




# Gender Differences in Pedestrians' Traffic Behaviors in Iran: A Study from a Candidate Safe Community

Morteza Haghighi<sup>1</sup>, Homayoun Sadeghi-Bazargani<sup>1</sup> , Fatemeh Bakhtari Aghdam<sup>2, \*\*</sup>, Leila Jahangiry<sup>3, \*</sup> and Haidar Nadrian<sup>1</sup>

<sup>1</sup>Department of Health Education and Promotion, Faculty of Health, Tabriz University of Medical Sciences, Tabriz, Iran

<sup>2</sup>Road Traffic Injury Research Center, Health Management and Safety Promotion Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran

<sup>3</sup>Tabriz Health Services Management Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

\*Corresponding author: Tabriz Health Services Management Research Center, Tabriz University of Medical Sciences, Tabriz, Iran. Email: jahangiry@razi.tums.ac.ir

\*\*Corresponding author: Road Traffic Injury Research Center, Health Management and Safety Promotion Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran. Email: fatemeh.bakhtari@gmail.com

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## Abstract

**Background:** Although the number of pedestrian traffic accidents is decreasing worldwide, more than one-third of traffic fatalities in Iran are related to pedestrians. High-risk behaviors of pedestrians increase their vulnerability to road traffic injuries.

**Objectives:** This study aimed to investigate gender differences in adopting safe pedestrian behaviors in Tabriz, Iran.

**Methods:** This cross-sectional study was carried out among pedestrians aged 18 years and over (n = 508) living in the second municipal district of Tabriz, Iran. The stratified random sampling method was used to recruit a representative sample of adults from 23 July to 21 November 2019. A standardized, structured questionnaire was used for evaluating traffic behaviors in five domains (i.e., adhering to traffic rules, pedestrians' traffic violations, positive pedestrian behaviors, pedestrians' distraction, and pedestrians' aggressive behaviors). The data was analyzed by SPSS version 22 using independent *t*-test, regression, chi-square, and ANOVA tests.

**Results:** Overall, 58.5% of the participants were female. Women had significantly higher scores in three domains of pedestrian traffic behaviors (i.e., no traffic violations, not being distracted, and not having aggressive behavior) than men ( $P < 0.001$ ). Additionally, married women and women with higher education levels earned significantly higher scores than others in total pedestrian traffic behaviors. There were significant differences between men and women regarding the use of a personal car and walking daily more than an hour ( $P < 0.05$ ).

**Conclusions:** Our findings suggest gender differences in the five dimensions of pedestrian traffic behaviors in Iran. Gender-specific risk reduction strategies in the Iranian pedestrians' safety intervention programs may promote safe traffic behaviors of pedestrians.

**Keywords:** Traffic Accident, Safety Behavior, Pedestrian, Gender

## 1. Background

Traffic accident is the eighth leading cause of death worldwide, and it is the most common cause of mortality in people aged 12 - 29 years. Traffic accidents represent the greatest economic burden of disease across the world. According to the World Health Organization (WHO), annually 1.24 million people are killed on the world's roads, 10 million are disabled, and over 50 million are injured due to traffic accidents (1-4).

In Iran, traffic accident is the leading cause of years of life lost (13.5%) and premature death. It is the second leading cause of death, as it is estimated that 2.5% of traffic accidents in the world occur in Iran (5-8). Although the number of pedestrian traffic accidents is declining worldwide, Iranian pedestrians are 1.5 times more likely to die due to

traffic accidents (9, 10).

Findings show that the rate of road traffic deaths among pedestrians in Iran is over 30% (11). Pedestrians are often vulnerable roadway users because of poor decision making or high-risk road crossing behaviors (12). Robust evidence shows that pedestrians not only are the most vulnerable victims, but they are also at fault for the accident (13).

For the prevention and control of pedestrian crashes, it is important to identify and understand the factors contributing to pedestrians' high-risk road-crossing behaviors (14). Various studies have shown that when pedestrians observe other pedestrians crossing the road in an improper manner, they tend to consecutively cross the street by following them (15-17). Some studies suggest that using mobile phones while cross walking increases the rate of in-

juries among pedestrians (12, 18, 19).

Also, alcohol consumption and inadequate visibility of pedestrians on the roads have been mentioned as the key risk behaviors (20, 21). Personality traits, age, and gender were additionally found to be influential factors in pedestrian behaviors (22, 23). Studies have revealed that female pedestrians had less death rates and fatal injuries than men did (24, 25). Male pedestrians are more likely to cross carelessly (60%) and on a red light (64%) compared to women (40% and 36%, respectively) (26). Since traffic behaviors depend on social and cultural factors (27), in different societies and cultures, women and men tend to present different traffic behaviors.

## 2. Objectives

This study aimed to investigate gender differences in adopting safe pedestrian behaviors. There has also been no study in Iran regarding the role of gender in safe pedestrian behaviors.

## 3. Methods

### 3.1. Participants

This study was carried out among pedestrians aged 18 years and over ( $n = 508$ ) living in the second municipal district of Tabriz city of Iran, which is a candidate safe community. District 2 was chosen for the study because of its distinctive traffic characteristics compared to all other municipal districts of Tabriz. In this district, large shopping centers, hospitals, and universities are located, causing heavy traffic congestion in this area. The inclusion criteria were age of 18 years and over and living in District 2 for at least 10 months. People with mental disabilities were excluded from the study.

### 3.2. Procedure

The cluster sampling method was used to select the sample of adults from 23 July to 21 November 2019. For this purpose, the district was divided into four sections, namely north, south, east, and west. Then, the researcher attended the health centers of each section and randomly selected the households according to their health records in the centers. From each household, people aged 18 years and over were enrolled in the study. The sample size was calculated at 250 according to the study of Jalilian et al. (25) and the sample size calculation formula .

$$n = \frac{\left(z_{1-\frac{\alpha}{2}}\right)^2 \times s^2}{d^2} \quad (1)$$

The sample size was calculated based on the probability of pedestrian risk behavior of 46% (25) with a 95% confidence, an error of 5%, and considering 15% attrition rate ( $n = 500$ ). Written informed consent was obtained from all the participants.

### 3.3. Data Collection and Questionnaire

We used a standardized, structured questionnaire for evaluating traffic behaviors in the past month (29). The questionnaire consisted of six questions related to demographic characteristics (i.e., age, sex, marital status, level of education, walking, and transportation) and 29 items addressing five domains of pedestrians' traffic behaviors, which were rated on a five-point Likert scale (i.e., never, rarely, sometimes, most often, and always). The first domain included seven items on adherence to traffic rules (when crossing the street, after complete stopping of cars and turning the pedestrian light into green), the second domain included 10 items on pedestrians' traffic violations (Most people do not use the pedestrian bridge, rather they prefer to cross the road in risky conditions.), the third domain with seven items measures positive pedestrian behaviors (e.g., I let the car pass, even if I have the priority to pass), the fourth domain with four items measures pedestrians' distraction (e.g., I use hands-free), and the fifth domain contains two items on pedestrians' aggressive behaviors (e.g., If I'm angry with the behavior of a motorcyclist, I hit his vehicle with my hands or feet). Walking rate per day and form of transportation (e.g., personal car, public transportation, and walking) were also asked from the participants.

The average content validity coefficient regarding relevancy, clarity, and overall average were 0.86, 0.88, and 0.87, respectively. To establish the reliability of the questionnaire, the intra-class correlation coefficient and Kendall's tau-b and kappa10 were eliminated, and the questionnaire's Cronbach's alpha coefficient was 0.84.

### 3.4. Analysis

Statistical analyses were performed using SPSS, version 22. The normality of the data was analyzed by the Kolmogorov-Smirnov test. Continuous and discrete variables are presented as mean and standard deviation (SD) and number and percentage, respectively (Table 1). In this study, independent samples *t*-test, multivariate regression, One-way analysis of variance (ANOVA), and chi-square test were used.

## 4. Results

The mean age of the participants was  $36.55 \pm 10.44$  years. Most of the participants (58.5%) were women, and

**Table 1.** Demographic Characteristics of the Participants<sup>a</sup>

Parameters	Men	Women	P-Value
<b>Age</b>			0.027
18 - 27	44 (44.9)	54 (55.1)	
28 - 35	57 (37.5)	95 (62.5)	
36 - 43	51 (35.2)	94 (64.8)	
≤ 44	59 (52.2)	54 (47.8)	
<b>Marital status</b>			
Single	54 (58.7)	38 (41.3)	0.001
Married	157 (37.7)	259 (62.3)	
<b>Level of education</b>			0.013
Illiteracy & elementary	31 (14.7)	34 (11.4)	
Secondary	84 (39.8)	97 (32.7)	
Associate degree	19 (9.0)	42 (14.1)	
Bsc and over	77 (36.5)	124 (41.8)	
<b>Walking rate per day</b>			0.001
Less than 30 minutes a day	70 (32.0)	149 (68.0)	
30 minutes to an hour	89 (42.4)	121 (57.6)	
Above an hour a day	52 (65.8)	27 (34.2)	
<b>Transportation</b>			0.006
Personal car	140 (44.9)	172 (55.1)	
Public transportation	44 (30.8)	99 (69.2)	
Walking	27 (50.9)	26 (49.1)	

<sup>a</sup> Values are expressed as No. (%) unless otherwise indicated.

80.1% of them were married. More than half of the women had a higher level of education (63.4%). Nearly half of the participants (42.9%) stated that they walked for less than 30 minutes every day, and 57.1% stated that they used a personal car to move around the city. There were significant differences between men and women for using personal car and walking daily more than an hour ( $P < 0.05$ ). About 44% of men stated that they used their personal car for transportation, and 65.8% walked more than an hour a day.

Table 1 shows the demographic characteristics of the participants by gender and statistical differences between them. As shown, more men had postgraduate education than women, and single women were more than single men.

Table 2 shows pedestrian traffic behaviors for men and women. There were significant differences in the mean scores of pedestrian traffic behaviors between men and women ( $P < 0.001$ ). Women had significantly higher scores in three domains of pedestrian traffic behaviors (i.e., no traffic violation, not being distracted, and not having aggressive behavior) than men did. Additionally, married

women and women with higher levels of education earned significantly higher scores than others in total pedestrian traffic behaviors and for no traffic violation, not being distracted, and not having aggressive behavior. Women in all age groups had significantly higher scores than men for not having aggressive behaviors.

According to Table 3, gender was a significant predictor for the behaviors in all the domains, except for adherence to traffic rules and positive behaviors. Also, educational status predicted the behaviors in all the domains.

## 5. Discussion

This cross-sectional study was conducted to investigate gender differences in pedestrians' traffic behaviors. Our findings indicated that gender differences exist in pedestrian traffic behaviors in Iran, just as in other countries (22, 30, 31). According to our findings, gender can be a predictor of pedestrian behaviors, such that women had safer traffic behaviors than men. Women had significantly higher safe pedestrian traffic behaviors scores than men in all age groups, except the 28 - 35 years' age group. Gender has been identified to play a role in decision-making in road crossing in that men were more likely than women to cross the road in risky conditions (14). It appears that pedestrian crossing behavior is a predictable factor; thus, pedestrian accidents and deaths can be predicted and prevented (30).

The results showed a significant gender difference in not having aggressive traffic behavior in all the age groups. However, the gender difference for no traffic distraction was observed among pedestrians < 35 years of age, where female pedestrians older than 35 years of age being less distracted than others. Additionally, in line with Deb et al. study, female pedestrians aged 44 years and older had significantly higher scores than male pedestrians and other age groups for no traffic violation. Regarding the mean scores of men and women in the dimensions of violation, aggressive, and distraction, men had more unsafe behaviors than women (32). According to Koh et al., female pedestrians are less likely to violate the traffic rules (31), which can be explained by the tendency of women to be more conservative and more precise, while men tend to be more competitive and controlling (28).

According to our findings, with increasing age (both in women and in men), pedestrians had more safe behaviors and were more frequently assigned to the group of safe behaviors. Similarly, in the study of Antić et al. (33), age had a significant positive correlation with safe traffic behaviors and a negative correlation with violations. Torquato and Bianchi (34) also reported that young pedestrians in the age group of 17-25 years showed more violations than older pedestrians (25 - 49 years), while Granie et al. found that

**Table 2.** Mean Scores of Pedestrian Traffic Behaviors by Gender and Demographic Characteristics<sup>a, b</sup>

Characteristics	Number of questions (Min to Max score)																	
	Total Score: 29 (29 - 145)			Adherence to Traffic Rules: 7 (7 - 35)			No Traffic Violation: 10 (10 - 50)			Positive Behavior: 6 (5 - 30)			No Traffic Distraction: 4 (4 - 16)			No Having Aggressive Behavior: 2 (2 - 10)		
Age	Men	Women	P-Value	Men	Women	P-Value	Men	Women	P-Value	Men	Women	P-Value	Men	Women	P-Value	Men	Women	P-Value
18 - 27	100 (14.77)	109.57 (14.79)	0.002	22.80 (4.43)	24.56 (4.46)	0.054	34.80 (8.15)	38.76 (7.29)	0.013	19.73 (4.45)	21.36 (4.19)	0.061	14.37 (3.31)	15.83 (3.20)	0.092	7.95 (2.30)	9.06 (1.67)	0.07
28 - 35	109.25 (15.60)	112.76 (13.82)	0.151	23.81 (4.18)	24.63 (4.55)	0.267	38.67 (6.99)	40.20 (6.27)	0.089	22.37 (4.56)	21.74 (4.20)	0.397	15.96 (3.01)	16.63 (3.39)	0.224	8.44 (2.19)	9.16 (1.63)	0.025
36 - 43	112.18 (14.80)	116.04 (11.85)	0.08	24.86 (5.15)	24.95 (4.93)	0.923	39.41 (6.33)	40.25 (5.79)	0.237	22.92 (4.66)	23.50 (3.84)	0.424	16.44 (3.14)	17.49 (2.81)	0.009	8.84 (1.92)	9.46 (1.08)	0.015
≥ 44	106.64 (19.03)	113.69 (15.3)	0.034	24.66 (4.62)	24.43 (5.92)	0.814	37.12 (9.17)	40.33 (7.02)	0.040	21.88 (4.17)	21.89 (4.07)	0.992	15.20 (4.32)	17.61 (3.45)	0.002	7.78 (2.84)	9.43 (1.92)	0.001
<b>Marital status</b>																		
Single	102.26 (16.35)	108.05 (16.23)	0.09	22.96 (4.94)	23.37 (5.60)	0.715	35.63 (8.82)	38.39 (7.43)	0.118	20.13 (4.58)	21.18 (5.25)	0.334	15.41 (3.09)	16.24 (4.27)	0.283	8.13 (2.48)	8.29 (2.04)	0.110
Married	109.03 (16.56)	114.17 (13.3)	0.001	24.48 (4.48)	24.87 (4.78)	0.404	38.29 (7.45)	40.50 (6.29)	0.001	22.39 (4.38)	22.45 (3.93)	0.958	15.58 (3.68)	17.04 (3.06)	0.001	8.29 (2.34)	9.34 (1.46)	0.001
<b>Educational level</b>																		
Illiteracy & elementary	96.10 (19.67)	102.82 (13.0)	0.106	22.29 (5.40)	21.74 (4.90)	0.66	33.26 (9.55)	36.06 (5.57)	0.14	20.03 (4.70)	20.09 (4.56)	0.961	13.74 (4.79)	16.15 (3.93)	0.03	6.77 (3.05)	8.79 (2.26)	0.003
Secondary	106.89 (16.24)	113.47 (13.1)	0.003	24.44 (4.45)	23.82 (5.15)	0.39	36.63 (8.13)	40.56 (6.02)	0.001	21.92 (4.16)	22.44 (4.58)	0.42	15.75 (3.52)	17.23 (3.36)	0.004	8.15 (2.47)	9.45 (1.37)	0.001
Associate degree	106.47 (17.23)	110.14 (15.6)	0.41	24 (4.13)	25.1 (5.23)	0.42	36.74 (8.23)	37.69 (8.01)	0.67	21.37 (4.41)	22.07 (4.39)	0.56	16 (2.44)	16.36 (3.48)	0.68	8.37 (2.06)	8.93 (1.77)	0.28
Bsc and over	112.45 (13.55)	117.31 (12.28)	0.009	24.45 (4.54)	26.02 (4.1)	0.013	40.64 (5.43)	41.99 (5.70)	0.09	22.53 (4.75)	22.76 (3.35)	0.69	15.91 (2.98)	17.13 (2.81)	0.004	8.92 (1.70)	9.43 (1.33)	0.02
<b>Walking rate per day</b>																		
Less than 30 minutes a day	108.21 (16.62)	115.14 (13.50)	0.002	24.41 (4.53)	25.29 (4.71)	0.197	37.97 (8.41)	40.77 (6.60)	0.008	22.63 (4.81)	22.81 (3.90)	0.772	15.21 (2.88)	17.01 (3.08)	0.001	7.99 (2.84)	9.27 (1.64)	0.001
30 minutes to an hour	109.24 (14.95)	111.50 (13.82)	0.258	24.20 (4.82)	24.17 (5.08)	0.967	38.64 (6.74)	39.43 (6.27)	0.384	21.73 (4.63)	21.74 (4.35)	0.983	16.01 (3.26)	16.91 (3.44)	0.058	8.65 (1.96)	9.25 (1.50)	0.014
Above an hour a day	102.75 (16.33)	112.15 (15.22)	0.015	23.46 (4.48)	23.59 (4.92)	0.905	35.35 (8.65)	40.85 (6.50)	0.005	20.87 (3.79)	21.48 (4.14)	0.510	15.15 (3.44)	16.70 (3.34)	0.059	7.98 (2.28)	9.52 (1.25)	0.001
<b>Transportation</b>																		
Personal car	107.96 (16.2)	115.34 (13.1)	0.001	24.04 (4.67)	25.30 (5.01)	0.024	37.88 (7.71)	41.01 (5.92)	0.001	21.99 (4.6)	22.54 (4.12)	0.270	15.45 (3.43)	16.98 (3.02)	0.001	8.35 (2.26)	9.37 (1.38)	0.001
Public transportation	106.14 (18.27)	110.51 (15.46)	0.143	24.04 (4.67)	25.30 (5.01)	0.994	37.27 (8.25)	38.95 (7.30)	0.224	21.27 (4.27)	22.01 (4.17)	0.333	15.68 (3.98)	16.66 (3.69)	0.153	7.86 (2.81)	9.08 (1.86)	0.003
Walking	105.78 (17.21)	111.42 (9.94)	0.151	24.41 (4.58)	25.96 (4.52)	0.263	36.74 (8.40)	40.08 (5.93)	0.111	21.78 (4.58)	21.21 (4.03)	0.642	15.74 (3.39)	17.79 (2.70)	0.022	8.37 (2.18)	9.54 (1.21)	0.24

<sup>a</sup>Independent t-test  
<sup>b</sup>Values are expressed as Mean (SD) unless otherwise indicated.

**Table 3.** Predictors of Pedestrian Behaviors According to Demographic Characteristics and Behavioral Dimensions

	Total Score			Adherence to Traffic Rules			No Traffic Violation			Positive Behavior			No Traffic Distraction			Not Having Aggressive Behavior		
	No. (%)	B	P-Value	B	P-Value	B	P-Value	B	P-Value	B	P-Value	B	P-Value	B	P-Value	B	P-Value	
<b>Sex (ref: ≤ women)</b>																		
men	211 (41.5)	-5.01	0.001	-0.24	0.58	-2.31	0.001	-0.01	0.96	-1.39	0.001	-1.03	0.001	-1.03	0.001	-1.03	0.001	
<b>Age (ref: ≤ 44)</b>																		
18-27	98 (19.3)	-8.13	0.001	-1.11	0.13	-3.04	0.005	-1.58	0.01	-1.98	0.001	-0.41	0.17	-0.41	0.17	-0.41	0.17	
28-35	152 (29.9)	-3.59	0.05	-1.28	0.037	-0.80	0.36	-0.64	0.23	-0.68	0.11	-0.17	0.47	-0.17	0.47	-0.17	0.47	
36-43	145 (28.5)	-0.39	0.83	-0.65	0.29	-0.43	0.62	0.62	0.25	-0.10	0.80	0.18	0.48	0.18	0.48	0.18	0.48	
<b>Marital status (ref: Married)</b>																		
Single	92 (18.1)	-2.1	0.27	-1.12	0.07	-0.58	0.52	-0.85	0.13	0.44	0.31	0.01	0.97	0.01	0.97	0.01	0.97	
<b>Level of education (ref: BSc and over)</b>																		
Illiteracy & Elementary	65 (12.8)	-16.43	0.001	-3.62	0.001	-6.77	0.001	-2.51	0.001	-2.10	0.001	-1.40	0.001	-1.40	0.001	-1.40	0.001	
Secondary	181 (35.6)	-4.12	0.005	-1.21	0.01	-2.30	0.001	-0.28	0.50	0.006	0.98	-0.32	0.10	-0.32	0.10	-0.32	0.10	
Associate degree	61 (12)	-5.98	0.002	-0.51	0.45	-4.14	0.001	-0.69	0.25	-0.57	0.23	-0.54	0.05	-0.54	0.05	-0.54	0.05	
<b>Walking (min/day) (ref: &gt;60)</b>																		
30 >	219 (43.1)	3.54	0.07	0.97	0.14	1.04	0.27	1.23	0.03	0.38	0.41	-0.09	0.71	-0.09	0.71	-0.09	0.71	
31-60	210 (41.3)	2.86	1.39	0.42	0.50	1.10	0.23	0.41	0.47	0.64	0.15	0.27	0.29	0.64	0.15	0.27	0.29	
<b>Transportation mode (ref: Walking or Bicycle)</b>																		
Personal car	312 (4.61)	-2.83	0.21	-0.51	0.49	-0.44	0.68	-0.34	0.60	-1.25	0.01	-0.27	0.36	-1.25	0.01	-0.27	0.36	
Public transportation	143 (28.1)	-3.98	0.09	-0.77	0.32	-1.12	0.31	-0.38	0.58	-1.17	0.03	-0.52	0.10	-1.17	0.03	-0.52	0.10	

pedestrians aged 35 - 45 years had the most positive behaviors (35). It seems that although pedestrians have different behavioral patterns in both developing and developed countries, they show similar types of gender differences in traffic behaviors (28, 31-35). Other existing evidence confirms that advancing age leads to a reduction in violations in pedestrians and drivers. Age has been reported as a factor for decision making in crossing the road among pedestrians (14). Additionally, adolescents and college students use technology more than others, which may lead to distracted walking (36).

According to the findings of our study, with increasing the level of education, safe behaviors in pedestrians was significantly increased (both in women and in men), which was consistent with Zheng et al. results (37). In another research (38), pedestrians with higher levels of education were more likely to use pedestrian bridges because those with higher education were more concerned about their personal safety while crossing the street. The education level of pedestrians may determine their behaviors and decisions when crossing the road.

In our study, people who walked less than 30 minutes exhibited safe behaviors more than other people. Pedestrians who walked more frequently as a means of transport were more likely to display unsafe behaviors than private car drivers. The results of Granie et al. (35) are consistent with these findings. Pedestrians who walk to school, office, and shops almost every day because of their obligations, they are in a hurry and choose the shortest route and focus on reaching the destination. This causes certain violations and leads to the display of aggressive behaviors to other road users.

Understanding which groups of pedestrians exhibit the most unsafe behaviors may help planners and policymakers to account for them. Since female pedestrians showed safe traffic behaviors, it is necessary to design interventions to promote safe pedestrian traffic behaviors for men.

### 5.1. Limitations of the Study

The study has some limitations; first, it was performed in only one district of Tabriz. Second, given the fact that the data collection tool was a questionnaire and the information was collected as self-report, there is the potential of overestimating/underestimating the data. Third, children were not included in this study.

### 5.2. Conclusions

Our findings showed gender differences in the five dimensions of pedestrian traffic behaviors in Iran. Gender-specific risk reduction strategies (for example, increasing risk perception among male pedestrians in the na-

tional driving licensing curriculum) in Iranian pedestrians' safety intervention programs may promote the safe traffic behaviors of pedestrians.

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### Footnotes

**Authors' Contribution:** MH, HN, HSB, and FBA were responsible for the study design. MH did the analyses. LJ was responsible for data interpretation. MH helped in the study design and data gathering, MH and LJ helped in drafting the manuscript. All authors have read and approved the final manuscript.

**Conflict of Interests:** The authors declare no conflicts of interest.

**Ethical Approval:** The study received ethical approval from the Ethics Committee of Tabriz University of Medical Sciences (No: IR.TBZMED.REC.1396.1091).

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