

Do Turbans Provide Protection Against Cranial Trauma in Two-Wheeler Accidents? A Review of the Indian Medical Literature

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Abstract

The wearing of turbans or head scarves is mandatory for practising Sikh men and women. Religious mandates stipulate that nothing may be placed on top of the turban (scarf), thus making it impossible for practicing Sikhs to wear protective motorcycle helmets. To honour the freedom of religious expression, many jurisdictions, including India, have exempted Sikhs from mandatory helmet laws. Despite studies into the efficacy of protective helmets while riding ‘two-wheelers,’ little is known about the protective potential of turbans. This paper represents a review of Indian literature (277 studies) related to head injuries sustained in road traffic accidents involving two-wheelers. This review shows that the extant literature is of limited value when trying to understand the extent of the protective potential of turbans and that systematic, evidence-based epidemiological studies derived from hospital admissions and forensic examinations are required.

Keywords: *Turban; helmet; road traffic accidents; cranial trauma*

Introduction

In Sikhism, the practice of permitting body hair to grow naturally expresses respect for the perfection of God’s creation, a tradition that reaches back to the Khalsa code defined by the tenth guru^[1]. Consequently, all practising Sikhs, men and women, are forbidden to cut their hair, while men are also not permitted to trim or shave their beard. To avoid impurities, the hair is covered with a piece of cloth (*patka*) in private and with a turban when in public, which also serves as an outward symbol of Sikh faith. Turban and unshorn hair are important marks of a Sikh male’s identity, even among Sikhs who do not live in complete accordance with Khalsa traditions^[2]. As male Sikhs may not cover their hair by any form other than by a turban, this rules out wearing caps, hats, or other head gear, as well as the wearing of helmets (as they are a form of a cap). The same applies to practising Sikh women who would wear a head scarf or a turban. Furthermore, according to Sikh religious practices, no further head coverings may be placed over turbans^[3]. This dissonance sets up a potential for conflict between national road safety

regulations and the cultural expectations of Sikh men.

In India, as well as in numerous other jurisdictions, Sikhs are exempt from the mandatory requirement of protective helmets while riding ‘two-wheelers,’ a generic term which encompasses mopeds, motorcycles and scooters as well as bicycles. Given that throughout India two wheeler accidents are the major cause of head injury^[4], and that helmets have a high efficacy of protecting riders and pillion passengers from traumatic head injuries, the exemption for Sikhs has been widely criticised by the Indian medical profession, which aims to overturn it. Despite studies into the efficacy of protective helmets while riding ‘two-wheelers,’ however, there is only a limited number of observational studies on the protective potential of turbans.

This paper was conceptualised during background research into how the cultural mandate to wear turbans meshes with the legal requirements to wear protective head gear during work and recreational pursuits^[5]. It was assumed that data on the relative performance of turbans as protective head gear would be readily available in the

Indian literature given the volume of research carried out on two-wheeler accidents in the country. Relevant data proved to be more elusive, creating an impetus for a formal review.

This review canvasses the attitudes and incidence of helmet use as well as the state of knowledge regarding the effects of helmet or turban use on head injuries as well as the nature of cranial trauma sustained in two wheeler accidents.

Methodology

This paper systematically reviews the extant literature but is not based on a systematic review. The methodology espoused a combination of systematic database searches with snowballing. In total, 277 papers, theses and reports were identified for this review, of which 223 could be evaluated for content. For details see the Supplementary Data file.

Results

A large number of studies (37.5%), although mainly based on autopsy or clinical data, remain at a too generic level to provide useful data for the research question at hand, as they neither discuss helmet use nor do they provide sufficient detail on the distribution of cranial injuries. Several studies place considerable emphasis on peripheral, but presumably easy obtainable data, such as the time of day when accidents occur or even the socio-economic and educational status and professions of the victims but then fail to report in more detail on injury patterns and injury severity as purported in the article titles.

From a regional perspective, one might assume that studies conducted in the wider Punjab area of both India (Chandigarh and Punjab State) and Pakistan (Punjab Province) would be more likely to comment on the wearing of turbans as an influencing fact. This, however, this was not the case (for references see Supplementary Data file).

Attitudes and incidence of Helmet Use

Although the use of helmets when riding two-wheelers is mandatory in India [6 §129] unless the rider and pillion passenger are Sikhs, compliance is lax and the enforcement is lacking or inconsistent.^[7]

A number of studies have been conducted that examine the extent of helmet use and the rationale for not wearing them. The main arguments by participants put forward against helmet use are discomfort, especially in a tropical climate, helmet cost, inability to hear, but also fear of hair loss or that the nature or speed of the trip did not warrant one, even though studies have shown that many understand the rationale for wearing a helmet (for references see Supplementary Data file).

The literature on helmet use is largely silent in turbans as alternatives. While some studies identify the religious affiliation of participants, they fail to consider the use of turbans in their analysis^[19]. Likewise, some studies in the Punjab and Ladakh areas discuss the lack of preparedness to wear helmets^[20], but do not to classify any other headwear among non-helmet wearing motorcyclists. The exception is a study of the attitudes of female pillion riders in Delhi, which showed that Sikh women were more likely to be opposed to mandatory helmet laws than Hindu women^[21].

Effects of Helmet or Turban Use

Many studies reporting on head/cranial injuries caused by two-wheeler accidents note the beneficial effects of helmet use (21.3 %). Only very rarely, however, do they pass informed comment on the nature or other types head protection, *i.e.* comparing helmets with turbans. In many instances the extent of protection provided by a turban is either simply assumed or noted as a possible mitigating factor of unknown benefit, but is not formally assessed.

Mohan, et al.²² were the first to discuss various forms of head protection in their seminal study ‘Helmet and head injury study of crash-involved motorcyclists in Delhi.’ The authors noted that “[s]ome Sikhs believe that turbans provide some protection, but our study showed no evidence of this” even in single-vehicle crashes with speeds as slow as 15 km/h. Another study of motorcyclists in Delhi by Grimm and Treibich²³, Grimm and Treibich²⁴, showed that two-wheeler riders wearing turbans drive on average more slowly and appear more risk averse than riders with helmets.

In the late 1980s, Sood, examining over 300 cases of head trauma caused by motorcycle accidents in New Delhi, however, noted that “[t]heir head injury incidence

and severity was midway between that of drivers with helmets and without, suggesting that the turban offers some degree of protection” [25], in particular in lesser accidents. A 2009 study of fatal two-wheeler accidents at Patiala noted that turbans appeared to provide partial protection [26]. None of the studies, however, are systematic, evidence-based epidemiological studies that compare hospital admissions and forensic examinations of head injuries.

Nature of Cranial Trauma

Even though a large number of papers comments on the beneficial effects of wearing helmets (see above), the reviewed papers provide little formal data that specifically examine the location of cranial fractures among two-wheeler riders not wearing an approved safety-helmet. In most cases, the trauma loci are only broadly described. For example, setting aside cranio-facial injuries (which will only be protected by full face helmets), a study in Chennai found that the majority of fractures appear to be in the temporo-parietal region (40%), followed by fractures of the frontal bone (15%). Occipital fractures were the least common (7.5%) [27]. This appears to be a universal pattern as similar patterns were reported from various parts of India, Pakistan and Bangladesh (Table S4).

Discussion

Observational studies outside the realm of road traffic accidents are limited in scope and detail, such as studies on the impact of blast injuries to the ear sustained by soldiers [28,29] and on head injuries sustained by batsmen during professional cricket matches [30].

Grimm and Treibich²³ noted that “drivers tend to compensate between speed and helmet use: the Sikhs who cannot wear a helmet because of the turban, drive, on average, slower.” Mohan, et al.²², however, noted that turbans provided no appreciable protection even in single-vehicle crashes with speeds as slow as 15 km/h.

The level of protection a turban might afford its wearer is dependent on its type. A *doumalla*, for example, a double length turban of ten or more meters, has considerably more fabric covering the sides of the parietal bones as well as the top of the cranium than other turban types. Canvassing publicly accessible imagery of Sikh on two-wheelers (via Flickr and other photo hosting sites), the most common types of turbans worn are the *pag(ri)*, a double width turban of five to six metres length, and the *dastar* a single width turban of four to six meters length. The *pag* has fewer but thicker layers of cloth on the sides than the *dastar*, and, critically, has a thicker coverage on the top of the cranium.

Experimental studies simulating the performance of a turban against blunt head impacts at various locations of the skull have shown that a turban buffers the impact, especially at the sides, front and rear of the head, albeit below the levels of a safety helmet. Setting aside the location of the *joora* (top knot) at the front of the head, the turban has no meaningful effect in the case of a blunt impact on the crown as there the covering with turban material is the thinnest (usually only one layer, Figure 1) [31,32]. In both experimental studies a *dastar* was used.

Unlike a helmet of near uniform thickness, a turban is wound round the head and thus provides differential covering depending on the extent of overlap between the individual layers. A turban-covered skull therefore exhibits different zones of protection against blunt impact, which need to be taken into account when examining cranial trauma. Figure 1 shows the relative thickness of cloth covering at various parts of the skull, ranging from three to a single layer.

As noted above, little formal data have been published that specifically examine the location of cranial fractures among motorbike riders not wearing an approved safety-helmet. In most studies, the observations of cranial trauma are kept at such a general level (e.g. temporo-parietal region’) that it is impossible to draw any conclusions about the prospective buffering effect a turban might have.

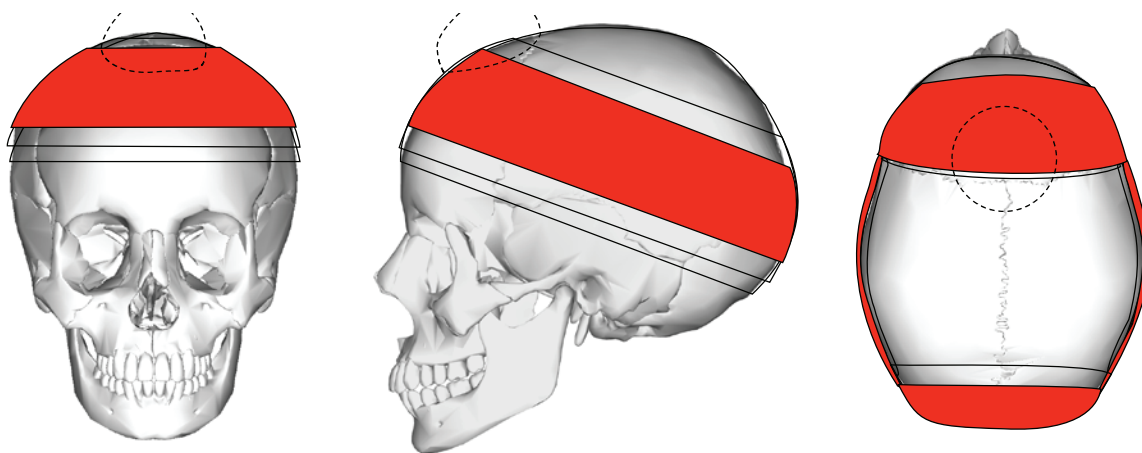


Figure 1. Schematic protection provided by a turban. The darker, the more layers. The dashed outline shows the approximate location of the joora which provides additional buffering. Base image of skull: Wikimedia.

Directions for future research

As this review has shown, the extant literature of head injuries sustained in two-wheeler accidents is of limited value when trying to understand the extant of the protective potential of turbans. The published data are too patchy and inconsistent to be informative. More rigour and in particular more detail in reporting is required. Systematic, evidence-based epidemiological studies derived from hospital admissions and forensic examinations are lacking. There is a need for a full systematic study that compares the number of fatal vs. non-fatal head injuries sustained during motorcycle or bicycle accidents of both drivers and passengers, and correlates these with the wearing of protective head gear (helmet or turban). The forensic departments are eminently situated to provide this.

Ethical Clearance: As the study is a review of published literature, a clearance from the Ethics in Human Research committee is not required.

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