



Injured Cyclists' Experiences of Risk Factors: A Content Analysis

Farshad Sedaghati Voshmeh Saraei¹, Leila Kouchakinejad-Eramsadati², Fateme Keihanian², Marieh Hosseinpour², Naema Khodadadi-Hassankiadeh^{2*}

¹School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

²Guilan Road Trauma Research Center, Guilan University of Medical Sciences, Rasht, Iran

*Corresponding author: Naema Khodadadi-Hassankiadeh

Address: Guilan Road Trauma Research Center, Trauma Institute Poursina Hospital, Namjoo St., Postal Code: 4193713194, Rasht, Guilan, Iran. Tel: +98 9113378344; Fax: +98 1333368773; e-mail: n_khodadady@yahoo.com

Received: July 14, 2024

Revised: August 28, 2024

Accepted: September 10, 2024

ABSTRACT

Objective: Cycling is a healthy and pleasurable activity, but it can also be hazardous. The risk factors for cycling injury are unknown, considering the cycling infrastructure and cyclists' behavior in northern Iran. This study aimed to explain the experiences of injured cyclists admitted to Poursina Educational and Medical Center, Rasht in 2021, as one of the risk factors associated with cycling.

Methods: A content analysis was conducted on the experiences of cyclists over the age of 18 who had one or more injured limbs due to a crash or fall while riding a bicycle. The data were obtained from the registration system of the Guilan Road Trauma Research Center. Potentially eligible participants were contacted by telephone. Twenty people with various characteristics in terms of age, sex, and other features were included in the interview.

Results: Cyclists' experiences with risk factors were divided into 13 categories; including lack of laws, lack of training, poor traffic culture, easy to lose balance, cycling infrastructure, inappropriate roads, darkness, bad weather conditions, unsafe behavior, non-standard bicycle, unsafe protection, intentional injury to female road users, and risk of collision with other road users.

Conclusion: The extracted risk factors can be used as the ABC of cycling to novice cyclists. Thus, responsible efforts to regulate, educate, promote, and monitor cycling can encourage people to ride.

Keywords: Bicycling; Safety; Traffic accident; Injury; Sport.

Please cite this paper as:

Sedaghati Voshmeh Saraei F, Kouchakinejad-Eramsadati L, Keihanian F, Hosseinpour M, Khodadadi-Hassankiadeh N. Injured Cyclists' Experiences of Risk Factors: A Content Analysis. *Bull Emerg Trauma*. 2024;12(4):193-201. doi: 10.30476/beat.2024.103355.1524.

Introduction

Cycling significantly reduces air pollution and traffic [1, 2]. It has been shown to reduce the risk of death from cardiovascular diseases, diabetes, cancer, and obesity in adults [3]. Despite these

advantages, cyclists are more prone to sustain serious injuries due to the bicycle's weak structure [4, 5].

A study of hospitalized cyclists found that mortality (5.7%) and injuries (41.0%) were significantly higher [6]. In the United States in 2022, 1,105 cyclists lost their lives, representing a 13% increase compared to 2021 [7].

Deadly bicycle incidents were associated with collisions with heavy vehicles, a lack of dedicated infrastructure, slope paths, and nighttime occurrences [8].

Cyclists' safety is a growing concern, as many adults utilize them for recreation, exercise, and transportation. They believe this means of transportation is absolutely safe and pleasurable [9]. Several measures were implemented in industrialized countries to promote cycling at the local and state levels [10, 11]. Cyclists typically choose routes for cycling depending on journey distance, number of turns, and traffic volume at intersections and slopes. Cyclists prefer to use designated bike paths on high-risk routes [12].

Cyclists in different countries share similar perspectives on the criteria for increasing cycling. These perspectives are sometimes influenced by local and indigenous conditions and attitudes [13]. For instance, Indian cyclists prefer wide streets, despite the high speed and the traffic volume of motor vehicles [14]. In addition, the findings of a comparative study of Italy and the United States indicated that high urban density, short-distance urban travel, low income, safe cycling conditions, and adequate cycling infrastructure, and training programs were the primary reasons for the higher rate of cycling in Italy than the United States [12].

The study by Namgung *et al.*, investigated the attitude towards cycling among bicycle users with different degrees of experience. The statements were divided into eight categories: understanding life in a bike-friendly community; understanding the barriers to cycling; willingness to ride a bike based on access to facilities; understanding the benefits of cycling; familiarity with local cycling information; cycling preference; sensitivity to bicycle safety, and understanding the availability of bicycle facilities. According to the findings, more experienced users had a favorable attitude towards cycling, while less experienced users perceived more obstacles to cycling. The availability of bicycle facilities was more important for the less experienced than for the more experienced riders [15]. No studies identified contributory factors other than cyclists and road users, bicycles and vehicles, and the road environment, and few specifically investigated causal correlations among contributory factors [16].

A qualitative content analysis revealed themes such as avoiding the road space, infrastructure, and the appeal of the surroundings. This means that cyclists will be more willing to ride a bicycle if the following three conditions are met. The routes should not be shared with other cars, the physical infrastructure should be modified because they do not fulfill their needs, and they prefer routes with more natural scenery [17]. Moreover in an Iranian qualitative study, new factors that were effective on cyclists' risky behaviors were grouped into four categories: personal predisposing factors (such as underestimation of risk, feeling of superiority, curiosity, emotional conditions, and experiences from previous stunts), social factors

of strengthening (traffic regulation norms and weaknesses), and environmental conditions (time conditions and structural factors) [18].

In Iran, injuries to cyclists, especially traffic injuries, account for a significant part of total injuries. However, no qualitative research has been conducted to analyze the victims' profound experiences with the circumstances that put them in danger. Preventing accidents and injuries of cyclists is crucial, which highlights the importance of investigating these risk factors. Therefore, in the present situation, where the deaths and injuries of cyclists are on the rise, studying the experiences of hospitalized victims of these incidents might pave the way for responsible organizations to develop and implement cycling safety measures. Therefore, the present study was conducted to explain the experiences of injured cyclists in Iran with regard to risk variables.

Materials and Methods

Study Design and Setting

In a qualitative study, 20 individuals were purposely included using the content analysis method with an inductive approach. The participants were individuals who had experienced bicycle-related injuries and were admitted to Poursina Hospital in Rasht (the capital of Guilan province in northern Iran). Thus, they had a profound understanding of the inherent dangers of cycling.

Participant Selection

The participants were cyclists over the age of 18 who were injured in a car accident or fell off their bikes. The phone numbers of the injured were obtained from the data registered in the trauma data bank. They were contacted by telephone, and if they agreed to participate in the study, the time, place, and mode of the interview (in-person/telephone) were scheduled.

The general inclusion criteria were living in Guilan, having a history of hospitalization due to a bicycle accident, and being under 60. Those who were unable to be reached by phone three times (10 people) or who refused to continue participating in the interview (1 person) were excluded from the study.

Data Collection Procedure

Following obtaining approval from the Ethics Committee, a content analysis was conducted in April, March, and May 2021. Twelve interviews were conducted using telephone and eight interviews were conducted in person. The primary data collection tools were in-depth and semi-structured individual interviews, which began with several general and open-ended questions about the research topic, such as "In your opinion, what are the risk factors of cycling?", "Describe your experience of your risk factors in recent injury during cycling in detail.", "Tell me anything else you like related to this topic.". During the interview, participants were asked

exploratory questions such as “What do you mean?” to clarify their opinions. Interviews were recorded with the participants' permission.

The interviews were conducted by experts in qualitative interviewing. Participants with various characteristics in terms of age, sex, marital status (single, married, divorced), cycling aim (going to work, shopping, or recreation), injury mechanism (cyclist injury due to crash with another user or fall from the bicycle), hospitalization length of stay (by day), and experience (cycling experience by year) were included in the study to facilitate the participation of individuals with diverse experiences, thereby maximizing diversity and achieving theoretical information richness. Each interview was conducted by observing and recording the participants' non-verbal cues. The interview lasted between 30 to 90 minutes.

Data Analysis

In the present study, Braun and Clarke's framework (2006) was applied with inductive approach analysis, which has six steps; including familiarizing with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and preparing the report [19]. Reaching saturation in the 17th interview was perceived as reaching similar and repeated themes. However, three additional interviews were conducted to ensure that saturation was achieved without creating new categories.

Validity of Data

Trustworthiness was ensured through four concepts proposed by Lincoln and Guba: credibility, dependability, confirmability, and transferability [20]. The credibility of the data was ensured

through the utilization of a participant review. The participants had the opportunity to correct any misunderstanding in the interviewer's perceptions. To gain dependability, qualitative research professionals reviewed the codes and categories (member check). Furthermore, the researchers attempted to achieve confirmability. All stages of the research were documented in detail so that other researchers could follow the data, and potential biases were eliminated.

Ethical Considerations

This study was approved by the Ethics Committee of Guilan University of Medical Sciences (code: IR.GUMS.REC.1399.597). The interviewer, who was a medical student, introduced himself before asking the research questions and completely described the objectives of the study. If the participant indicated a willingness to comply, written informed consent was obtained.

The interviews were conducted after obtaining written and verbal consent from the participants and ensuring their confidentiality. It was emphasized that participants could withdraw from the study at any point.

Results

The study included 20 participants, with an average age of 39.75 ± 2.46 , ranging from 18 to 56 years old. The majority of them were men ($n=17$, 81%), and 11 individuals were married (52.1%). Twelve (57.1%) intended to commute to work, and 11 (52.1%) reported less than 5 years of cycling experience. In addition, the majority of the incidents involved a collision 16 (76.2%). Of these, 14 (66.7%) were hospitalized for less than three days. The demographic characteristics of the participants are presented in Table 1.

Table 1. Demographic and clinical characteristics of participants

No	Age	Sex	Aim	Experiences	Marital status	Length of Hospitalization	Mechanisms
1	54	Female	Recreation	2	Married	2	Falling
2	31	Male	Recreation	5	Single	2	Crash
3	37	Male	Work	2	Single	15	Crash
4	42	Female	Work	1	Married	1	Crash
5	18	Male	Work	3	Single	1	Crash
6	37	Male	Recreation	4	Married	2	Crash
7	49	Male	Work	15	Married	14	Crash
8	50	Male	Work	20	Married	1	Crash
9	38	Male	Recreation	7	Divorce	2	Crash
10	42	Male	Work	5	Married	18	Crash
11	20	Male	Work	2	Single	6	Crash
12	26	Male	Work	3	Single	2	Crash
13	49	Male	Work	15	Married	5	Crash
14	52	Female	Recreation	6	Married	1	Crash
15	47	Male	Buy	1	Married	24	Crash
16	46	Male	Work	1	Married	1	Falling
17	56	Male	Buy	10	Single	2	Crash
18	28	Male	Work	8	Single	1	Falling
19	39	Male	Buy	10	Married	1	Crash
20	34	Male	Work	11	Single	1	Falling

Table 2. Risk factors from the experiences of injured cyclists admitted to Poursina Hospital

Categories	Subcategories
Lack of law	Supportive rules Insured Buying a bicycle
Not being trained	Not training Novice
Poor traffic culture	Awareness The right of way The cyclist's life
Easy to upset the balance	Other purposes Physical inadequacy Slippery hand grip Stress
Cycling infrastructure	Infrastructure Between cars Narrow streets Intersection Pedestrians colliding
Inappropriate roads	Speed bumps Alleys Holes
Darkness	Times Visibility Parked car
Unfavorable weather	Foggy weather The right speed in fog
Unsafe behavior	Hands-Free Mobile phone Group Cycling Doing a wheelie
Non-standard bicycle	Non-standard Being silent Brake lights Strong body
Unsafe protective	Helmet Reflective Kurdish pants Slippers Women's Clothing
Intentional injury to the female	Hitting Threat
Colliding with others	Animals Disabled

The risk factors were derived from the experiences of the injured cyclists, which were classified into 13 categories (Table 2). The extracted categories and subcategories are explained in the following section.

Lack of Law

Supportive Rules: “The court in charge of my accident case said that this case should be torn apart, and you have no right, despite the driver’s confession: Sir, it was my fault because I opened the door of the car accidentally and hit him, I said.” The judge replied, “The two of you are plotting to get some money from the government.” (Participant 10)

Insured: “I was in bed for a year and a half. If I was insured, I would get disability insurance, but now don’t. I had twenty years of work experience, but because I was not insured, my work experience was considered worthless. They said, “If you want,

you can stay and work, we will ensure you from now on.” (Participant 10)

Buying a Bicycle: “How a cyclist acquires skills is not regulated. There is no age limit. It is not clear at all what the requirements are for anyone to own a bicycle. We have no clear restrictive rules that specify how old a cyclist should be.” (Participant 6)

Not Being Trained

Not Training: “The main risk factor for any wheeled vehicle, whether two-wheeled, three-wheeled, etc., is the rider, who should have the necessary qualifications and training. If not, this person can cause a problem.” (Participant 7)

Novice: “Some people can maintain their balance while riding a bike, control it, and get off at high speeds with as much ease as pie. However, beginners or those who are not skilled enough should slow down

so that they can get off more easily.” (Participant 5)

Poor Traffic Culture

Awareness: “One of the risk factors for cycling is the lack of cycling culture among non-cyclists. This means that while the cyclist adheres to certain principles, other road users are unaware of the cycling culture.” (Participant 18)

The Right of Way: “The lack of a traffic culture in the streets poses a significant safety concern. There is no right of way.” (Participant 16)

The Cyclist’s Life: “The driver admitted that he had steered the vehicle in my direction to avoid a collision with the oncoming car. Indeed, his primary concern was the safety of himself and his vehicle, which he deemed more important than causing my death. What was the outcome of this incident? My face, legs, and arms were all scratched. I’m still limping. My body is bruised.” (Participant 4)

Easy to Upset the Balance

Other Purposes: “The cycling culture and the way people ride bicycles have undergone a significant transformation. In addition to personal transportation, bicycles are now used to move goods and belongings. This practice, however, introduces a potential hazard, as it disrupts the equilibrium of the bicycle, causing it to bump around.” (Participant 6)

Physical Inadequacy: “I might lose my balance due to the size and the weight of the bike, which could put a strain on the biker. Moreover, determining the speed at which you want to get off or ride a bike could be effective.” (Participant 5)

Slippery Hand Grip: “I have fallen more than a thousand times so far. When I drive for an extended period of time, such as five hours a day, my hand sweats and slips from the handlebar, and I fall.” (Participant 9)

Stress: “Usually when motorcyclists pass you fast, overtake you, or get too close, they upset the balance of the bicycle and also your balance due to the stress it creates.” (Participant 5)

Cycling Infrastructure

Infrastructure: “There is no specific route for cycling, especially in urban areas, and we have to use the same route as everyone else, which is extremely stressful and increases the risk.” (Participant 5)

Riding Between Cars: “A cyclist, who rides between cars and trucks, is at risk of getting injured. Therefore, cyclists should ride on distinct routes, or at least on sections of the roads that do not interfere with other traffic.” (Participant 6)

Narrow Streets: “... and as a car driver I say, the low speed of the bikes on the narrow streets can be dangerous for both vehicles.” (Participant 2)

Intersection: “I frequently have to ride along the sidewalk. Although I feel better on the sidewalk than on other paths, it often happens that I brake hard when passing a crossroad at an alley intersection

with the sidewalk due to the risk of colliding with passing cars.” (Participant 1)

Pedestrians Colliding: “On the track or on the boulevard, where there is a sidewalk, I have to ride the bicycle at a low speed, because if I ride too fast, I will collide with pedestrians and other people besides the shops.” (Participant 7)

Inappropriate Roads

Speed bumps: “Speed bumps can be dangerous not for cars, but for cyclists, as they can cause the bike to overturn, the cyclist to fall off the bike and hit their head, and damage to the bike and the front end.” (Participant 1)

Alleys: “The alleys are not the same as the main streets. They are not straight and have no clearly visible signs. They have sharp turns, and when you suddenly enter the main street, you do not have enough sight to avoid colliding with the car or motorbike which enters it, especially when their speed is slightly over the permitted limit you encounter.” (Participant 5)

Holes: “Road bumps are very annoying. These holes damage us.” (Participant 2)

Darkness

Times: “Cycling is extremely dangerous at night and dawn.” (Participant 4)

Visibility: “The bike itself is very small in size and difficult to see, especially at night. Its lights are too small. Standards must be fulfilled, particularly during low light hours.” (Participant 6)

Parked Car: “It was night as I was riding when a parked automobile opened its door and while I completely passed, it hit my fender and threw me. If it wasn’t dark, I could see if the driver was going to get off.” (Participant 10)

Unfavorable Weather Condition

Foggy weather: “Once it was night and the fog was very heavy, I could not see a single step forward at all. It was a difficult experience. I drove like a blind man. I reached our alley. There, I did not recognize my son who was walking in the alley and I screamed so loudly.” (Participant 4)

The Right Speed in Fog: “Because it is difficult to maintain the proper speed on the bike in foggy conditions. Even once, my son and I were returning from somewhere, it was so foggy that we preferred to walk with the bike instead of cycling.” (Participant 10)

Unsafe Behavior

Hands-free: “Some cyclists ride with headphones over both ears, which is the greatest danger. Once, I saw a cycling team with headphones in their ears, and the last cyclist collided with a truck and no one noticed.” (Participant 18)

Cell phone: “I collided with a bicycle. The cyclist was talking on his cell phone with his right hand and unable to control the bike with his left hand. He was careful not to hit me, he fell to the ground, and I hit

the wall.” (Participant 9)

Group Cycling: “I saw them cycling in groups of 30 to 40 bicycles, but they had no support cars.” (Participant 18)

Doing a wheelie: “Some even show off by doing a wheelie, which is extremely risky.” (Participant 18)

Non-standard Bicycle

Non-standard: “If the bike is not in good condition, it can cause problems and pose a risk. It stops when necessary. However, if it is not standard, it may still cause problems.” (Participant 15)

Being Silent: “One risk factor is that my bike is completely silent, and other drivers won’t notice that I am riding.” (Participant 1)

Brake lights: “When a motor vehicle brakes, the rear brake light immediately illuminates, signaling other cars behind your car to slow down. However, this does not occur when a bicycle brakes, and the vehicle behind must take extreme caution not to collide with that bicycle.” (Participant 2)

Strong Structure: “Cyclists wear no protective gear. A bicycle does not have a seat belt, a strong structure, and other features. There is little supervision and fines for cyclists.” (Participant 14)

Unsafe Protective

Helmet: “It is beneficial for individuals to wear helmets, which can enhance their confidence. It is important to note that they do not protect the spine. In contrast, lightweight and good protective gear that is specifically designed to safeguard the spine can be highly beneficial, even in the event of a fall from a bicycle.” (Participant 5)

Reflective: “The cyclist can compensate for this to some extent by wearing clothes that are decorated with reflective labels or by wearing gloves and shoes with reflective properties.” (Participant 2)

Kurdish pants: “Any cyclist must wear appropriate clothing and a helmet. We see cyclists wearing Kurdish pants that could get stuck in bicycle chains.” (Participant 3)

Slippers: “It is advisable to wear tread shoes rather than slippers. You fall to the ground with slippers because it’s slippery.” (Participant 9)

Women’s Clothing: “In the context of women’s cycling, it is essential to consider the role of clothing in ensuring safety. When I initially began cycling, I realized that certain items of clothing, such as a scarf or shawl and a long dress, could potentially pose a hazard. During cycling, it is necessary to move, arrange, or lift these items, which could otherwise lead to an accident.” (Participant 4)

Intentional Injury to Women

Hitting: “Once I noticed something strange, as if a driver was attempting to hit me on purpose. I stopped and let him go, but he did the same; then, he gave me a hand signal that I was allowed to pass, but as soon as I started moving, he rushed rapidly

to hit me on the dark side of the road and flee. I just assumed that this was true, and some men try to harass women cyclists. This made me quite skeptical of everyone.” (Participant 1)

Threat: “Once, a passing car driver stared at me strangely. I had the impression that he was looking at me differently, but I ignored him and walked away until I went a little further and saw that the driver was coming back. I was quite scared, and I assumed that I was in danger. He came to flirt with me. I was so scared that my heart stopped beating.” (Participant 4)

Colliding with Others

Animals: “More interestingly, those who have dogs frequently walk in the cyclist lane with their dogs. They go to the track and walk with them so that their dogs do not disturb anyone.” (Participant 19)

Disabled: “Unfortunately, families with disabilities are compelled to utilize the same lanes when they plan to take their disabled family members for a walk due to the lack of alternative secure lanes.” (Participant 20)

Discussion

The first category of risk factors was the dearth of cycling-specific legislation. However, it is noteworthy that the issue of cycling as a problematic phenomenon is predominantly observed in developing countries. In developed countries, the focus is on the degree of compliance and acceptance of the law, rather than on the lack of law enforcement. It is noteworthy that a study conducted in Spain revealed that 78.9% of the cyclists adhered to the established regulations at the intersection [21].

The importance of training cyclists in a shared lane is obvious. However, in Iran, how to interact with cyclists is rarely included in the novice drivers training [22-24].

The weakness of the cycling traffic culture was reported. However, our findings differed from those of a study conducted in the Netherlands, where cycling culture was such that drivers were accustomed to driving in the city at a speed of 20 miles per hour and were very respectful to other cyclists, riding in peace even on shared paths [25, 26].

The balance of the cyclist was easy to upset. The risk of accidents occurring is reduced for cyclists when the bicycle lane is completely exclusive, and there are few intersections and turns [27].

The lack of dedicated infrastructure was a risk factor; nonetheless, several cyclists reported feeling less stressed riding in a shared lane with cars than riding on a dedicated path. Since in a dedicated lane, they were at risk not only from parked cars but also from the cars that began to move [25].

The next category was inappropriate riding routes. Similarly, a study found that half of serious cyclists’ injuries occurred in paving, turns, and shoulder of

the roads [28], sloping grounds [8], sand, gravel, and pieces of glass on road asphalt [29]. Thus, cycling infrastructure quality must be prioritized [28]. Darkness was another important risk factor. In a similar study, fatal cyclist crashes were positively associated with nighttime and darkness [8].

Unfavorable weather conditions were the next risk factor. In a study, several participants reported that cycling paths were in poor condition in winter [29]. Cyclists' concerns in winter were found to be strong predictors of their subsequent travel and commuting behavior [30, 31]. Therefore, some researchers emphasized the importance of installing detecting systems in foggy and rainy weather conditions [32, 33].

Unsafe cyclist's behavior was out of control speed and right of the way, as well as the use of a hands-free device and a cell phone. In France, the rise in cycling injuries over the previous decade was correlated to the extensive use of ICT devices (cell phones, etc.) among young people [34, 35].

The tenth category was non-standard, especially because it moved without sound, which was inherently dangerous. The most critical condition for road users is to recognize the presence of other vehicles on the road. The quietness of a vehicle increases the risk of an accident [36].

Unsafe clothing was one of the most dangerous cycling experiences. Studies reported that wearing a helmet significantly reduced the risk of head injury [37-39]. However, the findings of a study indicated that enforcing the mandatory rules for cyclists to wear high-visibility clothing had no effect on the number of bicycle-involved road accidents [40]. Furthermore, according to several researchers, wearing a yellow jacket for better vision was not sufficient [41]. No study has investigated the effect of Kurdish pants, wearing slippers, and hijab on women cyclists. To assist the development of women's cycling, special emphasis should be paid to promoting cultures, such as the social adaptation to women cyclists, the design of women-specific bikes, and women's attire [42].

Female cyclists suffered intentional injuries. It was previously reported that female and young cyclists faced more aggressive attacks from motorcyclists [43]. Furthermore, women reported higher levels of discomfort and perceived risk when cycling in mixed traffic than men. However, there is a minority of drivers who disrespect cyclists and try to intentionally injure them [44, 45]. Interventions are required to reduce this type of violence [43].

Furthermore, the risk of accidents involving the disabled and animals on the track was experienced.

No similar evidence was found for these cases in other studies.

Risk factors in the experiences of injured cyclists included a lack of law and training, poor cycling culture, difficulty in maintaining the balance, a lack of infrastructure, inappropriate roads, darkness, bad weather conditions, unsafe clothing, and a threat from male drivers. The community health nurse can use the findings of this study to provide health education and improve the health of individuals who prefer cycling and a healthy lifestyle. The implementation of measures designed to enhance the safety of cyclists can serve to motivate a greater proportion of the community to engage in riding bicycles. Besides, injuries could be prevented by developing appropriate behaviors and habits.

Declaration

Ethics approval and consent to participate:

The study was approved by the Human Research Ethics Committee (HREC), Guilan University of Medical Sciences (code: IR.GUMS.REC.1399.597). All participants provided written informed consent before entering the study.

Consent for publication: All authors expressed their consent to the publication of this study.

Conflict of Interest: The authors declared that there was no conflict of interest.

Funding: There was no funding support for this study.

Authors' Contribution: The conception and design of the work by F.SV and N.KH; Data acquisition by F. K and M.H.; Analysis and interpretation of data by F.SV and N. KH; drafting the work by N.KH and L.KE. All the authors approved the final version to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work.

Acknowledgment: The authors would like to express their gratitude to Ms. Fatemeh Javadi, a PhD candidate in Translation Studies at Allameh Tabataba'i University and the Trauma Institute in Rasht, Iran, for her invaluable assistance in translating the manuscript into English. They would also like to extend their appreciation to all the participants who were admitted to Poursina Hospital.

References

- Rad EH, Kavandi F, Kouchakinejad-Eramsadati L, Asadi K, Khodadadi-Hassankiadeh N. Self-reported cycling behavior and previous history of traffic accidents of cyclists. *BMC public health*. 2024;**24**(1):780.
- Conrow L, Wentz E, Nelson T, Pettit C. Comparing spatial patterns of crowdsourced and conventional bicycling datasets. *Applied geography*. 2018;**92**:21-30.
- Shaker M, Hermans E, Zahoor A. Cycling as a means to improve the health and Wellbeing of both locals and visitors of national parks. *International Journal of Spa and Wellness*. 2021;**4**(1):93-105.
- Goddard T, McDonald A, Alambeigi H, Kim A, Anderson B. Unsafe bicyclist overtaking behavior in a simulated driving task: The role of implicit and explicit attitudes. *Accident Analysis & Prevention*. 2020;**144**:105595.
- Liu J, Khattak AJ, Li X, Nie Q, Ling Z. Bicyclist injury severity in traffic crashes: A spatial approach for geo-referenced crash data to uncover non-stationary correlates. *Journal of safety research*. 2020;**73**:25-35.
- Cittadini F, Aulino G, Petrucci M, Raguso L, Oliveri ES, Beccia F, et al. Bicycle-related accidents in Rome: investigating clinical patterns, demographics, injury contexts, and health outcomes for enhanced public safety. *Injury*. 2024;**55**(4):111464.
- Strohman M. 2022 Bicycle Injury & Fatality Statistics (2024 Data): Cyclist Deaths On The Rise in the U.S. 2022. Available from: <https://www.bikelegalfirm.com/2022-cyclist-deaths-statistics>.
- Carvajal GA, Sarmiento OL, Medaglia AL, Cabrales S, Rodríguez DA, Quistberg DA, et al. Bicycle safety in Bogotá: A seven-year analysis of bicyclists' collisions and fatalities. *Accident Analysis & Prevention*. 2020;**144**:105596.
- Chaloux N, El-Geneidy A. Rules of the road: compliance and defiance among the different types of cyclists. *Transportation research record*. 2019;**2673**(9):34-43.
- Nikitas A, Tsigdinos S, Karolemeas C, Kourmpa E, Bakogiannis E. Cycling in the era of COVID-19: Lessons learnt and best practice policy recommendations for a more bike-centric future. *Sustainability*. 2021;**13**(9):4620.
- Ryan-Collins J. Breaking the housing–finance cycle: Macroeconomic policy reforms for more affordable homes. *Environment and Planning A: Economy and Space*. 2021;**53**(3):480-502.
- Stamatiadis N, Cafiso S, Pappalardo G, editors. A Comparison of Bicyclist Attitudes in Two Urban Areas in USA and Italy. The 4th Conference on Sustainable Urban Mobility; 2018: Springer.
- Acharjee A, Sarkar PP. Influence of attitude on bicycle users and non-users: A case study of Agartala City, India. *Transportation research part D: transport and environment*. 2021;**97**:102905.
- Biswas A, Mittal S, Padmakar S. Why People Refrain from Cycling in Indian Cities: A Comparative Investigation. *International Review for Spatial Planning and Sustainable Development*. 2019;**7**(3):111-30.
- Namgung M, Jun H-J. The influence of attitudes on university bicycle commuting: Considering bicycling experience levels. *International journal of sustainable transportation*. 2019;**13**(5):363-77.
- Salmon PM, Naughton M, Hulme A, McLean S. Bicycle crash contributory factors: A systematic review. *Safety science*. 2022;**145**:105511.
- Desjardins E, Apatu E, Razavi SD, Higgins CD, Scott DM, Paez A. "Going through a little bit of growing pains": A qualitative study of the factors that influence the route choice of regular bicyclists in a developing cycling city. *Transportation research part F: traffic psychology and behaviour*. 2021;**81**:431-44.
- Saber F, Mirzaei-Alavijeh M, Mostafavi-Darani F, Zamani-Alavijeh F. Why male adolescent bicyclists perform risky stunts? A qualitative study. *Transportation research part F: traffic psychology and behaviour*. 2022;**88**:1-12.
- Zhang R. Exploring blended learning experiences through the community of inquiry framework. *Language Learning & Technology*. 2020;**24**(1):38-53.
- Stahl NA, King JR. Expanding approaches for research: Understanding and using trustworthiness in qualitative research. *Journal of Developmental Education*. 2020;**44**(1):26-8.
- Lind A, Honey-Rosés J, Corbera E. Rule compliance and desire lines in Barcelona's cycling network. *Transportation Letters*. 2020:1-10.
- Keliddar I, Afrash Tabar M, Torabipour A. Factors Affecting Community Health Volunteers' Motivation to Participate in Health Programs in Comprehensive Health Service Centers. *Journal of Qualitative Research in Health Sciences*. 2022;**11**(2):61-73.
- Abdolahi M. The assessment of rate of utilizing rehabilitation services among spinal cord injured cases of Bam earthquake. *Journal of Qualitative Research in Health Sciences*. 2020;**11**(1):1-6.
- Erfani M, Sahebozamani M, Daneshjoo AH. Epidemiological Indices of Sports Injuries in Male Students of Physical Education High Schools in Kerman and Explanation of Causes of Sports Injuries in the Sports Injury. *Journal of Qualitative Research in Health Sciences*. 2021;**10**(3):153-67.
- Caviedes A, Figliozzi M. Modeling the impact of traffic conditions and bicycle facilities on cyclists' on-road stress levels. *Transportation research part F: traffic psychology and behaviour*. 2018;**58**:488-99.
- Shamsi F, Malekzadeh G, Khorakian A, Zarei Matin H. Nudge management in healthcare organizations: causes and motives. *Journal of Qualitative Research in Health Sciences*. 2023;**12**(1):31-6.
- Cicchino JB, McCarthy ML, Newgard CD, Wall SP, DiMaggio CJ, Kulie PE, et al. Not all protected bike lanes are the same: Infrastructure and risk of cyclist collisions and falls leading to emergency department visits in three U.S. cities. *Accident Analysis & Prevention*. 2020;**141**:105490.
- Eenink R. Cycling in Amsterdam, if you can do it here, you'll do it anywhere. Town and Infrastructure Planning for Safety and Urban Quality: CRC Press; 2018. p. 31-7.
- Johansson O, Bjørnskau T. Cyclists' Perceptions of Operation and Maintenance-Results From a Survey in Nine Urban Areas. 2020 8248014088.
- Kummeneje A-M, Ryeng EO, Rundmo T. Seasonal variation in risk perception and travel behaviour among cyclists in a Norwegian urban area. *Accident Analysis & Prevention*. 2019;**124**:40-9.
- Pazdan S. The impact of weather on bicycle risk exposure. *Archives of Transport*. 2020;**56**.
- Ahmed S, Huda MN, Rajbhandari S, Saha C, Elshaw M, Kanarachos S, editors. Visual and thermal data for pedestrian and cyclist detection. Annual Conference Towards Autonomous Robotic Systems; 2019: Springer.

33. Kamel MB, Sayed T. Accounting for seasonal effects on cyclist-vehicle crashes. *Accident Analysis & Prevention*. 2021;**159**:106263.
34. Buhler T, Comby E, Vaudor L, von Pape T. Beyond 'good' and 'bad' cyclists. On compensation effects between risk taking, safety equipment and secondary tasks. *Journal of Transport & Health*. 2021;**22**:101131.
35. Iranizadeh J, Zareei Mahmoodabadi H, Vaziri S, Afshani SA. Family Stability Based on the Theory of Planned Behavior: A Qualitative Study. *Journal of Qualitative Research in Health Sciences*. 2021;**10**(2):92-9.
36. Patil LN, Khairnar HP. Investigation of Human Safety Based on Pedestrian Perceptions Associated to Silent Nature of Electric Vehicle. 2021.
37. Fahlstedt M, Abayazid F, Panzer MB, Trotta A, Zhao W, Ghajari M, et al. Ranking and rating bicycle helmet safety performance in oblique impacts using eight different brain injury models. *Annals of biomedical engineering*. 2021;**49**(3):1097-109.
38. Hoye A. Recommend or mandate? A systematic review and meta-analysis of the effects of mandatory bicycle helmet legislation. *Accident Analysis & Prevention*. 2018;**120**:239-49.
39. Bland ML, McNally C, Zuby DS, Mueller BC, Rowson S. Development of the STAR evaluation system for assessing bicycle helmet protective performance. *Annals of biomedical engineering*. 2020;**48**(1):47-57.
40. Prati G. The effect of an italian nationwide mandatory visibility aids law for cyclists. *Journal of Transport & Health*. 2018;**9**:212-6.
41. Rogé J, Laurent S, Ndiaye D, Aillerie I, Vienne F. Does a yellow jacket enhance cyclists' sensory conspicuity for car drivers during daylight hours in an urban environment? *Safety Science*. 2019;**119**:385-91.
42. Russell M, Davies C, Wild K, Shaw C. Pedalling towards equity: Exploring women's cycling in a New Zealand city. *Journal of transport geography*. 2021;**91**:102987.
43. Poulos R, Hatfield J, Rissel C, Flack L, Grzebieta R, McIntosh A. Cyclists' self-reported experiences of, and attributions about, perceived aggressive behaviour while sharing roads and paths in New South Wales, Australia. *Transportation research part F: traffic psychology and behaviour*. 2019;**64**:14-24.
44. Bösehans G, Massola GM. Commuter cyclists' risk perceptions and behaviour in the city of São Paulo. *Transportation Research Part F: Traffic Psychology and Behaviour*. 2018;**58**:414-30.
45. Roosta M, Yadollahi S. Gender Differences and Women's Preferences In Factors Affecting Bicycle Use (Case study: Shiraz, Iran). *Iran University of Science & Technology*. 2022;**32**(2):0-.

Open Access License

All articles published by Bulletin of Emergency And Trauma are fully open access: immediately freely available to read, download and share. Bulletin of Emergency And Trauma articles are published under a Creative Commons license (CC-BY-NC).