Interaction of age and gender on post-discharge quality-of-life in adult trauma patients in urban India – a cohort study

# Introduction

Trauma contributes to one-tenth of the global disability-adjusted life-years (DALYs), with low-and middle-income countries (LMICs) bearing a disproportionate burden of the morbidity [@GBD2019DemographicsCollaborators2020; @Haagsma2019]. To address this burden it is important to understand the long-term outcomes of trauma and the different factors associated with these outcomes, especially in LMICs [@Kruithof2017; @Wisborg2017; @Rios-Diaz2017]. This encompasses a range of socioeconomic outcomes including health-related quality of life (QOL) [@Ahmed2017; @Nguyen2017; @Hossain2020; @Jagnoor2019].

Age and gender are associated with post-discharge QOL among trauma patients. Elderly populations and women tend to have limited access to resources, reduced social capital, disparities in support, poor health-seeking behavior, and restricted education and employment opportunities [@Amurwon2019;@Levasseur2015; @Brinda2016; @Gupta2019; @Kennedy2020]. This can shape their post-discharge well-being and outcomes after trauma [@Waqas2017; @Awang2018; @Quadir2019; @Fabricius2020].

Consequently, older age and being a women can make trauma patients more vulnerable to poorer post-discharge QOL [@Gopinath2017;@Brown2017c; @Mollayeva2018;@Rissanen2020]. There is some evidence that older women may have higher morbidity in LMIC settings [@Carmel2019; @Agrawal2014], but there is little research on the interaction between age and gender on QOL among post-discharge trauma patients in this setting.

Understanding the interaction between age and gender on QOL may provide insights for improving trauma management and developing support services in LMIC settings [@Meara2015; @Babhulkar2019]. The aim of this study is to assess the interaction of age and gender with post-discharge QOL among adult trauma patients using the context of urban India.

# Methods

## Study Design

This study is a cross-sectional study using data from an ongoing interrupted time series trial of trauma patients discharged from four tertiary-care hospital in urban India between November 2019 and May 2021.

## Setting

India accounts for nearly 20% of global trauma burden [@GBD2019DemographicsCollaborators2020]. More than one-tenth of all the DALYs in India are due to trauma and it is among the top five causes of morbidity [@Menon2019]. The patients were enrolled from the on-going Trauma Audit Filters Trial (TAFT) in four participating tertiary-care hospitals in Indian cities [@ClinicalTrials.gov2017]. These were the Grant Medical College and Sir Jamshedjee Jeejeebhoy Hospital in Mumbai, Lok Nayak Hospital of Maulana Azad Medical College (MAMC) in Delhi, the Institute of Post-Graduate Medical Education and Research and Seth Sukhlal Karnani Memorial Hospital (SSKM) in Kolkata and St. John’s Medical College, Bengaluru. The first three are public hospitals that have nominal fees catering to patients from lower socioeconomic sections of the population, while the fourth is a charitable private hospital catering to a mix of different socioeconomic sections of the population.

## Participants

We include patients aged 18, which is the legal age for consent in in India [@IndianCouncilofMedicalResearch2006], presenting to the casualty department with a history of trauma—as per the V01-Y36, chapter XX of the International Classification of Disease version 10 (ICD-10) [@WordHealthOrganization2016]–who are admitted and discharged alive.

## Variables

Age and gender were the main variables for this study. We also included vital sign measures such as systolic blood pressure (SBP), respiratory rate (RR), heart rate (HR), oxygen saturation (SPO), Injury severity scores (ISS) and Glasgow Coma Scale (GCS) and injury etiology measures like mode of transport to hospital, type of injury, mechanism of injury, and length of hospital stay.

## Outcomes

Health-related quality-of-life outcome was measured using the EQ-5D Tool [@EuroQolGroup]. EQ-5D is a standardized measure of quality of life using five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension in the tool has three levels: no problems, some problems, and extreme problems. Additionally there is a visual analog scale (VAS) The patients were followed up at 3-months. EQ-5D tool can be administered over the telephone and has translations available in multiple Indian languages [@EuroQolGroup]

Table 1: Description of study variables and outcomes

|  |  |
| --- | --- |
| Name | Description |
| Age | Patient’s age rounded up to closest whole year |
| Sex | Patient’s sex:  Female  Male |
| Vital Signs | Systolic blood pressure (SBP), respiratory rate (RR), heart rate (HR), oxygen saturation (SPO), and Glasgow Coma Scale (GCS) |
| Injury Etiology | Mode of transport, type of injury, mechanism of injury |
| Injury Severity | Injury Severity Score |
| Outcomes |  |
| Quality of Life | The participant’s reply to the EQ-5D questionnaire and VAS on health state at 3 months after arrival at the study site. |

## Data Source

Data was collected by one dedicated independent project officer in each of the hospitals who prospectively gather data on a standardized intake form for eight hours per day, five days a week, by directly observing the staff delivering trauma care. Vital signs such as systolic blood pressure, heart-rate, and oxygen saturation was recorded by the project officer independently. The project officer was rotated daily through each eight-hour shift in the morning, evening and night. Data for the variables was collected from patient records, or from the patient or patient representatives when they are at the hospital. Additionally, the project officer followed the patient or the patient relatives at 3-months after discharge by telephone the for information on the outcomes and any missed variables.

## Bias

There could be bias in collection of data and recording of vital signs used to calculate injury severity. Adequate training of the project officers, periodic quality control of the data with external project officers and weekly online review meetings was done to reduce this bias.

## Statistical Methods

Multivariable linear models was used to study the association of age and gender with the QOL estimating 95% confidence intervals and denote associations with a p-value of less than 0.05 as statistically significant [@Carey2013]. The statistical software R was used for all statistical analyses [@RCoreTeam2015].

## Study Size

Simulation studies indicate that as many as 25 events, observations with the outcome, and non-events or more per free parameter are required to obtain stable estimates for logistic regression [@Courvoisier2011]. Given that our logistic regression model included around 18 free parameters, we need to include 375 events and at least as many non-events. .

## Ethics

Ethical clearance for the data collection was obtained from the four participating hospitals as amendments to the existing ethical clearance for the on-going TAFT project (Grant Medical College & Sir J.J., Group of Hospitals, Mumbai—No. IEC/Pharm/CT/111/A/2017, Dated 22nd August 2017; Institute of Post-Graduate Medical Education, Kolkata—Memo No. IPGME&R/IEC/2017/396, Dated 21st August 2017; Maulana Azad Medical College, New Delhi-F.1/IEC/MAMC/(53/2/2016/No.97), Dated 3rd August 2016; St. John’s Medical College, Bengaluru—No. IEC/1/671/2017, Dated 24th August, 2017). Waiver of informed consent was granted for collection of clinical data which was routinely collected for the patients, as they were all admitted after trauma, often arriving in an altered level of consciousness and in severe physical and psychological distress. The amendment granted permission to collect the additional data necessary for this study (Grant Medical College & Sir J.J., Group of Hospitals, Mumbai—No. IEC/Pharm/CT/2059/2019, Dated 16th September 2019; St. John’s Medical College, Bengaluru—No. IEC/1/530/2019, Dated 25th June, 2019).

## Data management

Each center was assigned a center identification number and each patient a locally unique study identification number. Project officers first entered data on paper without any personal identification data. The project officers then transferred this data to an electronic format using a dedicated data entry application. The electronic data did not include any direct identifiers such as name, hospital record number, and telephone numbers. The only way to link an electronic record to a paper intake form was by combining the record’s hospital and study identification numbers. Paper forms were kept locally at each center for the duration required by locally applicable laws and regulations, or at least five years, whichever is longest. The adequacy of their storage was the responsibility of the principal investigator at each center. Care was taken taken to ensure that at no time where they stored with less than reasonable care.

# Results

Sample characteristics

|  |  |  |  |
| --- | --- | --- | --- |
|  | 5 | 14 | 42 |
| 3 | Age in years (median [IQR]) |  | 36.0 [26.0, 50.0] |
| 4 | Sex (%) | Female | 482 (19.9) |
| 5 |  | Male | 1937 (80.1) |
| 6 | Mechanism of injury (%) | Animal bites | 16 (0.7) |
| 7 |  | Assault | 149 (6.1) |
| 8 |  | Falls | 563 (23.2) |
| 9 |  | Other | 287 (11.8) |
| 10 |  | Railway injuries | 43 (1.8) |
| 11 |  | Road traffic injuries | 1369 (56.4) |
| 12 | Type of injury (%) | Blunt | 2372 (98.1) |
| 13 |  | Penetrating | 45 (1.9) |
| 14 | Mode of transport (%) | Ambulance | 1670 (69.1) |
| 15 |  | Police van | 119 (4.9) |
| 16 |  | Private Vehicles | 620 (25.6) |
| 17 |  | On Foot | 9 (0.4) |
| 18 | Transferred (%) | Direct Admissions | 527 (21.8) |
| 19 |  | Transferred | 1890 (78.2) |
| 20 | SBP (median [IQR]) |  | 118.0 [110.0, 130.0] |
| 21 | RR (median [IQR]) |  | 21.0 [18.0, 22.0] |
| 22 | HR (median [IQR]) |  | 84.0 [78.0, 93.0] |
| 23 | SpO2 (median [IQR]) |  | 98.0 [97.0, 98.0] |
| 24 | GCS (median [IQR]) |  | 15.0 [12.0, 15.0] |
| 25 | EQ5D Health Status (median [IQR]) |  | 80.0 [65.0, 90.0] |
| 26 | EQ5D Mobility (%) | No Problems | 360 (54.8) |
| 27 |  | Some Problems | 216 (32.9) |
| 28 |  | Confined to bed | 81 (12.3) |
| 29 | EQ5D Self Care (%) | No Problems | 415 (63.2) |
| 30 |  | Some Problems | 182 (27.7) |
| 31 |  | Unable to wash or dress | 60 (9.1) |
| 32 | EQ5D Usual Activities (%) | No Problems | 283 (43.0) |
| 33 |  | Some Problems | 245 (37.2) |
| 34 |  | Unable to perform usual activities | 130 (19.8) |
| 35 | EQ5D Pain/Discomfort (%) | No Pain | 228 (34.7) |
| 36 |  | Moderate Pain | 401 (60.9) |
| 37 |  | Extreme Pain | 29 (4.4) |
| 38 | EQ5D Anxiety/Depression (%) | No Anxious/depressed | 385 (58.9) |
| 39 |  | Moderately Anxious/depressed | 200 (30.6) |
| 40 |  | Extremely Anxious/depressed | 69 (10.6) |
| 41 | 30 day mortality (%) | Alive | 1196 (74.7) |
| 42 |  | Dead | 406 (25.3) |

Out of a total of 2427 trauma patients enrolled, 1796 were excluded for missing data. The final cohort of 631 included in this study had a median age of 36 years (IQR: 26-50) with 80.07 per cent of patients were male. The most common mechanisms of injury were Road traffic injuries ( per cent). Majority of the injuries were blunt (98.14 per cent) and 78.2 per cent were transferred to the study hospitals. The all cause 30-day mortality was 16.73 per cent. The median severity score was x. Details of the study population is given in Table 2.

## EQ-5D Scores

652 completed the EQ-5D questionnaire at 3 months after discharge. The mean EQ5D index score was 76 (SD = 20.5). Three months after discharge, young males (18-32 years) had the highest score while middle-aged females reported the lowest score. Just over half the patients (54.8%) reported no problems with mobility while two-thirds reported no problems with self-care. While less than half the patients (43.0%) could carry on usual activities without any problems and only one-third of the patients (34.7%) reported no pain or discomfort after three-months of post-discharge. Around 40% of the patients reported experiencing some form of anxiety or depression. Again, the proportion of young males reporting any problems across all the five domains was the lowest while the proportion middle-aged females reported experiencing the problems across all the five domains was the highest. The overall EQ-5D scores are provided in Table 3.

## EQ-5D in relation to gender and age

Overall females had a slightly higher mean EQ5D index score (77.6027397) than males (76.5790514). On running a linear regression of index scores across sex across age after adjusting for injury etiology, vitals, and severity, young males aged (aged 18-32) performed better than middle-aged (aged 33-49) and old (aged 50 and above) males. On the other hand, old females had higher scores than young and middle aged females. Middle-age group had the lowest performance, with middle-aged faring the worst (Fig 1).

Regression analysis in the mobility dimension keeping young males as the reference group, shows that the adjusted odds of reporting mobility problems was 1.0557517 in young females (aged 18-32), 1.0400443 middle-aged females (aged 33-49), and 1.0430457 old females (aged 50 and above). In middle-aged males (aged 33-49) the odds were 1.4203472 and in old males (aged 50 and above) the odds were 1.0578552. Thus, all groups had higher odds of reporting some mobility problems than young males.

Assessing the regression analysis in the self-care dimension, showed the adjusted odds of reporting problems performing self-care tasks was 1.3238941 in young females, 1.1692589 in middle-aged females, and 0.7880519 old females compared to young males. On the other hand, the odds of reporting these problems in middle-aged males was 1.3303163 and in old males it was 1.0728229times than young males. Only old females had lower odds of reporting problems with self-care than young males.

In the dimension of being able to perform usual activities, regression analysis indicated that the adjusted odds of reporting any problems in performing was 1.3246203 in young females, 0.798196 in middle aged females, and 0.8050678 old females with respect to young males. The odds of reporting these problems were 1.6970086 in middle aged males and 1.2401893 times in in old males. Thus, middle-aged and old females had lower odds of having problems performing usual activities than young males.

The adjusted odds of reporting any form of pain and discomfort were 1.7825876 in young females, 0.5814462 in middle-aged females, and 0.6054132 old females compared to young males. Among middle aged and old males these odds were 2.1505875 and 1.9242736 respectively. Thus, middle aged and old females had lower odds of reporting pain than young males.

In the anxiety and depression dimension, keeping young males as the reference group, the adjusted odds of reporting any form of anxiety or depression were 1.3986886 in young females, 0.4864969 middle-aged females, and 1.1036321 old females. In middle-aged males the odds was 1.5951319 and in old males the odds was 0.8453032. So, younger and middle-aged females had lower odds of reporting having any form of anxiety and depression than young males.

Though most of the odds of reporting any problems across the EQ5D domains were not statistically significant, middle aged males reported significant problems with pain and usual activity while old males reported significant problems with pain and anxiety (Table 4). The interaction of age and gender on the index EQ5D score and across its 5 domains was found to be not statistically significant.

# Discussion

This study examined the interaction of age and gender on QOL in trauma patients discharged from four tertiary-care hospital in urban India at 3-months after discharge. We did not find statistically significant differences across all age groups and gender as well as no interaction effect between age and gender in this population. The sub-group analysis showed differences in QOL between these groups. In each of the five EQ5D domains, odds of reporting problems varied between the groups. We found middle aged men report significantly lower QOL scores and was due to having higher odds of reporting problems in mobility, anxiety or depression, and especially pain, and usual activities.

The mean EQ5D index score of 76 of trauma patients in this study is lower than the general population norm for South Asia of 85 [@Kularatna2014]. This indicates that even after 3-months since discharge, trauma patients in urban India had not yet reached the pre-injury norm of QOL for the region. More services to address their needs.

In this study middle-aged cohort, especially women, seem to be having the odds for the poorest QOL outcomes.

Pain and discomfort was the domain that reported the highest proportion of reporting problems followed by usual activities.

However, middle-aged and older women had the lowest odds of reporting problems in pain and usual activities than other groups. Could be due to the social structure where men and younger women going to formal employment, which is deemed in higher value than domestic chores, that women engage in. Pain reporting tends to be lower in women again due social factors. Similarly women reported lowest odds of anxiety and depression again could be due to social factors

Young men had highest odds of reporting problems with mobility than other groups could be due to the group having more access to move/travel than other age groups.

<!–Just wondering why having a higher proportion of those reporting any problem does not translate to higher odds of having that problem. For e.g.Middle-aged women report the highest proportion of any pain but have the lowest odds of reporting any pain than young men.–!>

# Conclusion

# References