

# What are the challenges of pedestrian safety from the viewpoints of traffic and transport stakeholders? A qualitative Study

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## Research article

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# Abstract

## Background

Pedestrians are among the most vulnerable groups in traffic accidents. Our aim in this study was to explore the challenges associated to pedestrian safety from the perspective of traffic and transport stakeholders.

## Methods

In 2018, applying a qualitative approach, twenty-four traffic and transport stakeholders were invited to participate in semi-structured individual interviews in Tabriz, Iran. To analyze data, conventional content analysis approach was used. MAXQDA software version 11 was applied to manage data analysis process.

## Findings:

Participants reported a wide range of challenges which were grouped into six categories: "Challenges related to pedestrians", "Challenges related to drivers", "Management system challenges", "Environmental infrastructure challenges", "Educational and media challenges", and "Challenges of legislation and enforcement".

## Conclusion

We identified pedestrian safety as a challenging urban traffic and transport issue with specific complexities, particularly in the management system. With a holistic approach to the challenges, as discussed inside, all reported obstacles seem to be overshadowed by one core challenge, namely the lack of a traffic management system with health-oriented approach and enough authority. Using evidence while policy-making and intervention planning, as well as media support is recommended.

## Background

A large number of deaths and injuries occur annually as a result of road crashes among pedestrians, especially in low-income countries. Globally, about 400,000 pedestrians are killed due to road traffic crashes each year (1). Universal statistics show that the proportion of pedestrian deaths to total death caused by traffic accidents is high in developing countries (2, 3). In developed countries, however, road accidents are declining due to continued investment in infrastructure and safety programs. Studies on the risk of pedestrian accidents in developing countries (such as Iran) are in their infancy because road safety interventions have just begun and are in full swing. In addition, in such countries, the focus of road safety interventions is more on improving the safety of drivers than pedestrians (4).

Among all road users, pedestrians increase the risk of road accidents because they are so flexible and unpredictable (5, 6). In many studies, several behavioral factors like talking on the cellphone while crossing the street, neglecting traffic light, crossing a red light and crossing at inappropriate places (crossing dangerous lines) are suggested as pedestrians' unsafe behaviors (7–10). Furthermore, low perceived risk of unsafe behaviors (11, 12), consumption of unauthorized drinks, poor visibility on the roads (13, 14) and distraction (9) are also reported as other behavior-associated factors that endanger pedestrian safety.

As evident in literature, a wide range of factors are associated to pedestrian safety. In most cases, unsafe situations for pedestrians are not only related to poor decision making and risky behaviors exhibited during road crossings but also associated to lack of traffic and environmental factors (12, 15). As an instance, older people experience a sense of insecurity and unsafe to cross the streets because of lacking pedestrian crossing facilities (16). Based on literature, some factors like failing to give priority to pedestrians by drivers (17), ignoring to use facilities due to normalization (18), lacking a sense of security in using the facilities especially at night, lack of pedestrian escalators, and the presence of vendors along pedestrian bridges (18–20) are also reported as barriers to pedestrian safety.

Previous studies have emphasized the identification of pedestrian safety obstacles and challenges prior to designing any pedestrian safety promotion interventions within societies (21, 22). Pedestrian risky behaviors is a context dependent issue affected by a wide ranges of cultural and attitudinal factors (23). In many quantitative studies, the reasons for dangerous behaviors of pedestrians during road crossings have not well been discussed, as the quantitative studies on such risky behaviors alone cannot represent the motives behind the behaviors (24), so the association safety is remained ambiguous. Urban traffic researchers and policy makers can find a better understanding of pedestrian unsafe behaviors through conducting qualitative studies. In this regard, there is a great need to identify the opinions of both pedestrians themselves and traffic and transport stakeholders, as experts in the field pedestrian safety.

In 2018, a multi-method study was developed to design and implement a Pedestrian Safety Promotion Program (PSPP) aiming to improve the pedestrian safety in Tabriz, Iran. As the first phase of study, a qualitative method was applied to identify the challenges and obstacles of pedestrian safety from the perspectives of both pedestrians and urban traffic and transport stakeholders. The findings of this phase were then considered as the basis to develop the PSPP, as a community-based educational intervention, in the second phase. In a previously published paper (25), the challenges associated to pedestrian safety from the perspective of pedestrians were reported. In the present manuscript, we reported our qualitative findings on the challenges of pedestrian safety from the perspective of urban traffic and transport stakeholders.

## **Methods**

### **Setting and participants**

This qualitative study was conducted in Iran applying conventional content analysis approach from March 2018 to March 2019. Interviews were carried out either at the health centers or the work office of stakeholders, according to the agreement between the interviewer and participants. Twenty-four key stakeholders in the area of urban traffic and transport were selected based on purposive sampling with maximum variation in characteristics such as age, gender, specialty, the number of years worked as an urban traffic and transport specialist and education level. Participants' characteristics are presented in Table 1. Semi-structured individual interviews were conducted to collect data. Inclusion criteria for this study were living in Tabriz and to be consent to participate in the study.

Table 1: Characteristics of the traffic and transport stakeholders participated in the present study

variables		N	%
Gender	Male	17	70.83
	Female	7	29.17
Age	27 - 36	5	20.82
	37- 46	11	45.84
	Older than 47	8	33.35
Educational	B.S.	4	16.67
	M.Sc.	8	33.33
	Ph.D.	12	50.0
Job (workplace)	Ministry of Health	8	33.33
	Traffic police	5	20.82
	Ministry of Science	6	25.03
	Urban Traffic Organization	5	20.82

## Data Collection

To collect data, individual semi-structured interviews were carried out. In this study, an interview guide (Table 2) was prepared prior to the interviews, based on Krueger & Casey 2014 standard protocol (26, 27). This guide included participants' views on pedestrian safety and the barriers and challenges associated with the issue. Consequently, the interviews began with the following question "How is your opinion about the barriers and challenges related to pedestrian's safety in Tabriz?" Some probing questions such as "can you explain more" were used to extract more information and to advance the interview. After 21 individual interviews, we rarely identified new codes or categories in transcripts. However, we continued to conduct interviews, and in the interview number 24 no new code or category emerged. So, we concluded the theoretical saturation of data and terminated the interviews. The average length of time taken to complete the interviews was 45 minutes.

Table 2: The main question and its probing questions that were asked from the participants

What do you think about the obstacles and challenges of safe pedestrian behavior?

What role do you think the authorities can play in protecting pedestrians?

Why do you think pedestrians don't use the safe passages?

What role do you think drivers play in pedestrian safety?

What is your idea about the management system of urban traffic and transport for pedestrian safety in the country? Can you explain more?

What do you think about the rules for pedestrian safety?

How do you think about the causes of unsafe behaviors of pedestrians?

Explain the role of social media such as radio and television in the safety of pedestrians?

What do you think about the education available in the community for the safe behavior of pedestrians?

## Data analysis

Data analysis was performed during the data collection process. Conventional qualitative content analysis technique was initiated from the first interview in parallel with interviews. Initially, the recorded interviews were written and each interview was reviewed two to four times to ensure that the transcripts were correct. Then, the first researcher coded the transcripts of the interviews. The codes were read for several times, and the conceptually similar codes were then grouped into one category. With the progress of analysis process and reiterated reading of the texts, extracted codes and categories, the similarities and differences between the categories were identified and the themes were distinguished in terms of features and dimensions. The management of data was performed using MAXQDA 11 software.

To increase data validity and transferability, four criteria including credibility, conformability, transferability and dependability were considered (28). The validity of the current study was provided through careful selection of eligible participants, long-term and consistent participation of volunteers during the analysis of information, and applying experts' opinion at different stages of study. The confirmation of study was obtained after preserving documentation at all stages of the research, and there was possibility for others to examine the process through clarifying methodological decisions. The transferability of findings was evaluated using a complete and detailed description of the situation, participants and data analysis methods. To increase reliability of the research, all data were presented to a researcher who had no connection with the research study so that determine if he/she had a similar understanding of the data.

## Results

According to the experts' perspective, the challenges related to pedestrian's safety were classified under six categories including "Challenges related to pedestrians", "Challenges related to drivers", "Management system challenges", "Environmental infrastructure challenges", "Educational and media challenges" and "Challenges of legislation and enforcement" (Table 3).

Table 3: Challenges related to pedestrian safety classified in six categories			
R	Themes	subthemes	quotations
1	Challenges related to pedestrians	Not caring for one's safety	"Pedestrians do not care about their own vulnerability when crossing streets and highways, where all cars are passing at high speeds. They do not want to use the overpasses" (p22)
		Lack of demand by community members	"A part of the budget has to be paid for the development of urban infrastructure, but it doesn't happen in a reasonable amount unless the public demands of the community are effective. The people have to be demanding" (P18)
		Becoming accustomed to perform unsafe behaviors	"Pedestrians have become accustomed to risky behaviors; that is, people have become accustomed to a previous wrong culture. They think that they can get in car at the crossroads or making transverse passage where they want". (P3)
		Lack of knowledge, awareness, and literacy about traffic rules	"Most people are not aware of the traffic principles since they were not trained. They do not have the required knowledge". (P23) "A number of traffic problems are related to the low traffic literacy of people in the community. It is true that there is works in this field, but it is still not enough" (P 14)
		Poor perceived risk	"In occupational safety issues, perceived risk is much more important than knowing about the risk. In other words, being aware of a risk does not guarantee performing safe behaviors. Individuals have to perceive the traffic risk, properly". (P11)
		Adherence to people's unsafe behaviors	"The other point is that when you see that no one is following the traffic rules, you say why should not I do it?" (P10)
		Parents as poor role models	"For example, father or mother in a family usually crosses the street without paying attention to road signs and symptoms, ignoring that their children are looking at them. You now, parents play as role models for their children". (P12)
2	Challenges related to drivers	Drivers' poor perceived risk	"The drivers have not yet perceived how much the risk of increasing speed from 60 to 80 km/h is in causing a deadly accident with a pedestrian. They do not understand that pedestrians are really vulnerable ". (P14)
		Traffic rule violations by drivers	"Sometimes, drivers perform high-risk behaviors, like high-speed, which cause fear and confusion to pedestrians ". (P13) "Many times, I observe that the sidewalks are not safe and secure. At any moment, a motorcyclist may approach from behind and cause an accident". (P24)
		Distracting driving behaviors	"Most drivers either talk on their cell phones or send SMS, and they still don't follow the rules!" (P23)
3	Management system challenges	Improper urban planning management related to traffic and transport	"Passenger overpasses have become a place for addicts or drug dealers. Nobody dares to use an overpass after 12 a.m.". (P17) "Things need to be more cohesive; all relevant organizations should be actively involved in traffic and transport issues". (P6) "For instance, Tabriz Urban Traffic and Transport System has only one to two traffic experts; the other employees are from unrelated fields". (P22)" In my opinion, the issues of 'pedestrians' are neglected in urban furniture design. This subject has received less attention in our country". (P20) "A way to reduce traffic accidents is to create a leading organization. A leading organization headed by urban transport experts and policy makers could manage many aspects of the issue". (
		Lack of contact channels between people and officials	People do not know where to go to complain about pedestrian safety and if they do, will they be effective"? (P15)
		Poor policy making while planning pedestrian safety programs	"Our most important priority in the issue of pedestrian safety is the formulation of policies that have not well been implemented. If we consider this issue, our problems in public education, vehicle safety, and road safety will be resolved". (P7) "Decision-making based on scientific evidence is necessary to promote pedestrian safety. But, a majority of our stakeholders do not pay attention to it ". (P8) "When they want to build a pedestrian overpass, they need to conduct a need assessment and determine the busiest areas of the street where people pass by ". (P4)
		Lack of health-oriented perspective in the traffic and	"In fact, there should be a systemic approach with health promotion perspective to traffic safety. The related organizations should not act independently. We solve the problems through trial and error, and we now pay the price". (P11) "In the developed countries, traffic issues and pedestrian safety are considered from the aspect of health promotion, but this is a recent subject in our country". (P14)

		transport management system	
		Lack of proper vehicle manufacturing	"Another measure that can be taken to protect pedestrians is related to vehicles. Cars manufactured in the country are poorly designed". (P4) Nowadays, pedestrian-friendly vehicles have been designed that do not damage pedestrians too much while accidents". (P9)
4	Environmental infrastructure challenges	Inappropriate or lack of safe pedestrian lanes	"In many places, we don't have pedestrian bridges, or a lot of pedestrian bridges are not mechanized, and in many cases people prefer to take the risk and cross the street instead of climbing lots of stairs!, especially in this regard, the older and the disabled people are not considered." (P1) "Many of our streets don't even have sidewalks, and you know that all the streets must have sidewalks." (P9) "In our boulevards, pedestrians are not well visible in some places. Due to improper tree planting, drivers cannot see pedestrians when they enter the street." (P5)
		Inappropriate/poor traffic signs and equipment	"In the developed countries, there are pedestrian lights, but practically there are few numbers of such things in our country. At a majority of intersections, there are pedestrian crossings, but no pedestrian lights". (P10)" Over and over again, we have seen either half painted or poorly-colored pedestrian crossings on the streets, which means that painting was left incomplete or done with poor quality ". (P19) "If I want to use pedestrian overpasses, I have to walk 50-100 meters further down the street, go up the stairs about 50 steps, and then come down; so, I definitely do not use the overpass and cross the street!". (P2)
		Poor aesthetic pedestrian lanes	"Most overpasses are made from steel with no fascinating design, which do not attract pedestrians. I think the designers have not done a good practice in urban beauty". (P4)
		Obstruction of sidewalks	"Pedestrian crossings or sidewalks are blocked because of construction debris from construction works". (P20)
5	Educational and media challenges	Lack of pedestrian rights course in the national driving licensing curriculum	"At some point in time, all individuals have to apply for a driving license. One thing that should be educated to the applicants is pedestrians' rights, an important topic that is ignored in the national course plan". (P2)" Well, a person who gets a driving license of course drives based on the received trainings and does not pay much attention to pedestrians rights". (P17)
		Lack of training students about pedestrian safety at schools	"There is a training gap in this field at schools. We do not have any educational course or book in this regards. Pedestrian safety should be embedded in the educational programs of the schools". (P7)
		Lack of mass media in acculturation of traffic behaviors and pedestrian safety	"When an actor is talking on a cell phone while driving, crossing a street while talking either on a cell phone or with a friend, you know, people especially teenagers and young adults perceive such unsafe behaviors as the true way of crossing". (P6) "In my opinion, broadcasting organization can have a remarkable mission in this regard. It can have a wide range of educational programs to train people; they can highlight the consequences of not obeying traffic safety rules to the people". (P18)
6	Challenges of legislation and enforcement	Poor traffic and transport legislation	"We have fines for traffic violations of car drivers, but unfortunately we have no fine for pedestrians". (P16)
		Weakness in law enforcement	"The laws allow the police to fine offending pedestrians, but its mechanism and manner are not clear. I mean, this law is not applicable and the most of discussions are focused on drivers". (P12)

## Challenges related to pedestrians

As our participants believed, a wide range of pedestrian safety challenges is related to pedestrians themselves:

### 1- Not caring for one's safety

According to participants' opinion, a significant number of pedestrians were not careful about their safety:

"Pedestrians do not care about their own vulnerability when crossing streets and highways, where all cars are passing at high speeds. They do not want to use the overpasses". (p22)

2- Lack of demand by community members:

One area that a majority of participants mentioned was lack of demand from community members to resolve pedestrian safety issues. A contributor stated that:

"A part of the budget has to be paid for the development of urban infrastructure, but it doesn't happen in a reasonable amount unless the public demands of the community are effective. The people have to be demanding" (P18)

3- Becoming accustomed to perform unsafe behaviors

The habit of engaging in risky behaviors was one of the areas that most participants mentioned:

"Pedestrians have become accustomed to risky behaviors; that is, people have become accustomed to a previous wrong culture. They think that they can get in car at the crossroads or making transverse passage where they want". (P3)

4- Lack of knowledge, awareness, and literacy about traffic rules

Poor traffic literacy, lack of knowledge and awareness about traffic were some of the areas that many participants mentioned in various ways:

"Most people are not aware of the traffic principles since they were not trained. They do not have the required knowledge. ". (P23)

5 – Poor perceived risk

Lack of risk perception was also mentioned as a challenge for the pedestrians' safety.

"In occupational safety issues, perceived risk is much more important than knowing about the risk. In other words, being aware of a risk does not guarantee performing safe behaviors. Individuals have to perceive the traffic risk, properly". (P11)

6- Adherence to people's unsafe behaviors

In most cases, participants noted that the pedestrians usually follow the people's unsafe behaviors as they see.

"The other point is that when you see that no one is following the traffic rules, you say why should not I do it?" (P10)

## 7- Parents as poor role models

A majority of participants believed that children emulate parental behaviors, including their unsafe traffic behaviors.

"For example, father or mother in a family usually crosses the street without paying attention to road signs and symptoms, ignoring that their children are looking at them. You now, parents play as role models for their children". (P12)

## Challenges related to drivers

### 1- Drivers' poor perceived risk

Most participants reported the drivers' poor risk perception as one of the challenges and obstacles to the safety of pedestrians.

"The drivers have not yet perceived how much the risk of increasing speed from 60 to 80 km/h is in causing a deadly accident with a pedestrian. They do not understand that pedestrians are really vulnerable ". (P14)

### 2- Traffic rule violations by drivers

Traffic rule violations and unsafe behaviors of drivers, such as disregarding to pedestrians' right-of-way, crossing the green light, high speed, stopping on the pedestrian crossing, parking cars on the sidewalks, and motorcycling on the sidewalks were also mentioned by our participants as challenges to pedestrians' safety.

"Sometimes, drivers perform high-risk behaviors, like high-speed, which cause fear and confusion to pedestrians ". (P13)

### 3- Distracting driving behaviors

A majority of participants reported behaviors like sending short messages, talking on a cell phone, talking to a passenger, and watching a monitor while driving as the challenges that endanger pedestrians' safety:

"Most drivers either talk on their cell phones or send SMS, and they still don't follow the rules!" (P23)

## Environmental infrastructure challenges

### 1- Inappropriate or lack of safe pedestrian lanes

lack of pedestrian bridges and underpasses, non-mechanized pedestrian bridges, unsuitable pedestrian bridges for older adults and the disabled persons, as well as having potholes on the sidewalks, multiple disconnections in the sidewalks along a route, rugged and/or narrow sidewalks, the presence of stairs on

sidewalks, trees planted in improper places of sidewalks and even absence of sidewalks on some streets were among the pedestrian lane challenges reported by participants:

"Many of our streets don't even have sidewalks, and you know that all the streets must have sidewalks."  
(P9)

## 2- Inappropriate/poor traffic signs and equipment

As participants reported, inappropriate or lack of traffic and transport signs and equipment including out of service red lights, absence of pedestrian crossings in some routes, inappropriate location of pedestrian crossings, lack of lighting in the sidewalks, and mismatch between pedestrian crossings and traffic lights caused problems to pedestrian safety:

"In the developed countries, there are pedestrian lights, but practically there are few numbers of such things in our country. At a majority of intersections, there are pedestrian crossings, but no pedestrian lights". (P10)

## 3- Poor aesthetic pedestrian lanes

Poorly aesthetic design of pedestrian lanes and crossings was another infrastructure challenge mentioned by a majority of the participants:

"Most overpasses are made from steel with no fascinating design, which do not attract pedestrians. I think the designers have not done a good practice in urban beauty". (P4)

## 4- Obstruction of sidewalks

A majority of participants reported the obstruction of sidewalks due to vendors, shopkeepers' stands, and leaving construction materials. As they believed, such obstructions impede the pedestrians to cross over the sidewalks, and thus they inevitably walk on the street.

"Pedestrian crossings or sidewalks are blocked because of construction debris from construction works".  
(P20)

## **Educational and media challenges**

### 1- Lack of pedestrian rights course in the national driving licensing curriculum

Lack of training driving license applicants on pedestrian's rights was a challenge perceived by participants. As they believed, outlines on pedestrian safety have to be included in the national driving licensing course plan:

"Well, a person who gets a driving license of course drives based on the received trainings and does not pay much attention to pedestrians rights". (P17)

## 2- Lack of training students about pedestrian safety at schools

Participants also pointed out to the lack of training students about traffic rules and pedestrian safety at schools. They believed that there is a gap in the academic courses of all grades, from elementary to high school.

"There is a training gap in this field at schools. We do not have any educational course or book in this regards. Pedestrian safety should be embedded in the educational programs of the schools". (P7)

## 3- Lack of mass media in acculturation of traffic behaviors and pedestrian safety

Participants believed that mass media (e.g. television and radio) in the country lacks in developing the culture of traffic and pedestrian safety throughout the society. As an instance, they pointed out to the poor role modeling of actors in the movies:

"When an actor is talking on a cell phone while driving, crossing a street while talking either on a cell phone or with a friend, you know, people especially teenagers and young adults perceive such unsafe behaviors as the true way of crossing." (P6)

## **challenges related to traffic and transport management system**

### 1- Improper urban planning management related to traffic and transport

In terms of poor urban planning associated to pedestrian safety, participants reported a wide range of challenges, including ignoring pedestrian rights in designing urban furniture, lack of safety at a number of sidewalks for pedestrians (e.g. the presence of addicts, drug dealers and bag-rubbers, particularly at nights), poor inter-sectoral collaboration for pedestrian safety, and not employing the true specialists in the field of traffic and transport.

"In my opinion, the issues of 'pedestrians' are neglected in urban furniture design. This subject has received less attention in our country." (P20)

As they believed, the origin of these problems is the lack of a unique traffic and transport management system within the country, which has resulted in aggravating the urban traffic and transport issues:

"A way to reduce traffic accidents is to create a leading organization. A leading organization headed by urban transport experts and policy makers could manage many aspects of the issue". (P8)

### 2- Lack of contact channels between people and officials

According to participants, lack of communication channels for people to contact urban traffic and transport officials was an important challenge for pedestrian safety.

"People do not know where to go to complain about pedestrian safety and if they do, will they be effective?" (P15)

### 3- Poor policy making while planning pedestrian safety programs

As reported by participants, poor traffic and transport policy making, non-reliance on evidence to promote pedestrian safety, lack of comprehensive need assessments, non-compliance with pedestrian safety standards, poor budget allocation, and not employing private sector in implementing the programs were example of poor policy making related issues in planning pedestrian safety programs.

"Decision-making based on scientific evidence is necessary to promote pedestrian safety. But, a majority of our stakeholders do not pay attention to it ". (P8)

### 4- Lack of health-oriented perspective in the traffic and transport management system

Absence of health-oriented perspective on urban transportation was one of the major management challenges addressed by a majority of participants.

"In the developed countries, traffic issues and pedestrian safety are considered from the aspect of health promotion, but this is a recent subject in our country." (P14)

### 5- Lack of proper vehicle manufacturing

A majority of participants pointed out to the improper design of domestic vehicles, which is associated to pedestrian safety while accidents. Poor brake system, early depreciation and non-adaptation with pedestrian safety were the mainly reported issues by participants that endanger pedestrian health.

"Another measure that can be taken to protect pedestrians is related to vehicles. Cars manufactured in the country are poorly designed". (P4)

## **Challenges of legislation and enforcement**

### 1- Poor traffic and transport legislation

As most participants believed, lack of legal boundaries contributed to the pedestrian and drivers' behaviors as well as lack of a penal/incentive system for pedestrian behaviors were among the challenges of pedestrian safety.

"We have fines for traffic violations of car drivers, but unfortunately we have no fine for pedestrians". (P16)

### 2- Weakness in law enforcement

The most participants stated the lack of penalties for drivers who disregard the rights of pedestrians, failure in enforcing the existing laws for pedestrian safety, improper enforcement of urban traffic laws, and poor inspection of traffic law enforcement.

"The laws allow the police to fine offending pedestrians, but its mechanism and manner are not clear. I mean, this law is not applicable and the most of discussions are focused on drivers." (P12)

## **Discussion:**

Our aim in the present qualitative study was to explore the viewpoints of urban traffic and transport stakeholders on the challenges and barriers of pedestrian safety in Tabriz, Iran. Participants, as the experts of urban traffic and transportation, reported several challenges ranged from those associated to pedestrians themselves and inner-city drivers to the obstacles related to environment, society and culture, education, legislation and management. In agreement with those reported by Haghighi et al., (25) pedestrian safety seems to be a multi-factorial issue affected by a wide range of factors.

Besides emphasizing some common factors in developing countries, participants stressed some pedestrian factors that are not reported so high in the literature. Not caring about one's safety in the streets, lack of demand for resolving pedestrian safety issues in the community, poor perceived risk, and lack of traffic safety literacy were pedestrian associated factors that needs to be paid attention in future studies. Poor level of traffic literacy, for example, is a common problem among individuals in developing countries. Although we can improve knowledge and road crossing behaviors through implementing educational programs (29), traffic and road safety literacy is something more than having knowledge about traffic safety, and incorporates a series of abilities and skills to access, understand and apply pedestrian safety behaviors (30). In many cases, pedestrians are unaware of their traffic-associated high-risk behaviors, road hazards and the consequences of their behaviors (4, 31). Thus, promoting pedestrians' awareness of road hazards is also an important factor in adopting safe behaviors (32). Of course, to enable pedestrians in performing pedestrian safe behaviors, planning educational programs is not enough, and instead multifaceted interventions including public health campaigns, community mobilization, as well as advocacy and social marketing efforts are necessary. So, policymakers and traffic stakeholders should improve pedestrian safety in the community through developing multifaceted traffic safety promotion programs.

Similar to those reported in previous studies (25, 33, 34), drivers' poor perceived risk, traffic rules violations and distracting behaviors were challenges associated to pedestrian safety reported by participants in the present study. According to a previous study, risky behaviors in drivers are factors that can lead to pedestrians' overruns (35). Findings from another study similarly showed that most pedestrians did not feel safe while crossing the road due to disregarding to pedestrians' right-of-way by drivers (17). Drivers-related factors noted in the present study were expected, as previously reported in several studies (36, 37). In a current study in Ghana, many drivers were reported to not pay attention to pedestrian crossings and approach them very quickly. Also, Permissible speed was not observed in residential areas, and pedestrian safety was at risk, especially for children who are playing (38).

Another hindrance of pedestrian safety, as participants reported, was environmental infrastructures of urban traffic and transport. Lack of safe pedestrian lanes, particularly for older adults and disabled

persons, inappropriate/poor traffic signs and equipment and obstruction of sidewalks were frequently reported by participants. In a community with such common infrastructural problems, it is not unusual for pedestrians to violate traffic rules. For instance, "If I want to use pedestrian overpasses, I have to walk 50–100 meters further down the street, go up the stairs about 50 steps, and then come down; so, I definitely do not use the overpass and cross the street!". So, the consequence is that more than one third of road traffic injuries happen while walking on the roads (39). Similar to our findings, non-mechanized pedestrian bridges with high number of steps influenced the rate of bridge use by pedestrian (20). As our participants stated, pedestrians are indifferent to the bridges located in inappropriate places or have difficult accessibility, so they prefer to cross the street, as noted in a previous study (40). According to the literature, pedestrians give higher priority to convenience and time-saving compared to safety (18, 41). So, in the planning to promote infrastructures of urban traffic and transport, the policy makers and stakeholders should pay a great attention to these factors. Osama and Sayed (42) showed that the continuity of sidewalks and their appropriate slope had a positive relationship with less accident's occurrence. Factors like uneven surfaces, crowded intersections and stairs, and slippery surfaces, as the environmental issues commonly reported by participants in our study, play important roles in the rate of pedestrian falls (43). According to our findings, the mismatch of facilities with older pedestrians and disabled individuals was another barrier of pedestrian safety. Addressing the issues of older adults in the design of urban spaces is so important that the WHO urged the needs for constructing the cities, in terms of the distribution of public services and facilities, based on the needs of the older population (44).

Weakness in legislative performance and poor law enforcement were identified as other important barriers to pedestrian safety, in our study. The illegal crossings on the roads in some developing countries has been well studied, and in many cases, they have emphasized the high rate of pedestrian accidents associated to this behavior (45, 46). A study in Chile found that pedestrians have a positive attitude toward illegal crossings (47). Of course, in some cases, due to the lack of facilities, illegal crossing is the only way to cross the road. It seems that in addition to promote safety culture and educational interventions, the adoption of appropriate laws and regulations for pedestrians as well as inspection on law enforcement can be good options to improve the safe behaviors of pedestrians.

Moving further, poor traffic management system was an important theme emerged from the data. A majority of participants pointed out to poor urban design with no consideration on pedestrian safety, a systemic approach and a leading organization in the field of urban traffic. A consequence of these managerial issues is a great lack in inter-sectoral collaboration, as there is no unique management system to mediate between different sectors associated to urban traffic and transport. For example, "Things need to be more cohesive; all relevant organizations should be actively involved in traffic and transport issues". In countries with successful experience in reducing the number of traffic accidents, there is usually an organization with sufficient authority and stewardship for managing urban traffic and transport system, and other organizations are responsible for a high level of collaboration and cooperation with (43, 48). According to the WHO reports, traffic accidents prevention and traffic safety promotion may not be achieved without cooperation among different organizations (49). Similar findings were reported in previous Iranian studies (50, 51). Lack of proper design in Iranian-manufactured cars in

terms of pedestrian safety was another issue mentioned by stakeholders. Compliance with vehicle safety standards has a significant impact on pedestrian safety (4), and have to be considered as the rules to be obeyed by car manufactures in developing countries. Because proper design of vehicles plays an important role in maintaining the safety of pedestrians and injure them less in accidents (52).

Lacks of traffic safety trainings from elementary schools to the universities, as well as lack of media support and advocacy for traffic and transport safety emerged as another obstacle to pedestrian safety. Previous studies have shown that public education alone may not reduce deaths or injuries resulting from accident (53, 54). Our participants believed that beside public education and awareness raising, there is great needs for media advocacy, supportive legislations and law enforcement, as recommended in previous research (55). These challenges altogether bear in mind the lack of a traffic management system with health-oriented approach and enough authority in Iran, as a developing country. Such a system with the characteristics noted can manage and mediate the traffic and transport initiatives among different organizations in a comprehensive manner. In Iran, like a majority of developing countries, although limited trainings on traffic principles such as Police Aid Program (PAP) are conducted at schools (56), there is almost no credible and formal training program on traffic safety at schools and universities. Limitations of this study were difficult access to participants and gain their confidence to participate in the study. Despite efforts to build trust through self-introduction and study objectives, a small number of professionals still declined to be interviewed.

## **Conclusion**

Based on the findings, we concluded that pedestrian safety was a challenging issue in urban traffic and transport systems of developing countries with specific complexities, particularly in the management system. Traffic safety researchers, traffic policymakers, municipalities and government officials, particularly in the developing countries, may consider these various range of pedestrian safety challenges while traffic safety policy making and/or designing pedestrian safety promotion programs within urban environments. Using evidence while policy-making and intervention planning, as well as media support is recommended. With a holistic approach to the challenges, we can conclude that all the obstacles reported in the present study are overshadowed by one core challenge, namely the lack of a traffic management system with health-oriented approach and enough authority. Such a system can manage and mediate the traffic and transport initiatives among different organizations and eventually represent the health and safety of pedestrians as the subject of everyday life, as suggested in the Ottawa Charter for health promotion (57).

## **Abbreviations**

WHO: World Health Organization, PSPP: Pedestrian Safety Promotion Program,

## **Declarations**

## **Ethics approval and consent to participate**

Ethical approval for this study was obtained from Research Ethics Committee in Tabriz University of Medical Sciences (Ethic code: REC.TBZMED.IR.1091.1396). Our ethical considerations were the statement of study purpose to participants, reassuring the participants about confidentiality of all recorded data, obtaining informed written consent from participants, keeping anonymity of data, and participants' right to withdraw at any time during the research process.

## **Availability of data and materials**

All data used for the analysis are available from the corresponding author upon request.

## **Competing interests**

The authors declare that they have no competing interests.

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Vice chancellor for research, Road Traffic Injury Research Center, Tabriz University of Medical Sciences.

## **Authors' contributions**

MH, HN and FBA are the main investigator and were involved in the study Design. HSB were also involved in the data collection and analysis.

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