



ORIGINAL ARTICLE

## Socioeconomic Factors Affecting Willingness to Pay for Non-Alcoholic Fatty Liver Care in Isfahan City

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### ABSTRACT

**Background:** Non-alcoholic fatty liver disease (NAFLD) is recognized as one of the most common metabolic diseases worldwide. Given the increasing prevalence of this disease and its serious complications, examining the willingness to pay for treatment costs is of particular importance. This study aims to identify and analyze factors affecting the willingness to pay for treatment costs among patients with fatty liver disease.

**Methods:** This descriptive-analytical study was conducted using a regression model. Patients diagnosed with NAFLD who referred to the lifestyle clinic in Isfahan were studied. Data were collected using a standardized willingness-to-pay questionnaire and analyzed using SPSS<sub>25</sub> and statistical tests including Chi-square and multivariate logistic regression.

**Results:** The mean willingness-to-pay score was 3.25. Findings showed that variables such as age (P-value=0.035), gender (P-value=0.045), income (P-value=0.003), and basic insurance coverage (P-value=0.001) significantly affected willingness to pay (WTP). Moreover, the study indicated that WTP significantly decreased after a 20% tariff increase for NAFLD care services (P-value=0.003).

**Conclusion:** There was a relative WTP for these services within the studied community, and socioeconomic factors played a critical role in determining this willingness. Moreover, the significant decrease in WTP following tariff hikes reflected consumer sensitivity to price changes. It is recommended that future studies delve deeper into these factors and the long-term impacts of pricing changes on access and utilization.

**Keywords:** Health Expenditure, Patient Behavior, Willingness to Pay, Non-Alcoholic Fatty Liver Disease, Isfahan

### Introduction

Non-alcoholic fatty liver disease (NAFLD) is one of the most common causes of chronic liver disease worldwide (1). Its incidence is estimated at about 20 new cases annually per 10,000 people. Some studies have indicated that peak incidence occurs in individuals in their 60s (2). The global prevalence ranges between 3% to 25% across countries (3). Studies have suggested that increasing prevalence in Asian countries is primarily due to lifestyle changes such as high-fat diets, low physical activity, obesity, and type 2 diabetes. For instance, hepatic steatosis alone occurs in 16% to 30% of the general

population (4). In Iran, NAFLD prevalence ranges from 2.9% to 7.1% depending on the population studied (5-8).

Beyond clinical and medical aspects, the economic burden and healthcare costs associated with NAFLD are critical for health system planning. NAFLD affects roughly 25% of the global population and is expected to impose significant medical and societal costs (9). Direct medical costs include diagnosis, treatment, and disease management, encompassing physician visits,

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diagnostic tests (e.g., blood tests, imaging, liver biopsy), medications, hospitalization for complications (e.g., liver failure, liver cancer), and liver transplantation in severe cases (10-12).

However, comprehensive cost-of-illness studies remain limited. For example, a French study estimated annual hospital costs per patient at €7,736, increasing with disease severity (13). In Italy, inpatient care cost averaged €8,762 per patient (14). Other studies estimated costs between €354 to €1,163 per patient across several European countries (15). Cost-of-illness studies typically aim to identify the economic impact of a disease on society and healthcare systems through type and magnitude of incurred costs (16).

In addition to direct costs, assessing individuals' willingness to pay (WTP) for treatment offers further insight. WTP quantifies perceived value of health services and is often used in health economics to inform resource allocation (17). This can be assessed using revealed preferences (market behavior) or stated preferences (direct surveys) (18). WTP is widely applied in economic evaluations of health services. Although various Iranian (19-21) and international (22-29) studies have examined WTP in healthcare, limited research exists specifically for NAFLD. Thus, this study aimed to determine WTP and related socioeconomic factors among NAFLD patients.

## Materials and Methods

This cross-sectional analytical study used both literature review and field survey. Data were collected in 2023 via a structured questionnaire. The statistical population included all NAFLD patients who had been diagnosed at least one year prior and referred to the Iranian Health Specialty Clinic in Isfahan. A census sampling method was employed, including all 102 eligible patients unless they opted out.

To evaluate WTP before and after a service tariff increase during two three-month of care periods, data were gathered using the same WTP questionnaire. The care package included physician visits, diagnostic tests, imaging, nutrition counseling, body analysis, psychological counseling, physical activity consultation, and lifestyle education, each with specified tariffs that were raised by 20% in the second period. A total of 102 patients completed the questionnaire (39 before and 63 after the tariff hike).

The questionnaire had two parts: demographic data (including 19 items covering age, gender, marital status, education, employment, household size, income, expenses, insurance, duration of illness, and clinic service use) and WTP assessment (10 Likert-scale items from "strongly disagree" to "strongly agree"). Higher scores indicated greater WTP. Validity was confirmed by experts and reliability was measured by Cronbach's alpha 0.85 (30).

Data were analyzed using SPSS<sub>25</sub> with descriptive statistics, chi-square tests, and logistic regression. Since WTP was rated on a 1–5 scale, a score of 3 was used as the threshold: scores above 3 indicated willingness, and below 3 indicated unwillingness.

## Results

Most respondents aged 31–40 (24.5%), with the fewest over 60 (12.7%). The mean age was 44.5 years (SD=13.5). Totally 42% were male; 84.4% were married and most had a high school diploma (32.4%). Employment status showed that 39.2% were unemployed due to the older age and higher female participation. The majority had a household income of 100–150 million IRR (42.2%) and expenses in the same range (43%). The most common insurance was Social Security (65.7%), with 62% also holding supplementary insurance (Table 1).

Table 1. Demographics

| Variable  |                     | Frequency | Percent | Variable           |                   | Frequency | Percent |
|-----------|---------------------|-----------|---------|--------------------|-------------------|-----------|---------|
| Age       | <30                 | 18        | 17.6    | Employment status  | Unemployed        | 40        | 39.2    |
|           | 31-40               | 25        | 24.5    |                    | Employed          | 33        | 32.4    |
|           | 41-50               | 23        | 22.5    |                    | Retired           | 29        | 28.4    |
|           | 51-60               | 23        | 22.5    | Household income   | <100 million IRR  | 12        | 11.8    |
|           | 60<                 | 13        | 12.7    |                    | 10-15 million IRR | 43        | 42.2    |
| Gender    | Male                | 43        | 42.2    |                    | 15-20 million IRR | 25        | 24.5    |
|           | Female              | 59        | 57.8    | >20 million IRR    | 22                | 21.1      |         |
| Marital   | Single              | 18        | 17.6    | Household expenses | <100 million IRR  | 18        | 17.6    |
|           | Married             | 84        | 82.4    |                    | 10-15 million IRR | 44        | 43.1    |
| Education | Illiterate          | 10        | 9.8     |                    | >15 million IRR   | 40        | 39.2    |
|           | High school Diploma | 33        | 32.4    | Insurance          | Social Security   | 67        | 65.7    |
|           | Associate degree    | 22        | 22      |                    | Iranian insurance | 15        | 14.7    |
|           | Bachelor            | 12        | 11      |                    | Army              | 9         | 8.8     |
|           | Master and PhD      | 25        | 24.5    |                    | Banks             | 3         | 2.9     |
|           |                     |           | None    |                    | 8                 | 7.8       |         |

A 10% decrease (0.34 points) in mean WTP score was observed after tariff increase. Paired t-test results confirmed a statistically significant difference between two periods (P-value = 0.003) (Table 2).

Table 2. WTP before and after tariff increases

| Group  | Number of respondents | Mean score | SD    | Mean error SD | Paired T-test |                 |                       |
|--------|-----------------------|------------|-------|---------------|---------------|-----------------|-----------------------|
| Before | 39                    | 3.42       | 0.490 | 0.078         | P             | Mean difference | Std. Error Difference |
| After  | 63                    | 3.08       | 0.572 | 0.072         | 0.003         | 0.334           | 0.110                 |

Chi-square and Cramer's V tests showed significant associations between WTP and the variables: age (P-value =0.035), gender (P-value =0.045), income (P-value =0.003), and basic insurance (P-value =0.001). The strength of associations ranged from moderate to high (Table 3).

Table 3. Relationship between independent variables and WTP

| Relationship between independent and dependent variables | Item             | P     | df | sig   |
|----------------------------------------------------------|------------------|-------|----|-------|
| Age and WTP                                              | Chi-square       | 3.468 | 1  | 0.035 |
|                                                          | Likelihood ratio | 3.954 | 1  | 0.031 |
|                                                          | Cramer's V       | 0.363 |    | 0.003 |
|                                                          | Valid Items      | 102   |    |       |
| Gender and WTP                                           | Chi-square       | 9.128 | 1  | 0.045 |
|                                                          | Likelihood ratio | 8.954 | 1  | 0.039 |
|                                                          | Fisher           |       |    | 0.045 |
|                                                          | Cramer's V       | 0.073 |    | 0.045 |
|                                                          | Valid Items      | 102   |    |       |
| Household income and WTP                                 | Chi-square       | 8.309 | 2  | 0.003 |
|                                                          | Likelihood ratio | 8.573 | 2  | 0.003 |
|                                                          | Cramer's V       | 0.373 |    | 0.005 |
|                                                          | Valid Items      | 102   |    |       |
| Insurance and WTP                                        | Chi-square       | 8.569 | 4  | 0.001 |
|                                                          | Likelihood ratio | 8.702 | 4  | 0.001 |
|                                                          | Cramer's V       | 0.463 |    | 0.035 |
|                                                          | Valid Items      |       |    |       |

Overall, the results obtained from chi-square correlation test indicated various relationships between independent variables and dependent variable, "WTP" in patients with NAFLD. Variables that showed a significant association included age,

gender, income level, and insurance status. Subsequently, the relationship between these variables was further analyzed using regression testing (Table 4).

Table 4. Regression results

| Variable    | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Income 1 | Income 2 | Income 3 | Income 4 | Male | Female | Insurance 1 | Insurance 2 | Insurance 3 | Insurance 4 | Insurance 5 |
|-------------|-------|-------|-------|-------|-------|----------|----------|----------|----------|------|--------|-------------|-------------|-------------|-------------|-------------|
| Coefficient | 1.23  | 0.48  | 0.36  | 0.14  | 0.34  | 0.11     | 0.49     | 0.78     | 0.31     | 0.89 | 1.39   | 2.21        | 0.67        | 0.18        | 0.14        | 0.08        |
| sig         | 0.24  | 0.01  | 0.53  | 0.01  | 0.00  | 0.00     | 0.23     | 0.01     | 0.04     | 0.00 | 0.00   | 0.03        | 0.00        | 0.41        | 0.00        | 0.00        |

- Age: Increased age correlated with decreased WTP.
- Income: Higher income groups had higher WTP.
- Gender: Males showed lower WTP than females.
- Insurance: Group 1 insurance holders had higher WTP compared to other insurance types.

Discussion

WTP for healthcare services is a critical factor in understanding how individuals value healthcare and their ability to access it. This concept is particularly significant in low- and middle-income countries, where out-of-pocket expenditures are substantial. Various studies have examined determinants and levels of WTP across different health services and regions, highlighting a complex interplay of socio-economic and demographic factors (26,27). The present study explores social and demographic factors affecting WTP for fatty liver disease care.

The findings indicated that several variables, including age, gender, income level, and basic insurance status, significantly affected WTP for fatty liver care. Moreover, the results showed that the WTP for NAFLD care decreased significantly following an increase in service tariffs.

While WTP for healthcare is affected by various factors, it is often lower than the actual cost of services, particularly in low-income settings. This discrepancy underscores the need for targeted interventions, such as financial subsidies and educational campaigns, to enhance access and equity in healthcare (5). Moreover, understanding determinants of WTP can help policymakers design more effective health financing strategies that

consider the socio-economic realities of different populations.

Based on the findings of this study, individuals in different age and gender groups exhibited different behaviors in response to healthcare costs due to cultural, economic, and social differences. Younger individuals and those with higher incomes may be more willing to pay for medical care, whereas older individuals or those with lower incomes may have reduced WTP due to financial constraints. Furthermore, the study highlighted that increased healthcare tariffs significantly affected WTP. This suggests that rising costs may lead to reduced access to medical services, particularly in cases where basic insurance coverage is insufficient. This decline in WTP may ultimately exacerbate health problems and increase the burden of disease in society.

The results of this study emphasize the need for policymakers and decision-makers to consider the socio-economic variables affecting WTP and develop strategies to facilitate access to healthcare services. Economic effects on different population segments should also be considered in financial planning and service pricing. Ultimately, raising awareness and education about liver diseases and prevention methods could contribute to an increased WTP for medical care and improved healthcare outcomes.

The findings indicated that WTP increased with income. WTP was minimal among individuals with an income below 10 million tomans but reached its maximum in groups earning above 15 million tomans. This suggests that higher-income patients are more willing to cover treatment costs. Therefore, implementing supportive policies for lower-income patients could enhance their access to healthcare and prevent complications arising from lack of treatment. A study on willingness to purchase health insurance found that household income significantly affected willingness to buy coverage (31), aligning with the findings of the present study. However, another study on dental services did not find a significant effect of income on WTP (32). Jafari et al. (30) identified that education level, employment status, actual income, disease history, health status, frequency of doctor visits, actual healthcare costs, and satisfaction with healthcare services are influential factors in WTP. Cerda et al. (33) also found that income level, education, and having a family member affected by COVID-19 increased the likelihood of individuals paying more for vaccines. The findings of the present study align with these observations. Studies conducted in other countries have identified age, marital status, employment status, and income level as key determinants of WTP. For instance, younger individuals and those with higher incomes generally exhibited greater WTP for healthcare services (28,27). Another study found that factors such as employment status, marital status, family history of medical care, awareness level, medical history, distance to healthcare centers, and wealth index affected WTP (29).

Furthermore, the results indicated that men had a lower WTP for fatty liver disease care compared to women (1.39). This difference may be attributed to cultural and economic factors shaping financial behaviors across genders. Catma et al. (34) reported similar findings, showing that women have a higher WTP for vaccination services than men. In this regard, tailored financial and medical counseling for men could enhance their WTP.

Age has also been identified as a significant factor affecting WTP. The findings showed that WTP

decreased with age, with older patients being less willing to cover treatment costs. This could be related to financial conditions and perceptions of illness. Consequently, designing specific treatment programs for different age groups is essential. Faisalprapa et al. (35) found that WTP for screening services increased among older individuals due to cost-effectiveness considerations. However, this finding contradicts the results of the present study.

Basic insurance status was also found to be a key determinant of WTP, consistent with the findings of Mohammadi et al. (36). Their study highlighted that basic insurance, along with household income, risk aversion, employment status, and marital status, significantly affected WTP for supplemental health insurance services.

### Limitations

Given that this study was conducted within a limited population in Isfahan, caution should be exercised when generalizing the results. However, the findings provide valuable insights for policymakers.

### Conclusion

Various factors can affect patients' WTP for NAFLD care, including age, gender, household income level, and basic insurance coverage. Moreover, an increase in service tariffs has led to a decline in WTP. These findings highlight the importance of improving insurance coverage for healthcare services and implementing educational programs to raise awareness among patients across different age groups and cultural backgrounds.

It is recommended that policy strategies in education, finance, and innovative technologies be considered to enhance WTP. Such measures can assist healthcare managers and providers in improving service quality and increasing patient satisfaction. These findings contribute to the development of effective health policies and improved access to medical services while addressing the specific needs of patients.

### Ethical considerations

This article is derived from the master's thesis of

Arman Kolahdouzan (2024), No. 162950236, approved at the meeting held on December 6, 2024, at the Islamic Azad University, Tehran Province. The research team ensured participant anonymity to safeguard privacy and minimize any potential consequences. All sources have been properly cited to maintain academic integrity and avoid plagiarism.

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### Authors' contributions

A.K, L.R and S.B contributed to the design of the study; A.K collected the data; L.R and S.B analyzed and interpreted the data; A.K wrote the first draft of the manuscript; L.R reviewed the manuscript; and S.B critically revised the manuscript. All authors read and approved the submitted version.

### Conflict of interests

The authors declared no conflict of interests.

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