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Until recently, there was no consensus on the definition of whiplash. According to the Quebec Task Force (QTF) on whiplash-associated disorders (WAD), “whiplash is an acceleration-deceleration mechanism of energy transfer to the neck. It may result from rear-end or side-impact motor vehicle collisions, but can also occur during diving or other mishaps. The impact may result in bony or soft-tissue injuries (whiplash-injury), which in turn may lead to a variety of clinical manifestations called Whiplash-Associated Disorders.”[1] Patients with whiplash can be classified by the severity of signs and symptoms: Grade 0 means no complaints or physical signs; Grade 1 indicates neck complaints (such as pain, tenderness, and stiffness) but no physical signs; Grade 2 indicates neck complaints and musculoskeletal signs (such as a decreased range of motion or muscle weakness); and Grade 3 and Grade 4 indicate neck complaints and, respectively, neurological signs (such as sensory deficit) or fracture or dislocation.

The incidence of whiplash injury varies between different parts of the world, with rates as high as 70 per 100,000 inhabitants in Quebec [1], 106 per 100,000 in Australia [2], and 188–325 per 100,000 inhabitants in the Netherlands [3]. Versteegen also reported a sharp increase in whiplash injuries from 1989 to 1995 in the Netherlands, in conjunction with a more or less stable pattern of seat belt use [4].

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Moreover, Versteegen et al. identified patients who complained of neck pain after having been involved in a traffic accident and gone to an emergency room. Over a 20-year period, they found a tenfold increase in such visits, from an average annual incidence of 3.4 visits per 100,000 inhabitants (1970–1974) to 40.2 visits per 100,000 (1990–1994) [5].

Richter reported an increase of whiplash injuries in drivers injured in motor vehicle collisions in Hanover, Germany; these went from less than 10 % in 1985 to more than 30 % in 1997 [6].

The cumulative incidence of patients seeking healthcare for whiplash arising from a road traffic accident has increased during the last 30 years to recent estimates of >3/1,000 inhabitants in North America and Western Europe [7] and between 1.0 and 3.2/1,000 inhabitants in Sweden [8].

A 1983–1984 hospital-based study from the UK (which included persons going to the hospital for evaluation of WAD symptoms) reported an annual incidence of WAD of 27.8 (95%CI 23.6–32.6) per 100,000 inhabitants [9]. In the UK, insurance statistics indicate that 300,000 patients present per annum with whiplash-associated disorders [10].

With annual North American incidence rates estimated to be between 70 and 329 per 100,000 people [1, 11], whiplash injuries are the most common injury following a motor vehicle collision [4, 12]. Indeed, in 2000, whiplash was the most common emergency room-treated motor vehicle injury in the USA [4]. In the Canadian province of Saskatchewan, 83 % of traffic injury claims were for whiplash during 1994–1995, giving an annual incidence of 677 insurance claims per 100,000 adult population [13].

Incidence data for WAD are based mainly on study settings such as emergency room visits and insurance injury claims.

In literature, there are no published studies regarding the Italian epidemiology of WAD. Thus, data collection comes from the “Casellario Centrale Infortuni,” which includes data on damage to the person with particular reference to those covered by “RC Auto” insurance [14].

Specifically, in 2009, there were 491,736 reports made to the CCI, 355,334 of which involved the cervical rachis. Of these latter, 218,754 qualify for definition as whiplash. Whiplash represented 44.5 % of all accidents.

In 2010, there was a notable decrease in the overall number of accidents and cases of whiplash. There were 130,433 cases of whiplash, which represents 42.8 % of all accidents.

2.1 Factors Associated with WAD

One potentially important factor for risk of WAD is the severity of impact, but no method exists to assess this in a standardized way. However, various preventive devices have a protective effect in passenger cars in rear-end collisions [7].

Although it seems that females are at slightly greater risk of WAD, the evidence of gender as a risk factor for seeking healthcare or making a claim for WAD is not consistent [15, 16].

Younger persons (aged 18–23) seem to be at greater risk of making insurance claims and/or being treated for WAD [13].

There is some evidence that neck pain before a collision might be a risk factor for acute neck pain after a rear-end collision [17]. Today, there are no scientifically admissible studies examining the effect of psychological, social, genetic, and cultural factors in the onset of WAD after traffic collision [7].

2.2 Prognosis

The Quebec Task Force states that whiplash injuries have favorable prognosis and their conclusion is that the 87 % and the 97 % of the patients recovered (recovery is defined by authors as cessation of time-loss compensation) from their injury at 6 and 12 months after the vehicle collision, respectively. Statement and conclusion are questionable. Whether these patients still had pain or discomfort and needed medical care, it was not reported. A review contradicted the QTF's conclusions that most whiplash injuries were short-lived [18]. These authors concluded that between 14 and 42 % of the whiplash patients developed chronic complaints (longer than 6 months) and that 10 % of those had constant severe pain. Internationally, the proportion of chronic complaints varies between 2 and 58 % [19, 20], but lies mainly between 20 and 40 %. Other studies observed that the proportion of patients who report pain and disability 6 months after the accident varies between 19 and 60 % [21, 22].

Various studies of how possible insurance compensation may influence the course of WAD have produced diverging results, but according to Jansen et al. [23], there is no evidence indicating any significant differences between those patients who have applied for such compensation and those who have not.

Regarding the economic cost due both to management of whiplash disorders and time off work, epidemiological results are limited, but it could be estimated as \$3.9 billion in the USA and €10 billion in Europe in a year [24].

References

1. Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Duranceau J, Suissa S et al (1995) Scientific monograph of the Quebec Task Force on Whiplash Associated Disorders: redefining 'whiplash' and its management. *Spine* 20(8 Suppl):8S–58S
2. Miles KA, Maimaris C, Finlay D, Barnes MR (1988) The incidence and prognostic significance of radiological abnormalities in soft tissue injuries to the cervical spine. *Skeletal Radiol* 17:493–496
3. Wismans KSHM, Huijken CG (1994) Incidentie en prevalentie van het 'whiplash'-trauma. TNO report 94. R.B.V.041. TNO Road-Vehicle Research Institute, Delft
4. Versteegen GJ, Kingma J, Meijler WJ et al (2000) Neck sprain after motor vehicle accidents in drivers and passengers. *Eur Spine J* 9:547–552
5. Versteegen GJ, Kingma J, Meijler WJ et al (1998) Neck sprain in patients injured in car accidents: a retrospective study covering the period 1970–1994. *Eur Spine J* 7:195–200

6. Richter M, Otte E, Pohlemann T et al (2000) Whiplash-type neck distortion in restrained car drivers; frequency, causes and long-term results. *Eur Spine J* 9:109–117
7. Holm LW, Carroll LJ, Cassidy JD et al (2008) The burden and determinants of neck pain in Whiplash associated disorders after traffic collisions, results of the Bone and Joint Decade 2000–2010 Task Force on Neck pain and its Associated Disorders. *Spine* 33(4 Suppl):S52–S59
8. Jansen GB, Edlund C, Grane P et al (2008) The Swedish Society of Medicine and the Whiplash Commission Medical Task Force. Whiplash injuries: diagnosis and early management. *Eur Spine J* 17(Suppl 3):S359–S418
9. Otremski I, Marsh JL, Wilde BR et al (1989) Soft tissue cervical spinal injuries in motor vehicle accidents. *Injury* 20:349–351
10. Burton K (2003) Treatment guidelines: is there a need? In: *Proceedings of Whiplash Conference 2003*, Bath, England, 6–8 May. Lyons Davidson Solicitors, Bristol
11. Quinlan KP, Annett JL, Myers B, Ryan G, Hill H (2004) Neck strains and sprains among motor vehicle occupants – United States, 2000. *Accid Anal Prev* 36:21–27
12. Berglund A, Alfredsson L, Jensen I, Bodin L, Nygren A (2003) Occupant-and crash-Related factors associated with risk of whiplash injury. *Ann Epidemiol* 13:66–72
13. Cassidy JD, Carroll LJ, Côté P et al (2000) Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. *N Engl J Med* 342: 1179–1186
14. Il Casellario Centrale Infortuni, Rapporto Statistico (2011) <http://casellario.inail.it/repository/ContentManagement/information/N115396216/RapportoStatisticoCasellario2011.pdf>
15. Bjornstig U, Hildingsson C, Toolanen G (1990) Soft-tissue injury of the neck in a hospital based material. *Scand J Soc Med* 18:263–267
16. Bring G, Bjornstig U, Westman G (1996) Gender patterns in minor head and neck injuries: an analysis of casualty register data. *Accid Anal Prev* 28:359–369
17. Obelieniene D, Schrader H, Bovim G, Miseviciene I, Sand T (1999) Pain after whiplash: a prospective controlled inception cohort study. *J Neurol Neurosurg Psychiatry* 66(3):279–283
18. Barnsley L, Lord S, Bogduk N (1994) Whiplash injury: clinical review. *Pain* 58(3):283–307
19. Côté P, Cassidy JD, Carroll L, Frank JW, Bombardier C (2001) A systematic review of the prognosis of acute whiplash and a new conceptual framework to synthesize the literature. *Spine* 26:E445–E458
20. Scholten-Peeters GGM, Verhagen AP, Bekkering GE, van der Windt DAWM, Barnsley L, Oostendorp RAB et al (2003) Prognostic factors of whiplash-associated disorders: a systematic review of prospective cohort studies. *Pain* 104:303–322
21. Freeman MD, Croft AC, Rossignol AM (1998) Whiplash associated disorders: refining whiplash and its management. The Quebec Task Force. *Spine* 23:1043–1049
22. Stovner LJ (1996) The nosologic status of the whiplash syndrome: a critical review based on a methodological approach. *Spine* 21:2735–2746
23. Jansen GB, Edlund C, Grane P, Hildingsson C, Karlberg M, Link H, Måwe U, Portala K, Rydevik B, Sterner Y, Swedish Society of Medicine; Whiplash Commission Medical Task Force (2008). Whiplash injuries: diagnosis and early management. The Swedish Society of Medicine and the Whiplash Commission Medical Task Force. *Eur Spine J* 17 (Suppl 3):S355–S417
24. Eck JC, Hodges SD, Humphreys SC (2001) Whiplash: a review of a commonly misunderstood injury. *Am J Med* 110:651–656

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