Reviewer’s report

Title: Burden of traumatic spinal fracture in 2006 - 2007 in Tehran, Iran

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Reviewer: Farshad Pourmalek

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Round 2 review of manuscript titled “Burden of traumatic spinal fracture in 2006 - 2007 in Tehran, Iran”

Farshad Pourmalek 25 June 2011

(1) Clear delimitation of the reference year of study is needed. Did the study cover 12 months or more or less? From when to when (e.g. March 2006 – March 2007).

Correct

Addition of the above clarification to manuscript text is needed.

(2) Page 9. “The study had several limitations. Data for the population of Tehran was available at 2006, but the data for incidence was from 2006 – 2007 and the data for sex, age, and associated injuries was related to 1999-2004. Different types of vertebral fractures have the same DW; therefore, different types did not separate.” Discuss how the limitations are believed not to hamper validity of the study results. What are the predictable overestimations or underestimations in different components of DALYs?

We believe that annual incidence has not changed significantly in two consecutive years. The age-sex structure of people with spinal fx. is influenced by different risk factors among sex and age subgroups. During the recent decade, there is not any recognized change in the pattern of risk factors in sex-age subgroups (such change happened during the Iraq-Iran war which influenced men more than women). So the authors believe that these assumptions have not significant impact on our estimation for burden of spinal fractures. We do not expect to have different age-sex pattern of spinal fractures among large Iranian cities.

Addition of the above clarification to manuscript text is needed.

fractures, S22.0, and S22.1 for thoracic and S32.0 and S32.7, S32.8 for lumbar vertebral fractures were used to identify patients with TSF in the “National Trauma Data Bank (NTDB)”.

In brief, the NTDB is a database on more than 16,000 trauma patients that had been collected from 1999 to 2004 in 8 major cities of Iran including six hospitals in Tehran. Age and sex distribution of TSF patients (Table 1), outcome (death vs. survival), and associated injuries of TSF patients were also extracted from the databank.

There are considerations regarding the place, time, and person (the injuries codes to be included or excluded).

(3) Place: Patient inflow of third-level hospitals in Tehran includes many patients from other cities. In the meantime, only six hospitals cannot include all the patient inflow from Tehran itself. So the patient population that is represented by six hospitals in Tehran does not exactly represent the population of Tehran.

We agree with the reviewer that it is not an exact calculation, but it is the best available estimate. Furthermore, we used just the age-sex pattern from that datum, not the incidence of fracture.

So this is not an estimate of burden of traumatic spinal fracture in “Tehran”, but it is the burden in another population that is mentioned above. Clear delimitation of the study population in the manuscript text is needed.

(4) Time: Where the study title mentions years 2006-2007 as the reference years, why the National Trauma Data Bank (NTDB) data from 2006-2007 was not used for? Where the data for 1999-2004 were used, how can this affect the study results? There is no mention of using average annual values for 1999-2004 data. Should average annual value be used for representing burden in one year, even though the mean value would refer to average for 1999-2004 time period.

Unfortunately, the National trauma Data Bank was not continued after 2004 and we do not have more recent alternative estimate. So, we extracted agesex pattern of spinal fractures from 1999-2004 dataset.

There is no mention of using average annual values of age and sex pattern from 1999-2004 data in the manuscript.

(5) Injury codes: Some of the codes that need to be included are not included and some of the codes that should not be included are included.
S12.8 that is “Fracture of other parts of neck (Hyoid bone, Larynx, Thyroid cartilage, and Trachea)” should not be included but is included. This should not be included since it is not spinal fracture.

S18 that is “Traumatic amputation at neck level (Decapitation)” is not included but should be included since it is traumatic spinal fracture.

S19 that is “Other and unspecified injuries of neck” should be partly included but is not included. Parts of this code are traumatic spinal fracture and need special treatments like redistribution.

S22.9 that is “Fracture of bony thorax, part unspecified” should be partly included but is not included. Parts of this code are traumatic spinal fracture and need special treatments like redistribution.

S29.7 that is “Multiple injuries of thorax” should be partly included but is not included. Parts of this code are traumatic spinal fracture and need special treatments like redistribution.

S29.9 that is “Unspecified injury of thorax” should be partly included but is not included. Parts of this code are traumatic spinal fracture and need special treatments like redistribution.

S32.8 that is “Fracture of other and unspecified parts of lumbar spine and pelvis” is totally included whereas just a part of it is traumatic spinal fracture (that is “Fracture of lumbosacral spine NOS” – noted that lumbar is meant to be included in this study and sacral meant to be excluded) but the other part is not traumatic spinal fracture (that is “Fracture of ischium” and “Fracture of spine NOS”). This code needs special treatments like redistribution.

S39.9 that is “Unspecified injury of abdomen, lower back and pelvis” should be partly included but is not included. Parts of this code are traumatic spinal fracture - lower back - and need special treatments like redistribution.

We accept to delete S12.8 from the list, however that was very rare and its deletion does not change the final estimate. We extracted all types of spinal fractures from our dataset. Not-stating ICD codes such as S22.9 or S29.7 does not mean that we have excluded such codes; we do not have such codes in our dataset which was the result of a research project and its nonclear and ill-defined codes were rare.

There is need to clearly mention the following items:
(a) Codes that should have been partly included but are totally included and the relevant rationale
(b) Codes that should have been included but are not included at all and the relevant rationale
(b) Codes that were included in definition of disease but happened to have zero cases in data.
(6) Why the data on “outcome (death vs. survival)” are not provided. How were they used?
As written under title of "Relative risk of mortality (RRM)" we assumed that isolated spine fracture (iTSF) can not cause pre-hospital or in-hospital death (deaths are related to comorbid injuries such as spinal cord or brain injuries). We provided an estimate of increased post-hospital mortality based on the Ioannidis (2009), Center (1999), Puisto(2009) and Leucht(2009) studies. So, we do not have real follow-up data of outcome of our patients.
Last sentence of the first paragraph in Methods section reads as “Age and sex distribution of TSF patients (Table 1), outcome (death vs. survival), and associated injuries of TSF patients were also extracted from the databank”. The sentence sounds as outcome (death vs. survival) was extracted from the data bank. It is still present in the second version of the manuscript.
(7) Provide data on all-cause death rates, cause-specific death rates, incidence, YLL, disability weights, YLD, and DALYs by age and sex in an appendix spread sheet.
Was attached – We accessed all cause death rates for 2006 through personal communication, but they have not published yet and we are not permitted to publish them.
Regarding all-cause mortality data used for the study: There is need for mention of the following items in order to provide a basis for judgment about validity of results:
(a) Source of data: death registry?
(c) Completeness of death registration: how was the under-registration estimated and corrected?
(d) Crude death rate for all-ages and both sexes used in analysis: was it 3 or 4 or 5 or what in 1000 population?
Regarding the other items mentioned above, please do put cause-specific death rates, incidence, YLL, disability weights, YLD, and DALYs in columns and causes’
names and ICD codes in rows and repeat for age groups and sexes.

(8) Pages 4-5. “In the study of Puisto and colleagues, a lifelong RRM of 1.33 for females and 1.43 for males following TSF was reported which was mainly due to cancers or respiratory diseases, even after exclusion of metastatic fractures at the time of TSF occurrence.(18) We considered post-hospital mortality based on these studies.” What was done to transform the lifelong relative risk of mortality to that during the reference year of study?

We have estimated incidence-based DALYs, so all consequences (including life-long consequences) of incident cases of spinal fractures in the reference year, have been attributed to the reference year. It means that we estimated the number of increased mortalities in the future years after incidence of spinal fx in the reference year.

(9) Page 3. “For this purpose, the data on population structure and general mortality rates and at least three of the above mentioned epidemiological indices are necessary.” What was the source of data on general mortality rates and how was under-registration of deaths treated. More details needed on general mortality rates for Tehran in 2006-2007. Discuss the effects of cause of death misclassification on study results.

We used the Iranian Ministry of Health death registry which covers all provinces of Iran except Tehran; that was the best available evidence for estimating general mortality and cause-specific mortality rates. All mortality rates have been adjusted after correction of ill-defined causes of death and garbage codes.

Before- and after-redistribution death numbers for the causes included in the study are needed. Please add to the appendix table. Response to the question about treatment of death under-registration is missing.

(10) Page 3. “To estimate the incidence of TSF in 2006 and 2007, two population based studies were performed in September 2007 and 2008 in Tehran. The details of these studies have been described previously.(16)”

Page 4. “Totally, 3 new cases of TSF (C1- L5) were found in 18,346 person4 years that provided an incidence of 16.35 (95%CI: 3.4-48.0) per 100,000. TSF incidence was 21.29 and 11.17 per 100,000 for males and females, respectively.” Citation to the second study is not mentioned here. Is there an interpretation of how the low number of cases in age and sex specific groups (essentially one case, each in one age-sex group, summing up to 3 cases)
renders or not the estimates unreliable and how this affects the results? The second study has not been published yet; the study has been performed by the co-authors of the present study.

We would agree that low number of cases decrease reliability of the study. It has been shown by wide 95% confidence interval of 3.4-48.0 per 100,000. However, the incidence of spinal cord injury (SCI) is almost half to one-third of traumatic spine fracture, which comparing with our previous publication of burden of SCI in Tehran seems reliable: Almost 7/100,000 SCI versus 16.35/100,000 spine fracture.

Addition of the above clarification to manuscript text is needed.

(11) Page 5. “The estimated sex-age specific incidence of 354 cases of iTSF has been demonstrated based on disease modeling in Table 2.” How does estimation of 354 cases of isolated Traumatic Spinal Fracture in 2006-2007 in Tehran with census-based population of 7,976,000 in 2006 (mentioned in page 2) relate to the estimated all-age incidence rates of 10.89 for males and 5.61 for females (mentioned in table 2), where 354 / 7,976,000 is 4.44 in 100,000? The estimated all-age incidence rates of 10.89 for males and 5.61 for females for isolated Traumatic Spinal Fracture (mentioned in table 2) multiplied by all-age population of 3,986,419 for males and 3,817,464 for females (mentioned in table 3) could produce about 434 and 214 cases respectively. How are these 648 cases related to “the estimated sex-age specific incidence of 354 cases of iTSF”? Why is the total population of Tehran in 2006-2007 mentioned in table 3 (i.e. 7,803,883) even less than the census-based population of Tehran in 2006 mentioned in page 2. i.e. 7,976,000?

354 cases of iTSF are not among Tehran population. These are patients from National Trauma Data Bank in Iran, 1999-2004. As we mentioned in previous paragraphs, we used this data just for age-sex distribution of TSF not for calculation of incidence. On the other hand, it is important not to mix it.

There is small difference between Tehran urban population (7,803,883) in Table 3 and total rounded population of Tehran district (7,976,000 in page 2).

There are small differences between delivered data of Iranian Statistical Centre in different times and the current version is a little different with our input population data (7,872,285 vs. 7,803,883).

Clarification is needed about whether the estimations were originally intended for
the urban population of Tehran or the urban and rural population of Tehran (i.e. Tehran district) or this differentiation was not judged to be important (at the definition of population level, not at the quantitative level).

(12) Page 9. “Regarding other associated injuries, we did not find a correlation between thoracoabdominal injuries and increased rate of mortality. Although the patients were severely injured, it was mainly due to increased incidence of associated thoracic injuries. No significant difference in mortality was observed (20).” Not ideal to present some results in the discussion section of the manuscript that have not been mentioned in the previous sections. Provide relevant details in methods and results sections and discuss the findings in discussion section. Reference number (20) is for DisMod II software. Is this a relevant reference for this paragraph?

"…we did not find a correlation between thoracoabdominal injuries and increased rate of mortality" in the literature (not in our study). Reference number 20 is "Rabinovici R, Ovadia P, Mathiak G, Abdullah F. Abdominal injuries associated with lumbar spine fractures in blunt trauma. Injury. 1999 Sep;30(7):471-4." The reference for DisMod is 2 not 20. The reference number 20 from the first version of the manuscript:

(The second version of the manuscript does not have the References at all.) Rabinovici 1999 appears as blow in the first draft, that differs in citation format details with the one mentioned above.

(13) The manuscript does not have an abstract.

The article has an abstract which has been submitted in the special field for manuscript submission. You can find it here:

Background: The Disability-Adjusted Life Year (DALY) was designed by the World Health Organization (WHO) to measure, compare, and analyze the burden of various diseases. To the best of our knowledge, this is the first study on the assessment of burden of traumatic spinal fracture (TSF) in an Iranian community. TSF includes both isolated (iTSF) and associated injuries related to traumatic spinal fractures (aTSF) in Tehran, the capital of Iran, for the year 2006-2007 using DALYs.

Methods: Burden of TSF was estimated based on information provided by the national data on Iranian trauma, data from the WHO, and literature data using disease modeling (DISMOD). Incidence of TSF and associated injuries were obtained from two population based studies and National Trauma Data Bank.
in Iran, while duration, and relative risk of mortality (RRM) were obtained from WHO data and the literature. The incidence, duration, and relative risk of mortality (RRM) were used to calculate DALY for TSF. To calculate DALY, the years of life lost because of premature mortality (YLL) were added to the number of years lost because of disability (YLD). DALY were calculated separately for both iTSF and aTSF. In-hospital YLD and post-hospital YLL for iTSF and in-hospital YLL and YLD were calculated for aTSFs.

Results: TSF incidence was 16.35 (95%CI: 3.4-48.0) per 100,000. The incidence of TSF in males was more than twice that of females. The largest DALY were seen in 15-29 years. The highest burden of associated injuries of TSF was related to spinal cord and head injury. DALY for aTSF were estimated to be 2496.9 years (32.0 DALY /100,000 population). The YLD and YLL was almost similar. Total DALY for iTSF and aTSF was 2568.9 years (32.92 DALY /100,000 population). Based on the literature, post-hospital increased risk of mortality was increased by 1318 DALY (16.89 DALY /100,000 population).

Conclusion: This study showed a considerable burden for TSFs mainly due to associated injuries and increased lifelong RRM in patients with TSF.

(B) Minor Essential Revisions

(1) Page 1. “To the best of our knowledge, there is no previous study on the assessment of burden of TSF in the Iranian community using the DALY.” The databases that were searched should be mentioned.

We searched PubMed and two Iranian database of Iranmedex and Scientific Information Database (SID).

Addition of the above clarification to manuscript text is needed.

(2) Page 2. The 2006 census was used to determine Tehran’s population (7,976,000), age, and sex distribution. Provide citation.


Addition of the above clarification to manuscript text is needed.

(3) Page 3. “In the present study, among all associated injuries, we included only SCI, head, and extremity injuries in the calculation.” Why?

We corrected the above-mentioned sentence in the article. "There were not any other combination between vertebral fractures and injuries other than SCI, head and extremity in non-fatal cases."
“Short-term mortality of iTSF was considered as zero.” Why is this assumption needed? Does it mean, for instance, that short-term mortality of head injury is zero? How does this assumption, if it holds true (that should not be the case here), affect the estimations?

Spine fracture does not kill anyone unless it is associated with other organs such as spinal cord injury. Head injury short-term mortality is not zero. This assumption was necessary, because it shows that there was no pre-hospital death in isolated cases (iTSF). Regarding head injury, there are many died patients before entry to the hospital (Pre-hospital). Thus, for calculation of burden of head injury, we need autopsy findings or literature based studies to show how many percents of patients died before hospital entry. In SCI, there were two studies in the literature one in Portugal and the other in Canada, which showed 16% SCI death pre-hospital which comprises the great burden.

“In brief, cluster random sampling was used and structured interviews were performed with participants to detect history of spine fracture. All cases with positive history were evaluated by a specialist to document the spine fracture.” Was this evaluation a review of medical documents held by patient and/or examination? More details needed. What about the fatal cases? What about cases that have migrated out of Tehran? How the validity and reliability of these measurements can be judged about?

All suspected cases of spinal fractures had been evaluated by their medical records and documents and some of them have been examined by neurosurgeon. We had a list of died people among household survey, but non of them were suspected for a spine fx.

The other concerns (such as migration of household) are common shortages of estimating incidence based on cross-sectional surveys and interview with current residents. As overall, underestimation of incident cases in a population-based survey is lower than hospital-based data (according to problems such as access and cost of treatment)

Addition of the above clarification to manuscript text is needed.

“Post-hospital YLD was estimated to be zero, because there was no definite evidence for continuous pain or disability after 51 days.” Is this an empirical finding or a clinical impression?

It is based on the assumptions of the first round of GBD. In that study, just a short-term 51 days disability was considered for isolated spinal fractures.
(7) Table 5. Where the long-term YLD for “Open wounds” is zero (in the second row of data - if dash is meant to represent zero), how can that for “Open wound plus skull Fx” that is 8.409 be greater than that for “Skull Fracture” that is 8.408? How can long-term YLD for “Brain [injury??] + Limb Fx” be marked with “ - ” (second last row of data) where “Brain Injury” has the second highest long-term YLD of 10.362? Why it is not correct if one interprets these figures as if a limb fracture on the top of one’s brain injury prevents long-term disability that would otherwise ensue if there were no limb fracture?

We used detailed case-by-case data to calculate YLDs. Some of the injuries to head are not expected to produce long-term disabilities.

(8) Page 6. “In 25 died patients with aTSF, 9 patients presented with intracranial hemorrhage, 2 with skull fractures, 6 with spinal cord injuries (SCI), 4 TSF and associated dislocation, 1 tracheolaryngeal crush, 1 open wound, and 2 unknown injuries.” What does “presented” mean here? Is it the main clinical presentation or cause of death? How are these categories mutually exclusive? Was not there any patient with two of these conditions together?

"Presented with" means "had …" and It is "cause of death" here. We did not have any combination of associated injuries in the dataset. Sum of the numbers are less than 25. Is there a number missing from the presentations or another possible explanation?

(C) Discretionary Revisions

(1) Provide ICD-10 codes for associated injuries in an appendix file. This can be useful for other researchers and readers.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.