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Predictors of public transportation in Mashhad: A population-based study

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Abstract:

BACKGROUND: The development of public transportation (PT) is a crucial issue in the modern societies. The aim of this study was to assess the status of PT usage among the population residing in Mashhad.

MATERIALS and METHODS: In a cross-sectional design, 464 citizens of Mashhad filled a checklist about PT-use (i.e., bus, taxi, and metro) to find their supporting and opposing factors in 2014. Chi-square, Mann–Whitney, Student's *t*-test, and logistic regressions were used for inferential analysis in SPSS 11.5.

RESULTS: Mean age was 30.02 ± 11.24 years and 57% (263) were female. Bus (169, 50%) was the most popular PT means, followed by metro (98, 29%) and taxi (74, 21%). Most transportations were happened at morning (248, 35%) and evening (221, 31%). Increasing age (odds ratio [OR] =1.04, confidence interval [CI] 95% = 1.008–1.07), higher education (OR = 2.91, CI 95% = 1.14–7.38), being homemaker (OR = 2.97, CI 95% = 1.19–7.36), or student (OR = 2.91, CI 95% = 1.14–7.38) were predictors of PT-use.

CONCLUSION: Individual preference between PT and driving is associated with social, economic, and cultural aspects of a population. Recognizing the influencing factors can help to design population-oriented services.

Keywords:

Bus, Iran, metro, predictor, public transport, taxi

Introduction

The development of public transportation (PT) is a crucial issue in the modern societies. In the recent decades, along with the growing residing population of big cities, overall welfare of people have been increased, which is associated with greater use of personal vehicles, instead of PT.[1] The increased amount of CO and CO_2 emissions due to transportation has become a great concern.[2,3]

The demand for petroleum, as the primary fuel used in vehicle engines, has also been constantly increasing. Extensive use and inefficient combustion of fossil fuels, particularly petroleum, and traffic congestions in the major cities all over the world including Mashhad, lead to air and noise pollution, which have many adverse effects on environmental health.

As well as finding solutions to traffic-related problems, governments, and authorities should consider PT as a viable option. Influential measures such as informative advertisements that enhance the awareness of general population through multimedia networks can be of cardinal importance.[1,4] On the other hand, traffic congestion, urban parking difficulties, and increasing pollution have made car drivers consider using the PT system. However, to attract them to switch from personal vehicles into PT, the services should be of high quality and quantity.[1,5] We know that the PT planning is usually achieved through taking necessary measures in the design of routes, setting

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of frequencies, timetabling, vehicle scheduling, and crew scheduling.[1] The users of transportation services demand affordable and direct service to passengers, vehicle and transfer terminal comfort, regularity, and service coverage and frequency for all, as well as equity of access to different regions. The authorities and operators may think of the transportation system as a means to make a profit. The major challenge in planning PT systems is to find a balance between these two ideas.[1,4]

Mashhad, being located in the Northeast of Iran, is the second largest city in this country and the second most major destination for Muslim pilgrims. An increasing number of inhabitants besides overload of tourists has made this city overcrowded and caused traffic-related problems, making routine urban travels annoying for residents and visitors. Although biking lanes and subway paths have been provided in the recent decade, the majority of the city's transit is being carried out by motor vehicles.[6] The optimization of PT system in Mashhad remains a challenge for the authorities. To the best of our knowledge, no recent study has focused on PT usage. It seems that current PT system cannot meet the high transit demand of Mashhad residents. Moreover, lacking harmonization between different means of PT has made it difficult for the residing people to access all urban areas with PT systems. The aim of the present study was to assess the status of PT usage among the population residing in Mashhad.

Materials and Methods

This cross-sectional study was performed on 464 citizens of Mashhad, Iran in 2014. Due to lack of data on this issue in current literature, we assumed the prevalence of PT-use as 0.5 which provides the largest sample size. The study sample was obtained through multi-stage sampling method. The city was divided into five districts based on health-care divisions. In each area, five public places including but not limited to parking lots, public transport stations, car parks of shopping centers, hospitals, banks, and educational centers were selected randomly, and the research team was available there to perform the data collection.

An expert panel approved the reliability of checklist. The validity was shown by a Cronbach's alpha of 0.93. This checklist consisted of sociodemographic characteristics and possible related factors on PT-use such as age, gender, marital status, education level, job situation, and owning a personal vehicle. Besides, there were 14 and ten questions for pros and cons of PT, respectively. For these issues, answers were obtained on a 5-point Likert scale from "Not important = 0" to "very important = 5." Oral consent was obtained before filling the checklist. Ethics Committee of Mashhad University of Medical Sciences approved the study.

SPSS 11.5 software (SPSS Inc., Chicago, Illinois, USA) was used for data analysis. Descriptive statistics were applied to describe the pattern of the data. Chi-square, Mann–Whitney, and Student's *t*-test were used for inferential analysis. Logistic regressions were used to find the responsible factors for not using PT. All tests were 2-tailed, considering $P < 0.05$ as statistically significant.

Results

The mean age of study population was 30.02 ± 11.24 years (range: 13–76). Fifty-seven percent (263) were female, and more than half of them were married (258, 56%). Nearly, half of the participants (230, 49%) were employed, and 154 (35%) were students. Most of them had higher than diploma degree (397, 87%).

Bus (169, 50%) was the most popular PT means, followed by metro (98, 29%) and taxi (74, 21%). Six percent used both bus and metro for transportation. All three PT means were mostly used by individuals who did not own a vehicle (all three $P < 0.001$), [Figure 1].

All these three public transmission methods were mostly used by younger people (bus: $P = 0.001$; taxi: $P < 0.001$; metro: $P = 0.045$). There was a gender difference for bus and taxi usage: 64% of bus travelers and 74% of taxi users were females ($P = 0.019$ and $P = 0.001$, respectively). Although 61% of metro users were female, this difference was not statistically significant ($P = 0.175$).

Single individuals were dominant in transmitting with bus (59%, $P < 0.001$), taxi (54%, $P = 0.037$), and metro (55%, $P = 0.008$). Students had used bus (46%, $P = 0.002$), taxi (45%, $P = 0.023$), and metro (46%, $P = 0.057$) more than other job categories. Educational level was not related to usage of any of these transmission methods.

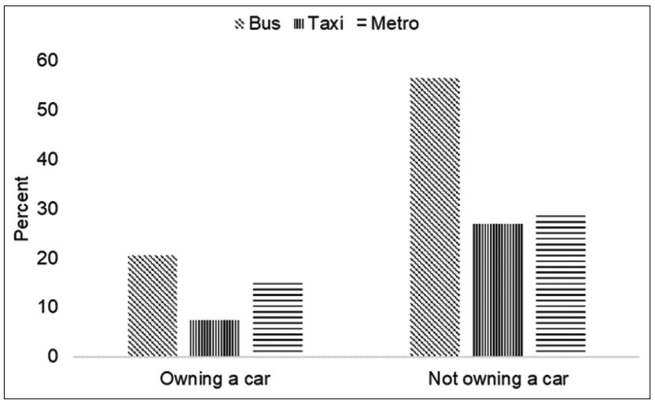

Figure 1: Comparison of using PT in individuals owning a personal vehicle and those who do not

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Individuals with a longer duration of driving license used PT more often (bus: $P = 0.001$; taxi: $P = 0.004$; metro: $P = 0.029$). The price of the personal vehicle was not significantly related to usage of PT.

Most transportations were happened at morning (248, 35%) and evening (221, 31%) followed by night (129, 18%) and noon (104,15). Considering each PT method alone revealed that a combination of at least two of the times as mentioned earlier has the most frequent. Although metro was used less often than the other two in the morning, it was a favorable method at night [Figure 2].

Not needing to focus on driving and traffic reduction were the two main pros for using a bus as a PT means. Being a fast transmission method and high-speed transmission were the most favorable advantages for taxi and metro, respectively. Poor coverage was the main cons for bus and metro but being expensive was reported as the biggest obstacle to using a taxi [Table 1].

Logistic regression showed that not owning a vehicle was a constant factor to increase the chance of using different PT vehicles [Table 2]. When considering all PT methods together, individuals who did not own a vehicle had a 17-fold (confidence interval [CI] 95% = 8.66–33.3) chance of using PT. Being married reduced the chance of selecting bus as a public vehicle (odds ratio [OR] = 0.37, CI 95% = 0.19–0.93). Besides, the incapability of bus to be exactly near the destination was a con factor to use it (OR = 0.30, CI 95% = 0.10–0.91). Males were less probable to use taxi (OR = 0.41, CI 95% = 0.19–0.89). Self-employed individuals were three times more probable, compared with governmentally employed ones to use a taxi (OR = 3.18, CI 95% = 1.19–8.48). Men (OR = 2.2, CI 95% = 1.08–4.55) and students (OR = 2.5, CI 95% = 1.16–5.59) were more eager to use metro. However, believing in that metro can reduce traffic was a protective factor to select it as a PT method (OR = 0.05, CI 95% = 0.01–0.48). Finally, we pooled all three methods together, and it was revealed that by increasing age, the chance of using public vehicles increases slightly (OR = 1.04, CI 95% = 1.008–1.07). Interestingly, having a higher education was also related to using PT (OR = 2.91, CI 95% = 1.14–7.38). Homemakers (OR = 2.97, CI 95%=1.19–7.36) and students (OR = 2.91, CI 95% = 1.14–7.38) had a higher chance to use one of these PT methods.

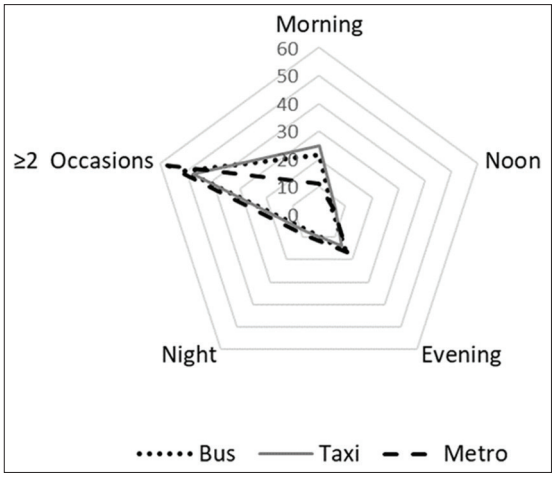

Figure 2: Percentage of using public transportation in different times of a day

Discussion

This study showed that bus as the most popular PT means, followed by metro and taxi. All three PT means were mostly used by individuals who did not own a vehicle. Most transportations happened at morning and evening. Not needing to focus on driving and traffic reduction were the two main pros for using a bus as a PT means. Being a fast transmission method and high-speed transmission were the most favorable advantages for taxi and metro, respectively.

As mentioned earlier, the bus was the most frequently used means of PT among the surveyed population, which was consistent with the results of several previous studies.[7-10] Our results showed that there were gender and occupational differences among the surveyed population regarding the tendency toward the use of

Table 1: Pros and cons of different public transportation vehicles

	Bus	Taxi	Metro
Pros			
Proper accessibility	4±0.9	-	-
No cost for maintenance	3.9±1	-	3.8±1
Low pollution	3.9±0.9	2.4±1.1	4.1±0.9
Healthy walking	3.7±1	-	3.8±1
Usable in bad weather	3.8±0.9	3.8±1	4.1±0.8
Cheap	3.8±1	2.2±1.1	3.9±0.9
No need to focus on driving	4.1±0.9	3.8±1	4.1±0.9
Reduce traffic	4.1±0.9	3.4±1.2	4.2±0.8
Meeting new people	2.8±1.3	-	2.8±1.3
No need for parking	3.8±1	-	3.9±1
Door to door transmission method	-	3.7±1	-
No waiting	-	3.8±1	-
High-speed transmission	-	3.8±0.9	4.3±0.8
Cons			
Waiting	3.9±0.9	-	3.4±1.1
Poor coverage	4±0.9	3.2±1.1	4±0.9
Sometimes impossible to sit-down	3.7±1	2.2±1.1	3.3±1.1
Need to buy ticket	3±1.2	-	2.9±1.2
It is not a door to door transmission method	3.5±1.1	-	3.3±1.1
No privacy	3.6±1.1	-	-
Robbery	3.7±1.1	-	-
Crowding	3.7±1.2	-	-

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Table 2: Predictors for using different public transportation vehicles

	P	OR	CI 95%
BUS			
Marital Status (R=Single)	0.004	0.37	0.19-0.93
Car Ownership (R=Yes)	<0.001	5.45	3.13-9.50
Door to door transportation (R=Not at all)			
Low importance	0.347	0.57	0.18-1.82
Moderate importance	0.165	0.47	0.16-1.35
Important	0.005	0.22	0.08-0.64
Very Important	0.035	0.30	0.10-0.91
TAXI			
Gender (R=Female)	0.025	0.41	0.19-0.89
Car Ownership (R=Yes)	<0.001	4.57	2.43-8.61
Job (R=Employed)			
Self-employed	0.021	3.18	1.19-8.48
Jobless	0.999	0.0	0.0
Housewife	0.298	1.74	0.61-4.95
Student	0.280	1.62	0.67-3.92
METRO			
Gender (R=Female)	0.029	2.22	1.08-4.55
Car Ownership (R=Yes)	0.004	2.44	1.33-4.47
Job (R=Employed)			
Self-employed	0.401	0.67	0.26-1.70
Jobless	0.999	0.0	0.0
Housewife	0.099	2.47	0.84-7.26
Student	0.019	2.55	1.16-5.59
Reduce Traffic (R=Not at all)			
Low importance	0.552	0.37	0.01-9.58
Moderate importance	0.009	0.05	0.01-0.48
Important	0.286	0.36	0.05-2.33
Very Important	0.097	0.20	0.03-1.33
Public Transportation (Total)			
Age	0.014	1.04	1.008-1.07
Marital Status (R=Single)	0.022	0.42	0.20-0.88
Education (R=Under Diploma)	0.024	2.91	1.14-7.38
Car Ownership (R=Yes)	<0.001	17.00	8.66-33.3
Job (R=Employed)			
Self-employed	0.045	0.12	0.01-0.95
Jobless	0.151	1.82	0.80-4.16
Housewife	0.019	2.97	1.19-7.36
Student	0.024	2.91	1.14-7.38

public transport. Women and students were dominant users in all three means of PT. This difference might be due to economic issues and that women and students are not likely to be able to afford to own a personal vehicle, compared to men, and employed persons, respectively. We also found that younger people tended to use PT significantly more frequently than the elderly did. These findings support a recent study on the satisfaction of BRT transportation method in Tehran.[11]

Among the individuals who owned or did not own a vehicle, the bus was more frequently selected as the usual means of PT, which might be due to general accessibility of this means of transportation. However, the tendency toward the bus was more remarkable for the individuals who did not own a vehicle. Owning a car had a negative association with using the PT system. On the other hand, having higher education and older age were associated with choosing PT for short travels.

Webb *et al*. studied on the pension-aged people in the United Kingdom and found out that bus pass holders, who would probably use the bus more, were more likely to be female, retired, and without access to a car, which is somehow consistent with our results. They went on further and reported that these pass holders are more likely to use PT and to be physically active, which confirms the positive effect of PT on the general health status. They concluded that free bus travels could contribute to the higher accessibility of PT and healthier lifestyle for old aged individuals, as well as prevent social isolation of these persons.[12]

Developing an efficient PT system regarding quality and quantity is pivotal for maintaining regional sustainability.[13] The proximity of public transport stations to the local population can affect the performance of the public transport system by large.[14] A recent study on BRT transportation method showed that accessibility to stations and not breaking down were the main pros selecting this method.[11]

On the other hand, according to previous works, driving is associated with higher risks, compared with using PT.[6,15] Moreover, mean CO_2 emissions of personal vehicles in a big city such as Tehran has been reported to be higher than other vehicles. The report indicates that high volume of traffic and consumption of fossil fuels, along with the defects in public transport system are major causes of the high CO_2 concentrations and air pollution in Tehran. Thus, planning an efficient PT system, especially in the major cities would assuage the concerns over the rising levels of greenhouse gasses in urban environments.[13,16,17] A more holistic view to investment in PT-use has shown that it can increase output, productivity, income, property values, employment, real wages and decrease costs of production, and noncommercial travel time.[18,19]

To the best of our knowledge, this is the first study from Iran which evaluates the factors of PT-use in lay people. The last stage of sampling method of our study may reduce the generalizability of findings.

Conclusion

Investments in the enhancement of public transit services can broadly benefit the governments and societies by lessening the combustion of fossil fuels and environmental pollution. Individual preference between

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PT and driving is associated with social, economic, and cultural aspects of a population and is better to proceed on the voluntary basis. The governments can encourage communities toward using public transport system by running advertising and awareness-enhancing multimedia programs.

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Conflicts of interest

There are no conflicts of interest.

References

1. Guihaire V, Hao JK. Transit network design and scheduling: A global review. Transp Res A Policy Pract 2008;42:1251-73.
2. Iran Shanghai Cooperation Organization. National Statistical Report on Air Pollution and Greenhouse Gass Emission: 2013.
3. Institute Telecommunications Standards. National Greenhouse Gas Inventory Report; 2012.
4. Farahani RZ, Miandoabchi E, Szeto WY, Rashidi H. A review of urban transportation network design problems. Eur J Oper Res 2013;229:281-302.
5. Alyuz U, Demir HH, Okten HE, Yilmaz O, Demir G. Management plan optimization and application of public spots for increasing widespread usage of public transportation: Istanbul case. Int J Environ Sci Dev 2013;4:76.
6. Mousavi Bazzaz M, Zarifian A, Emadzadeh M, Vakili V. Driving behaviors in Iran: A Descriptive study among drivers of Mashhad city in 2014. Glob J Health Sci 2015;7:39-45.
7. Chan KM, Pang WS, Ee CH, Ding YY, Choo P. Functional status of the elderly in Singapore. Singapore Med J 1999;40:635-8.
8. Egbert H. Cross-border small-scale trading in South-Eastern Europe: Do embeddedness and social capital explain enough? Int J Urban Reg Res 2006;30:346-61.
9. Ahlström A, Pilesjö P, Lindberg J. Improved accessibility modeling and its relation to poverty – A case study in Southern Sri Lanka. Habitat Int 2011;35:316-26.
10. Loker L. Backpackers in Australia: A motivation-based segmentation study. Journal of Travel & Tourism Marketing 1997;5:23-45.
11. Hataminejad H, Purahmad A, Faraji Sabokbar HA, Azimi A. Measuring the satisfaction of public transportation users in the South Alborz area. J Urban Econ Manag 2015;3:105-23.
12. Webb E, Laverty A, Mindell J, Millett C. Free bus travel and physical activity, gait speed, and adiposity in the English longitudinal study of ageing. Am J Public Health 2016;106:136-42.
13. Zarei Mahmoud Abady H, Veyseh S, Dehghan Tezerjani F. Estimation of minibus and taxi indused air pollution in Yazd-Ardakan rord. Toloo E Behdasht 2011;9:36-44.
14. Murray AT, Davis R, Stimson RJ, Ferreira L. Public transportation access. Transp Res D Transp Environ 1998;3:319-28.
15. Ardalan A, Masoomi GR, Goya MM, Sarvar MR, Haddadi M, Miadfar J, *et al*. Road traffic injuries: A challenge for Iran's health system. Iran J Public Health 2009;38 Suppl 1:98-101.
16. Kakouei A, Vatani A, Idris AK. An estimation of traffic related CO2 emissions from motor vehicles in the capital city of, Iran. Iran J Environ Health Sci Eng 2012;9:13.
17. Rahnama MR, Forghani H. Bus accessibility planning in Iran: Mashhad. Modarres Hum Sci 2008;12:73-96.
18. Dev Bhatta S, Drennan MP. The economic benefits of public investment in transportation: A review of recent literature. J Plann Educ Res 2003;22:288-96.
19. Khadem-Rezaiyan M, Moallem SR, Vakili V. High-risk behaviors while driving: A population-based study from Iran. Traffic Inj Prev 2017;18:257-61.