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Adolescent's perception of road risk on their routes to school in Makwanpur, Nepal; a qualitative study

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ABSTRACT

Background: Busy and poor road infrastructure along routes to school poses high risk of traffic injury for children and adolescents. Ensuring every young person's safe journey to and from school is fundamental to achieving reductions in road injuries and Sustainable Development Goal 3.6. However, there is little evidence reporting adolescent's views about their school travel from low and middle income countries. This study aims to understand adolescent's perceptions of injury risks on their journey to school in Nepal.

Methods: We used Photo-Elicitation Interview (PEI) methods to collect data from fourteen purposively identified adolescents (12–16 years) who walk to Tribhuwan Secondary School along the East-West Highway which is known to be at high risk of crashes in Makwanpur, Nepal. The participants used a camera to record parts of their journey, which they perceived as dangerous or safe. Photographs were used as prompts during an interview afterwards. Interviews were audio-recorded, transcribed, translated and analysed thematically.

Results: The identified themes were categorised as either environmental or behavioural factors. The adolescents were scared to walk on narrow roadsides because of speeding vehicles. They also found crossing the road dangerous because of the lack of designated pedestrian crossings and disregard shown by drivers. Poor visibility caused by random roadside parking and trees also increased the sense of road danger.

Conclusion: Adolescents expressed multiple concerns which made their journeys difficult and dangerous. They illustrated issues such as poor road condition, inadequate pedestrian crossings and traffic signs, narrow roadsides, vehicle speeding and overtaking, failing to obey traffic rules and regulation -providing evidence that could be shared with the authorities to improve road safety near schools.

1. Introduction

Road Traffic Injuries (RTIs) are a leading cause of deaths for children and young adults aged 5–29 years ([World Health Organization, 2018](#)). Rapid urbanization, mobilization and motorization are the root causes of the escalating burden of RTIs in Low and Middle Income Countries (LMICs) especially in Asia ([Nantulya and Reich, 2003](#)). In the South East Asia Region, transport injuries account for 12% of deaths among children aged less than fourteen years old - a mortality rate of 7.4 per 100,000 children ([Mohamed](#)

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et al., 2011). The World Health Organisation (WHO) reporting from the Ministry of Health and Family Welfare, Bangladesh stated that of all deaths in adolescents aged 10–14 years in Bangladesh, 38% were due to RTIs (Peden et al., 2008). In a representative cross-sectional study in Hyderabad, India, out of 2809 children aged 5–14 years, 11% of boys and 6% of girls became a victim of a RTIs in the previous 12 months in 2009 (Dandona et al., 2011). There is an absence of national level report on RTIs among adolescents in Nepal. However, a survey of 1557 adolescents aged 10–13 years across 14 schools showed that 23% reported being a victim of pedestrian injuries in the past 3 months (Poudel-Tandukar et al., 2006a). Beyond this study little is known about pedestrian injuries among adolescents in Nepal.

The journey to school is considered the in-between space outside family, home and school and is an important aspect in young people's everyday experiences (Morojele and Muthukrishna, 2013). However, these everyday experiences involving an interaction with roads can increase the possibility of RTIs among young people (Peden et al., 2008). In a case-control study of environmental risk factors for child pedestrian RTIs in Peru, high vehicle speed increased the risk of injury in children over 5 times (OR = 5.35, 95% CI 1.55–18.54); increased risks were also found due to high vehicle volume, high number of street vendors and the absence of lane demarcation (Donroe et al., 2008). In a similar case-control study in Peru, during the journey to school, children who crossed more than five streets were nine times more likely to be injured in a RTI than children in the control group (OR = 9.45, 95% CI 2.16–41.3) (Pernica et al., 2012). Children are vulnerable to RTIs as pedestrians because they may be engrossed in play and not observe risks, be less able to judge the speed and distance of oncoming vehicles, and their small physical stature may limit their ability to see or be seen (Peden et al., 2008; Sethi et al., 2008; Hyder et al., 2006). In addition to this, young adolescents often acquire road crossing skills in the quieter environments around primary schools and they may be therefore, less prepared for dealing with the busier roads that may surround secondary schools (Tolmie et al., 2006). Furthermore, risk-taking behaviour and peer pressure among adolescents can increase their vulnerability to RTIs as pedestrians (Peden et al., 2008).

Given that parents tend to make decisions about their child's trip to school (McMillan, 2005; Faulkner et al., 2010), most research on young people's journeys to school describe the adult or parent perspective (McMillan, 2005; Shokoohi et al., 2012). However, as young people do not perceive danger in the same way as adults do, we therefore need to understand adolescent's perceptions of road risks on their trips to school. Factors such as a drive to have fun (performing stunts, enjoying high speeds), to learn a new skill (inspired by TV and movies), and to be accepted by peers, may lead adolescents to take risks as a driver; as a pedestrian, adolescents may be easily distracted while talking with friends, using mobile phones making them less aware at crossings, roadsides and junctions (Jagnoor et al., 2020). In a survey of 1557 teenagers across 14 schools in Nepal, only 575 adolescents perceived safe to cross the road from zebra crossings. Out of these, one-quarter of the adolescents were likely to look both ways before crossing (Poudel-Tandukar et al., 2007). Beyond this study there is no published research about how adolescents as pedestrians perceive the road environment surrounding them. Therefore, the study aims to understand the risks adolescents perceive in the road environment while they walk to school in Hetauda, Nepal. By perception of risk we meant the danger adolescents felt on their routes to school.

2. Methods

2.1. Design

To support adolescents to participate in this qualitative study we incorporated photo-elicitation interview (PEI) methodology. Art based activities may be used to engage young people in research (Coad, 2007) and PEI is commonly used with children and young people who may find it difficult to convey feelings using traditional forms of qualitative enquiry (Byrne et al., 2016). It involves facilitating participants to take photographs and then use them to pictorially illustrate and describe their experiences or the issues being explored (Darbyshire et al., 2005; Poku et al., 2019). Using photographs, this technique evokes feelings, memories and information during the course of a semi-structured interview (Harper, 2002).

2.2. Setting and participants

The study was conducted in Makwanpur, one of 77 districts of Nepal, and situated to the south and west of Kathmandu valley. The district has a population of 420,477, of whom 192,720 (45%) are aged below 19 years (Central Bureau of Statistics, 2012). The district has three different topographical terrains (plains, hills and mountains) that are characteristic of many districts and therefore research in this district has the potential to be relevant to other districts in Nepal. The district was also chosen because it is traversed by the main highway running east-west across Nepal, and intersecting with the highway from the Indian border making this a particularly busy highway with lots of commercial traffic.

To identify potential participating schools, we used road crash data from the Nepal Traffic Police to determine three locations on the East-West Highway known to be at high risk of crashes, where there was a secondary school either on, or very close to, the highway. The first of these schools that we approached, Tribhuvan Secondary School, agreed to take part in the study and the other schools were therefore not approached. With a total of 369 children aged between 11 and 18 years, Tribhuvan Secondary School is a non-fee paying

school which holds classes from 10 a.m. to 4 p.m. To be eligible for inclusion, adolescents had to be in 6th to 10th grade, (aged between 12 and 16 years); take their journey to school by walking; and be exposed to the East-West Highway (rather than minor/inner roads) during their journey to school. The age group reflects that young people, on average are aged 12–16 years, while they are in secondary school (6th to 10th grade) in Nepal (Poudel-Tandukar et al., 2006b). Within this population, we purposively selected potential participants to generate diversity by grade and sex, as well as, location of journey start-point. A total of fourteen adolescents were in the initial sample. After the Headteacher helped in identifying adolescents who could be potential participants, the school notified the parents of the study and the opportunity for their child to participate through an information sheet describing the study and written in Nepali. Facilitated by the Headteacher, one researcher (PG) then visited each household to explain the study, and answer queries from parents and adolescents. Parents and adolescents had the option to decline participation, or to withdraw from the study at any time. Where parents and adolescents agreed to take part, written consent was obtained from the parents, and written assent from the adolescents. However, none of the parents and adolescents declined to participate. Using the concept of ‘saturation’ (Sandelowski, 1995), at the twelfth interview we assessed that the information being received were repetitive. Hence, we interviewed the remaining two adolescents who were in our initial sample of fourteen to further strengthen the evidence which we had available for analysis, but did not seek to recruit additional participants.

2.3. Data collection

The researcher accompanied one adolescent on their usual route to school each day during the data collection period (June–July 2019). The researcher arrived at the adolescent’s home before the time the adolescent would normally leave for school. The adolescent was provided with a digital camera, shown how to use it, and given the chance to practice taking some photographs. We asked participating adolescent to take photographs of the places, objects, or things in the environment that made their journey to school safe or unsafe. The adolescent and the researcher then walked to school, with the researcher walking a short distance behind the adolescent; to be able to support the adolescent if there were any difficulties with the camera and to ensure that the adolescent did not place themselves at risk whilst taking photographs. On reaching the school, the adolescent returned the camera to the researcher who transferred the photographs onto a laptop computer.

Later the same day, the researcher conducted a semi-structured interview with the adolescent in a quiet room at school. In the interview, each adolescent was asked to talk about their journey to school and the photographs they took, including why they took each photograph and what their photograph represented about their journey to school. A topic guide informed by a review of the literature was developed by the multi-disciplinary research team and used in each interview. The topic guide is provided as a supplementary material. To encourage conversation during the interview, adolescents were asked to draw a map to mark the places where they took the photographs. Where necessary, young adolescents were supported by the researcher to draw the map. At the end of the interview, we gave each adolescent a notebook, a pencil, a sharpener and an eraser as a gratuity to thank them for participating in the study.

2.4. Data analysis

All interviews were conducted in Nepali and audio-recorded. One researcher (PG) transcribed each interview and then translated it into English. Transcripts were anonymized with names replaced by a participant identification code. The data were analysed thematically, taking inductive approach, using methods described by Braun and Clarke (2006). First, transcripts were read repeatedly



Fig. 1. Adolescents walk along a dirt verge to school, close to the passing traffic. They may walk on the main road when the verge gets narrow [P8, Grade8, Girl].

to become familiar with the data. Initial codes were generated and grouped into broader themes that explored adolescent's experiences of their journeys to school and their perceptions of road dangers they encountered (Braun and Clarke, 2006).

2.5. Ethical considerations

A letter of permission to carry out research with students was received from the school. The main ethical issue for consideration was procedures to protect adolescents from additional risk due to study participation. These were considered and approved during ethical review process. Ethical approval for this study was obtained from the Institutional Review Committee (Ref: 310620191) of Kathmandu Medical College (KMC) in Nepal and from the Faculty Research Ethics Committee (HAS.19.04.173) at the University of the West of England (UWE), UK.

3. Results

Fourteen adolescents were interviewed. Participants were aged between 12 and 16 years and were evenly recruited across grades 6–10. Eight children were female and six male. Interviews lasted an average of 32 min (range 13–50 min). These fourteen adolescent's journeys took between 10 and 40 min' walk.

The findings are presented through two overarching themes: environmental factors and behavioural factors.

3.1. Environmental factors

3.1.1. Narrow roadsides

3.3.1.1 All adolescents expressed a fear of being hit by a vehicle when walking to school. The adolescents walked on a dirt verge stretching in both directions from the school and on either side of the road. The verge is variable in width and in places overgrown and not passable; forcing adolescents to walk in the carriageway at that point.

Adolescent: "Because the vehicle might hit me. The verge is too narrow!" [P4, Grade 9, Boy] (Fig. 1).

Some of the adolescents also shared that they felt safer from the traffic when the verge was wider. Consequently, they crossed the road, even at places where there was no pedestrian crossing, to walk on the wider verge available on the other side of the road. This sometimes meant that they crossed the road more frequently than they would otherwise have done. Several boys expressed that as they had been using the road for several years, they had become more confident to use the road environment surrounding the school.

3.1.2. Visibility

Most of the adolescents took several photos of the vehicles that were broken down or parked on the side of the highway, obstructing the verge where they walked (Fig. 2). Most of the pictures were of heavy flatbed trucks and tipper trucks. Where this occurred, the adolescents were forced to walk on the carriageway to get passed the vehicle.

Interviewer: And why did you take this photo?

Adolescent: umm ... this photo ... This is our pavement. That's why trucks can't be parked in this way.

Interviewer: Why can't the truck be parked this way?

Adolescent: If they park in this way then we have to walk on the main road. And this might increase the chance of getting involved in an accident. [P6, Grade 9, Boy].

Several adolescents expressed that it was not easy to see the on-coming traffic as they stepped into the road to get around the



Fig. 2. Adolescents have to walk on the road to get around the parked vehicle [P1, Grade 10, Boy].



Fig. 3. Tress along the side of the road reduce the view of approaching vehicles [P8, Grade 8, Girl].

vehicle. One adolescent observed that it may be difficult for the drivers to observe adolescents about to step out from behind the parked vehicles.

Because of this truck it is difficult for us to see small vehicle such as motorcycles. Likewise, other vehicle also might not be able to see us because of which accident might occur. [P1, Grade 10, Boy].

A few of the students also felt it was not easy to see the traffic at bends in the road, requiring them to cross the road at that point. One adolescent pointed out the trees along the road which prevented them from seeing approaching vehicles (P8, Grade 8, Girl).

We cross the road from here. Because of this turning we won't be able to see the vehicle coming this side. And sometimes trees also hide the vehicle. [P8, Grade 8, Girl] (Fig. 3).

3.1.3. Road condition

Adolescents expressed concern over the poor condition of the road. Some pointed out how potholes on the road could increase their risk of being involved in a road traffic crash. One participant explained that when the monsoon rain collects in the potholes, they are less visible. As the road can become slippery in the wet, the vehicle may hit the pothole and then hit pedestrians. The participant also explained that the road edge and the verge where they walk may be covered with water during the rainy season (June to September). This increases danger to pedestrians because the verge and the edge of the road are unclear (Fig. 4).

In addition, some adolescents spoke about uncovered side drain at the side of the road. They complained that they might fall into uncovered side drain while walking on the verge on the way to school.

There are many uncovered side drains just situated near the pavement. And sometimes when we provide side/space to the vehicle we might fall into those uncovered side drains. [P2, Grade 10, Girl].



Fig. 4. Unclear edge of the road as potholes fill with water during the rainy season [P1, Grade 10, Boy].



Fig. 5. A vehicle parked next to a 'No parking' sign just outside the school gates [P1, Grade 10, Boy].

3.1.4. Signs and symbols

Some adolescents photographed traffic signs and symbols and discussed their importance. They explained that some signs were designed to make it safer for them, for example, indicating places where the traffic should slow down, or places where vehicles should not be parked. However, the participants explained that the traffic signs are not strictly followed by the drivers, and that the school had a responsibility to enforce this safety feature. Some participants also commented on where they thought new signs needed to be placed.

This photo in particular is near our school. Vehicles should not be parked especially in areas around school. The school also has the responsibility to see that vehicles are not parked around the school. In fact, there is a 'no parking' signpost near the premises of the school. Yet, we can see that vehicles have been parked here. This is also violation of traffic rules. The school should not have allowed to park here. The school should be more responsible. [P1, Grade 10, Boy] (Fig. 5).

I feel a bit safe. Because it makes people aware that this is school area and students are walking around. So, it alerts the drivers to slow down the speed of the bus. That's why I took the photo. [P3, Grade 9, Girl].

In this photo the road is a bit steep. The speed of the vehicle increases on this steep road. That's why we need to have a 'speed limit' board here. [P8, Grade 8, Girl] (Fig. 3).

3.1.5. Safety features on the road

A small number of the older students pointed out specific road infrastructure that could reduce the risk of road traffic injuries and make their journey to school safer. Features included reflectors (cat's eyes), lane markings to separate traffic and pedestrians, and pedestrian crossings.

Adolescent: In addition, reflectors (cat's eyes) present on the road are almost destroyed by the vehicle by pressing too hard on it.

Interviewer: Why are reflectors important?

Adolescent: The reflectors works in such a way that during the foggy days especially during winter light of vehicle falls on the reflectors and reflection occurs. Because of this the drivers know that they should not cross the lane they are driving at. So the students are quite safe to walk on their pavements. [P1, Grade 10, Boy] (Fig. 6).

In this school area, if there was a different lane for heavy and small vehicle then it would be easy for the students. I think these small vehicles are a bit safer than the big ones. [P3, Grade 9, Girl].

We need to place the yellow line on the side of the road. That indicates that away from the yellow line is the road for the pedestrian. Likewise, we have to have white line on the main road which separates the lane. [P8, Grade 8, Girl].

3.2. Behavioural factors

3.2.1. Speeding and overtaking

Adolescents were anxious about vehicle speeds along the highway. They reported that vehicles had to brake suddenly to avoid collisions and when it was not applied the vehicle could hit pedestrians. Adolescents across all grades at the school shared a recent incident where a student had been severely injured by a speeding vehicle. In addition to speeding, several participants observed that overtaking at speed on a narrow highway pushed the vehicle being overtaken closer to the verge, where they may be walking. Therefore, the participants felt scared.

A small boy from this school was crossing the road to search something on the other side. And then a motorbike was coming in speed. The rider could not stop motorbike and hit the boy. [P7, Grade 8, Girl].

Sometimes, the driver overtakes other vehicle and runs vehicle near the pavement. So, I feel scared. [P8, Grade 8, Girl].



Fig. 6. Reflectors on the road [P1, Grade 10, Boy].

3.2.2. Lack of courtesy from drivers

The adolescents expressed their concern about the drivers' behaviour toward pedestrians. They complained that drivers do not stop their vehicle to let them cross the road, even at the pedestrian crossings. It seemed to the adolescents that the drivers both disregarded formal road rules and lacked basic courtesy when driving near school areas. Some adolescents felt the need of additional pedestrian crossings or suggested they required repainting as the paint was faded, but more reported that even if there were sufficient pedestrian crossings, there was no guarantee that the drivers would stop their vehicles and allow pedestrians to cross. One adolescent noted that having a traffic policeman to help them cross the road would be helpful, as the drivers would obey the traffic policeman and then they could cross the road safely. One of the older students described how unsafe some driving behaviours were, including driving under the influence of alcohol and using mobile phones while driving. The participant said that all drivers should not drink, or use mobile phones while driving as that could cause a distraction for them.

Vehicle should stop at the zebra crossing. But they don't stop. They only stop the vehicle when we are in group. We need traffic policeman to help us cross the road; just like the one we have in Hetauda [P2, Grade 10, Girl].

I want to request all the drivers to not drink while driving and to keep the mobile phones in silent. Mind is diverted when we use the phone. That is why please keep the phone in silent mode. [P3, Grade 9, Girl].

In addition to these, the adolescents were also worried about the way goods were being transported. They observed that drivers do not always fasten their goods properly to the vehicle. They told of incidents when goods had fallen from vehicles onto pedestrians and injured them. One participant shared a story of how her sister was hit by a falling brick from a fast moving vehicle while she was walking along the verge to her school.



Fig. 7. Adolescents crossing the road in group.



Fig. 8. T-junctions along adolescent's routes to school.

3.2.3. Adolescents behaviour when crossing the road

The adolescents were aware of the risks as a road user and some talked of taking active measures to keep safe. They pointed out that they looked in both directions before crossing the road. Most adolescents had figured out that the vehicles are more likely to stop if they are crossing in a group and hence would do so (Fig. 7). Adolescents of all ages offered examples of how they had found it difficult to judge the speed and distance of oncoming vehicles while they were waiting to cross the road. One participant explained how her younger sister was hit by a vehicle when she tried to cross the road thinking the vehicle was far away.

Sometimes we feel that the vehicle is too far and we try to cross the road. But the vehicle immediately reaches to the place where we are. [P2, Grade 10, Girl].

First I see the vehicle. If the vehicle is far away, then I cross the road. If it's near, then I allow the vehicle to pass. And I cross the road. [P11, Grade 6, Boy].

The vehicle was speeding. Vehicle was far away. And my sister thought that she will be able to cross the road. And at that speed the vehicle was not able to brake quickly. And then the vehicle hit her. [P5, Grade 10, Girl].

However, some adolescents reported behaviors that placed them at increased risk of road injuries. One girl reported being so involved in a conversation with her friends that she had not realized she was walking in the road close to moving traffic. Some younger participants said that they sometimes rushed across the road in instances where someone older might have waited.

Yes! As we will be too busy in talking, we won't realize it. As roads in some places are wider. And then all of the sudden I tend to walk in the main road. Because the road gets narrow. And then when a bus passes by then only I realize that I am in the main road. [P3, Grade 9, Girl] (Fig. 1).

Because I feel scared at such place, I walk a bit fast to cross the road. [P11, Grade 6, Boy].

3.2.4. Understanding where to walk

There were several T-junctions along the adolescent's routes to schools, where side roads joined the highway. These junctions appeared to be particularly challenging for the adolescents to navigate safely. The adolescents used words such as "confusion" or "scary" when describing such junctions. Several adolescents across all grades marked areas around junctions as 'unsafe' on their maps of their journeys to school.

Vehicle comes from this side and also from this side. And then I get confused where to go. [P7, Grade 8, Girl].

I said earlier in the map that this is Smarak Gate (indicating T-junction as shown in Fig. 8). There is an inclined road in Smarak Gate. Vehicle comes in high speed in this road and the vehicle also goes in high speed from the highway. So, here vehicles may hit each other. That's why this place is a bit unsafe. [P1, Grade 10, Boy].

The traffic rules for vehicles in Nepal require vehicles to drive on the left side of the road and that pedestrians should walk on the right side of the road, facing the oncoming traffic. However, several adolescents either did not know or did not understand this guidance.

And they have also taught [us] to walk on the same direction that the vehicle goes. But as the sidewalk is too narrow, we walk from the other side. [P6, Grade 9, Boy].

4. Discussion

This qualitative study explored adolescent's perceptions regarding road risks on their journey to school on the East-West Highway in Nepal. Road "accidents" were frequently described by participants in this sample, and they were able to provide examples of incidents occurring in their communities and explain what had happened. The adolescents provided stories of how they felt unsafe due to

the lack of pavements, difficulties in being seen by drivers, difficulties navigating road junctions safely, holes on the sides of roads, and lack of compliance by drivers with road signs and safety features such as pedestrian crossings. They also described dangers and fears they perceived because of driver's behaviour of speeding, inappropriate overtaking and driving under the influence of alcohol.

This study identified that there was no pavement for pedestrians along the East-West highway. The width of the available road verge is not sufficient or uniform. As a result, adolescents have to walk on the main road and therefore they perceived themselves at risk of being hit by a vehicle. This is similar to a finding by [Ahlport et al. \(2008\)](#) who reports that discontinuous pavements forced children to repeatedly cross the street; resulting in increased exposure to vehicles and making walking more dangerous for child pedestrians in North Carolina. In a study by [Boarnet et al. \(2005\)](#) in California, connected and improved pavements increased the number of children walking to school and reduced the proportion of children walking in the street. The pavement provided a safer space by enabling pedestrians to walk without sharing roads with vehicles.

In a study by [Collins and Kearns \(2001\)](#) in New Zealand, illegal or dangerous parking were one of the reasons why primary school aged children considered places near the vicinity of the school as dangerous because parents may reverse their car from an inappropriate parking space while the children tried to walk around the vehicle. Parents chauffeuring adolescents to schools in a private car is unusual in Nepal, especially around public schools. However, young people in this study did express concern about the dangers they faced while navigating parked trucks and were aware that they may not be seen by drivers in oncoming vehicles. In a survey study of 1996 pedestrians aged above 15 years in India, approximately 50% of the pedestrians perceived high risk by parked vehicles as pedestrians lacked space to walk ([Rankavat and Tiwari, 2016](#)). [Peden et al. \(2008\)](#) in the World Report on Child Injury Prevention describes how heavy vehicles limit the ability to see or be seen because of the small physical stature of children.

In this study, the adolescents described challenges of using the spaces at T-junctions and the pedestrian crossing that was outside their school. A study conducted to assess the behaviours of primary school -aged children in Scotland shows that only 18% of the 56 children sought help from the adult to cross the road at T-junction. However, 88% of the remaining children who chose to cross on their own showed poor behaviour such as not looking for moving vehicles, failing to stop at the pavement before proceeding onto the road or running while crossing the road ([Zeedyk et al., 2002](#)). Lack of pedestrian crossings has been reported to reduce independent walking among children in Tehran ([Shokoohi et al., 2012](#)) and increased the risk of road traffic injuries ([Schuurman et al., 2009](#); [Pernica et al., 2012](#)). In a survey of 1557 teenagers in Nepal, adolescents who didn't wait for green signals to cross the road were 1.5 times more likely to sustain pedestrian injury (AOR = 1.51, 95% CI 1.14 to 1.99) ([Poudel-Tandukar et al., 2007](#)).

Apart from the built environment, adolescents in the study were concerned about the behaviour of drivers. The adolescents perceived that the driver's attitudes to overtaking, speeding, and driving under the influence of alcohol all increased the risk of RTI to the children while walking to school. The Traffic Accident Records of the Nepal Police (2013) show that around 80% of road traffic crashes were as a result of poor driver behaviour such as speeding, overtaking and drinking and driving ([Thapa, 2013](#)). According to Motor Vehicles and Transport Management Act 2049, Article 142 driving under the influence of alcohol and drugs is prohibited in Nepal. However, lack of traffic police capacity and the availability of adequate breathalyzer may hinder to the effective enforcement of the law against drunk driving.

The interviews suggested that the adolescents in this study were not all aware of traffic safety guidance. The Department of Roads have traffic rules for pedestrians in Nepal which suggest that they should walk on the right side of the road so that they can see the approaching traffic. However, little knowledge is known whether pedestrians are aware of those traffic rules or not. A study conducted by [Baniya and Timilsina \(2018\)](#) in Nepal did suggest that 90% of the 240 students were aware of the traffic lights and its purpose. But the results of this study cannot be generalised as it was conducted only in one school with a small sample of population. Therefore, exploring the knowledge of traffic rules among teenagers could be an area of potential future research.

4.1. Strengths and limitations

This study contributes new insights to the issue of road safety in Nepal. Very few studies are available from developing countries that focus on adolescent's journeys to school, or seek their views on the road environment they use every day for school. This is, to the knowledge of the researchers, the first qualitative study to understand perception of adolescents on road risks during their journey to school in Nepal.

The study design uses an innovative technique of photo-elicitation interviews as a tool to facilitate engagement of adolescents in a research project and to help them express their views on factors influencing their safety. This enabled adolescent's voices to contribute to the wider debate about road safety in Nepal. Though most previous studies have used disposable cameras, the financial cost associated with purchasing disposable cameras and developing film ([Clark, 1999](#)), together with the lack of local capability to develop the pictures before the interview, led us to use a digital camera in this study. The adolescents were interested to engage in taking photographs and talking about them, and we suggest that this method could be used equally successfully in other studies seeking to engage adolescents.

Conducting data collection in the monsoon season (June–July) was a potential strength as if we had conducted outside of this season we might not have captured the issues about the potholes filled with monsoon rain and the slippery roads.

Time restrictions limited the number of schools involved and interviews conducted. However, the data obtained from the participants yielded similar codes suggesting that saturation was reached, and enabled a number of clear themes to be identified. Future studies could explore if the findings are replicated with adolescents attending different schools and interviews with parents and teachers may help place the adolescents voices in context.

As most adolescents walk to school in the company of other adolescents, the participating adolescents received constant input from their friends. In this study, the researcher chose to walk behind the student and tried not to influence their choice of photographs.

However, the other adolescents may have influenced the participants with regard to what was photographed. Additionally, the adolescents chatted informally about road risks and safety features as they walked. An alternative approach would have been a 'walk-along' interview such as that described by [Carpiano \(2009\)](#), where the researcher interviews the participants while walking through their neighbourhood. Due to concerns that it may be quite distracting for both the child and researcher to do an interview while negotiating the traffic, this technique was not used in this study.

4.2. Implications

The East-West highway in Makwanpur is currently planned to be upgraded from a 2 lane highway to a 4 lane highway. Hence, the results of the study could be useful to those designing the road improvements and policy makers who may consider the needs of adolescent pedestrians walking to school. There is a growing movement to consider the needs of adolescent pedestrians when designing urban spaces and that hearing young people's voices should be included in that process if it to be done ethically and effectively. This study may encourage greater involvement of adolescents in road improvement consultations.

The results of the study could also be used to help Tribhuwan Secondary School engage with their local government authorities to consider how to improve the road safety around their school and make a child's journey to school safer. The International Road Assessment Programme's (iRAP) Star Rating for Schools initiative can be used for measuring, communicating and managing the relative level of risk associated with road infrastructure around schools. iRAP star ratings range from five star (safest) roads to one-star (least safe), and thus provides a simple and objective measure of the level of safety of the road for all road users. [Bhavsar et al. \(2019\)](#) report that annual road traffic fatalities were reduced by 54% and annual traffic injuries by 42% when the section of Belgaum-Yaragatti (SH-20) corridor in Karnataka, India rose from 1 star to 3 star with simple interventions such as introducing raised pedestrian crossings with refuge space, adequate road markings and bus lay-bys. Similarly, a study in Tanzania shows that RTIs were reduced by at least 25% ($P = 0.045$) when the road around the schools were improved with pavements, speed humps, pedestrian crossings and road signage, together with road safety programme ([Poswayo et al., 2019](#)).

5. Conclusion

This study explored adolescent's perception of risks during their journey to school. The views of adolescents are often ignored in issues pertaining to their health and wellbeing, yet adolescents in this study clearly expressed multiple concerns regarding factors which made their journeys difficult and dangerous. PEI was an engaging method that encouraged adolescents to voice their concerns about safety. There were concerns regarding poor road condition, inadequate pedestrian crossings and traffic signs, narrow roadsides, vehicle speeding and overtaking, failing to obey traffic rules and regulation.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jth.2021.101009>.

Credit author statement

Preeti Gautam: Conceptualization, methodology, resources, investigation, formal analysis, visualization, writing - original draft, writing – review and editing, project administration. **Julie Mytton:** Funding acquisition, conceptualization, methodology, supervision, writing – review and editing. **Sunil Kumar Joshi:** Funding acquisition, supervision, writing – review and editing. **Paul Pilkington:** Methodology, supervision, writing – review and editing.

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