

## Concussion in Older Population

Oyeneyin Babatunde David<sup>1\*</sup>, Opeyemi Oluwasanmi Adeloye<sup>1</sup> and Oyeneyin Oluwatosin<sup>2</sup>

<sup>1</sup>University of Medical Science Teaching Hospital, Ondo, Nigeria

<sup>2</sup>General hospital, Owo, Nigeria

\***Corresponding Author:** Oyeneyin Babatunde David, University of Medical Science Teaching Hospital, Ondo, Nigeria.

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### Abstract

Concussion present with many symptoms but the most common is headache. Other symptoms include dizziness, nausea, imbalance or vertigo, fatigue or drowsiness, sensitivity to light and noise, amnesia (which is a typical feature), abnormal behavior and seizure. At old age, the human skull has an increased space as the brain begin to shrink just like the other body tissues which experience the same physical changes due to ageing. Subdural hematoma, easily occur in the aged brain vessels following an accident and could be worsened when patient is on anti-inflammatory drugs. In this study, we critically review the current knowledge of concussion in the older populations.

**Keywords:** Concussion; Symptoms; Ageing; Brain Vessels; Knowledge

### Introduction

Concussion is a type of traumatic brain injury which is commonly associated with contact sport, however this condition is more common in older population than thought. Interestingly, little attention is given to this category of population as regard traumatic brain injury (TBI) as much attention is on Sport- and military-related TBI not minding the fact this older population account for the highest incidence of TBI-related emergency department (ED) visits and hospitalizations [1]. In the outcome of TBI, old age has been identified as an independent predictor in the poor outcome of recovery in concussion however little evidence is available to explain the rationale behind this [2,3]. Studies have shown that fall is the leading cause of TBI among geriatrics affecting the female population more, 25% cases are idiopathic, others are road traffic-related TBI (8%), hit by or against objects (6%) and assaults (1%) [4,5]. Cuthbert JP, *et al.* in a study revealed that there is an increase in primary diagnosis of TBI with an increase in age for patients on admission for rehabilitation occurring more in patients from 80 years and above [6]. With an average age of 80 years, 800,000 adults from 65 years and above in EDs in the US were evaluated for TBI [7]. The incidence of cerebral concussion among the elderly and the general population at large is difficult to assess as many cases are not reported.

### Definitions and presentation

Concussion is define as a type of mild traumatic brain injury caused by a mechanical force directed toward the head or the body which transmit to the head and brain, resulting in a complex pathophysiological processes with brain affectation [8]. These pathophysiological changes lead to series of neurometabolic events with associated changes in glucose metabolism, intracellular and extracellular ions concentration and blood flow in the brain [9]. Concussion present with many symptoms but the most common is headache. Other symptoms include dizziness, nausea, imbalance or vertigo, fatigue or drowsiness, sensitivity to light and noise, amnesia (which is a typical feature), abnormal behavior and seizure. It can be a neurological cause of loss of consciousness (LOC) but LOC does not need to occur before a diagnosis of concussion can be made as the event only occur in 8-10% cases of concussion [10,11]. Incidence of dementia has been established to increase following concussion among the elderly [12]. In most cases, it resolve spontaneously after few days. Concussion cannot be diagnosed by any imaging as most of the deficits that it present with are functional rather than structural [8]. It is the most common type of brain injury accounting for 85% of all injuries to the brain.

### Concussion and the geriatric

Cases of concussion is more common among the older population than severe TBI with a presentation of intracranial hemorrhage following its occurrence [13]. Raz N., *et al.* in their study established that ageing caused functional and structural changes in the brain [14]. At old age, the human skull has an increased space as the brain begins to shrink just like the other body tissues which experience the same physical changes due to ageing. These changes also affect the vessels that connect the brain to skull. These vessels can easily be damaged as they are already taut and narrow. When intracranial hemorrhage occurs following concussion, symptoms might not manifest on time because the brain tissues have already experienced atrophy creating more space for blood to occupy in the cranium before symptoms begin to appear [15]. Subdural hematomas easily occur in the aged brain vessels following an accident and could be worsened when the patient is on anti-inflammatory drugs.

Aside the changes that occur in the bridging vein, neurocognitive deficit is also associated with ageing, following functional alteration in the role of dopamine, serotonin, glutamate and acetylcholine [16]. All these changes bring about a worsened cognitive, somatic, behavioral, physical and sleep disturbances easily following concussion however there is no strong evidence to establish that ageing has a key role in the physiology of brain injury that takes place following an impact on the brain.

With ageing, the gait pattern at old age becomes poor as balance becomes less reliable, motor function deteriorates and reaction time drops [17]. This unsteady gait coupled with other issues like side effect of drugs and other underlying health challenges mostly associated with old age like vision impairment predisposes aged people more to fall, which is the leading cause of concussion in this population group.

The clinical symptoms of concussion in older adults is similar to those in adolescents and children, however there are some other symptoms to also watch out for: urinary incontinence, amnesia, confusion and problem with balancing [18].

The diagnosis of concussion is challenging in older population giving that there is no confirmatory diagnostic test or biomarker for it and some of its signs and symptoms which are relied on in making a diagnosis might be present pre-injury state. Self-reported symptoms is not good enough in making a diagnosis as it is subjective and might be under-reported or over-reported, however elaborate assessment not limited to symptoms alone but also neurocognitive and balance testing might improve the accuracy of

concussion diagnosis. Neuroimaging particularly CT and MRI are valuable to rule out more severe brain injury that might necessitate surgical management. Although, several other imaging techniques (like magnetic resonance spectroscopy and functional magnetic resonance imaging) have emerged and have been demonstrated on animal models in monitoring the changes that occur after concussion but their clinical relevance in evaluation particularly in human has not been established [19].

Electroencephalography can also be used after concussion has occurred to monitor changes in the electrical activity of the brain [20]. Serum biomarkers also play an important role in evaluation as it can serve as a pointer to know an individual that might have a prolonged recovery.

### Management of concussion in geriatrics

Study by Chen, *et al.* showed that recovery of older populations from concussion is slower compared to other population groups [2]. Treatment is based on symptoms manifestation. Management of headache which is the most common symptom of concussion should be parallel to other causes. Somatic symptoms treatment should be based on individual assessment and presentation. Drugs and psychotherapeutic modalities can both be employed in the management of psychiatric symptoms of concussion among the elderly based on its severity and nature. Medications used in concussion management should be carefully prescribed to avoid drugs that have sedative effect which can in turn affect motor and cognitive functions.

### Prognosis

Most cases of concussion symptoms resolve spontaneously, however some patients go on to develop post-concussion syndrome (PCS) and even neurodegenerative diseases. The mechanism for which older age is a negative predictor for poor TBI prognosis is still unknown [3]. Age has been reported to play a role in development of PCS, as the elderly are at higher risk of developing it and higher risk of never recovering from it [21]. Post-traumatic headache following concussion is more common than in severe head injury with 15% - 75% of patients still present with it at 3 months and 20% of patients complaining of post-traumatic headache at 4 years [22]. The chances of developing dementia by older adult is further increased following concussion.

The incidence of mortality in older people with concussion is higher than the other population group, their recovery is slower, and their functional, psychosocial and cognitive outcomes poorer [23,24].

## Conclusion

Studies on concussion in the older population are few despite the statistics that have shown that this age group is the most vulnerable to TBI. The financial implication in the management of mild brain injury is enormous in geriatrics as they require longer hospital stays and longer period of rehabilitation if need be, than younger population. Research on concussion as it relate to older population group should be encouraged.

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