



Technical evaluation of the pedestrians' model on the roads within the city (case study: Gilan province)

Hooman Sotoudeh¹, Hooman Rahimi² and Keyvan Ahzan³

1School of Civil Engineering, Islamic Azad University, Malard Branch, Iran

2School of Civil Engineering, Islamic Azad University, Shahre-e- Qods Branch, Iran

3School of Civil Engineering, Islamic Azad University, Shahre-e- Qods Branch, Iran

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ABSTRACT

Since the adverse effects of each accident is subordinated to its direct severity, in studies of the traffic safety, has been tried a lot for providing the severity models to identify the severity factors of the adverse effects of the accidents. In this research, the modeling of the pedestrian accidents severity has been evaluated by using the dual logistic regression and three methods. In the number one and two methods, the relationship between the independent variables and the dependent variables respectively was investigated separately (Enter method) and integrated in the model (forward stepwise method). In the third method, first the primary independent variables have been reduced to the fewer variables by using a multi variables statistical method as the analysis to factors method, the variables and then the new variables relationship with the dependent variable, was analyzed by using the logistic regression. The dependent variable in the following models is the pedestrian accidents severity in two injury and fatal categories.

Keyword:

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* Corresponding author: *Hooman Rahimi*

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INTRODUCTION

Walking will increase the quality of the life of people in all age groups. Also, the physical activity helps in having a moderate weight, stress reduction, better sleep and generally in having a good feeling. After transportation also, many streets had been a traffic volume more than their planned capacity and consequently lead to the net nodes, wasting the time and energy, pollution and disappointment and frustration of the drivers. However, the walking to the driving, requires far less space for every passenger. Also optimizing the streets for accommodating the pedestrians can increase safety for motorized vehicles.

When the safety facilities be provided for the pedestrians, people can walk more and use of other modes of transportation less (1). Pedestrians are the legal and legitimate users of the transportation system, and therefore should be able to use this system safely and without an unreasonable delay. Pedestrians have the right to pass the streets safely and therefore, the planners and engineers, have a formal and professional responsibility in planning, designing and installing the safe and convenient facilities for the pedestrians. Pedestrians should be seen in the streets designs as a user, according to the accomplished designs, our society is heavily dependent on the motorized transport. This issue has been affected our economy and effects on our culture deeply. In addition to this, each of us are the pedestrians daily which need to share the street safely with the vehicles and also we have this right.

Pedestrian accidents on within the city roads, relate to the various factors of the road, human, vehicle and environment. The share of the pedestrians in the total within the city accidents in the country, especially in Gilan province and in Rasht city is a significant share and on average the fatal crashes are more than 35% during the years 2008 to 2012 and the injured accidents are more than 20%. The share of pedestrians in the injured accidents and especially the fatal accidents of Gilan province, is noticeable. Identifying the factors that cause the severity in the adverse effects of the accidents has a considerable importance, as the adverse effects of each accident are subordinated to their direct severities. For this reason, has been done a lot of efforts to provide models of severity in the traffic safety studies. Many factors such as gender, age, type of the involved vehicles, the movement of vehicles in a crash, the movement speed and the geometric design of roads factors and so on which effect on the crash severity can be considered in the severity model. The accidents severity modeling depending on the related parameters, provides the possibility of forecasting the occurrence or lack of the occurrence of the accidents which need the relief equipment, and in addition, by using this model, it can evaluate the effect amount of each factor on intensifying the accidents. It is obvious that such recognition leads to the possibility of developing the traffic immunization programs to reduce the adverse consequences of the accidents. While the extensive studies have been done in all over the world on the pedestrian safety, but so far, has been received little attention to this vulnerable group of road users in Iran, particularly in Gilan province.

Therefore, an analysis and evaluation of the traffic patterns and pedestrians is required to protect the safety of the

citizens. Understanding the main characteristics of the accidents is important for identifying the optimal strategies. These characteristics include information about the time and place of the accident, the factors leading to the accident, the pedestrian's response in the time of accident, the geometric characteristics of the road, the road speed limits, the traffic volume and compounds, the pedestrian's age and driver's age and other characteristics.

These information are collected and recorded by the centers and institutions related to the transportation safety. Thus the aim of this research is to research on the pedestrian accidents on the within city roads of Gilan province to examine and evaluate the relationship between these types of the accidents and the road, environmental, humanitarian diverse factors and other factors. So the purpose of this research, is finding a relationship between the pedestrians severity accidents on the within city roads, and diverse factors.

Theoretical Foundations

Traffic accidents have been of the most important factors of the mortality and the life and financial severe injuries and their social, economic and cultural heavy effects, have been threatened the human societies severely.

Among these the pedestrian accidents have heavier lesions than other accidents. Because the pedestrians as the most vulnerable road users, are faced with the dangerous and threatening problems of their lives.

Since the adverse effects of each accident is subordinated to its direct severity, identifying the factors that promote the adverse effects of the accidents is of a considerable importance. For this reason, in studies of the traffic safety, has been tried a lot for providing the severity models.

The impact of the road characteristics on the pedestrian's accidents

Some studies have taken a look at the effects of the road designed characteristics on the severity of the injuries such as road width, intersections place, and presence of the crosswalks repetition, sidewalks and traffic lights that these factors will be evaluated in this part. Crossing width: street width has been known as a positive factor in terms of the pedestrian's accidents intensity (2). Davis has reported the results of a study by Thomson & Heyden on the effects of the crossing width which in it the tactile sidewalks were expanded to the 2.5 meters in the streets in Nottingham, United Kingdom, in 1991. According to the author's reports, the pedestrian's accidents have reduced from 4.7 accidents to one accident per year after performing the work. Of course, the sufficient information has not existed in order to obtain and determine the Accident modification factor (AMF) (3). Presence of crosswalk: most pedestrians accidents have occurred at the time of their passing through the street width and on the basis of the researches, the accident risk is much higher on the non-crossings facilities than the crossings facilities [4 and 5]. National statistics show that nearly 40% of the pedestrians accidents occurred when they were crossing the roads width and in a place other than pedestrian crossings in 2003. Only 9% of the pedestrians accidents occurred on the presence of crosswalks and near to 8% of them occurred at a distance of 50 meters from the presence of crosswalk [5].

A study in Sweden showed that in the streets posted speed of under 30 km/h, the crosswalks crossings increase vehicular yield rates for pedestrians.

Based on the findings of this study, the installed speed cushions at a distance of the length of two cars from the crosswalks crossings reduce the amount of stop for pedestrians and cyclists in comparison to the installed speed cushions in a closer distance to the crosswalks crossings [6]. Sidewalk: a study by Wootton et al. in 2006 showed that there has not been a sidewalk in 57 percent of the 353 pedestrian walking along the roadway fatal accident. traffic light: an evaluation of the engineering treatments impact in improving the pedestrians safety who passing from the streets with the high passing traffic volume and high speed showed that the use of red light or Beacon devices (one red circle sign to notice the motorized vehicles in the crossing pedestrians place) has been effective in the crosswalks crossings. The amount of stop for the pedestrians, was observed more than 94% for all 45 crosswalks crossings [8]. One-way streets: the consensus of opinions of these studies indicates that the one-way streets have higher levels of safety for the pedestrians in comparison with the two-way streets Of course, the impact of the pedestrian traffic volume in these studies has not been evaluated; therefore, noticing to the exposure of the pedestrians (pedestrian volume) in the one-way streets and its impact in the pedestrian safety, requires the accurate determination. The results of the above studies have been reported in the resources (9). Intersections place: in a study on the pedestrian passing, the possibility of being killed of the pedestrians after being hit by a vehicle, was found in the middle of the block more than the street intersections with any condition of the light. From the same study, the effects of the speed restrictions on the severity of the injuries were extracted, of course, its results remained incomplete and inconclusive [10].

The impact of the characteristics and behavior of the pedestrian in the pedestrian's accidents

Pedestrian Volume: the intersections with less than 1,200 pedestrians a day, had been the average number of 0.178 pedestrians accident in every intersection in a year, while in the intersections with 1200 or more pedestrians per day, had experienced an average of 0.553 pedestrians accident in each intersection in a year and the intersections with 3,500 or more pedestrians per day, have had an average of 1.002 pedestrians accident in each intersection in a year [11].

The effect of the pedestrians' volume and the traffic volume on the pedestrians accidents were studied in the intersections in cities of Sweden. Based on their findings, the pedestrians' volume had had a major and positive relationship with the pedestrian's accidents in the single prediction model that has included all types of the intersections (12). In a study, the safety of the crosswalks pedestrian's crossings and the non-crosswalks pedestrian's crossings and on the non-controlled places were compared with each other under the traffic and road different conditions.

The results showed that the pedestrian's volume had had a major and positive relationship with the pedestrian's accidents in the prediction-made models for both types of the crosswalks pedestrian's crossings and the non-crosswalks pedestrian's crossings [9].

Traffic volume: the traffic volume is an important participatory factor in the pedestrians' accidents. The second most important factor in explaining the pedestrian accidents, is the traffic volume.

The analyses show that the frequency of the pedestrian's accidents increases usually with an increase in the motor vehicle traffic volume for a specific level of the pedestrian's volume in each intersection in a year [13]. Also the number of vehicles entering the intersections in each day, had been a major and positive factor in the pedestrian's accidents prediction models [9 and 12].

The traffic volume has a correlation with the traffic collisions and the severity of the injuries as well. A study of Rear-end collisions in the light trucks showed that Annual average daily traffic (AADT) in each line of the highway is related to the major decline of the injury severity [2].

Environmental characteristics influence on the pedestrians accidents

Atmospheric condition: the atmospheric condition that has an impact on the road surface and the drivers braking capability for the pedestrians has not been shown as an effective factor in injuries risk, according to a study in 2002 [2]. The pedestrians risk in the poor weather conditions and low light, higher and has been higher and the injury severity is more in this condition also [5].

Lighting condition: according to this study, the lighting condition is more important in the intersections rather than the middle of the block which the probability of the drivers' knowledge of the pedestrians' potential presence is lower because of the high-speed of the cars [10].

Drivers tend to use low light at night which it makes less the sight distance. Consequently, the existed distance for the night drivers is less than total stopping sight distance required, due to the lack of crash while appears on road[14]. About half of all the severe injuries to the pedestrians occur in daylight. Presence of the pedestrians in the day had been more than the night and therefore we can guess that the accidents risk is more at night than during the day [15].

Travelling Alone: it seems that traveling alone has a major effect on the pedestrians' accident risk. According to the accomplished researches, the adult pedestrians had been traveling without the help of a person in many accidents. This issue does not apply to children who probably travel in a group [2].

Pedestrian's accidents models

In this section, it is referred to the results of the some of the pedestrian's accidents models and other obtained traffic accidents in the previous researches. In general, identifying the factors that cause the severity in the adverse effects of the accidents has a considerable importance, as the adverse effects of each accident are subordinated to their direct severities.

For this reason, in the traffic safety studies, many efforts have been made to provide the severity models. In general, for modeling the accident severity in terms of parameters such as gender, age, type of the involved vehicles at the time of the accident, the movement speed and the road geometrical plan and so on which impact the accidents severity, there is considered the two methods of doing an experiment in the actual environment and modeling based on the collected data [16].

Modeling of the accidents severity can be done by using the collected data, with different methods. Commonly, used models in this section, are the logistic regression models or its derivatives.

Multiple Prabitolajit models, have had the most usage in the safety studies, in conditions where the dependent variable is a classified variable.

In the cases which the dependent variable classification had an ordinal structure, it means that the classification of the lower rank to the higher rank, is made depending on the intensity or degree of importance of a parameter, the natural selection as the top model, is the ordinal logistic regression models [16].

Chang & Mannering studied the trucks accident severity by using the logit model [16]. In the accidents modeling with the statistical models, has been used also of Poisson and the negative binomial models widely. Hakkert & Mahalel for the study of accidents in the intersections have used of the Poisson model in 1978.

They have considered the fatal and injured accidents and signalized and without lights intersections in their studies. Their studies show that more than 50 percent of accidents occur in the intersections.

Pickering, Hall & Grimmer in their studies on the three-way intersections, have used of the Poisson model with the multivariate linear model in 1986.

According to their studies 33 percent of the injured accidents have occurred in the intersections which 45 percent of them were related to the three-way intersections. Other studies that have used of the negative binomial model are including the study of Miaou et al on the trucks accidents in 1993.

According to this, the vertical arcs cause to increase the number of accidents. Also Bonneson & McCoy, have evaluated 125 within-city four-way intersections for a study on the accidents in the within-city intersections in Mine Sootara in 1993.

Miaou & Lum in their studies in 1993 have compared two models of the linear regression and two models of Poisson each other and showed that the negative binomial model or double Poisson is better [17].

Also Afandizadeh et al. were determined that in order to understanding capability and the usage, the statistical model is better than the neural network model, in a comparison between the statistical models and the neural network in predicting the number of accidents in Tehran city intersections [17].

Research History

Monter and Fernanda, Kamboos and Anya (2012) in an article entitled "The indicators suggestion for evaluating the urban spaces" have suggested the indicators for evaluating the urban spaces in relation to the pedestrian and bicycle users and by evaluating and reviewing the academic researches indicators, have put them in a new classification and under the titles such as diversity and choice, comfort, form and structure, distinction and reorganization, environmental considerations and access.

Two researchers in an article entitled "Validity of the walking-acceptation factor": how different families respond to walking-acceptation of their neighborhood? The results showed that this subject depends on the travel destination of the family members. It cannot yet be defined same for all members of the family (me, Al Junaid, 2011).

An article entitled walking-acceptation in the developing countries has published in 2011 and has evaluated Tehran as the subject.

The obtained results showed that the neighborhoods which have more walking-acceptation, are in more favor of the older people for walking than the neighborhoods with lower levels of walking-acceptation and this subject will not relate to the socio-economic levels of people (Lutfi and Koohsari, 2011).

Researchers in an article as Comparative comparison of the walkability in the designed residential neighborhoods from the perspective of residents (Case Study: Neighborhoods of Haft Hoz and phase one of Ekbatan town in Tehran) have compared the quality of this topic in two neighborhoods of NARMAK Haft Hoz and phase one of Ekbatan town with the objective of evaluating the walkability.

The research findings show six factors that have the highest portion in the walkability definition in the residential neighborhoods level, including the general health status, immune status, and access to local services, easily walking, attractive walking and the security condition (Habibi et al, 2014).

In an article entitled "Determining the effective factors in creating the walkability safe places to promote the social interactions" (Case Study: Bahar Azadi Street, Khake Sefid neighborhood in Tehran) researchers have used of the survey method to identify the traits and attributes and making relationship between indicators, also of the library studies to explain the literature and history of the research topic and to provide the analytical model and of the field methods to gather the data by regarding the nature of the research.

The results showed that among the evaluable indicators, the function indicator has been the most impact amount in creating the pedestrian's safe traffic route in the study area (Saif Elahi Fakhher and et al, 2013).

Mr. Mohammad Amin Rezapour in his research topic in 2012 entitled "Walk-riding and the pedestrian comprehensive plan" has referred to the different views in connection with the way of using the street and its comparison with the several countries to increase the walking-acceptation capabilities.

The area of study and research method

The main objective of this research is to find a relationship between the pedestrian's accidents and the different effective factors on it in within-city roads.

Gilan province and Rasht city were selected as the study area, due to the rapid growth and the high proportion of the pedestrians in the within-city accidents of the province and its increasing trend and also the researchers' familiarity to this city.

Severity of accidents modeling can be done by using the collected data by the different methods. In this study, the pedestrian's accidents severity will be analyzed by using the logistic regression models. The way of using logistic regression is done in three ways. So that first, the relationship between each of the independent variables is investigated with the dependent variable separately and by using the Enter way, in the software environment of SPSS.

In the second solution, the relationship between all independent variables has been evaluated with the

dependent variable as integrated (all independent variables has been evaluated together and not separately as in the first case in the model and at this stage has been used of forward stepwise method.

In the third solution that is the most important and major part of this research, first the primary independent variables change to less variables by using one of the multivariate statistical methods as the analysis to factors method, and then the relationship between the new variables is evaluated with the same dependent variable in the two previous solutions, by using logistic regression.

Research hypotheses

Among the hypotheses of this research are:

-According to the traffic police accidents database of the police is the main source of information in the field of the pedestrian's accidents and related factors to it in the province, it is assumed that this information is reliable and trustworthy.

- In the area division, it is assumed that the location of each pedestrian is located near the place of the accident, for the relationship of the demographic characteristics with the pedestrian's accidents, according to the maximum length of two miles of people walking.

- In the accidents distribution between different areas of this research, and in places where the accidents address has been shared between one or more common areas (In other words, the accident place was located on the border among the areas), has been guessed the accident occurred in one of the areas.

-It seems can obtain a relationship between the pedestrians' accidents severity.

-It seems there are the variables for evaluating the pedestrians' model.

Required data

The most important and most essential required data for this research, are the pedestrian's accidents characteristics in the within-city roads in a given time frame.

The demographic characteristics of Rasht is including of the other specifications based on the census in 2001. The death statistic caused by the traffic accidents in the study area was received from General Department of Forensic Medicine. The way of gathering data has been noted as: reports of Traffic Police, reports of General Department of Forensic Medicine Department and reports of Governorate Planning Assistance.

Data analysis

Summary of the accidents statistics

This sections data is of the statistics related to the pedestrian's accidents of Rasht along 9 months. The details of the existed statistics Statistical unit of Traffic Police in Gilan province, is related to the end fourth months in 2012 to the first five months of 2013(December 2012 to the end of August 2013).

In fact, the statistics of this research has been on the same basis for evaluation of the pedestrian's accidents condition in the within-city roads. Therefore, the statistical reference which analysis in the following part, is the results of the Traffic Police of Guilan province.

In a number of accidents, a vehicle collision has been with more than one pedestrian. In Figure 1, the frequency and percentage of the accidents number, has been presented for each month for the period of 9 months.

Accordingly, most of the pedestrians' accidents, have been occurred during the warm months. This could be due to the

presence increase of the pedestrians and the walking amount in this period and as well, the more travel of the tourists to Gilan province in this period. (Warm months)

Distribution of the number of the pedestrian's accidents in the days of a week, has been mentioned in Figure 2 for each day. Accordingly, the most number of the accidents have been occurred on Sunday and Monday.

Interestingly, the number of the pedestrians' accidents is the lowest on Friday which is a holiday, in comparison to other days. This can be due to the lower presence of the pedestrians in the city, on Friday.

Pedestrians' characteristics in accidents

In Figure 3 the place lighting condition has been mentioned at the time of an accident. As it is known, the highest number of the pedestrian's accidents have been occurred in the day. This is due to the presence of more pedestrians in a day than to the night.

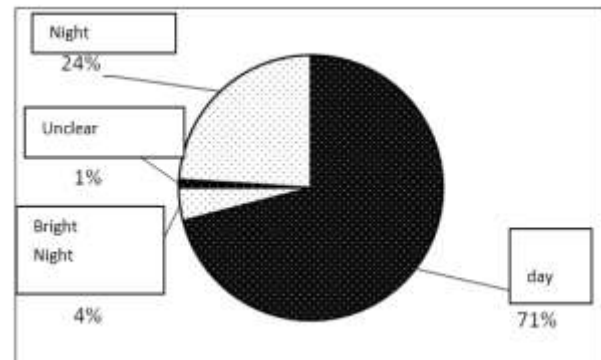


Figure 3: Percentage of the accidents due to the lighting conditions

the pedestrians movement conditions at the time of the accident is that, 67.8 percent of the pedestrians have had the vehicle accidents while crossing the street in a period of 9 months of the research.

This issue could be caused due to the various reasons. Including this, can refer to the lack of attention of pedestrians in crossing the street width, that this issue is clearly visible in Rasht.

Pedestrians have not feel any restrictions for crossing the street width and they use of each place for crossing the street width also with the lack of safety. Of course the high speed of the vehicles and their inability to control the vehicles is considered to be one another of the reasons.

Finally, should say that the absence and or the lack of adequate traffic signals and crosswalks crossings and other traffic issues in Rasht, is one of the major causes of the mentioned issues.

The interesting thing is that the high percentage of the accidents is while crossing the field. Fields of Rasht, do not have the appropriate conditions for the pedestrians, such as proper and exact timing of the pedestrians' lights in terms of the demographic studies and the pedestrians' movement speed and etc.

Also the percentage of the pedestrians in standing mode is relatively high. This percentage can indicate a type of the irregularity in the behavior of vehicle drivers and their non-compliance to the traffic rules and regulations.

The pedestrians accidents statistics in different areas has shown that the most width-crossing accidents, has been occurred respectively in areas of 22, 19, 10, 13 and 16 based

on the pedestrians movements condition at the time of accident occurrence.

the mentioned areas are located in the downtown region, which has a commercial use and has the highest volume of the pedestrians traffic, based on the existed map of Rasht and the placement way of 23 areas in it.

Although the demographic density is lower in some of these areas than other areas, but the focus of the presence of pedestrians in these areas of the city is clearly visible and understandable. Therefore, can be realized the relationship between the volume of the pedestrians and their accidents.

in statistical analysis of the pedestrians accidents can be concluded that although the men and women population have an equal ratio in Rasht but the pedestrians accidents statistics has shown that the men pedestrians are at higher risk of accident, based on the pedestrians condition at the time of the accident and according to the gender of pedestrian and involved vehicles driver in an accident.

As men and women accidents ratio of all accidents is 62.2 and 36.8 percent respectively.

The evaluation results of the number and percentage of the pedestrians accidents show that the most pedestrians accidents, occur in people aged 10 to 45 years, according to different age groups;

So that this age group of the pedestrians, alone accounted the 2/51percent of the accidents. The pedestrian's accidents based on the age-separation of the involved vehicles drivers: share of the drivers aged 19 to 36 years has a significant percentage.

This age group of the drivers, alone involve in 52 percent of the pedestrian's accidents.

Can be seen that the carelessness of the vehicle driver and lack of attention to the front to the pedestrian, is mentioned as the definite cause of the accident.

In primary and secondary causes of the accidents, which were picked from the accidents plan tabs, ignoring the regulations and the need for more training for drivers were mentioned as the most common reasons.

The most number of accidents has been mentioned ignoring the regulation and hurry based on the human factor involved in the accidents. Bringing these points together can have some conclusions.

The pedestrians accidents statistics based on the type of involved vehicle in the accident: based on this, more

occurred accidents have been due to the Pride vehicle collision (9.34%) and Arrow vehicle (3.22%) with the pedestrian.

Of course, the number of Pride and Arrow vehicles are much more than other vehicles, but the existed statistics can be indicated other reasons such as the weak brake system in these vehicles than any other vehicles.

Type of pedestrians accidents (injured and fatal)

The number and percentage of the pedestrians accidents based on the pedestrians movement condition: most fatal accidents (68.4 percent) has been occurred during the crossing of the pedestrians across the street.

This issue represents a greater risk of accidents and the need for more attention to the pedestrians' conditions in crossing the street. The cause of accidents severity can also be the high speed of the vehicle and their inability to control the vehicles.

So the speed and severity of the vehicle while crashing with a pedestrian that is crossing the street width is more than other conditions such as crossing the intersection and so on. According to the statistics, the vulnerability of the older age groups is obvious clearly. Most fatal accidents, have been occurred for the pedestrians, with the age over 54 years and while crossing the street width.

Logistic regression model by using (Enter) method

As it is seen in Table 3, the only variable that has been in an acceptable significant level is the pedestrian age variable (ped-age).

A seen significant level for all variables have been more than 0.05except ped-age variable, none of them is not in final model and only ped-age variable is in the final model of this method.

A seen significant level for the variable ped-age, is equal to 0.004. Since all the variables enter into the equation in Enter method, there is only one step to the model. Tables 1 and 2 are indicated other the model statistical characteristics.

As in Table 2, the R^2 value in the model is 0.287that despite being qualitative of the analyzed data, the capability has been relatively low and is indicative of the low confidence coefficient of the model.

Table 1: Omnibus Tests of Model Coefficients (regression with enter method)

Sig.	df	Chi-square		
0/057	15	24.51	step	First step
0/057	15	24/511	Block	
0/057	15	24/511	Model	

Table 2: (Model summary (regression results with enter method)

Nagelkerke R Square	Cox & Snell R Square	-2 Log likelihood	Step
0/287	0/075	70/832	1

Table3: Variables in the equation

Exp(B)	Sig.	df	Wald	S.E.	B		
0/784	0/236	1	1/403	0/206	-0/244	Day	1
0/682	0/410	1	0/679	0/465	-0/383	Time	2
1/660	0/004	1	8/322	0/176	0/507	Ped.age	
0/755	0/711	1	0/138	0/759	-0/281	Ped.sex	
0/000	0/998	1	0/000	8893/540	-17/674	Driv.sex	
1/251	0/656	1	0/198	0/503	0/224	Driv.age	
0/566	0/279	1	1/172	0/526	-0/570	Vaziat.ped	
1/081	0/550	1	0/357	0/130	0/078	Veh.type	
1/365	0/703	1	0/145	0/816	0/311	light	
0/801	0/299	1	1/077	0/214	-0/222	Ellat.tameh	
0/874	0/871	1	0/026	0/830	-0/134	Sharayet.rah	
1/448	0/758	1	0/095	1/201	0/370	Pop.density	
1/561	0/349	1	0/878	0/475	0/445	Family.den	
0/000	0/998	1	0/000	9059/238	18/114	House.den	
0/000	0/998	1	0/000	9059/238	-18/843	Basavad.den	
0/021	0/219	1	1/510	3/149	-3/869	constant	

According to Table 3 results, which is obtained from the analysis of SPSS statistical software, ped- age variable (pedestrians age) has a direct correlation with the dependent variable, so by increasing in ped- age variable, the dependent variable will increase.

According to this, since the increase in ped-age variable has been meant the pedestrians age increase and also the increase in the dependent variable is indicative of being fatal of the type of accident, it can be concluded that by increasing the pedestrians' age, also fatal accidents will increase.

Ped-age variable coefficient in the final model is equal to 0.507. It should be noted that the validity of the statistical models in the ordinal regression is evaluated by the statistical test likelihood ratio.

Table 2 indicates the likelihood amount of the above model that the logarithm has been gained of it by multiplying it in the 2 coefficient .It is obvious that being less of this number indicates the more likelihood of the model and its adaptation to reality.

Logistic regression model by using (Forward stepwise) method

The results obtained of this method also are similar to results obtained of Enter method. As can be seen 4-6, the final model in this method, also has been obtained in a

single step and has the R^2 determination coefficient equal to 0.165.

Also only ped-age variable is in the final model by considering the confidence interval of 95% for the forecasts mean, the coefficient of this variable has an acceptable level of significance.

This coefficient is equal to 0.001 in Table 6. According to Table 6 results, ped-age variable (pedestrians age) has a direct correlation with the dependent variable, so an increase in ped-age variable, the dependent variable will increase.

Accordingly, can be concluded that with increasing the pedestrians' ages, the fatal accidents also will increase. Ped-age variable coefficient equals to 0.549 in the final model.

In Table 6, in addition to the mentioned items, other important statistical parameters, such as the standard deviation value (S.E) and wald statistical coefficient also have been brought for the ped-age variable in the final model.

The obtained R^2 value is indicative that the final model could not well express the characteristics of the data, of course, despite being qualitative of the data and less importance of the R^2 determination coefficient in the qualitative data.

So was decided to analyze the accidents data with other methods. This method consists of the analysis of the primary variables to less factors.

Table 4: Omnibus Tests of Regression Model Coefficients by using forward stepwise method

Sig.	df	Chi-square		
0/000	1	13/857	step	First step
0/000	1	13/857	Block	
0/000	1	13/857	Model	

Table 5: Regression Model Results Summary by using forward stepwise method

Nagelkerke R Square	Cox & Snell R Square	-2 Log likelihood	Step
0/165	0/043	81/486	1

Table 6: The Regression Model Final Variables by using forward stepwise method

Exp(B)	Sig.	df	Wald	S.E.	B		
1/731	0/001	1	11/795	0/160	0/549	ped.age	First step
0/001	0/000	1	31/803	1/169	-6/592	Constant	

Analysis of the analyzed factors by using the logistic regression model

Tables 7-9 are indicative of the obtained results of dual logistic regression model for five factors. Model results summary has been presented in Table 7.

As can be seen, after analyzing to factors, unlike the first and second methods which the final model was obtained in one step, in this method, two steps have been passed. In the first step, the R2determination coefficient model, is equal to 0.131.

The only factor that has been entered in the first model, is the fourth factor (Fac4_1). In the final model, factor 3 (FAC3_1) was added and the R2determination coefficient, has been increased the final model to the rate of 0.202and leads to 0.333. This value of R², is very good according to being qualitative of the data.

In fact, the model capability also has had a significant increase in describing the data after analyzing the primary variables to five-point factors. In both primary and final models, factors three and four coefficients, have the acceptable significance level by taking into account the confidence interval of 95% for the forecasts means. These coefficients is less than 0.005according to Table 9.

According to the results of Table 9, the fourth factor (Fac4_1) has a direct relationship with the dependent variable, so an increase in the factor (Fac4_1), also the dependent variable will increase. Also the third factor (FAC3_1) had had the inversely relationship with the

dependent variable, so that with increasing of (FAC3_1) also dependent variable will increase.

As in the analysis phase to factors, ped-age variable (pedestrian’s age) was the most and only significant variable in the fourth factor and also ellat.tameh variable (complete cause) is the most and the only significant variable in the third factor, can be achieved the following results.

Since ped-age coefficient is negative in the third factor (has an inverse relationship with it) and (FAC3_1) coefficient is positive in the final model (having a direct relationship with each other), it can be concluded that the dependent variable decreases with increasing the ped-age.

It means the injured accidents increase with increasing of the pedestrians’ age. The third factor coefficient (FAC3_1) equals to (304/1) in the final model. Of course, this does not mean that with increasing the pedestrians’ age, the fatal accidents do not increase but can be due to the increase of the number of injured accidents to the fatal ones.

Also, according to this that the ellat.tameh coefficient is positive in the fourth factor and the (FAC4_1) coefficient is also positive in the final model (having a direct relationship with each other), it can be concluded that by increasing the ellat.tameh, the dependent variable increases. Of course, by this problem cannot be achieved certain results.

The fourth factor coefficient (Fac4_1) equals (762/0) in the final model. In Table 9 other important statistical parameters have been brought such as the standard deviation (S.E) and wald statistical coefficients for the ped-age variable in the final model in addition to the mentioned items.

Table 7: Omnibus Tests Model Coefficients (results of logistic regression model after analyzing to the factors with a method)

Sig.	df	Chi-square		
0/000	1	16/876	Step	First step
0/000	1	16/876	Block	
0/000	1	16/876	Model	
0/000	1	27/599	Step	Second step
0/000	2	44/474	Block	
0/000	2	44/474	Model	

Table 8: Model Summary (results of logistic regression model after analyzing to the factors)

NagelkerkeR ²	cox & snellR ²	-2 LogLikelihood	model
0/131	0/042	135/406	1
0/333	0/107	107/807	2

Table 9: Final Variables of Logistic Regression Model after analyzing to the factors

Exp(B)	Sig.	df	Wald	S.E.	B	Variables	
1/792	0/000	1	20/713	0/128	0/583	FAC4_1	Step one
0/040	0/000	1	140/793	0/271	-3/220	constant	
0/272	0/000	1	22/068	0/278	-1/304	FAC3_1	Step two
2/143	0/000	1	19/874	0/171	0/762	FAC4_1	
0/018	0/000	1	85/668	0/436	-4/037	constant	

Conclusion

In this part will be discussed the technical evaluation of the entire research results and the final conclusion, after doing research on the pedestrians accidents on the within-city roads and during the different stages such as the evaluation of previous studies on the research topic, the collection of accidents information and other required data for the project and the explanation of research methodology for data analysis and discussion of the results of accidents models in the within-city roads of Gilan province.

Many factors can be affective on the pedestrian's accidents. According to the previous studies, the logistic regression model was chosen to analyze the accidents data in the present research to evaluate the relationship between the accidents severity and related factors.

Based on the obtained statistical results and also the pedestrian's accidents models, it was found that the relationship between the pedestrians' ages and the accidents severity (injured and fatal) is a direct relationship. As by increasing the pedestrians' age, the number of deaths will increase. The pedestrian's age and the accidents severity, have a direct relationship with each other. Also, no other independent variables, hah not the acceptable level of significance in any of the three being used methods in this research. According to the obtained statistics it turned out that the most pedestrians accidents, have been occurred in the pedestrians crossing across the street condition and the complete cause of the most accidents also had been the driver's carelessness and lack of attention to the front.

Suggestions

Due to the absence of many of the desired data in the study area of this research (and Rasht city, Gilan province), it is recommended in the next studies, are evaluated the other variables such as the traffic volume, pedestrians volume, streets width and other variables that some impacts of them are mentioned in the second section in the pedestrians accidents models.

1-The economic evaluation of this research has been based on the cost of the pedestrian's accidents in Gilan province and based on the costs of the traffic accidents in one of the hospitals of the province. It is recommended to use of more complete and more specific data in hospitals in future studies. Because according to the obtained data, some hospitals have begun more details of their accident patients in the form of the software applications.

2-It is recommended to evaluate the pedestrians accidents and the ways to promote their safety by using other ways of economic.

3-It is natural that all operations related to improving the pedestrians safety have not have an equal rate of benefit versus the cost and therefore it is suggested to calculate this rate for different safety operations and their comparisons and to determine the best strategy for improving the pedestrians safety in the following of this research.

4-The pedestrian's accidents are analyzed by using other statistical models and the existed methods.

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