

# Road users' opinion about pedestrian safety in the emirate of Sharjah, UAE- survey results

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**Abstract.** This paper is to investigate the pedestrian safety in Sharjah (UAE), and suggest recommendations to improve safety in the emirate. A survey data was collected from 570 participants in December, 2016, and included the following informations: measure the awareness of drivers and pedestrians, determine the behavior of road users, take general views from the road users, and measure the level of users' satisfaction. The results showed that characteristics of road users including (gender, age group, nationality, social status, education level and the income) can affect their behavior at different levels and that may lead to pedestrian accidents. Also, most participants noticed that there are differences in the behavior of drivers and pedestrians based on their nationalities, and they indicated that pedestrian mistakes are main cause of this type of accidents. Moreover, the data showed that most drivers confirmed that they give more attention to pedestrians in mixed land used than other areas and they mentioned that "traffic signal + marked lines" is the clearest place for them to be attentive to pedestrians crossing the road. Overall, based on the results of this paper, there is an urgent need to re-evaluate the pedestrian facilities in the Emirate such as ( Design, locations, and their availability) as well as focusing more on the education and the law enforcement.

## 1 Introduction

The United Arab Emirates (UAE) has achieved remarkable development at all levels since the 1980s, particularly the Emirate of Sharjah which is characterized by a renaissance in urban, culture and economics. However, this significant development was accompanied by an increase in population and, consequently, the number of vehicles moved around the emirate. Unfortunately, this rapid increase has led to an increase in traffic problems, especially pedestrian accidents. Actually, pedestrian accidents are a global problem, which were a one of leading causes of death, injuries, as well as increased financial costs worldwide. Statistics showed that an average of over 270,000 pedestrians are killed in highway accidents every year worldwide, which is about 22% of all road fatalities (WHO, 2013). Also, global statistics indicated that the fatality rate for road users is significantly higher in Arab Gulf countries comparing to western countries, for example, in 2007 mortality rates because of road traffic accidents were 37.1, 29 and 16.9 per 100,000

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population in the United Arab Emirates (UAE), Saudi Arabia and Kuwait respectively (Who.int, 2013), compared to the rates of 6.1 for the UK and 14.8 for the USA (WHO, 2013). Although a significant difference in the levels of fatalities being observed between Arab Gulf countries and western countries, studies on traffic safety that represent our region are very limited.

Therefore, there is an essential need for such studies to improve road safety standards in our region, which in turn will increase the awareness among road users, thus will eliminate the heavy losses in lives and money. The study area of this research is the Emirate of Sharjah in the United Arab Emirates. The Emirate of Sharjah, stretching along the Arabian Gulf and the Indian Ocean coast, it is the third emirate in the United Arab Emirates in terms of area, density of population, and popularity. It covers 2590 Km<sup>2</sup> and has an official estimated population of over 793,573 residents in 2005. (Federal Competitiveness and Statistics Authority). This paper aims to investigate pedestrian safety in the Emirate of Sharjah by conducting and analyzing a survey study and then suggest strategies to improve pedestrian safety in the emirate.

## **2 Literature review**

This section addresses some studies which investigated subjects in traffic safety in the UAE. Bener and Alwash (2005), evaluated the impacts of over speeding on traffic safety in the United Arab Emirates. They found that characteristics of road users strongly attributed to 90% of road accidents. Also, the authors indicated that the speed rates decreased significantly as a result of installing the radar systems and speed cameras in 1994; thus significantly reduced the number of deaths and injuries caused by traffic accidents. However, the number of human losses were still higher than in USA and UK, knowing that the traffic accidents was the second cause of death in the UAE. In addition to that, the authors observed that, although the number of speeding vehicles decreased, the fatalities rate remained the same, the interpretation of this finding is that there was a strong impact of behavior of local drivers on fatalities rate. Bener and Crundall (2005), studied traffic accidents in the UAE during 2000 to identify the major factors attributed to these accidents. The authors found that 38% of the accidents occurred because of careless driving, 13% caused by excessive speed, and 32% because of other human factors. Abdalla (2002), identified causes of increasing traffic fatalities and injuries in the Emirate of Dubai, UAE. The findings of this study indicated that the risk of traffic fatality was higher in Dubai, compared to some other developed countries, also it is found that the probability of a driver causing an accident is considerably higher for those driving goods vehicles, however it is also associated with other factors. Moreover, many countermeasures were applied to improve pedestrian safety but the result did not well evaluated. Abuzwidah and Abdel-Aty (2015) countermeasures must be evaluated to ensure the maximum benefits from the treatments and to avoid the unexpected mistakes. Hamad (2016), described the extent of the road traffic accidents problem in the Emirate of Sharjah, UAE for the period (2001-2014). The findings of this paper revealed several useful facts which could be used to find directions for future research, policies, and programs on highway safety in the Emirate of Sharjah. Hamad (2016) indicated that Sharjah's population almost doubled during the period 2001-2014, however the number of injury/fatality caused by traffic accidents decreased by more than half during the same period. Also, the author indicated that the annual number of road accidents and injuries increased until 2008 then the number sharply decreased thereafter remained stable in recent years, he attributed this finding to the introduction of the new traffic law of the UAE. In addition to that the author found that, although both accidents and injuries per 100,000 population extremely decreased annually, the fatalities per 100,000 population only slightly decreased, he attributed this to the

increasing of severity levels of accidents. Generally, Hamad (2016), concluded that Sharjah showed a better rate of fatalities per 100,000 population than that for the whole UAE. El-Sadig et al. (2004), evaluated the effectiveness of seatbelt legislation in the Eastern District of Abu Dhabi (UAE). The authors found that the implementing of this legislation resulted in statistically significant reduction in morbidity in those arriving alive at hospital following a accidents, including reduced severity of injury, admission rate to hospital and the duration of hospital stay. Bendak & Al-Saleh (2013), evaluated seat belt (SB) wearing rates for drivers and Front Seat Passengers (FSPs) in the UAE through an observational field study. They also investigated perceptions and behavior of drivers on this issue as well as human factors that affect wearing rate through a randomly distributed questionnaire. The findings of this paper showed that the overall SB wearing rate in the country was 61% for drivers and 43.4% for FSPs, indicating that there were considerable differences between the seven emirates in the country. The questionnaire results show that age, education level, gender, social status and nationality of drivers affect wearing habits and perceptions.

While some efforts has been completed in studying traffic safety in the UAE, this paper will contribute with them by investigating pedestrian safety in the Emirate of Sharjah, aiming to provide friendly environment for this important category of road users around the emirate. This research should be considered as a first step in research into this important area, and recommendations for further research can be concluded from this paper.

### **3 Methodology**

In the beginning of this research we aimed to collect, investigate and analyze pedestrian accident records from all available sources in Sharjah. These sources include traffic department, insurance companies, government/private hospitals and Roads and Transport Authority (RTA). Whoever, there is a lack of the data sources and therefore, collection of pedestrian accidents data has proven more challenging than anticipated. Instead, a questionnaire was designed as an alternative way to collect data and investigate pedestrian safety in Sharjah. Finally, policies and measures to tackle the identified problems are investigated and discussed. The questionnaire was randomly distributed for unspecified sample of public, private sector and government organizations across the Emirate of Sharjah after clarifying the purpose of the study and getting their attention.

Google Forms was used to create two links (in Arabic and English) for this questionnaire, and then social media including Instagram, WhatsApp, emails, Facebook in addition to hard copies were used in publication of the questionnaire. Questionnaire distribution took place in December, 2016 and was stopped after the number reached 570 participants. It was thought that such a sample size would reflect the behavior and attitudes of the whole road users population and is within the norm of sample sizes used in similar studies.

The main objectives of this questionnaire are to determine factors that affect pedestrian safety in the Emirate of Sharjah, study and analyze road users' perceptions and attitudes, specifying level of satisfaction, and other general opinions in this area. In the beginning, the questionnaire enquired about road users' personal characteristics including (age, gender, education level, nationality, social status, and income) and then, it followed by questions that clarified respondents' views and facts. Descriptive statistics, tables and Fig.s including pie charts and bar charts were used to explore and assess questionnaire results.

## 4 Results and discussion

### 4.1 The Identities of respondents

Determining identities of participants is very important to measure the differences among different categories. This questionnaire started with questions on identity, Fig.1 shows the identities of the participants includes the following: gender, age group, nationality, social status, educational level and income.

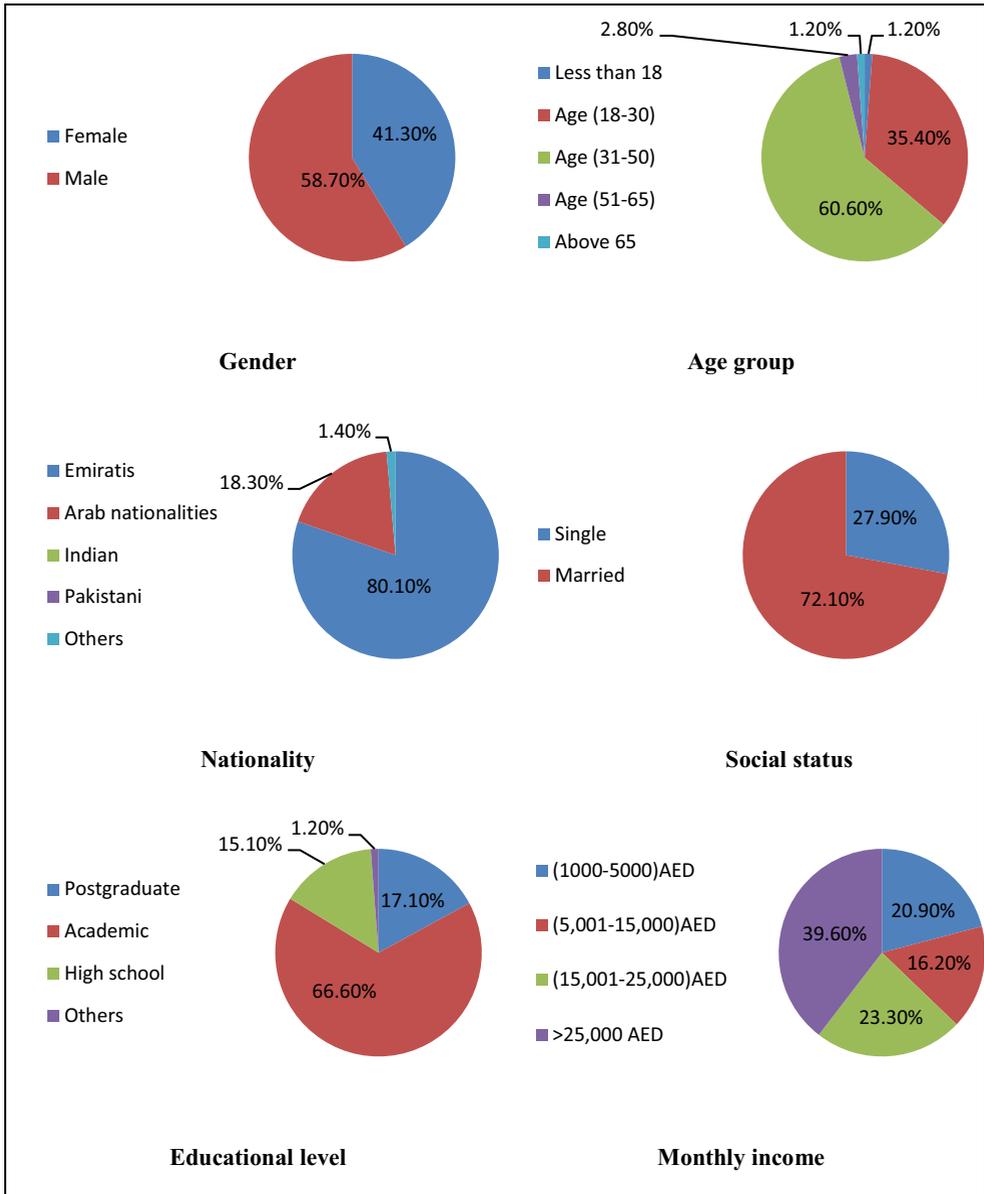
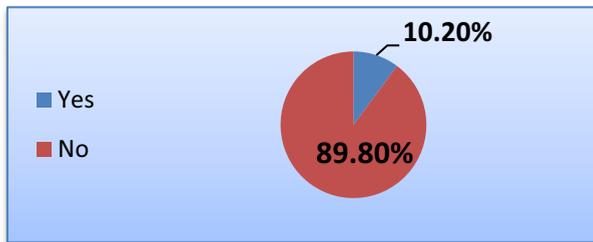


Fig. 1. Identities of respondents.

Based on Fig. 1, it could be concluded that this survey showed the opinion of both genders almost equally, regarding the ages, the largest age groups of respondents were (18-30) and (31-50) where they formed 35.4% and 60.6% respectively, Emiratis were the primary respondents, with other Arabs at 18.3%, married persons constituted 72.1% of respondents and 27.9% were single, the majority of respondents were educated, and finally, the respondents were from high, middle, and low income.

**4.2 The summary of respondents’ views and facts**

Initially, respondents were asked if they have a pedestrian accident before. As shown in Fig. 2, 10.2% of respondents reported that they experienced pedestrian accidents, while 89.8% did not. This result revealed the fact that Emirate of Sharjah faces the problem of pedestrian accidents, where it is despite the fact that this sample represents only 0.07 from the emirate’s residents according to the 2005 census, we found that 10.2% exposed to pedestrian accidents.



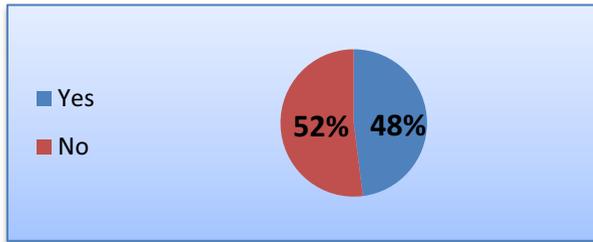
**Fig. 2.** Did you have a pedestrian accident before?

The characteristics of respondents that exposed to pedestrian accidents were examined to determine related significant factors using  $\chi^2$ - test and 95% of significance level, Table.1 clarifies the results.

**Table 1.** Characteristics of respondents that exposed to pedestrian accidents.

Characteristics	Categories	Significance
Gender	Female=21 Male=36 Undefined=1	Not significant
Age group	18-30=17 31-50=39 51-65=1 Less than 18=1	Significant
Nationality	UAE=39 Arab Nationalities=17 Pakistani=2	Significant
Social status	Married=42 Single=16	Significant
Education level	Postgraduate=11 Academic=33 High school=11 Other=3	Significant
Income	1,000-5,000=12 5001-15,000=14 15,001-25,000=13 >25,000=19	Not significant

Respondents were then asked to report if they exposed to hazardous situations while walking or crossing the roads. The answer presented in Fig. 3, indicated that 48% of the sample was exposed to hazardous situations while walking or crossing the roads, which is a high percentage. On the other hand, 52% responded that they were not exposed to such situations. This result indicates that the likelihood of pedestrian accidents occurring is very high in the emirate. Also, this result, particularly we mean (48% who answering “yes”) attributed to the behavior of drivers and pedestrians. In Table 2, characteristics of respondents who exposed to hazardous situations while walking or crossing the roads were examined to determine related significant factors using  $\chi^2$ - test/ $\alpha=0.05$ .



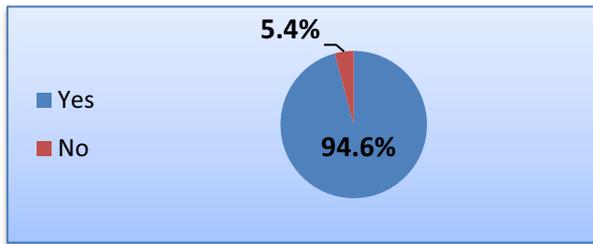
**Fig. 3.** Are you exposed to hazardous situations while walking or crossing the roads?

**Table 2.** Characteristics of respondents who exposed to hazardous situations while walking or crossing the roads.

Characteristics	Categories	Significance
Gender	Female=80 Male=190 Undefined=2	Significant
Age group	18-30=109 31-50=148 51-65=9 Less than 18=6	Significant
Nationality	UAE=208 Arab Nationalities=60 Others=4	Significant
Social status	Married=190 Single=80 Undefined=2	Significant
Education level	Postgraduate=46 Academic=178 High school=45 Others=3	Significant
Income	1,000-5,000=50 5001-15,000=43 15,001-25,000=69 >25,000=100 Undefined=10	Significant

In Fig. 4 respondents were asked as drivers, if they pay attention to pedestrians when they drive their vehicles. It is concluded that the respondents have a very good degree of awareness and attention to pedestrian traffic, where the percentage of respondents who answered “yes” reached 94.6%. However, the percentage of answering “yes” could be less, since some people might have been shy or embarrassed to report the truth. In Table 3,

characteristics of respondents who do not pay attention to pedestrians when they drive were examined to determine related significant factors using  $\chi^2$ - test/ $\alpha=0.05$ .

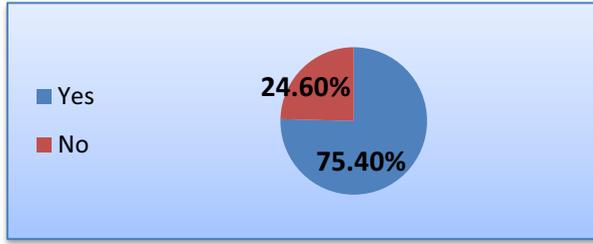


**Fig. 4.** Do you pay attention to pedestrians when you drive your vehicle?

**Table 3.** Characteristics of respondents as drivers who do not pay attention to pedestrians.

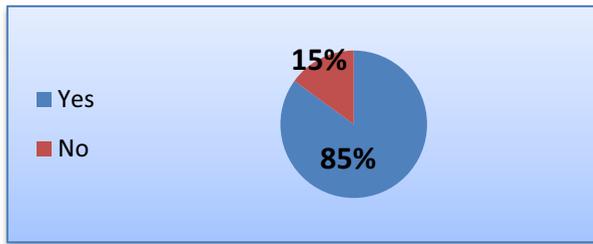
Characteristics	Categories	Significance
Gender	Female=9 Male=19 Undefined=2	Not significant
Age group	18-30=14 31-50=13 Less than 18=1 Undefined=2	Significant
Nationality	UAE=21 Arab Nationalities=6 Pakistani=1 Undefined=2	Significant
Social status	Married=17 Single=11 Undefined=2	Not significant
Education level	Postgraduate=6 Academic=17 High school=4 Others=3	Significant
Income	1,000-5,000=8 5,001-15,000=2 15,001-25,000=6 >25,000=11 Undefined=3	Not significant

In Fig. 5, respondents were asked if they give way to pedestrians in case of crossing places not designated to them. The result shows that 75.4% of the drivers stopped for pedestrians even though they were crossing wrong. On the other hand, 24% of the drivers retained their priority for the road and did not open the way for pedestrians.



**Fig. 5.** Do you give way to pedestrians in case of crossing places not designated to them?

In Fig. 6 respondents were asked about their commitment to speed limits in congested pedestrian movement places. The result shows that 85% of the drivers are committed to speed limits, which is good thing; unfortunately, 15% said they are not, where this percentage could be higher, since some people might have been shy or embarrassed to report the truth. In Table 4, characteristics of respondents who are not committed to speed limits in congested pedestrian movement places were examined to determine related significant factors using  $\chi^2$ - test/ $\alpha=0.05$ .



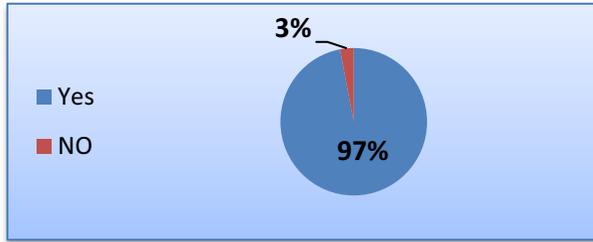
**Fig.6.** Are you committed to speed limits in congested pedestrian movement places?

**Table 4.** Characteristics of respondents as drivers who are not committed to speed limits.

Characteristics	Categories	Significance
Gender	Female=28 Male=57	Significant
Age group	18-30=54 31-50=29 Less than 18=2	Significant
Nationality	UAE=69 Arab Nationalities=16	Significant
Social status	Married=45 Single=40	Not significant
Education level	Postgraduate=8 Academic=61 High school=14 Others=2	Significant
Income	1,000-5,000=21 5,001-15,000=9 15,001-25,000=22 >25,000=30 Undefined=3	Significant

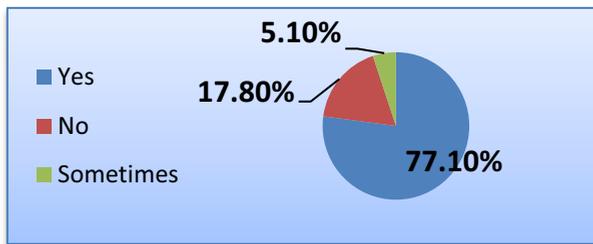
In Fig. 7 respondents were asked if they give priority to pedestrians in their designated places to cross. From Fig. 7, it is observed that 97% of the drivers are committed to giving priority to pedestrians in their designated places, which is very good thing; unfortunately,

3% they are not, where this percentage could be higher, since some people might have been shy or embarrassed to report the truth.



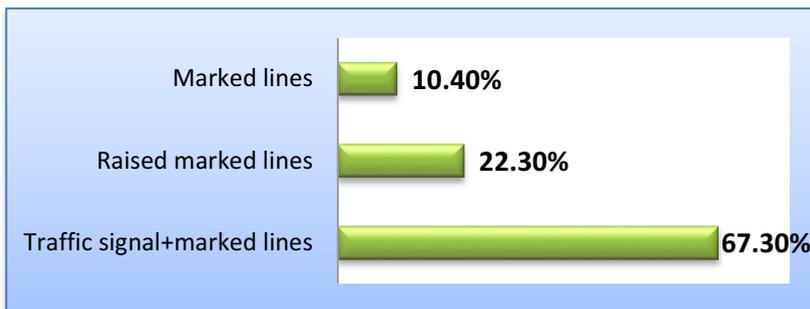
**Fig.7.** Do you give priority to pedestrians in their designated places to cross?

In Fig. 8 respondents were asked to answer yes or no with the stated reason if possible if they feel resentful of pedestrian traffic on the roads. As shown in Fig. 8, it is observed that 77.1% were not happy with pedestrian movement in the emirate, and their reasons were as follows: causing traffic jams, confusing drivers, increasing the likelihood of accidents through slow-motion, wrong estimation, crossing on high-speed roads, and sudden crossing. 17.8% of the drivers saw that pedestrian movements as normal, and they have the right to share the roads with vehicles with limitations. 5.1% of the drivers answered “sometimes”.



**Fig.8.** Do you feel resentful of pedestrian traffic on the roads?

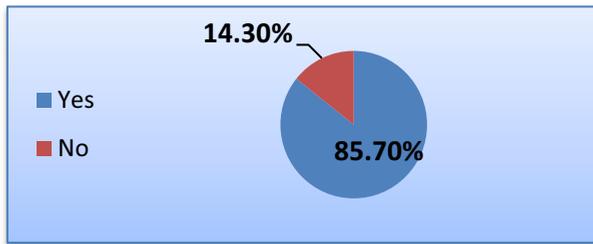
In Fig. 9 respondents were asked about the clearest crossing point for them as drivers. The result shows that the largest percentage in the sample agreed that “traffic signal + marked lines” is the clearest place for drivers to be attentive to pedestrians crossing the road. “Raised marked lines” came in second in terms of importance, and finally marked lines.



**Fig. 9.** What is the crossing point that is very clear for you as a driver?

In Fig. 10 respondents were asked if they expect pedestrian errors and braced for them. The result in Fig. 10 showed that 85.7% of the drivers expect pedestrian errors and pay attention to them, which is a good thing. On the other hand, 14.3% of the respondents do

not care about pedestrian movement. In Table 5, characteristics of respondents as drivers who are not expect pedestrian errors and braced for them were examined to determine related significant human factors using  $\chi^2$ - test/ $\alpha=0.05$ .

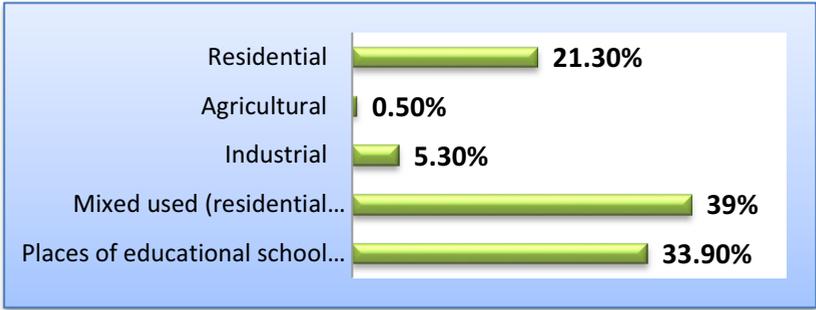


**Fig.10.** Do you expect pedestrian errors and braced for them?

**Table 5.** Characteristics of respondents as drivers who are not expect pedestrian errors and braced for them.

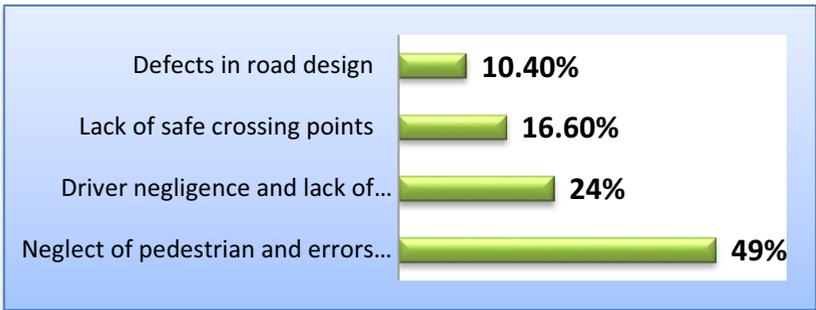
Characteristics	Categories	Significance
Gender	Female=38 Male=42	Not significant
Age group	18-30=44 31-50=34 Less than 18=2	Significant
Nationality	UAE=62 Arab Nationalities=15 Others=3	Significant
Social status	Married=45 Single=35	Not significant
Education level	Postgraduate=15 Academic=53 High school=11 Others=1	Significant
Income	1,000-5,000=22 5,001-15,000=13 15,001-25,000=17 >25,000=24 Undefined=4	Not significant

In Fig. 11 respondents were asked about the places that they give more attention to pedestrian traffic. From Fig. 11, we could concluded that drivers give maximum attention to pedestrians in mixed land used with 39%, then in school areas with 33.9%, followed by residential areas with 21.3%. They gave industrial areas 5.3%, and in last place agricultural areas with 0.5%. It is noted here that the drivers ignored pedestrian traffic in the industrial zones, note that these areas in Sharjah are vital and busy of pedestrian movement and workers, which require more attention and focus.



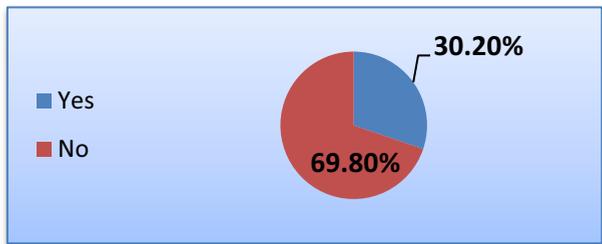
**Fig. 11.** Where do you give more attention to pedestrian traffic?

In Fig. 12 respondents were asked about the causes of pedestrian accidents in their views. From Fig. 12, it could be concluded that the main reason for pedestrian accidents is “neglect of pedestrian and errors committed by them” with 49%. “Driver negligence and lack of attention” came in second place with 24%, followed by “Lack of safe crossing points” with 16.6%, in last “Defects in road design” with 10.4%. It is noted here that respondents attributed pedestrian accidents mainly to human element including pedestrian and drivers with 73%, and 27% percentage distributed among other reasons. This result seems very logical and must be taken in consideration, where if we assumed that the roads designs have no defects and there are enough safe crossing points, the problem will remain in place and it is attributed to the primary factor which is the human element.



**Fig. 12.** Causes of pedestrian accidents.

In Fig. 13 respondents were asked as pedestrians if they will cross in places not intended for that. Fig. 13 shows that 69.8% were committed to crossing rules, while 30.2% are not. In Table 6, characteristics of respondents as pedestrians who will cross in places not intended for that were examined to determine human related significant factors using  $\chi^2$ - test/ $\alpha=0.05$ .

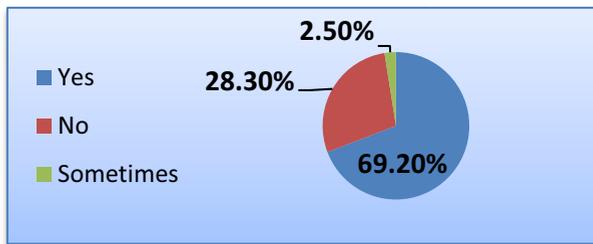


**Fig. 13.** If you are a pedestrian will you cross in places not intended for that?

**Table 6.** Characteristics of respondents as pedestrians who will cross in places not intended for that.

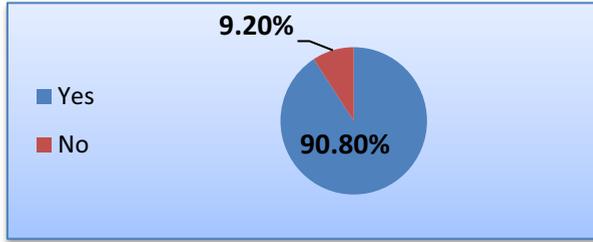
Characteristics	Categories	Significance
Gender	Female=48 Male=122	Significant
Age group	18-30=74 31-50=91 51-65=2 Less than 18=3	Significant
Nationality	UAE=119 Arab Nationalities=45 Pakistani=1 Others=5	Significant
Social status	Married=62 Single=108	Significant
Education level	Postgraduate=23 Academic=123 High school=20 Others=4	Significant
Income	1,000-5,000=44 5,001-15,000=22 15,001-25,000=42 >25,000=54 Undefined=8	Significant

In Fig. 14 respondents were asked as pedestrians to answer yes or no with the reasoning if they feel safe and satisfied during transit in designated place. Fig. 14 shows that 69.2% feel safe while crossing the roads in designated places; on the other hand, 28.3% feel unsafe because of feeling fear of reckless drivers and excessive speeds.



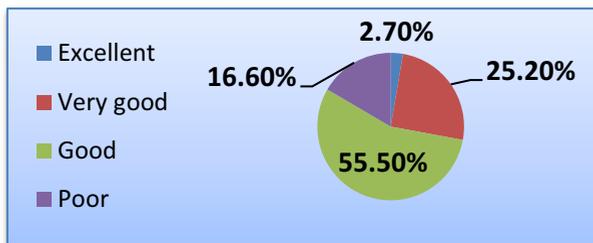
**Fig. 14.** Do you feel safe and satisfied during transit in designated places?

In Fig. 15 respondents were asked if they feel differences in the behavior/attitudes of drivers and pedestrians according to their nationalities. Fig. 15 shows that almost all participants in this questionnaire feel differences in the behavior of drivers and pedestrians according to their nationalities.



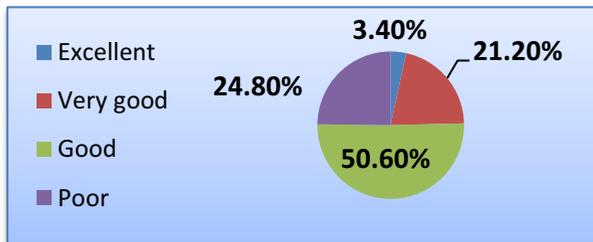
**Fig. 15.** Do you feel differences in the behavior/attitudes of drivers and pedestrians according to their nationalities?

In Fig. 16 respondents were asked to evaluate the drivers' behaviors in Sharjah towards pedestrians. The result is shown in Fig. 17, indicates to dissatisfaction in large percentage.



**Fig. 16.** Assessment of drivers' behaviors in Emirate of Sharjah towards pedestrians.

Finally, in Fig. 17 respondents were asked to evaluate pedestrian's behavior in the Emirate of Sharjah. The result is shown in Fig. 18, shows that this assessment reflects a bad impression, where almost three quarters of sample evaluated pedestrian's behavior in Sharjah between good and poor.



**Fig. 17.** Assessment of pedestrian's behavior in Emirate of Sharjah.

## 5 Conclusion and recommendations

### 5.1 Conclusion

This paper investigated pedestrian safety in the Emirate of Sharjah, UAE by conducting and analyzing a survey including the following targets: measuring the awareness of drivers and pedestrians regarding this area, determine the behavior of road users in some situations, take general views from the public, and measure the level of satisfaction. After analyzing the survey results, several interesting findings were revealed including the following points:

- Characteristics of road users including (gender, age group, nationality, social status, education level and income), affect their behavior at different levels, specifically behavior that may lead to pedestrian accidents.
- The largest percentage of respondents agreed that there are differences in the behavior of drivers and pedestrians according to their nationalities.
- The largest percentage of respondents attributed pedestrian crashes mainly to the negligence and mistakes committed by pedestrian.
- The largest percentage of respondents as drivers confirmed that they give more attention to pedestrians in mixed land used than other areas.
- The largest percentage of respondents agreed that “traffic signal + marked lines” is the clearest place for drivers to be attentive to pedestrians crossing the road.
- Based on questions that measure the level of satisfaction for drivers and pedestrian regarding this issue, it is found that a considerable percentage of drivers in the sample are not happy with pedestrian traffic in the emirate, and their reasons were as follows: causing traffic jams, confusing drivers, increasing the likelihood of accidents through slow-motion, wrong estimation, crossing on high-speed roads, and sudden crossing. On the other hand pedestrian in the sample, pointed to their feeling of uncomfortable while crossing the roads in their intended places because of feeling fear of reckless drivers and excessive speeds.
- The assessments of pedestrian’s behavior and drivers’ behaviors towards pedestrians in the Emirate of Sharjah reflect a bad impression, where almost three-quarters of both evaluations were between poor and good.

## 5.1 Recommendations

According to the results that have been reached through this research of pedestrian safety in the Emirate of Sharjah, we recommend that decision-makers consider the following suggestions in order to increase the comfort and safety of pedestrian environment around the emirate:

- Behavior and Education: increasing awareness of traffic culture among road users is the perfect solution to this issue, this can be achieved by educating road users through awareness and guidance campaigns, distribution of awareness brochures in several languages, and educational lectures at universities, schools, and institutions. More attention and focus should be given to some categories that committed errors lead to pedestrian accidents significantly and repeatedly. Improvement of Infrastructure, Road Design in busy Pedestrian Areas: there was a need shown to increase pedestrian access to services places, by installing pedestrian crossing points (whether foot bridges, subways, raised crosswalks, normal marked crosswalks, or others) according to the road needs and population density around it. In addition, speed reduction signs and warning signs should be installed in crowded areas which may also support pedestrian safety. Also, installing a pedestrian barrier in roads will force pedestrians to use the safe crossing points. Construction of speed bumps before pedestrian crossing points is a good measure which will force drivers to drive more slowly and give way for pedestrians to cross safely. The research noticed that there are available sidewalks in the Emirate of Sharjah, but they are not adequate and in some cases misused; therefore, we need to intensify control on the use and installation of a sufficient number of sidewalks in order to reduce the amount of time pedestrians are exposed to vehicles. Also, road marking must be improved, especially in places where pedestrians cross.

- Legislation: More stringent laws should be enacted for pedestrians and drivers concerning the crossing points and adherence to these rules. For example we can impose immediate fines on violators of pedestrians or drivers or install cameras in pedestrian crossing points and areas busy with pedestrians to monitor traffic violations.

Overall, based on the results of this paper, there is an urgent need to re-evaluate the pedestrian facilities in the Emirate such as ( Design, locations, and their availability) as well as focusing more on the research to reach a clear conclusions for the decision makers.

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