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# Exploring Acceptance and Influencing Factors of Prenatal Tests Among Women of Reproductive Age

Reprodüktif Çağdaki Kadınlar Arasında Prenatal Testlerin Kabulü ve Etkileyen Faktörlerin Araştırılması

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## ABSTRACT

Prenatal screening and diagnostic tests are essential for identifying congenital anomalies and genetic disorders during pregnancy. Understanding the factors influencing acceptance of these tests can improve maternal and fetal health outcomes. This study examined the acceptance of prenatal screening and diagnostic tests among women aged 18–49 and the factors influencing their hypothetical decision-making attitudes.

Using a cross-sectional design, data were collected from 1266 women who had been pregnant at least once in a university hospital and family health centers in Ankara, Türkiye. Participants were asked whether they would hypothetically accept these tests in a future pregnancy.

Results showed that 53.1% of participants would accept only non-invasive tests, while 37.5% would also accept invasive tests. The primary reasons for rejecting the tests were concerns about adverse outcomes (59.2%), unwillingness to consider pregnancy termination (23.8%), and test-related anxiety (17.3%). Multivariate logistic regression revealed significant associations between test acceptance and higher educational level, income, and the extent of information received. Women informed by healthcare professionals demonstrated significantly higher acceptance rates for invasive tests.

The findings emphasize the importance of comprehensive counseling and targeted health education to enhance awareness and reduce anxiety surrounding prenatal tests. Improving health literacy and promoting informed decision-making can help women navigate these critical healthcare choices.

**Key Words:** Decision Making, Health Literacy, Prenatal Diagnosis, Prenatal Screening

## ÖZ

Prenatal tarama ve tanı testleri, gebelik sırasında konjenital anomalileri ve genetik bozuklukları belirlemede hayati öneme sahiptir. Bu testlerin kabulünü etkileyen faktörlerin anlaşılması, anne ve fetüs sağlığı sonuçlarını iyileştirebilir. Bu çalışma, 18-49 yaş arasındaki kadınların prenatal tarama ve tanı testlerini kabul düzeylerini ve varsayımsal karar verme tutumlarını etkileyen faktörleri incelemiştir.

Kesitsel bir tasarım kullanılarak, Ankara'da bir üniversite hastanesinde ve aile sağlığı merkezlerinde en az bir kez gebe kalmış 1266 kadından veri toplanmıştır. Katılımcılara, gelecekte hamile kalmaları durumunda bu testleri varsayımsal olarak kabul edip etmeyecekleri sorulmuştur.

Sonuçlar, katılımcıların %53,1'inin yalnızca girişimsel olmayan testleri kabul edeceğini, %37,5'inin ise girişimsel testleri de kabul edeceğini göstermiştir. Testleri reddetmenin başlıca nedenleri, olumsuz sonuçlara ilişkin endişeler (%59,2), gebeliğin sonlandırılmasını düşünmeme isteği (%23,8) ve testlerden kaynaklanan kaygı (%17,3) olarak belirlenmiştir. Çok değişkenli lojistik regresyon analizleri, test kabulünün yüksek eğitim seviyesi, gelir düzeyi ve alınan bilginin kapsamı ile anlamlı şekilde ilişkili olduğunu ortaya koymuştur. Ayrıca, sağlık çalışanları tarafından bilgilendirilen kadınların girişimsel testleri kabul etme oranlarının anlamlı derecede yüksek olduğu görülmüştür.

Bu bulgular, prenatal testler hakkında farkındalığı artırmak ve bu testlere ilişkin kaygıları azaltmak için kapsamlı danışmanlık ve hedefe yönelik sağlık eğitiminin önemini vurgulamaktadır. Sağlık okuryazarlığını geliştirmek ve bilinçli karar verme süreçlerini teşvik etmek, kadınların bu kritik sağlık hizmetlerini daha iyi anlamalarına yardımcı olabilir.

**Anahtar Kelimeler:** Karar Verme, Prenatal Tanı, Prenatal Tarama, Sağlık Okuryazarlığı

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## INTRODUCTION

Congenital anomalies represent a significant public health issue worldwide, causing neonatal mortality and lifelong morbidity and affecting societies from medical, social, and economic perspectives.[1] The global incidence of congenital anomalies is approximately 6%, with 94% of cases reported in low- and middle-income countries. According to the World Health Organization (WHO), an estimated 240.000 newborns die annually within the first 28 days of life due to congenital anomalies. While the specific causes of many congenital anomalies remain unidentified, genetic, infectious, and environmental risk factors are thought to play a role.[2]

Prenatal tests are crucial during pregnancy to identify existing or potential fetal disorders at an early stage. These tests are categorized into two main types: invasive and non-invasive methods. [3, 4] Non-invasive methods include ultrasonography and biochemical tests such as double, triple, and quadruple screening and cell-free fetal DNA testing. Invasive methods include amniocentesis, chorionic villus sampling (CVS), cordocentesis, and coelomic fluid sampling.[5] Non-invasive methods primarily serve as screening tests that identify risks. If a risk is detected, individuals are informed and decide whether to proceed with invasive diagnostic procedures, which offer higher reliability.[6]

Despite differences across countries, prenatal screening tests have become standardized in many regions due to their reliability in determining congenital anomaly risks and ease of application.[7] The American College of Obstetricians and Gynecologists (ACOG) recommends routine genetic counseling and screening tests.[8] Similarly, the National Institute for Health and Care Excellence (NICE) emphasizes in its Antenatal Care Guideline that screening for Down syndrome (trisomy 21), Edwards syndrome (trisomy 18), and Patau syndrome (trisomy 13) should be recommended for all pregnancies.[9] In Türkiye, the Ministry of Health has prepared the Prenatal Care Management Guideline to protect maternal and infant health. This guideline recommends nuchal translucency and combined testing via ultrasonography between 11–14 weeks, maternal serum AFP and triple/quadruple testing between 16–20 weeks (if combined testing has not been conducted), and fetal anomaly screening through ultrasonography between 18–22 weeks. These tests are offered free of charge and voluntarily to all pregnant women in Türkiye.[10]

The detection of genetic disorders through prenatal tests depends primarily on pregnant women's awareness and acceptance of these tests. Studies have shown that acceptance of prenatal tests is influenced by sociodemographic characteristics, education level, clinical factors (such as high anomaly risk, history of abortion, or infertility treatment), perceived benefits and risks, and knowledge levels regarding prenatal tests.[11-14] Globally, several studies have explored attitudes, awareness, and acceptance of prenatal tests in various populations.[15, 16] Although some research has examined knowledge, attitudes, and understanding regarding prenatal tests in Türkiye, studies addressing test acceptance among pregnant women are limited.[17]

Prenatal tests allow parents to participate in decision-making actively and to select the option that best aligns with their views. For parents aiming for a healthy baby, these tests can provide critical information to guide termination decisions if an anomaly is detected. For those who do not consider termination, the tests help in preparing for caregiving and accepting the baby. [4, 18, 19] Increasing awareness about prenatal screening tests and emphasizing their importance requires conducting more studies, particularly among individuals from diverse socioeconomic backgrounds and those accessing various healthcare services.

This study examines the factors influencing the acceptance of prenatal screening tests among women attending family health centers (FHCs) in certain districts of Ankara and a university hospital's

obstetrics and gynecology outpatient clinic. It also explores the relationship between these factors and demographic characteristics to provide insights for enhancing maternal and fetal healthcare policies.

## MATERIALS AND METHODS

### Study design and sampling

This research is a cross-sectional study conducted with women aged 18-49, either currently pregnant or who have been pregnant before, attending the Gazi University Hospital Obstetrics and Gynecology clinics and specific family health centers within the borders of Ankara. The study was conducted in primary and tertiary healthcare settings to capture diverse demographic profiles, as sociodemographic characteristics may vary between healthcare levels.

When calculating the sample size, the total number of individuals attending the university's obstetrics and gynecology clinic within the week before the study was determined to be 301. The aim was to achieve maximum participation, and surveys were conducted with 286 individuals attending the Gazi University Faculty of Medicine Hospital's Obstetrics and Gynecology Pregnancy Clinic, corresponding to 95% of the target population. For the family health centers, it was determined that 1531 women aged 18 and above attended the clinics a week before the study. The sample size was calculated with an unknown frequency of 50%, a margin of error of 2%, and a 95% confidence interval, resulting in a target of 936 women, and 980 women were surveyed. A total of 1266 women participated in the study.

### Data Collection

Data were collected through face-to-face interviews with individuals waiting for or completing their examinations between September 10 and 14, 2018. In the study, a questionnaire consisting of 68 questions was used. The questionnaire, developed by the researchers, included nine questions on demographic information, 28 on pregnancy and health-related data, and 31 on participants' knowledge of prenatal diagnostic methods and related diseases.

### The ethical aspect of the research

The necessary permissions for the study were obtained from the Ethics Committee of Gazi University, the Chief Physician's Office of Gazi University Health Research and Application Center (Gazi Hospital), and the Ankara Provincial Health Directorate. The Gazi University Ethics Committee granted ethical approval for the study on 19.12.2017 (Decision No: 2017- 465).

### Statistical analyses

The study data were evaluated using the SPSS 20.0 version of statistical software. Descriptive statistics were presented for categorical variables using frequency and percentage, and for continuous variables, using mean ± standard deviation and median (minimum, maximum values). Categorical variables were compared using Pearson's Chi-square and Fisher's exact tests. The normality of continuous variables was assessed using visual (histograms and probability plots) and analytical methods (Kolmogorov-Smirnov / Shapiro-Wilk tests). Normally distributed data were presented as mean ± standard deviation, while non-normally distributed data were summarized as median (range: minimum-maximum). Comparisons between two independent groups with normal distribution were evaluated using Student's t-test. The Mann-Whitney U test was used for two independent groups that did not follow a normal distribution. For comparisons of more than two independent groups, the Kruskal-Wallis test was used.

For the dependent variable of whether prenatal screening/diagnostic tests were accepted when suggested, independent variables such as age, total number of pregnancies, education status, employment status, total monthly household income, familial relationship with the partner/child's father, presence of any health problems, smoking, religious beliefs, awareness of

congenital diseases in babies, awareness of Down syndrome, awareness of neural tube defects, knowledge about the existence of prenatal diagnosis, and the level of information received were considered. Univariate analyses were performed for each variable, and significant variables were subsequently included in multivariate logistic regression models to identify independent predictors. Statistical significance was accepted at $p<0.05$.

## RESULTS AND DISCUSSION

A total of 1266 women of reproductive age with at least one pregnancy (18-49 years of age) participated in the study. When the frequency of acceptance of prenatal screening/diagnostic tests is recommended, 53. 1% would accept only non-invasive tests (blood tests, USG), 37.5% would accept both non-invasive (blood tests, USG) and invasive tests (amniocentesis, chorionic villus sampling, cordocentesis, etc.), and 9.4% would not accept any test (Table 1).

**Table 1. Distribution of Descriptive Characteristics of the Participants**

| Variables | Number (n) | Percent (%) |
|---|---|---|
| **Acceptance Status of Tests if Suggested** | **1266** | |
| I do not accept any test | 119 | 9.4 |
| I accept only non-ınvasive tests | 672 | 53.1 |
| I also accept ınvasive tests | 475 | 37.5 |
| **Reasons for Not Accepting Tests** | **791** | |
| I believe there may be side effects and adverse outcomes | 468 | 59.2 |
| I would not consider termination even if my baby is sick | 188 | 23.8 |
| The tests cause stress/anxiety for me | 137 | 17.3 |
| I think the tests are insufficient in detecting diseases | 110 | 13.9 |
| I do not believe the tests will give accurate results | 93 | 11.8 |
| I do not want to take the tests due to my beliefs | 62 | 7.8 |
| I think the tests are unnecessary. | 62 | 7.8 |
| Other | 21 | 2.7 |
| **Reasons For Accepting the Test*** | **1137** | |
| Because I want a healthy child | 609 | 53.6 |
| To gain information | 606 | 53.3 |
| To alleviate my concerns | 462 | 40.6 |
| If recommended by my doctor, I will accept it | 347 | 30.5 |
| For treatment purposes | 297 | 26.1 |
| Personal risks (high-risk pregnancy, miscarriage, history of anomalies, etc.) | 142 | 12.5 |
| To decide whether to accept other invasive tests | 103 | 9.1 |
| Other reasons | 11 | 1.0 |
| **Information Status** | **1266** | |
| Yes | 520 | 41.0 |
| No | 746 | 59.0 |
| **Content of Information Provided*** | **520** | |
| Explanation of the reason and importance of the tests to be conducted | 403 | 77.5 |
| Explanation of how the procedures will be performed | 357 | 68.7 |
| Explanation of the benefits and risks of the procedures | 332 | 63.8 |
| Explanation of what could happen after the procedure | 211 | 40.6 |
| Explanation of the steps of the procedure and what should be done afterward | 182 | 35.0 |
| Providing information about the test results | 274 | 52.7 |
| Informing my spouse and accompanying individuals | 94 | 18.1 |
| Providing psychological support | 40 | 7.7 |
| Other | 3 | 0.6 |
| **Person Providing the Information*** | **520** | |
| Obstetrician at the follow-up site | 460 | 88.5 |
| Family doctor | 48 | 9.2 |
| Midwife/Nurse at the Family Health Center | 28 | 5.4 |
| Midwife/Nurse at the follow-up site | 22 | 4.2 |
| Other | 5 | 1.0 |

*: Multiple options were selected

A survey conducted in the US on the acceptance of non-invasive tests found that about 40% of pregnant women accepted non-invasive tests, while 60% did not.[20] The variability in insurance coverage in the US, where most private insurances only pay for high-risk pregnancies, may explain this situation. In Germany, 45% of pregnant women accepted invasive tests, while 34% were undecided, awaiting non-invasive test results.[21] The fact that 61% of participants had a high-risk pregnancy due to advanced maternal age (≥ 35 years) may have made them more inclined to accept invasive tests. A study conducted in Türkiye in 2021 found that the frequency of participants who reported undergoing one of the prenatal screening tests (double/triple/quadruple screening) was 36%.[17] Since the acceptance of tests in this current study was examined as a priori attitude, the frequency we found may be higher than the actual acceptance rate. However, considering that prenatal screening is offered free of charge and accepted as part of prenatal care in Türkiye, the frequency of screening tests found in previous studies and this research, especially for invasive tests, is seen to be low. This situation suggests that participants prefer less risky tests and may experience some hesitation in accepting invasive tests.

When the reasons for accepting the tests were examined, among the participants who stated that they would accept any test, 53.6% stated that they would accept the test because they wanted a healthy child, 53.3% stated that they would accept the test because they wanted information, about 40% said they would receive the tests to alleviate their concerns, and about 30% said they would take them if recommended by their doctor (Table 1). In another study conducted in Türkiye in 2024, 40% of women who had previously given birth stated that they wanted to undergo testing because of their doctor's recommendation, 26% said it was to obtain information, and 20% thought it would be beneficial. Differences in the study populations and the years in which they were conducted may have caused differences in the reasons for acceptance. The 2024 study was conducted only on pregnant women, where doctors' recommendations were more prominent, while in this 2018 study, the desire for information was more emphasized. This difference may reflect a shift in preference over time from difficulty accessing information to listening to trusted advice. The role of healthcare professionals as information providers directly impacts women's decisions regarding prenatal tests. This influence is especially likely to be observed in pregnant women in the short term.[22]

Regarding the reasons for not accepting any test, 59.2% of the women stated that they believed that there might be side effects and negative consequences, 23.8% indicated that they did not think of aborting their child even if the child was already sick, and 17.3% stated that they did not accept the test because the tests caused stress/anxiety (Table 1). In a 2016 study in Türkiye, when pregnant women who considered rejecting screening tests were asked about their reasons, 38% said "avoiding feeling bad in case of a bad result," 33% said they didn’t believe the test was necessary, and 19% were concerned about the possibility of harming the baby.[23] In a 2021 study conducted at a university hospital in Türkiye, the most common response for not undergoing screening tests was that they did not think the test was necessary.[24] A lack of adequate information about the advantages of prenatal tests, low awareness of this issue, concerns about the reliability of the tests, or a refusal to consider pregnancy termination may lead parents to perceive the tests as unnecessary. However, the primary aim of these tests is not to encourage abortion in case of any adverse outcome but rather to enable individuals to make informed decisions through counseling and, beyond that, to prepare families for potential anomalies in the child psychologically. Providing comprehensive information about prenatal tests and supporting parents in decision-making can enhance awareness and enable informed choices.

In this study, it was found that only 41% of women were informed about prenatal tests.

When examining the sources of information, 88.5% were informed mainly by obstetricians, about 9% by family doctors, and 5% by midwives/nurses at the family medicine center (Table 1). In a similar study conducted by Uğurlu et al. in 2022, it was also found that obstetricians informed 60% of pregnant women, and 60% were informed by nurses.[25] Pregnant women are thought to receive information about screening tests when they visit obstetrics clinics for more detailed examinations and follow-ups. Both studies emphasize the role of obstetricians and the midwives/nurses working there in raising awareness about prenatal tests. Additionally, providing pre-information about prenatal screening tests, which are part of prenatal care, to women who visit primary care centers for pregnancy planning or follow-up could further increase awareness in this area.

In Table 2, the analysis of test acceptance based on the descriptive characteristics of the participants is presented.

**Table 2. Analysis of Test Acceptance Based on Participants' Descriptive Characteristics**

| Descriptive Characteristics | n (%) | Do Not Accept Any Test [1] (n=119) | Accept Only Non-Invasive Tests [2] (n=672) | Accept Invasive Tests as Well [3] (n=475) | p-value |
|---|---|---|---|---|---|
| **Age, median (IQR 25-75)** | 1266 | 33.00 (28.00-45.00) | 35.00 (29.00-43.00) | 33.00 (28.00-42.00) | p*=0.820 |
| **Total Number of Pregnancies, median, (IQR 25-75)** | 1266 | 2.00 (1.00-400) | 2.00 (1.00-3.00) | 2.00 (1.00-3.00) | **p*<0.001** a=0.361 **b<0.000** **c=0.003** |
| **Educational Level** | | | | | |
| Primary school graduate | 179 (14.1) | 38 (21.2) | 100 (55.9) | 41 (22.9) | **p#<0.001** |
| Middle school-high school graduate | 647 (51.1) | 59 (9.1) | 378 (58.4) | 210 (32.5) | **a<0.001** **b<0.001** |
| Associate degree/University graduate | 440 (34.8) | 22 (5.0) | 194 (44.1) | 224 (50.9) | **c<0.001** |
| **Employment Status** | | | | | |
| Not working | 757 (60.0) | 88 (11.6) | 419 (55.4) | 250 (33.0) | **p#<0.001** **a=0.015** |
| Working | 509 (40.0) | 31 (6.1) | 253 (49.7) | 225 (44.2) | **b=0.001** **c<0.001** |
| **Monthly Total Household Income** | | | | | |
| Equal to or less than the minimum wage | 51 (4.0) | 11 (21.6) | 29 (56.9) | 11 (21.6) | **p#<0.001** |
| Up to twice the minimum wage | 311 (24.6) | 35 (11.3) | 196 (63.0) | 80 (25.7) | a=0.145 **b<0.001** |
| Up to three times the minimum wage | 373 (29.5) | 31 (8.3) | 200 (53.6) | 142 (38.1) | **c<0.001** |
| Up to four times the minimum wage or more | 531 (41.9) | 42 (7.9) | 247 (46.5) | 242 (45.6) | |
| **Relationship with Spouse or Child's Father** | | | | | |
| No | 1068 (84.4) | 91 (8.5) | 560 (52.4) | 417 (39.0) | **p#=0.006** a=0.071 |
| Yes | 198 (15.6) | 28 (14.1) | 112 (56.6) | 58 (29.3) | b=0.036 **c=0.002** |
| **Presence of Any Health Problems** | | | | | |
| No | 931 (73.5) | 83 (8.9) | 500 (53.7) | 348 (37.4) | p# 0.561 |
| Yes | 335 (26.5) | 36 (10.7) | 172 (51.3) | 127 (37.9) | |
| **Smoking Status** | | | | | |
| I don't smoke | 918 (72.5) | 96 (10.5) | 498 (54.2) | 324(35.3) | **p#=0.026** |
| I smoke | 292 (23.1) | 18 (6.1) | 143 (49.0) | 131 (44.9) | a=0.287 |
| I quit smoking | 56 (4.4) | 5 (8.9) | 31 (55.4) | 20 (35.7) | b=0.048 c=0.019 |

**Table 2. (Continued)**

| | | | | | |
|---|---|---|---|---|---|
| **Religious Beliefs Definition**[€] | | | | | |
| Atheist | 42 (3.7) | 3 (7.1) | 23 (54.8) | 16 (38.1) | **p[#]<0.001[€] a<0.001 b<0.001 c<0.001** |
| Non-Religious Believer | 195 (17.0) | 10 (5.1) | 85 (43.6) | 100 (51.3) | |
| Moderately Religious | 473 (41.3) | 21 (4.4) | 261 (55.2) | 191 (40.4) | |
| Strictly Religious | 436 (38.0) | 63 (14.4) | 247 (56.7) | 126 (28.9) | |

€:120 individuals, those who selected the option "I do not wish to share/answer" in the religious beliefs definition section and did not respond to the question, have been excluded from the analysis.
*: Kruskal Wallis Test [#]: Pearson Chi-Square Test
The letter "a" represents the p-value for the comparison between Group 1 and Group 2, "b" represents the p-value for the comparison between Group 2 and Group 3, and "c" represents the p-value for the comparison between Group 1 and Group 3. Post-hoc comparisons were conducted using Bonferroni correction

The median age of the participants was 34.00 years (range: 18.00–49.00), and the median number of total pregnancies was 2.00 (range: 1.00–14.00). Approximately 51.1% of the participants were middle school or high school graduates, 49.3% were housewives, and 29.5% had a household income up to three times the minimum wage. Among the participants, 84.4% reported having no consanguinity with their partner, 73.5% stated they had no health problems, and 73.5% reported not smoking. Additionally, 41.3% of the participants indicated that they believed in religious principles and tried to follow them as much as possible, but occasionally deviated (Moderately Religious). When analyzed based on test acceptance on specific descriptive characteristics of the participants, statistically significant differences were found in prenatal test acceptance concerning educational level, employment status, income, consanguinity, smoking status, and religious beliefs (Table 2).

Table 3 presents the analysis of test acceptance based on the participants' birth-related characteristics.

**Table 3. Analysis of Test Acceptance Based on Birth-Related Characteristics of the Participants**

| **Birth-Related Characteristics** | **n (%)*** | **Do Not Accept Any Test [1] (n=119)** | **Accept Only Non-Invasive Tests [2] (n=672)** | **Accept Invasive Tests as Well [3] (n=475)** | **p-value** |
|---|---|---|---|---|---|
| **Awareness of congenital disorders in babies** | | | | | |
| Yes | 1115 (88.1) | 58 (5.2) | 606 (54.4) | 451 (40.4) | **p[#]<0.001 a<0.001 b=0.003 c<0.001** |
| No | 151 (11.9) | 61 (40.4) | 66 (43.7) | 24 (15.9) | |
| **Awareness of Down Syndrome** | | | | | |
| Yes | 1179 (93.1) | 85 (7.2) | 631 (53.5) | 463 (39.3) | **p[#]<0.001 a<0.001 b=0.005 c<0.001** |
| No | 87 (6.9) | 34 (39.1) | 41 (47.1) | 12 (13.8) | |
| **Awareness of Neural Tube Defects** | | | | | |
| Yes | 546 (43.1) | 32 (5.9) | 251 (46.0) | 263 (48.1) | **p[#]<0.001** a=0.028 **b<0.001 c<0.001** |
| No | 720 (56.9) | 87 (12.1) | 421 (58.5) | 212 (29.4) | |

**Table 3. (Continued)**

| | | | | | |
|---|---|---|---|---|---|
| **Awareness of Prenatal Diagnosis** | | | | | |
| **Availability** | | | | | |
| Yes | 973 (76.8) | 37 (3.8) | 505 (51.9) | 431 (44.3) | **$p^{\#}$<0.001 a<0.001** |
| No | 293 (23.1) | 82 (28.0) | 167 (57.0) | 44 (15.0) | **b<0.001 c<0.001** |
| **Information Status** | | | | | |
| Yes | 520 (41.0) | 18 (3.5) | 240 (46.2) | 262 (50.4) | **$p^{\#}$<0.001 a<0.001** |
| No | 746 (59.0) | 101 (13.5) | 432 (57.9) | 213 (28.6) | **b<0.001 c<0.001** |

#: Pearson Chi-Square Test

The letter "a" represents the p-value for the comparison between Group 1 and Group 2, "b" represents the p-value for the comparison between Group 2 and Group 3, and "c" represents the p-value for the comparison between Group 1 and Group 3. Post-hoc comparisons were conducted using Bonferroni correction.

An analysis of test acceptance based on participants' knowledge of conditions that can be diagnosed through prenatal diagnostic methods revealed statistically significant differences associated with awareness of congenital disorders in infants, familiarity with Down syndrome, awareness of neural tube defects, and knowledge of the availability of prenatal diagnostic methods (Table 3).

Due to the many significant variables identified in the univariate analyses (Tables 2 and 3), logistic regression analysis was performed to determine the most critical factors. For this analysis, participants' acceptance of screening or diagnostic tests was assessed by combining the groups "Does not accept any tests" and "Accepts only non-invasive tests" into a single category labeled "Does not accept invasive screening/diagnostic tests if offered." The analysis was conducted using this classification. For the logistic regression analysis, model 1 included age, total number of pregnancies, education level, employment status, monthly household income, consanguinity with the spouse/child's father, smoking status, religious beliefs, awareness of congenital diseases in infants, and knowledge of the availability of prenatal diagnosis. Model 2 included age, the total number of pregnancies, education level, employment status, monthly household income, consanguinity with the spouse/child's father, smoking status, religious beliefs, and information status. According to the results of Model 1, religious beliefs, awareness of congenital diseases in infants, and knowledge of the availability of prenatal diagnosis were significantly associated with the acceptance of invasive tests. In Model 2, education level, religious beliefs, and information status were identified as significant factors associated with the acceptance of invasive tests (Table 4).

Multivariate analysis showed that women who were informed about prenatal tests were more likely to accept invasive tests. A similar study conducted in a university hospital in Türkiye in 2021 also found that the knowledge level of pregnant women and the counseling provided by obstetricians positively influenced their decisions to undergo the tests.[24] Additionally, studies conducted in the UK and France have reported that prenatal screening tests are directly related to the knowledge level of pregnant women and the quality of information provided by healthcare professionals.[26, 27]

**Table 4. Logistic Regression Analysis of Acceptance of Invasive Screening/Diagnostic Tests if Suggested**

| | Univariate | | Multivariate-Model 1 | | Multivariate-Model 2 | |
|---|---|---|---|---|---|---|
| **Variable Examined** | **OR* (Confidence Interval)** | **p-value** | **OR* (Confidence Interval)** | **p-value** | **OR* (Confidence Interval)** | **p-value** |
| **Age** | 0.99 (0.97-1.02) | p=0.963 | 1.02 (0.99-1.06) | p=0.075 | 1.02 (1.00-1.05) | p=0.050 |
| **Education Level** | | | | | | |
| Middle School Graduate or Below# | 1.00 | | 1.00 | | 1.00 | |
| High School Graduate or Above | **3.54 (2.40-5.20)** | **p<0.001** | 1.66 (0.96-2.86) | p=0.067 | **2.64 (1.64-4.25)** | **p<0.001** |
| **Employment Status** | | | | | | |
| Not working# | 1.00 | | | | | |
| Working | **10.82 (1.32-3.10)** | **p<0.001** | | | | |
| **Monthly Total Household Income** | | | | | | |
| 2800 TRY or below# | 1.00 | | | | | |
| 2801 TRY or above | **1.65 (1.12-2.45)** | **p=0.011** | | | | |
| **Number of people living in the household** | 1.01 (0.86-1.17) | p=0.899 | | | | |
| **Relationship with Spouse or Child's Father** | | | | | | |
| Related# | 1.00 | | | | | |
| Not related (1) | **1.76 (1.12-2.78)** | **p=0.014** | | | | |
| **Smoking Status** | | | | | | |
| I don't smoke# | 1.00 | | | | | |
| I smoke | **1.76 (1.04-2.96)** | **p=0.033** | | | | |
| **Religious Beliefs Definition** | | | | | | |
| Strictly Religious # | 1.00 | | 1.00 | | | |
| Moderately Religious | **3.63 (2.18-6.07)** | **p<0.001** | 2.14 (1.20-3.81) | **p=0.010** | **2.84 (1.68-4.83)** | **p<0.001** |
| Religiously Uninfluenced | **3.12 (1.57-6.23)** | **p<0.001** | 175 (0.79-3.88) | p=0.167 | 1.74 (0.84-3.62) | p=0.135 |
| **Total Number of Pregnancies** | **0.87 (0.77-0.98)** | **p=0.030** | | | | |
| **Awareness of congenital disorders in babies** | | | | | | |
| **No#** | 1.00 | | 1.00 | | | |
| **Yes** | **12.35(8.12-18.78)** | **p<0.001** | **5.64 (3.32-9.59)** | **p<0.001** | | |
| **Awareness of Prenatal Diagnosis Availability** | | | | | | |
| No# | 1.00 | | 1.00 | | | |
| Yes | **9.83 (6.48-14.90)** | **p<0.001** | **4.69 (2.70-8.15)** | **p<0.001** | | |
| **Information Status** | | | | | | |
| No# | 1.00 | | | | 1.00 | |
| Yes | **4.36 (2.61-7.30)** | **p<0.001** | | | **3.61 (1.93-6.77)** | **p<0.001** |
| **Estimated Relative Risk with 95% Confidence Interval*<br>*# Reference category* | | | Nagelkerke R square: 0.323<br>Hosmer and Lemeshow Test: 0.297<br>p<0.001 | | Nagelkerke R square: 0.152<br>Hosmer and Lemeshow Test: 0.440<br>p<0.001 | |

This highlights the crucial role of information in the use of prenatal tests. However, in Türkiye, doctors' consultation times could be better, which may prevent sufficient counseling about prenatal tests. To be adequately informed, individuals must fully understand the topic and be able to ask questions about any uncertainties. In this context, midwives and nurses play an essential role alongside doctors. Midwives and nurses must allocate enough time to parents and provide counseling on prenatal tests. In some secondary and tertiary healthcare facilities in Türkiye, prenatal education, including information about prenatal tests, is offered to many pregnant women as part of "pregnancy education classes" organized by doctors, nurses,

midwives, and other healthcare staff.[28] Encouraging more participation in these education programs, addressing prenatal tests in detail within the educational content, and raising awareness about these tests will help increase awareness among parents and contribute to informed decision-making.

Although it is well known in the literature that maternal age is an essential factor in determining the risk of having a baby with chromosomal abnormalities, this study did not find a significant relationship between maternal age and the acceptance of prenatal tests. A similar survey conducted in Türkiye by Dolanbay et al. found no significant relationship between maternal age and the acceptance of invasive tests.[29] However, many studies suggest that the acceptance of invasive tests increases with advanced maternal age . [7, 11] Advanced maternal age (>35) is one of the key indications for diagnostic tests due to the increased risk of chromosomal abnormalities. However, the need for more awareness of this societal issue may explain the discrepancy between our results and international literature. Detailed counseling about risk factors for women of advanced age may increase participation in screenings.

This study found that as educational levels increased, the acceptance of invasive prenatal tests also increased (Tables 2 and 4). A survey conducted in the Netherlands by Gitsels-van der Wal et al. found that women with higher education levels were more likely to undergo screening tests.[30] A study conducted in the US also found that women with lower education levels (high school or less) were less likely to undergo invasive diagnostic testing.[31] A study conducted in China, however, found that individuals with lower education levels were more likely to opt for invasive prenatal diagnosis.[12] The literature has different findings regarding the educational level and acceptance of invasive tests. However, it is known that education in Türkiye also affects health literacy, which likely influenced our results. As education levels increase, health literacy improves, and women may become more informed when making health-related decisions. To enable women with lower education levels to make more informed decisions, there is a need to provide more counseling on the benefits and risks of prenatal tests or to prioritize this group when planning counseling services.

This study found that the acceptance of tests was higher in women without consanguineous partners (Tables 2 and 4). Similarly, a cohort study conducted in 23 cities across Türkiye in 2020 found that the frequency of prenatal screening tests was higher in pregnant women without consanguineous marriages than in those with consanguineous marriages.[32] Consanguineous marriage is influenced by low education levels, cultural characteristics, religious beliefs, and moral values.[33] It is known that consanguineous marriage increases the risk for certain genetic disorders. Therefore, it is essential to detect consanguineous marriage during the initial consultation and provide more attention to prenatal education, screening, and genetic counseling in regions where consanguineous marriages are common.

This study found that women with a monthly income twice the minimum wage or higher were more likely to accept tests than women with lower income levels (Table 4). A survey conducted by Beulen et al. in the Netherlands found that women with below-average income were more likely to reject prenatal tests.[34] Income level can affect test acceptance by influencing access to healthcare and information resources.

According to the results of multivariate analysis in this study, the acceptance of prenatal tests increased as religious adherence decreased among women who reported having religious beliefs (Table 4). In a study conducted in Israel with Jewish pregnant women, it was found that the frequency of amniocentesis was lower in religious women, and religious and moral reasons affected their decision to undergo amniocentesis.[35] A study conducted in France also found that women's religious beliefs played an essential role in their decision-making process, and women who valued religion highly were less likely to

accept prenatal tests.[36] In the Netherlands, it was found that both Protestant and Muslim women were less likely to undergo prenatal screening compared to others.[30] A study conducted in Lebanon comparing prenatal test acceptance among Muslims, Christians, and Druze found no differences in acceptance rates based on religion.[37] The similar views held by these three religious groups regarding pregnancy termination may explain why their acceptance rates were similar despite their different religious affiliations. Consistent with the literature, this study found that religious beliefs influenced the acceptance of prenatal tests. Parents' misconceptions or incomplete knowledge about these tests, or their belief that prenatal tests are only performed to make decisions about pregnancy termination, may affect their views and acceptance. However, these tests are crucial for allowing individuals to make informed decisions and prepare them for the possibility of having a genetically abnormal baby. To support informed decision-making, it may be necessary to ensure that healthcare professionals provide counseling and support when dealing with sensitive issues such as religious beliefs.

This study found that working women were 10 times more likely to accept invasive prenatal tests (Table 4). A cohort study conducted in the US also found that working women were more likely to undergo diagnostic testing compared to unemployed women.[38] Employment status may influence decision-making as it is associated with factors like education level, access to healthcare services, and health insurance, making it easier for working women to access tests and information.

This study also found that as the number of pregnancies increased, the acceptance of prenatal tests decreased (Table 4). Similarly, a UK study found that women with two or more children were significantly less likely to undergo screening tests.[26] In Türkiye, the number of children a woman has is influenced by her socio-cultural characteristics, and multiparous women may feel less need for testing or perceive screening tests as unnecessary due to their previous pregnancy experiences and healthy children. However, every pregnancy carries the possibility of different outcomes, and as the number of pregnancies increases, the risk of a high-risk pregnancy also increases due to the woman's age. Healthcare professionals should emphasize this to raise awareness and facilitate more informed decision-making.

## CONCLUSION AND RECOMMENDATIONS

The findings reveal that women's decisions to undergo prenatal tests are influenced by various factors, including education level, employment status, income level, number of pregnancies, religious beliefs, and the quality of information they receive. To support informed decision-making, it is essential to provide targeted assistance to vulnerable groups, such as those with lower education levels or deeply rooted religious beliefs. Developing culturally sensitive and non-judgmental counseling approaches for these groups can enhance their understanding and acceptance of prenatal tests.

Healthcare systems should establish clear counseling roles at all service levels. To improve the quality of counseling, doctors' consultation times must be extended. At the same time, midwives and nurses should receive regular training and updated resources on prenatal tests, covering both their benefits and potential risks. This approach can ensure that healthcare professionals are well-equipped to address patients' concerns comprehensively.

In addition, there is a need for qualitative studies, including in-depth interviews or focus group discussions, to gain deeper insights into the psychosocial and cultural factors influencing individuals' decisions. Such studies could help uncover personal, familial, and societal dynamics that quantitative research may not capture.

Finally, broader awareness campaigns should be implemented at the community level, emphasizing the importance of prenatal care and the role of these tests in ensuring

maternal and fetal health. These campaigns can be designed to align with cultural values and address misinformation or stigma surrounding prenatal testing. By combining individual-level interventions with system-wide reforms, healthcare providers can create a more supportive environment that empowers women to make informed decisions about their prenatal care.

**REFERENCES**

**1**. Narapureddy BR, Zahrani Y, Alqahtani HEM, Mugaiahgari BKM, Reddy LKV, Mohammed Asif S, et al. "Examining the prevalence of congenital anomalies in newborns: A cross-sectional study at a tertiary care maternity hospital in Saudi Arabia". Children. 2024;11(2):188.https://doi.org/10.3390/children11020188.

**2**. World Health Organization. Congenital Disorders. 2023. [cited 2024 August 07]. Available from: https://www.who.int/news-room/fact-sheets/detail/birth-defects/.

**3**. Van den Veyver IB. "Recent advances in prenatal genetic screening and testing". F1000Res. 2016;5:2591 https://doi.org/10.12688/f1000research.9215.1.

**4.** KURT E. "Prenatal tanıda genetik danışmanlık sürecine etik bir bakış". Turkiye Klinikleri Journal of Medical Ethics-Law and History. 2013;21(3):136-40.

**5.** Koçak DY, Kızılkaya Beji N, Büyükkayacı Duman N. "Prenatal tanı yöntemlerinde etik yaklaşım". Hemşirelik Akademik Araştırma Dergisi. 2015;1(2):86-90.

**6.** Ergün P, Köken GN, Coşar E, Şahin FK, Arıöz DT, Yılmazer M. "Gebelerin üçlü tarama testi ve gebelikte yapılan diğer testler hakkındaki bilgi düzeyinin ölçülmesi". TAF Preventive Medicine Bulletin. 2011;10(4):403-8.

**7**. Di Mattei V, Ferrari F, Perego G, Tobia V, Mauro F, Candiani M. "Decision-making factors in prenatal testing: A systematic review". Health psychology open. 2021;8(1):2055102920987455.https://doi.org/10.1177/2055102920987455.

**8.** ACOG Practice Bulletin No. 77: Screening for Fetal Chromosomal Abnormalities. Obstetrics & Gynecology. 2007;109(1):217-28.

**9.** NICE. Antenatal care. 2021. [cited 2024 August 19]. Available from: https://www.nice.org.uk/guidance/ng201.

**10.** T.C. Sağlık Bakanlığı. Halk Sağlığı Genel Müdürlüğü KvÜSDB. Doğum Öncesi Bakım Yönetim Rehberi. Ankara2018.

**11.** Tzela P, Antsaklis P, Kanellopoulos D, Antonakopoulos N, Gourounti K. "Factors influencing the decision-making process for undergoing invasive prenatal testing". Cureus. 2024;16(4).https://doi.org/10.7759/cureus.58803.

**12.** Chan YM, Leung TY, Chan OKC, Cheng YKY, Sahota DS. "Patient's choice between a non-invasive prenatal test and invasive prenatal diagnosis based on test accuracy". Fetal Diagnosis and Therapy. 2013;35(3):193-8.https://doi.org/10.1159/000356075.

**13.** Skutilova V. "Knowledge, attitudes and decision-making in Czech women with atypical results of prenatal screening tests for the most common chromosomal and morphological congenital defects in the fetus: selected questionnaire results". Biomedical Papers of the Medical Faculty of Palacky University in Olomouc. 2015;159(1)

**14.** Lund ICB, Becher N, Petersen OB, Hill M, Chitty L, Vogel I. "Preferences for prenatal testing among pregnant women, partners and health professionals". Dan Med J. 2018;65:1-6.

**15.** Belahcen A, Taloubi M, Chala S, Thimou Izgua A, Mdaghri Alaoui A. "Mother's awareness and attitudes towards prenatal screening for Down syndrome in Muslim Moroccans". Prenatal Diagnosis. 2014;34(9):821-30.https://doi.org/10.1002/pd.4373.

**16.** Pop-Tudose ME, Popescu-Spineni D, Armean P, Pop IV. "Attitude, knowledge and informed choice towards prenatal screening for Down Syndrome: a cross-sectional study". BMC Pregnancy and Childbirth. 2018;18:1-8.https://doi.org/10.1186/s12884-018-2077-6.

**17.** Pala E, Yiğitbaş K, Alın MA, Demirkol M, Olcar EG, Cesur FB, et al. "Gebelerde prenatal tanı testlerinin ve sonuçlarının farkındalığı: Gaziantep'te yapılan kesitsel bir çalışma". Van Sağlık Bilimleri Dergisi. 2021;14(1):1-6.https://doi.org/10.52976/vansaglik.728371.

**18.** Dondorp W, De Wert G, Bombard Y, Bianchi DW, Bergmann C, Borry P, et al. "Non-invasive prenatal testing for aneuploidy and beyond: challenges of responsible innovation in prenatal screening". European Journal of Human Genetics. 2015;23(11):1438-50.https://doi.org/10.1038/ejhg.2015.57.

**19.** Crombag NM, Bensing JM, Iedema-Kuiper R, Schielen PC, Visser GH. "Determinants affecting pregnant women's utilization of prenatal screening for Down syndrome: a review of the literature". The Journal of Maternal-Fetal & Neonatal Medicine. 2013;26(17):1676-81.https://doi.org/10.3109/14767058.2013.798289.

**20.** Vahanian SA, Baraa Allaf M, Yeh C, Chavez MR, Kinzler WL, Vintzileos AM. "Patient acceptance of non-invasive testing for fetal aneuploidy via cell-free fetal DNA". The Journal of Maternal-Fetal & Neonatal Medicine. 2014;27(1):106-9.https://doi.org/10.3109/14767058.2013.806477.

**21.** Willruth A, Vieten J, Berg C, Gembruch U, Geipel A. "Decision making and attitudes towards invasive prenatal diagnosis in the early second trimester". Ultraschall in der Medizin-European Journal of Ultrasound. 2010;31(05):515-9.https://doi.org/10.1055/s-0028-1109897.

**22.** Çoban D, Yılmaz S. "Prenatal tarama testleri için başvuran gebelerde risk algısı". Anatolian Journal of Health Research. 2024;5(1):87-92.https://doi.org/10.61534/anatoljhr.1447291.

**23.** Seven M, Akyüz A, Eroglu K, Daack-Hirsch S, Skirton H. "Women's knowledge and use of prenatal screening tests". Journal of Clinical Nursing. 2017;26(13-14):1869-77.https://doi.org/10.1111/jocn.13494.

**24.** Karahan S, Karademir D, Ağadayı E. "Knowledge Levels, Attitudes, And Behaviors Of Pregnants About Prenatal Screening Tests: A Sectional Study". Cumhuriyet Medical Journal. 2023;45(3):21-7.https://doi.org/10.7197/cmj.1344696.

**25.** Uğurlu M, Beydağ KD. "Bir Aile Sağlığı Merkezine Başvuran Gebelerin Gebelikte Yapılan Prenatal Tarama Testlerine İlişkin Görüş ve Tutumlarının İncelenmesi". Güncel Hemşirelik Araştırmaları Dergisi. 2022;2(2):84-94.

**26.** Shantha N, Granger K, Arora P, Polson D. "Women's choice for Down's screening—A comparative experience in three district general hospitals". European Journal of Obstetrics & Gynecology and Reproductive Biology. 2009;146(1):61-4.https://doi.org/10.1016/j.ejogrb.2009.05.009.

**27.** Schoonen M, Wildschut H, Essink-Bot M-L, Peters I, Steegers E, de Koning H. "The provision of information and informed decision-making on prenatal screening for Down syndrome: a questionnaire-and register-based survey in a non-selected population". Patient education and counseling. 2012;87(3):351-9.https://doi.org/10.1016/j.pec.2011.10.001.

**28.** T.C. Sağlık Bakanlığı. Halk Sağlığı Genel Müdürlüğü KvÜSDB. Gebe Bilgilendirme Sınıfı Eğitim Kitabı. Ankara: Sağlık Bakanlığı Yayınları; 2014. 39-40 p.

**29.** Dolanbay M, Kutuk MS, Terzioglu A, Ozgun MT, Subasioglu A. "Factors influencing the acceptance of prenatal testing by pregnant women". Kuwait Medical Journal. 2020;52(2):138-42.

**30.** Gitsels-van der Wal JT, Verhoeven PS, Manniën J, Martin L, Reinders HS, Spelten E, et al. "Factors affecting the uptake of prenatal screening tests for congenital anomalies; a multicentre prospective cohort study". BMC pregnancy and childbirth. 2014;14:1-12.https://doi.org/10.1186/1471-2393-14-264.

**31.** Dicke JM, Van Duyne L, Bradshaw R. "The utilization and choices of aneuploidy screening in a midwestern population".

Journal of Genetic Counseling. 2014;23(5):874-80.https://doi.org/10.1007/s10897-014-9711-x.

**32.** Sahin E, İnciser Paşalak Ş, Seven M. "Consanguineous marriage and its effect on reproductive behavior and uptake of prenatal screening". Journal of Genetic Counseling. 2020;29(5):849-56.https://doi.org/10.1002/jgc4.1214.

**33.** Sharma SK, Kalam MA, Ghosh S, Roy S. "Prevalence and determinants of consanguineous marriage and its types in India: Evidence from the National Family Health Survey, 2015–2016". Journal of Biosocial Science. 2021;53(4):566-76.https://doi.org/10.1017/S0021932020000383.

**34.** Beulen L, Grutters JP, Faas BH, Feenstra I, Groenewoud H, van Vugt JM, et al. "Women's and healthcare professionals' preferences for prenatal testing: a discrete choice experiment". Prenatal diagnosis. 2015;35(6):549-57.https://doi.org/10.1002/pd.4571.

**35.** Sher C, Romano-Zelekha O, Green MS, Shohat T. "Factors affecting performance of prenatal genetic testing by Israeli Jewish women". American Journal of Medical Genetics Part A. 2003;120(3):418-22.https://doi.org/10.1002/ajmg.a.20047.

**36.** Seror V, Ville Y. "Prenatal screening for Down syndrome: women's involvement in decision-making and their attitudes to screening". Prenatal Diagnosis: Published in Affiliation With the International Society for Prenatal Diagnosis. 2009;29(2):120-8.https://doi.org/10.1002/pd.2183.

**37.** Usta IM, Nassar AH, Abu-Musa AA, Hannoun A. "Effect of religion on the attitude of primiparous women toward genetic testing". Prenatal Diagnosis: Published in Affiliation With the International Society for Prenatal Diagnosis. 2010;30(3):241-6.https://doi.org/10.1002/pd.2447.

**38.** Morgan T, Tan CD, Della-Torre M, Jackson-Bey T, DiGiovanni L, Enakpene CA. "Determinant of Prenatal Diagnostic Testing among Women with Increased Risk of Fetal Aneuploidy and Genetic Disorders". American journal of perinatology. 2021;41(4):470-7.https://doi.org/10.1055/a-1692-0309