a review of all patients admitted during the harvest season (August to October) of the year 2006 with such injuries who survived to reach our hospital. This excludes all those patients who could not make it to our hospital or were treated at rural health centres. This study was carried out with the objectives of

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**Table 1.** Age distribution.

| Age group | No. of patients |
|---|---|
| 0-10 | 2 |
| 11-20 | 18 |
| 21-30 | 22 |
| 31-40 | 38 |
| 41-50 | 20 |
| >51 | 6 |

**Table 2.** Injury pattern.

| Injury | No. of patients |
|---|---|
| Head | 12 |
| Spine | 28 |
| Upper limb | 48 |
| Lower limb | 42 |
| Chest | 8 |
| Abdominal | 22 |
| Others | 8 |

**Table 3.** Fracture pattern (most common)

| Fracture | No. of patients (%) |
|---|---|
| Upper limb-Distal end radius | 50 |
| Lower limb-Calcaneum | 35 |
| SPINE- D12-L1 | 40 |

**Table 4.** Timing of injury.

| Time of injury | No. of patients |
|---|---|
| During harvesting | 86 |
| Post-harvesting | 14 |
| Others | 6 |

**Table 5.** Morbidity and mortality.

| Morbidity and mortality | No. of patients |
|---|---|
| Deaths | 6 |
| Paraplegia | 16 |
| Splenectomy | 18 |
| Others | - |

determining: the incidence of injuries attributable to walnut harvest related falls; the profile of the injured; the nature and severity of the injuries sustained; and the measures needed for preventing these injuries.

#### MATERIALS AND METHODS

A prospective study was carried out in the Accident and Emergency Departments of General Surgery and Orthopaedic Surgery, Government Medical College Srinagar, during the harvest and the immediate post-harvest season for walnuts, that is, August through October of 2006.

The Government Medical College, Srinagar, with its associated hospitals, is a tertiary care centre with total bed strength of about 2000. It is the biggest healthcare provider in the region providing specialized health services in almost all medical and surgical specialties and sub-specialties. It caters to a major portion of the population of the state directly as well as by virtue of its being the main referral hospital for receiving cases from all over the province.

All the cases related to injuries resulting from fall from the walnut trees were included in the study. In each case, a detailed history and examination was carried out supplemented by relevant investigations.

## RESULTS

A total of 106 patients (105 male and 1 female) with injuries attributable directly or indirectly to walnut harvesting were admitted during the period of our study. 104 cases had a fall from a walnut tree, 2 of the injured had sustained injuries while being struck by the broken off branches in two separate incidents. The data is summarized as shown in Tables 1 to 5.

## DISCUSSION

Injuries related to trees are an important cause of morbidity and mortality, fall from a tree being the most common cause of these injuries (Jeong, 1998). The severity of injuries sustained is determined by a number of factors including the height of the fall, landing surface, orientation at the time of hitting the surface, etc (Schermer, 2002). In addition, the horizontal, rotational, and gravitational forces acting upon the falling body also influence the nature of the injuries (Grace, 1997).

Injuries resulting from a fall from a walnut tree are infrequent and restricted to a particular season, but nevertheless an important cause of admission in the trauma unit. The most common cause of injury related to harvesting of walnuts is a fall from these trees. In fact it was found during our study that in the peak harvest season these injuries ranked 4th among the various injuries that reported to the accident and emergency unit of our hospital. Most of the injured were farmers or laborers involved in harvesting walnuts using the conventional methods of climbing these trees and either using a long stick or resorting to vigorous shaking to dislodge the fruit. Children were the second important group to be injured, sustaining injuries mostly during the post-harvest phase when they climbed these trees to claim

the residual fruit for themselves. Our study revealed skeletal injuries to be the most common injury suffered by these patients, which have been observed in similar other studies as well (Grace, 1997; Mulford et al., 2001; Centers for Disease Control (CDC), 1979-1989; Peter et al., 1984).

A study of walnut tree related injuries by Syed et al. (2004) had shown cervical and brain trauma to be the most common finding in these patients. The bias towards cervical and brain trauma in their study as contrast to our study is mainly due to the fact that their study was carried out in a predominantly neurosurgical referral centre.

In a study conducted in Georgia, it was found that tree-stand related injuries accounted for 36% of all reported hunting-associated injuries. 73% of the injured had sustained fractures. In order to prevent such injuries, a law was promulgated which made training related to hunting mandatory and prescribed a minimum age limit of 16 years to undergo the hunting course and obtain the required license (Centers for Disease Control (CDC), 1979-1989).

In Louisiana, during the hunting season of 1985 through 1991, 28 deer stand falls resulted in trauma leading to permanent paralysis.13 cases of trauma with a temporary neurological deficit were also received during the same period. As a result of a vigorous public campaign and legislation making it mandatory for spinal trauma to be reported, there has not been a single case for the last 3 years.

Another study in West Africa found that with the introduction of grafted dwarf palm trees, incidence of trauma due to fall from a palm tree decreased considerably (Courtney et al., 2002). Cost factor associated with injuries related to a fall is very high. In one study it has been found to be as high as $ 45000 per year for the permanently injured (Syed et al., 2004).

From our hospital sources it was established that cost of admission per patient was about 20,000 INR (400 US Dollars). Operative charges varied from 15000 to 50000 INR.

## Conclusion

We conclude that falling from walnut trees is an unusual but important cause of morbidity and mortality in Kashmir, particularly affecting the farmers and laborers involved in harvesting walnuts. The seedling origin of the trees resulting in their considerable heights as well as harvesting before maturity and the crude traditional methods of harvest are important factors contributing to these injuries. After discussions with researchers at the University of Agricultural Sciences, Kashmir, the following measures are suggested to prevent the morbidity and mortality attributable to harvesting walnuts:

(1) Cultivation of grafted walnut trees and gradual phasing out of the seedling origin trees, the grafted variety being dwarf sized and yielding more produce.
(2) Educating the farmers about the proper time of harvest, that is, after the fruit is completely matured (breakage of hulls being an important indicator of the same).
(3) Legislation allowing only the properly trained personnel to carry out harvesting.
(4) Designing protective gear and tethering of the harvesting farmer or laborer by a proper restraining apparatus to prevent them from falling to the ground.

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