**Association of road traffic injuries with independent mobility of adolescents in a megacity of lower middle income country**

**Background**

Independent mobility – he freedom of children and adolescents to move around without being accompanied by an adult - positively impacts physical activity as well as on psychological, social, cognitive and spatial development (REF). It is also precursor to future fitness and health. Daily independent mobility of adolescents for schools is window of opportunity to meet recommended daily physical activity.

Walking and cycling have decreased in many developed countries (1). Short distances are covered by car or other motorized vehicles. Nearby parks and playgrounds are often lacking (REF). There is a lack of safe environment both social and physical. Neighbors are unfamiliar to each other. The streets have become motor centric. There are concerns about child and adolescents’ safety.

Adolescents are vulnerable to road traffic injuries (RTIs), which are the leading cause of deaths in adolescents aged 10-19 years. In 2013, the RTI death count in adolescents was 115,186 globally, out of which 90% occur in developing countries (2). There is higher road traffic fatalities and injuries among pedestrians, cyclists and motorcyclists in low and middle income countries where the built environment is least likely to be according to needs of vulnerable road users (3).

Research on independent mobility with respect to road traffic injuries among adolescents is scarce. Previous literature was primarily on road safety related to school trips but whether independent mobility of adolescents is associated with road traffic injuries is not well established. A study from Auckland showed that adult accompaniment with 5 to 12 years old was associated with reduced pedestrian injury risk (4). A study from India showed no association of road traffic injuries with independent travel of children 11-14 years old (5).

The objective of this study is to determine the association of adolescents’ independent mobility with road traffic injury in an urban lower middle-income setting.

Methods

Study design: This was a cross-sectional study during September till December in 2014.

Setting: The study was conducted in schools in Karachi, Pakistan. Altogether 75 schools participated in the study, out of which 26 (34%) were public schools and 49 (65%) were private schools.

For the public sector schools, a list of schools and permission was obtained from the Executive District Office – Education (EDO - Education) for Karachi District. For private schools, a list was obtained from director private school association Karachi. Both lists included the location addresses, and phone numbers of contact persons at the schools. Schools for the study were randomly selected from the said list. These schools were first approached through the given phone numbers and email addresses, but because the official lists of schools were not updated, many times contact with schools could not be made. To overcome the issue, two data collectors were dispatched to locate each school in person prior to data collection.

At each public and private sector school approached, permission to conduct the study was obtained from the school principal. During their first visit to each school, research assistants explained the study to the management and then to a class of students from the school. Each class and section (if there were multiple sections of a grade in a school) was randomly selected through paper chits to avoid selection bias. In each class, a parental permission letter giving details of the study (in either Urdu or English language, as advised by the school administration) was distributed to each student. A week’s time was given for students to get the letters signed by their parents or guardians. It was ascertained that a weekend fell in between before the research assistants’ second school visit, so as to allow for adequate time for parents to read the permission letters.

Participants: Adolescents (aged 10 to 19 years) in grades 6 to 10 were enrolled from schools. Only those students who had assented to participate and whose parents had given them permission to enroll in the study were included for data collection. For students’ assent, oral script was used.

Variables

*Outcome:* Any road traffic injury that resulted in any first aid or consultation in healthcare setting

*Exposures:* Parental licensing to independent mobility of adolescents was asked by whether they were allowed to cross main road, travel to and from school alone, travelling in bus, cycling, travelling in night versus day time and activities alone on the weekend. The responses were either yes or no.

Data sources/measurements: All the information was asked from adolescents in a written questionnaire. The study questionnaire for school adolescents was available in Urdu and English. The questionnaires had multiple choice questions. The study questionnaires were first pilot tested to see their effectiveness, acceptability, and clarity for study participants, and modifications were made accordingly before launching the main data collection process. For data collection, research assistants were trained about administering the questionnaires. Each question in the data collection tool was explained to students by research assistants to ensure clarity in comprehension. The questionnaires took approximately 25 minutes to be filled by a class of students.

Study size: The sample size for the study population was 1,270 school students. Since there was no past information on adolescents’ school mobility patterns in Pakistan, it was estimated that at least 50% students may be active commuters in the study population with 95% confidence level and a bound on error of ± 5%. The sample size required after multiplying with design effect of 3 and inflating the sample size by 10% to account for non-responders was approximately n=1267. The size of each class in schools is 15-30 students so list of around 100 schools was randomly generated with 40% public and 60% private schools to get sample of 1267 school adolescents. This percentage share of public versus private schools depicts the enrollment of children in urban areas in Pakistan(6).

There were numbers of class rooms/sections in school for our desired Grades 6-8. We attempted to have equal representation of grades overall in total sample of schools so the research team used to inform which grade they want to survey.

Quantitative variables: Age was the only quantitative variable in the data and we grouped it into 10-14 years and 15-19 years. These age categories are used in road injury research as both are different in terms of injuries burden.

Statistical analysis**:** We performed the analysis using R (REF). Categorical variables are describes using frequencies and percentages. Continuous variables... We used logistic regression to estimate unadjusted and adjusted associations as well as 95% confidence intervals (CI) between exposures and the outcome. All exposures were included in the adjusted models.

Results

Data of 1267 adolescents were included in the study with girls in majority (60%). Around 70% adolescents reported no adult accompaniment on their school travel and same percentage reported walking to schools. Half of adolescents reach to school within 5 to 15 minutes. Overall 21% adolescents reported road traffic injuries. (Table 1)

In Univariate analysis, boys (OR 0.45, 95%CIs 0.34, 0.59), 31 to 45 minutes (OR 2.92;95% CIs 1.54,5.42) or greater than 45 minutes (OR 2.87;95% CIs 1.16, 6.76), parents licensing to cross main roads alone (OR 1.61; 95% CI 1.23,2.12), allowed to use public buses (OR 1.93; 95% CIs 1.4, 2.64) and adolescents who were on their own or with same age for weekend activity(OR 3.54; 95% CIs 2, 6.79). have more odds to have RTIs. (Table 2)

In the final multivariable logistic regression model;), boys (aOR = 1.51 ; 95% CI = 1.09, 2.09), adolescents who were allowed to cross main roads alone (aOr =1.3; 95% CI = 1.0,1.8), when their time to reach school is within 31 to 45 minutes (aOr 2.43; 95% CIS 1.22, 4.77), adolescents who did any activity outside home alone on last weekend (aOR=2.5; 95% CI = 1.3, 4.9) and when they had mix pattern of weekend activities with adults as well as some activities alone (aOR=2.1; 95% CI = 1.1, 4.1) have more odds of RTIs. (Table 3

Table 1: Descriptive of adolescents 10-19 years surveyed from schools in Karachi, Pakistan. 2014

|  |  |  |
| --- | --- | --- |
| Variables | levels | n(%) |
|  |  |  |
| n |  | 1267 |
| Age groups (%) | 10 to 14  15 to 19 | 748 (59)  519 (41) |
| Gender (%) | Boy | 508 (40.1) |
|  | Girl | 759 (59.9) |
| Grade (%) | 6 | 264 (20.8) |
|  | 7 | 255 (20.1) |
|  | 8 | 200 (15.8) |
|  | 9 | 343 (27.1) |
|  | 10 | 205 (16.2) |
| Type of School (%) | Private | 754 (59.5) |
|  | Public | 513 (40.5) |
| Mode of transport to school (%) | 2 or 3 wheelers | 169 (13.3) |
|  | Four wheelers | 186 (14.7) |
|  | Walking | 912 (72.0) |
| School travel was alone or accompanied (%) | Alone or with someone of same age | 901 (71.1) |
|  | Either with parent or any other adult | 271 (21.4) |
|  | Mix travel pattern; alone or with parents | 95 ( 7.5) |
| Time to reach school (%) | < 5 mins | 464 (36.6) |
|  | > 46 mins | 23 ( 1.8) |
|  | 16 to 30 mins | 89 ( 7.0) |
|  | 31 to 45 mins | 48 ( 3.8) |
|  | 5 to 15 mins | 643 (50.7) |
| Mode of transport on way back to home from school (%) | Four Wheelers | 203 (16.0) |
|  | Two or Three Wheelers | 107 ( 8.4) |
|  | Walking | 957 (75.5) |
| Home travel from school was accompanied with (%) | Mix travel pattern; alone or with parents | 86 ( 6.8) |
|  | On own or with other child | 1042 (82.2) |
|  | Parent or adult | 139 (11.0) |
| Parents trust on child when in traffic alone (%) | Always | 576 (45.5) |
|  | Never | 224 (17.7) |
|  | Sometime | 467 (36.9) |
| Adolescent allowed to cross main roads (%) | No | 719 (56.7) |
|  | Yes | 548 (43.3) |
| Adolescent allowed to go on public bus (%) | No | 1030 (81.3) |
|  | Yes | 237 (18.7) |
| Adolescent activity over the weekend (%) | Activities either with parents or alone | 442 (34.9) |
|  | No activity on the weekend | 139 (11.0) |
|  | On own or with other young person | 456 (36.0) |
| Road traffic injuries | With a parent or other adult  No road traffic injuries  Road traffic injuries | 230 (18.2)  1001(79)  266 (21) |
|  |  |  |

Table 2: Univariate association of road traffic injury with independent variables in adolescents (n= 1267)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Level | | No road traffic injury | Road traffic injury | OR (95% CIs) |
| n |  | | 1001 | 266 |  |
| Age groups (%) | 10 to 14 | | 603 ( 60.2) | 145 ( 54.5) | 1 |
|  | 15 to 19 | | 398 ( 39.8) | 121 ( 45.5) | 1.26(0.96, 1.66) |
|  | |  |  |  |  |
| Gender (%) | Boy | | 360 ( 36.0) | 148 ( 55.6) | 2.23 (1.7, 2.94) |
|  | Girl | | 641 ( 64.0) | 118 ( 44.4) | - |
| Type of School (%) | Private | | 588 ( 58.7) | 166 ( 62.4) |  |
|  | Public | | 413 ( 41.3) | 100 ( 37.6) | 0.86 (0.65,1.13) |
| Mode of transport to school (%) | 2 or 3 wheelers | | 132 ( 13.2) | 37 ( 13.9) | 1.13 (0.75,1.67) |
|  | Four wheelers | | 138 ( 13.8) | 48 ( 18.0) | 1.4(0.97,2.01) |
|  | Walking | | 731 ( 73.0) | 181 ( 68.0) | 1 |
| School travel was alone or accompanied (%) | Alone or with someone of same age | | 700 ( 69.9) | 201 ( 75.6) | - |
|  | Either with parent or any other adult | | 221 ( 22.1) | 50 ( 18.8) | 0.79 (0.55,1.1) |
|  | Mix travel pattern; alone or with parents | | 80 ( 8.0) | 15 ( 5.6) | 0.65 (0.35,1.13) |
| Time to reach school (%) | < 5 mins | | 379 ( 37.9) | 85 ( 32.0) | 1 |
|  | > 46 mins | | 14 ( 1.4) | 9 ( 3.4) | 2.87 (1.16,6.76) |
|  | 16 to 30 mins | | 67 ( 6.7) | 22 ( 8.3) | 1.46 (0.84,2.47) |
|  | 31 to 45 mins | | 29 ( 2.9) | 19 ( 7.1) | 2.92 (1.54,5.42) |
|  | 5 to 15 mins | | 512 ( 51.1) | 131 ( 49.2) | 1.14 (0.84,1.55) |
| Mode of transport on way back to home from school (%) | Four Wheelers | | 150 ( 15.0) | 53 ( 19.9) | 1.44 (1,2.03) |
|  | Two or Three Wheelers | | 83 ( 8.3) | 24 ( 9.0) | 1.17 (0.71,1.87) |
|  | Walking | | 768 ( 76.7) | 189 ( 71.1) | 1 |
| Home travel from school was accompanied with (%) | On own or with other child  Parent or adult  Mix travel pattern; alone or with parents | | 819 ( 81.8)  111 ( 11.1)  71 ( 7.1) | 223 ( 83.8)  28 ( 10.5)  15 ( 5.6) | 1  0.93 (0.59,1.42)  0.78 (0.42,1.34) |
| Parents trust on child when in traffic alone (%) | Always | | 446 ( 44.6) | 130 ( 48.9) | 1 |
|  | Never | | 184 ( 18.4) | 40 ( 15.0) | 0.75 (0.5,1.1) |
|  | Sometime | | 371 ( 37.1) | 96 ( 36.1) | 0.89 (0.66,1.19) |
| Adolescents allowed to cross main roads (%) | No | | 593 ( 59.2) | 126 ( 47.4) | 1 |
|  | Yes | | 408 ( 40.8) | 140 ( 52.6) | 1.61(1.23,2.12) |
| Adolescents allowed to go on public bus (%) | No | | 837 ( 83.6) | 193 ( 72.6) | 1 |
|  | Yes | | 164 ( 16.4) | 73 ( 27.4) | 1.93(1.4,2.64) |
| Adolescent activity over the weekend (%) | Activities either with parents or alone | | 340 ( 34.0) | 102 ( 38.3) | 2.91(1.63,5.6) |
|  | No activity on the weekend | | 126 ( 12.6) | 13 ( 4.9) | 1 |
|  | On own or with other same age | | 334 ( 33.4) | 122 ( 45.9) | 3.54(2, 6.79) |
|  | With a parent or other adult | | 201 ( 20.1) | 29 ( 10.9) | 1.4(0.71,2.88) |

Table 3: Multivariable logistic regression of factors associated with road traffic

injury among adolescents (n=1267)

|  |  |  |
| --- | --- | --- |
| Variables | Odds ratio | 95% CIs |
| Gender  Girls  Boys | 1  1.51 | -  1.09,2.09 |
| Mode of transport on way back to home from school (%)  Walking  Two or three wheelers  Four wheelers | 1  1.16  1.25 | -  0.69, 1.89  0.83, 1.87 |
| Allowed to cross main road alone  No  Yes | 1  1.34 | -  1.0,1.79 |
| Allow to travel on public buses  No  Yes | 1  1.31 | -  0.92, 1.85 |
| Any activity outside home on last weekend  No  Yes, alone or with someone of same age group  Yes, mix ( adult or alone/ same age group)  Yes, with parents or adults | 1  2.51  2.10  1.36 | -  1.36, 4.96  1.15, 4.11  0.69, 2.82 |
| Time to reach school  < 5 minutes  5 to 15 minutes  16 to 30 minutes  31 to 45 minutes  >46 minutes | 1  1.10  1.20  2.43  2.33 | -  0.80, 1.51  0.66, 2.11  1.22, 4.77  0.89, 5.83 |

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