Cognizance of Road Safety among Young Adults Based on Unmediated and Mediated Responses

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Abstract

**Background:** Road traffic accident (RTA) has been increasing to significantly higher percentages leading to disabilities and fatalities among the inhabitants, thereby causing social, emotional, and economical losses. In this study, an attempt was made to observe the prompt and the deferred effects of an “audiovisual program on road safety,” on the attitude and the knowledge of adolescents and young adults regarding the catastrophes on roadways and how safety can be ensured. **Materials and Methods:** About 1760 students between 16 and 24 years were selected at random from various educational institutes in the city of Nagpur. With the aid of structured questionnaires, the participants were tested for their knowledge and attitude toward the traffic rules. At the end of this assessment, there was an interactive educational audiovisual PowerPoint presentation that highlighted the likely complications and long-term adverse effects of RTA. After the presentation phase, two questionnaire rounds were scheduled: one immediately following the presentation and another after 3 months to observe the change in their knowledge and attitude. **Results:** The resultant positive attitudinal change immediately after the intervention was significant. However, the positive attitudinal change dropped significantly after 3 months to a percentage almost comparable to the preexposure attitudinal level. **Conclusion:** It can be concluded that adolescents and young adults need to be repeatedly administered by indulging them in such enlightening pedagogical programs, in order to reduce the incidence of road accidents.

**Keywords:** Attitude, knowledge, road traffic accidents

**Introduction**

Road traffic accident (RTA) has been increasing to significantly higher percentages leading to disabilities and fatalities among the inhabitants, thereby causing social, emotional, and economical losses. Orthopedic surgeons have been effectively treating such victims on a daily basis. In this study, an attempt was made to observe the prompt and the deferred effects of an “audiovisual program on road safety,” on the attitude and the knowledge of adolescents and young adults regarding the catastrophes on roadways and how safety can be ensured. The primary hypothesis of the study was that educating adolescents with audiovisuals regarding traffic rules, complications of not following them, long-term adverse effects of RTA, and guidance on ways to avoid them will have a favorable impact on their attitude and behavior. The secondary hypothesis was that this favorable impact is not permanent and needs repeated reinforcements. The effects of gender, possession of valid driving license, and duration of the possession on the attitudes and the behaviors of individuals toward traffic rules were studied.[1-3]

On reviewing the literature, it was observed that about 30.2% of the road accident victims belonged to the age group of 15–24 years.[4] This group mostly comprises college students and employed/unemployed youth who are negligent and unaware about the traffic rules and the likely and long-lasting complications of RTA.[1,3] Singh et al. 2011 stated that it is immensely demanding to implement measures to improve safety on Indian roads.[5] Thus, an attempt was made to assess the practicability and the viability of one such countermeasure
to increase road safety in Nagpur, India. It has also been observed that these adolescents have tender and moldable attitudes; and if groomed well about the rules and regulations, many of the casualties due to rash and negligent driving can be avoided, thus greatly reducing the percentages of deaths and economic losses caused by RTA in the otherwise economically productive population. As a result, the age group of 15–24 years was targeted in our study.

**Materials and Methods**

For the study, about 1760 students in the age group of 16–24 years were selected at random from various educational institutes in the city of Nagpur. With the aid of the structured questionnaires, the participants were tested for their knowledge and attitude toward the traffic rules. At the end of this assessment, there was an interactive educational audiovisual PowerPoint presentation that highlighted the likely complications and long-term adverse effects of RTA including explanations about loss of life, loss of limbs and economic loss to the individual, the family, the society, and the country arising out of RTA in the productive population. At the same time, these adolescents and young adults were educated about traffic rules. After the presentation phase, two questionnaire rounds were scheduled: one immediately following the presentation and another after 3 months to observe the change in their knowledge and attitude.

The data were then analyzed to know if a significant positive attitudinal change occurred toward obeying the traffic rules after the first presentation. It was hypothesized that there will be a favorable impact of audiovisual education regarding traffic rules and regarding long-term adverse effects of RTA, but this impact will not be permanent and will require repeated reinforcements at defined intervals.

**Statistical methods**

The structured questionnaire comprised questions that were divided into two broad categories based on their types, that is, knowledge and attitude. All the questions pertaining to knowledge about traffic rules were dichotomous, i.e., having either correct or incorrect answers, and were treated on a nominal scale. The questions relating to attitude were mostly on an ordinal 4-point scale and were assigned numeric score 0 or 1 depending on the choice on the scale. Finally, the attitude scores on different questions for a student were summed and transformed to a scale of 0–100. Higher the aggregate score, the more affirmative is the attitude toward following traffic regulations. The knowledge and attitude levels were analyzed in relation to factors such as gender, driving license status, and years of driving experience. The statistical significance of association of these factors with each knowledge-related question was determined using z-test of proportions. Further, the change in the attitude (pre and post) for each level of the factor was tested for significance using the Wilcoxon signed-rank test. A comparison of mean scores at three times was done using Friedman's one-way ANOVA. Entire analyses were performed using SPSS version 20.0 (IBM Corp. Armonk, NY, USA), and statistical significance was considered at 5% level.

**Results**

The responses of 1618 junior college students in the age group of 16–24 years were analyzed following the approach described in methods. The analysis of knowledge and attitude level of students was performed independently.

**Assessment of knowledge levels**

Table 1 presents the number and percentage of correct responses of students for each knowledge related question according to factor levels. In regard to the question, “proper age to acquire driving license,” the percentage of males providing the correct answer (88.52%) was statistically significant and higher than that of females (84.74%) with $P = 0.0335$. Interestingly, the percentage of students not holding the driving license and answering the question correctly (90.83%) was significantly higher than those holding license and answering correctly (77.32%) ($P < 0.0001$). Thus, despite knowing the proper age to obtain the driving license, many students were not conforming to the age criteria of traffic regulations. Further, the percentage of students driving for more than 2 years and aware about the age criteria (93.13%) was significantly higher than those driving for <2 years (83.22%). Awareness about “fine imposed for driving without license and valid documents” was also tested between the factor levels. The awareness among females (54.06%) was significantly higher than that of males (43.51%) with $P < 0.0001$. Other factors such as possessing driving license and years of driving experience had no statistical relevance with familiarity about the fine imposed ($P > 0.05$). Knowledge about “the imprisonment period” was significantly more in females (14.61%) as compared to that of males (3.49%) with $P < 0.0001$. Further, those holding a permanent driving license had better awareness about imprisonment period (12.47%) than those not holding a permanent driving license (6.03%) ($P < 0.0001$). Driving experience did not show any relevance with knowledge of imprisonment period. A significantly higher proportion of students with <2 years of driving experience (93.78%) were aware about “the helmet compulsion” as compared to those with more than 2 years of experience (86.56%). In regard to the question about “the speed limits within city,” female students were better aware with 75.32% giving a correct answer as compared to males with 70.66% giving right answers ($P = 0.0475$). The other two factors, i.e., holding a driving license and years of driving experience, were not related to the “knowledge about speed limits within city” ($P > 0.05$). The awareness about “the driving side on road” was significantly higher among males (91.62%) as compared to females (84.09%) with $P < 0.0001$. Further, among those holding a driving license, awareness about the driving side (91.61%) was significantly higher as compared to those not holding a license (87.69%) with $P = 0.0332$. The familiarity about “overtaking” was equivalent in males and females. Among those holding a permanent license, the
awareness about the side from which overtaking should be done was significantly higher (79.37%) as compared to those not holding the license (70.66%) with \( P = 0.0006 \). Years of driving experience had no relevance with the knowledge about overtaking rules. About “the fractures in road accidents,” <50% of the students had awareness and the levels of three factors did not show any association with the understanding about fractures. Less than 50% of the students knew about fractures that could lead to permanent disability, and the association of factor levels with awareness of fractures leading to permanent disability was insignificant with \( P > 0.05 \).

Assessment of students’ attitude toward road traffic regulations

The other component of the study was to assess the impact of audiovisual education regarding traffic rules in adolescents and young adults at different time points, i.e., before the audiovisual presentation, immediately after the presentation, and after 3 months. The interest was to determine the postinteraction attitudinal changes among students with time. Accordingly, the attitudinal score was determined for each student as per the approach described in the methods section. Table 2 shows that the overall mean attitude score before interaction was 73.63 (±15.89). After the presentation, the mean score increased to 92.91 (±10.0). Change in the postpresentation attitude score distribution was significantly higher as indicated by \( P < 0.0001 \) using the Wilcoxon signed-rank test. The statistical parameters were also obtained according to levels of three factors, i.e., gender, driving license status, and years of driving experience. In both genders, the attitude changed drastically conforming to the traffic regulations as indicated by the significantly increased mean scores (\( P < 0.0001 \)). For the permanent driving license holders as well as nonholders, the attitudinal change was significant (\( P < 0.0001 \)).

### Table 1: Knowledge level of students about road traffic regulations

| Questions                                                                 | Gender | Male (n=1000) | Female (n=616) | P*       | Permanent driving license | Yes (n=441) | No (n=1145) | P*       | Driving experience | ≤2 (n=900) | >2 (n=320) | P*       |
|--------------------------------------------------------------------------|--------|---------------|----------------|----------|---------------------------|-------------|-------------|----------|-------------------|------------|------------|----------|
| What is the age (years) to get a major driving license?                  |        | 887 (88.52)   | 522 (84.74)    | 0.0355   | 341 (77.32)               | 1040 (90.83)|< 0.0001     | 749 (83.22)| 298 (93.13)       |< 0.0001    |            |          |
| What is the fine imposed for driving without license and valid documents?|        | 436 (43.51)   | 333 (54.06)    | <0.0001  | 203 (46.03)               | 552 (48.21)| 0.4703      | 434 (48.22)| 146 (45.63)       | 0.4630     |            |          |
| What is the imprisonment period for getting into a bike accident, without proper documents? |        | 35 (3.49)     | 90 (14.61)     | <0.0001  | 55 (12.47)                | 69 (6.03)  |< 0.0001     | 73 (8.11)  | 34 (10.63)       | 0.2111     |            |          |
| Are you supposed to wear helmet while travelling on a two wheeler?       |        | 918 (91.62)   | 571 (92.69)    | 0.4947   | 407 (92.29)               | 1053 (91.97)| 0.9117      | 844 (93.78)| 277 (86.56)       | 0.0001     |            |          |
| What should be the speed limit when you are driving in the city?         |        | 708 (70.66)   | 464 (75.32)    | 0.0475   | 312 (70.75)               | 840 (73.36)| 0.3254      | 672 (74.67)| 230 (71.88)       | 0.3666     |            |          |
| Which side of the road one should to drive?                             |        | 918 (91.62)   | 518 (84.09)    | <0.0001  | 404 (91.61)               | 1004 (87.69)| 0.0332      | 799 (88.78)| 287 (89.69)       | 0.7316     |            |          |
| Ideally from which side one should overtake the vehicles?               |        | 746 (74.45)   | 438 (71.10)    | 0.0156   | 350 (79.37)               | 809 (70.66)| 0.0006      | 692 (76.89)| 234 (73.13)       | 0.2019     |            |          |
| Do you know which are the most frequent accidental fractures in road accidents within city? |        | 411 (41.02)   | 271 (43.99)    | 0.2606   | 190 (43.08)               | 480 (41.92)| 0.7165      | 393 (43.67)| 138 (43.13)       | 0.9186     |            |          |
| Do you know, which type of fractures can lead to permanent disability of person? |        | 371 (37.03)   | 249 (40.42)    | 0.1896   | 164 (37.19)               | 444 (38.78)| 0.5992      | 357 (39.67)| 128 (40.00)       | 0.9696     |            |          |

*Obtained using z-test for proportions

### Table 2: Change in attitude score of students toward traffic regulations

| Factor                              | Levels | n (%)   | Attitude score, mean (±SD) | P*  |
|-------------------------------------|--------|---------|-----------------------------|-----|
|                                     |        |         | Preinteraction | Postinteraction (first) |     |
| Age (years) (n=1618)                | ≤20    | 1618 (100) | 73.63 (±15.89) | 92.91 (±10) | <0.0001 |
|                                     | >2     | 320 (26.23)| 69.52 (±14.43) | 90.47 (±12.36) | <0.0001 |
| Gender (n=1618)                     | Male   | 1002 (61.93) | 73.05 (±15.75) | 92.62 (±9.65) | <0.0001 |
|                                     | Female | 616 (38.07)  | 74.57 (±16.08) | 93.37 (±10.53) | <0.0001 |
| Permanent driving license (n=1586)  | Yes    | 441 (27.81)| 74.32 (±13.44) | 92.92 (±10.10) | <0.0001 |
|                                     | No     | 1145 (72.19)| 73.29 (±16.66) | 92.88 (±9.99)  | <0.0001 |
| Driving experience (n=1220)         | ≤2     | 900 (73.77)  | 76.17 (±12.80) | 93.96 (±9.04)  | <0.0001 |
|                                     | >2     | 320 (26.23)  | 69.52 (±14.43) | 90.47 (±12.36) | <0.0001 |

*Obtained using Wilcoxon signed-rank test. SD: Standard deviation
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However, the mean attitude score (72.83 [±16.21]) reduced substantially and was closer to the preinteraction mean score (72.83 [±16.21]), as derived based on 795 responses. The statistical relevance of the score distribution at the three time points was highly significant with \( P < 0.0001 \). The significance was mainly attributed to immediate postpresentation response. Reduction in the mean score implies the deviation of students' attitudes from being affirmative toward regulations. In other words, the study reveals that the impact of presentation was for a limited period of time, and after certain duration, students’ attitudes reverted to original, perhaps reflecting their usual approach toward traffic rules. The analysis was also performed with reference to the factor levels. Gender-wise analysis showed that in both males and females, the mean attitude scores reduced significantly after 3 months as compared to immediate postpresentation scores. The reduction was more in males as compared to that of females which is evident from the mean scores. Further, the reduction of mean scores was significant irrespective of whether the students hold permanent driving license or not (\( P < 0.0001 \)). Similar was the observation with driving experience.

**Discussion**

A number of studies have elicited the characteristics and causes of casualties during road mishaps. Researchers have even studied the diurnal variations in accident rates and the age groups cardinally involved in the accidents. A significant percentage (30.2) in the age group of 15–24 years has been associated with them. These victims could be the future bread earners of their respective families. Loss of life at such a young age affects the family immediately and also in the future. Our study is inclined toward this cohort, having considered their very high involvement. Various synonymous studies have been carried out showing an immediate positive change in the knowledge and attitude of students after an enlightening intervention. One such study by Peck (2011) reviews the literature on the efficacy of classroom and behind-the-wheel driver training. A limitation posed by the latter is that it lays emphasis only on the skill aspect which shows no correlation with the accident rates. In contrast, there have been numerous studies documenting the highly significant role of attitudinal and lifestyle factors in the high crash rates of young drivers.\(^8\)

Lund *et al* 1986 documented the role of attitudes and found that the attitude in males was strong and thus explained the higher incidence of crash rates.\(^9\) This raises the question of how the attitudinal and maturational factors underlying risky driving behavior be changed through classroom and on-the-road training. It is complicated to perceive how simply acquiring more hours of on-the-road training addresses the underlying problem. Harrington performed a longitudinal study on 13,915 novice drivers based on their first 4 years of driving.\(^10\) These drivers were in the age group of 16–17 years at the time of initial licensing. The analysis provided clear evidence of training and gender interaction in which training effects were moderated by gender. The Dekalb County study, despite some flaws, is by far the most definitive evaluation of driver training because of its relatively large sample size (\( n = 16,000 \)) and random assignment design.\(^10\) However, it raises serious questions about efforts to increase hours of on-the-road training beyond minimum requirements without further research support. In the study by Venguidaragavane, attitude was tested with the aim to implant a positive attitude toward road safety among B. Ed. students. It culminated with a few propositions to curb the issues related to road mishaps.\(^11\)

| Table 3: Difference in attitude toward traffic rules and regulations at preinteraction, first postinteraction, and second postinteraction |
|-----------------|----------------|----------------|-----------------|-----------------|
| Factor          | Levels | n (%) | Preinteraction | Postinteraction 1 | Postinteraction 2 |
|-----------------|--------|-------|----------------|-------------------|-------------------|
| Overall (\( n = 795 \)) | \( \leq 20 \) | 795 (100) | 72.83 (±16.21) | 93.02 (±10.14) | 79.42 (±13.97) | <0.0001 |
| Gender (\( n = 795 \)) | Male | 483 (60.75) | 72.79 (±16.36) | 92.74 (±9.11) | 77.38 (±13.81) | <0.0001 |
|                | Female | 312 (39.25) | 75.89 (±16.46) | 92.72 (±11.86) | 85 (±13.63) | <0.0001 |
| Permanent driving license (\( n = 781 \)) | Yes | 292 (37.39) | 76.99 (±14) | 93.01 (±8.61) | 80.98 (±13.63) | <0.0001 |
|                | No | 489 (62.61) | 71.91 (±17.46) | 92.58 (±11.12) | 79.82 (±14.57) | <0.0001 |
| Driving experience (years) (\( n = 628 \)) | \( \leq 2 \) | 435 (69.27) | 76.36 (±12.92) | 93.95 (±8.72) | 80.068 (±14.03) | <0.0001 |
|                | >2 | 193 (30.73) | 73.03 (±16.27) | 91.53 (±11.69) | 81.23 (±15.10) | <0.0001 |

*Obtained using Friedman’s One-way ANOVA. SD: Standard deviation*
These include propagating awareness about road safety through extracurricular activities in college, inculcating significance of safety measures while driving, abiding by rules and regulations, inviting connoisseurs, conducting competitions, incessantly reminding them about the importance of wearing seat belts and helmets, and educating them about signboards and symbols. It was also suggested that efforts should be made to liaison with the traffic department to give elementary and essential training on road safety. In the Safety Research Report (2010) as well, attitude was stated as the major cause of road accidents.[12]

Kostyniuk et al. analyzed 34,244 car–car crashes and 10,732 fatal car–truck crashes in which they concluded that the main causes behind these accidents were failing to keep the lane, overspeeding of vehicles, inattentiveness, not enough distance between two consecutive vehicles (usually found with male drivers), more consumption of drugs and alcohol by younger drivers as compared to older drivers, ignorance of traffic control devices or laws, etc.[13] Chakrabarty et al. 2013 included 102 car drivers from Delhi in their study to determine their understanding of traffic rules and their knowledge of signboards. It was concluded that enhanced training of learners and improved testing techniques for issuing the license can condense these mishaps.[14]

In our study, an attempt was made to assess the positive change in the attitude of the students immediately after the educative intervention, which is comparable to the other studies. However, this study estimates the sustainability of the positive impact on the students which has not been observed in other analogous studies. To measure the latter, the same set of students was given the prestructured questionnaire after 3 months of the first intervention. They were then measured on the attitude and the knowledge-based scale. A drop in the positive attitude of students was observed and it neared the preintervention level.

**Conclusion**

With the significant decline in the attitude of students toward traffic rules merely after 3 months, it can be concluded that efforts should be made to educate them frequently. It can be concluded that adolescents and young adults need to be repeatedly administered by indulging them in such enlightening pedagogical programs, in order to reduce the incidence of road accidents.

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**Conflicts of interest**

There are no conflicts of interest.

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