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# Before and After Covid-19: What Has Changed in HIV Knowledge Level?

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**Introduction:** The most essential way to prevent the transmission of Human Immunodeficiency Virus (HIV), one of the most important communicable diseases, is to enhance public knowledge. Our study aimed to assess whether there were any changes in HIV knowledge following the onset of the Covid-19 pandemic.

**Methods:** In Turkey, information stands were established in Izmir on 1 December 2017 and in public locations in both Istanbul and Izmir on 1 December 2021 to providing education the public about HIV/AIDS. Prior to the educational intervention, a voluntary information survey was administered to 618 people aged 18 and older (149 pre-pandemic and 469 post-pandemic) The questionnaire consisted of seven questions designed to assess participants' knowledge about HIV. Participants were stratified by gender, marital status, and educational status, and responses were compared before and after the pandemic. Patient characteristics were reported as n (percentage) or mean ± SD (standard deviation) for categorical and continuous variables, respectively. Nominal variables were reported as percentages and compared using two-tailed Chi-square or Fisher's test, where appropriate. A p-value of less than 0.05 was considered statistically significant.

**Results:** Comparing responses to all questions, the correct response rates before and after the pandemic were 57.62% and 73.77%, respectively. The rates for these questions were as follows: 59.29% and 79.63% for females, 47.31% and 78.57% for males; 48.78% and 75.47% for married individuals, 52.08% and 80.89% for single individuals; 39.38% and 56.43% for primary school graduates, 58.13% and 72.24% for secondary school graduates, 52.16% and 85.11% for university graduates, and 41.56% and 83.44% for master's degrees.

**Conclusion:** Compared to the pre-pandemic period, the level of HIV knowledge of the participants increased in the post-pandemic period. The increase in knowledge levels was more significant in men than in women and in single individuals than in married individuals. The greatest difference in terms of education status was observed among those with a master's degree or higher.

**Keywords:** AIDS, COVID-19, HIV, knowledge

## Introduction

The human immunodeficiency virus (HIV) is the infectious agent that causes acquired immune deficiency syndrome (AIDS). [1] The most effective method for combating the spread of HIV is through the implementation of preventative measures.[2] In areas experiencing an HIV epidemic, the level of knowledge regarding HIV prevention strategies was found to be only 44.7%. [3] There is a paucity of publications in Turkey that examine the level of HIV knowledge. In addition, these studies that have been conducted indicate that the level of knowledge is, at most, 62.5%. It is notable that the majority of studies have identified a positive correlation between higher education levels and levels of knowledge.[4,5] The dissemination of information about HIV has the potential to result in an increase in the number of HIV screening tests, a reduction in stigmatization, and a decrease in the spread of HIV.[6]

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We conducted the study, repeating surveys measuring HIV knowledge that were conducted pre-pandemic (PrP) (December 1, 2017) and post-pandemic (PP) (December 1, 2021). The goal of this study was to assess the impact of the pandemic on the public's HIV knowledge by comparing the results from these two surveys.

## Materials and Methods

On December 1st, World HIV/AIDS Day, the Association for the Prevention of Infectious Diseases (BUHASDER), set up stands in public areas with the objective of raising HIV awareness. At these locations, healthcare professionals provide the public with training on HIV/AIDS and administer the "HIV Knowledge Level Survey" Prior to the training. The surveys, completed in Izmir on December 1st, 2017, prior to the advent of pandemic, were conducted once again in both Izmir and Istanbul on the same date in 2021. A total of The study was conducted on a purely voluntary basis. The questions were selected from a battery of items designed to assess the level of knowledge held by the general public on a range of issues, thereby identifying areas where further information is required. No scale was employed. 618 individuals aged 18 and above who expressed willingness to participate in the survey by reading the "Informed Voluntary Consent Form" were included in the study. A total of 149 individuals completed the survey in PrP period, while 469 individuals completed it in PP period. The survey comprised seven questions pertaining to the definition of HIV/AIDS, modes of HIV transmission, symptoms of HIV/AIDS, diagnosis and treatment of HIV/AIDS. Subsequent to the distribution of printed versions of the survey, participants proceeded to complete it. The seven survey questions, each with a specific objective, were designed to measure the demographic characteristics of the participants and their level of knowledge about HIV. "Which is false about HIV positivity and AIDS?", "Which of the following is HIV transmitted by?", "Which of the following does not transmit HIV?", "What is the correct method for preventing the transmission of HIV/AIDS?", "What are the symptoms of HIV/AIDS?", "What is the definitive diagnosis of HIV disease?" and "Is there any treatment for HIV infection?" The survey employed multiple-choice questions and categorized participants according to gender, marital status, and education level. A comparative analysis of the survey results before and after the pandemic enabled the researchers to ascertain whether there was a change in the level of knowledge about HIV/AIDS among the public.

### Ethical Approval

The study was conducted in accordance with the ethical standards set forth in the Declaration of Helsinki and was approved by the Scientific Research Ethics Committee of Şehit Professor İlhan Varank Training and Research Hospital (Study number: 2023/16-11.01.2023).

### Statistics

Data analysis was performed using the Statistics Package for Social Science (SPSS 29.0-IBM, NY, USA). Characteristics of patients, as n (percent) or mean ± SD (Standard Deviation) for categorical and continuous variables, respectively, were reported. Nominal variables were reported as percentages and compared using a two-tailed Chi-square or Fisher test, when applicable. The P value was set at $<0.05$ for statistical significance.

## Results

A total of 618 people responded to the survey, 149 in PrP period and 469 in PP period. Of the participants, 289 (46.8%) were female and 329 (53.2%) were male; 222 (35.9%) were married and 396 (64.1%) were single. Table 1 presents the demographic characteristics of the participants.

Table 2 presents a comprehensive overview of all questions and the corresponding correct answers. Upon examination of the data at the individual question level, it was found that the correct answers to the definitions of HIV positivity and AIDS, as well as the protection methods utilized to prevent HIV transmission, exhibited a statistically significant increase during the PP period when compared to the PrP period across all groups. Additionally, when the average responses to all survey questions were compared between the PrP and PP periods, a statistically significant increase was observed in the PP period when compared to the PrP period for each group ($p<0.01$).

**Table 1** Demographic Features

| | | Total | 2017 | 2021 |
|---|---|---|---|---|
| **Age** | **Mean ± SD** | **36 ± 15.4** | **37 ± 12** | **35 ± 16.3** |
| Gender | | | | |
| | Male | 329 (53.2%) | 109 (73.2%) | 220 (46.9%) |
| | Female | 289 (46.8%) | 40 (26.8%) | 249 (53.1%) |
| Marital status | | | | |
| | Married | 222 (35.9%) | 70 (47.0%) | 152 (32.4%) |
| | Single | 396 (64.1%) | 79 (53.0%) | 317 (67.6%) |
| Educational status | | | | |
| | Primary School | 77 (12.5%) | 37 (24.8%) | 40 (8.5%) |
| | Secondary School | 181 (29.3%) | 58 (38.9%) | 123 (26.2%) |
| | UniversityDegree | 305 (49.4%) | 43 (28.9%) | 262 (55.9%) |
| | Master'sDegree | 55 (8.9%) | 11 (7.4%) | 44 (9.4%) |

**Table 2** Distribution of the Correct Answers Given to the Questions According to Gender, Marital Status and Educational Status

| **Correct answers to questions** | | **2017** | | **2021** | | ***p*-value** |
|---|---|---|---|---|---|---|
| | | **N[a]** | **n (%)[b]** | **N[c]** | **n(%)[d]** | |
| Which is false about HIV positivity and AIDS? | | | | | | |
| TOTAL | | 149 | 44 (29.5%) | 469 | 297 (63.3%) | **<0.001** |
| Gender | Male | 109 | 28 (25.7%) | 220 | 139 (63.2%) | **<0.001** |
| | Female | 40 | 16 (40.0%) | 249 | 158 (63.5%) | **0.005** |
| Marital status | Married | 70 | 16 (22.9%) | 152 | 90 (59.2%) | **<0.001** |
| | Single | 79 | 28 (35.4%) | 317 | 207 (65.3%) | **<0.001** |
| Educational status | Primary School | 37 | 9 (24.3%) | 40 | 21 (52.5%) | **0.021** |
| | Secondary School | 58 | 17 (29.3%) | 123 | 66 (53.7%) | **0.002** |
| | University Degree | 43 | 16 (37.2%) | 262 | 181 (69.1%) | **<0.001** |
| | Master's Degree | 11 | 2 (18.2%) | 44 | 29 (65.9%) | **0.006** |
| Which of the following is HIV transmitted by? | | | | | | |
| TOTAL | | 149 | 104 (69.8%) | 469 | 416 (88.7%) | **<0.001** |
| Gender | Male | 109 | 72 (66.1%) | 220 | 197 (89.5%) | **<0.001** |
| | Female | 40 | 32 (80.0%) | 249 | 219 (88.0%) | 0.259 |
| Marital status | Married | 70 | 46 (65.7%) | 152 | 132 (86.8%) | **<0.001** |
| | Single | 79 | 58 (73.4%) | 317 | 284 (89.6%) | **<0.001** |

(*Continued*)

**Table 2** (Continued).

| Correct answers to questions | | 2017 | | 2021 | | *p*-value |
|---|---|---|---|---|---|---|
| | | N[a] | n (%)[b] | N[c] | n(%)[d] | |
| Educational status | Primary School | 37 | 19 (51.4%) | 40 | 29 (72.5%) | 0.093 |
| | Secondary School | 58 | 47 (81.0%) | 123 | 102 (82.9%) | 0.918 |
| | University Degree | 43 | 31 (72.1%) | 262 | 245 (93.5%) | **<0.001** |
| | Master's Degree | 11 | 7 (63.6%) | 44 | 40 (90.9%) | **0.042** |
| Which of the following does not transmit HIV? | | | | | | |
| TOTAL | | 149 | 85 (57.0%) | 469 | 400 (85.3%) | **<0.001** |
| Gender | Male | 109 | 57 (52.3%) | 220 | 185 (84.1%) | **<0.001** |
| | Female | 40 | 28 (70.0%) | 249 | 215 (86.3%) | **0.017** |
| Marital status | Married | 70 | 40 (57.1%) | 152 | 123 (80.9%) | **<0.001** |
| | Single | 79 | 45 (57.0%) | 317 | 277 (87.4%) | **<0.001** |
| Educational status | Primary School | 37 | 12 (32.4%) | 40 | 23 (57.5%) | 0.048 |
| | Secondary School | 58 | 38 (65.5%) | 123 | 96 (78.0%) | 0.107 |
| | University Degree | 43 | 29 (67.4%) | 262 | 241 (92.0%) | **<0.001** |
| | Master's Degree | 11 | 6 (54.5%) | 44 | 40 (90.9%) | **0.011** |
| What is the correct method for preventing the transmission of HIV/AIDS? | | | | | | |
| TOTAL | | 149 | 62 (41.6%) | 469 | 399 (85.1%) | **<0.001** |
| Gender | Male | 109 | 45 (41.3%) | 220 | 188 (85.5%) | **<0.001** |
| | Female | 40 | 17 (42.5%) | 249 | 211 (84.7%) | **<0.001** |
| Marital status | Married | 70 | 28 (40.0%) | 152 | 124 (81.6%) | **<0.001** |
| | Single | 79 | 34 (43.0%) | 317 | 275 (86.8%) | **<0.001** |
| Educational status | Primary School | 37 | 12 (32.4%) | 40 | 28 (70.0%) | **0.002** |
| | Secondary School | 58 | 28 (48.3%) | 123 | 95 (77.2%) | **<0.001** |
| | University Degree | 43 | 17 (39.5%) | 262 | 236 (90.1%) | **<0.001** |
| | Master's Degree | 11 | 5 (45.5%) | 44 | 40 (90.9%) | **0.002** |
| What are the symptoms of HIV/AIDS? | | | | | | |
| TOTAL | | 149 | 77 (51.7%) | 469 | 366 (78.0%) | **<0.001** |
| Gender | Male | 109 | 52 (47.7%) | 220 | 172 (78.2%) | **<0.001** |
| | Female | 40 | 25 (62.5%) | 249 | 194 (77.9%) | 0.056 |
| Marital status | Married | 70 | 33 (47.1%) | 152 | 122 (80.3%) | **<0.001** |
| | Single | 79 | 44 (55.7%) | 317 | 244 (77.0%) | **<0.001** |

(*Continued*)

**Table 2** (Continued).

| Correct answers to questions | | 2017 | | 2021 | | *p*-value |
|---|---|---|---|---|---|---|
| | | N[a] | n (%)[b] | N[c] | n(%)[d] | |
| Educational status | Primary School | 37 | 21 (56.8%) | 40 | 25 (62.5%) | 0.779 |
| | Secondary School | 58 | 32 (55.2%) | 123 | 93 (75.6%) | **0.009** |
| | University Degree | 43 | 20 (46.5%) | 262 | 211 (80.5%) | **<0.001** |
| | Master's Degree | 11 | 4 (36.4%) | 44 | 37 (84.1%) | **0.003** |
| What is the definitive diagnosis of HIV disease? | | | | | | |
| TOTAL | | 149 | 172 (78.2%) | 469 | 194 (77.9%) | **0.001** |
| Gender | Male | 109 | 69 (63.3%) | 220 | 168 (76.4%) | **0.013** |
| | Female | 40 | 29 (72.5%) | 249 | 202 (81.1%) | 0.293 |
| Marital status | Married | 70 | 47 (67.1%) | 152 | 110 (72.4%) | 0.427 |
| | Single | 79 | 51 (64.6%) | 317 | 260 (82.0%) | **0.001** |
| Educational status | Primary School | 37 | 19 (51.4%) | 40 | 16 (40.0%) | 0.441 |
| | Secondary School | 58 | 46 (79.3%) | 123 | 91 (74.0%) | 0.553 |
| | University Degree | 43 | 27 (62.8%) | 262 | 228 (87.0%) | **<0.001** |
| | Master's Degree | 11 | 6 (54.5%) | 44 | 35 (79.5%) | 0.124 |
| Is there any treatment for HIV infection? | | | | | | |
| TOTAL | | 149 | 57 (38.3%) | 469 | 350 (74.6%) | **<0.001** |
| Gender | Male | 109 | 38 (34.9%) | 220 | 161 (73.2%) | **<0.001** |
| | Female | 40 | 19 (47.5%) | 249 | 189 (75.9%) | **<0.001** |
| Marital status | Married | 70 | 29 (41.4%) | 152 | 102 (67.1%) | **<0.001** |
| | Single | 79 | 28 (35.4%) | 317 | 248 (78.2%) | **<0.001** |
| Educational status | Primary School | 37 | 10 (27.0%) | 40 | 16 (40.0%) | 0.336 |
| | Secondary School | 58 | 28 (48.3%) | 123 | 79 (64.2%) | 0.061 |
| | University Degree | 43 | 17 (39.5%) | 262 | 219 (83.6%) | **<0.001** |
| | Master's Degree | 11 | 2 (18.2%) | 44 | 36 (81.8%) | **<0.001** |

| Total correct answers | | 2017 | | | 2021 | | | |
|---|---|---|---|---|---|---|---|---|
| | | N[a] | Correct/ total[e] | %[f] | N[c] | Correct/total[g] | %[h] | p-value |
| TOTAL | | 149 | 601/1043 | 57.62 | 469 | 2422/3283 | 73,77 | **<0.001** |
| Gender | Male | 109 | 361/763 | 47.31 | 220 | 1210/1540 | 78.57 | **<0.001** |
| | Female | 40 | 166/280 | 59.29 | 249 | 1388/1743 | 79.63 | **<0.001** |
| Marital status | Married | 70 | 239/490 | 48.78 | 152 | 803/1064 | 75.47 | **<0.001** |
| | Single | 79 | 288/553 | 52.08 | 317 | 1795/2219 | 80.89 | **<0.001** |

(*Continued*)

**Table 2** (Continued).

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Educational status | Primary School | 37 | 102/259 | 39.38 | 40 | 158/280 | 56.43 | **<0.001** |
| | Secondary School | 58 | 236/406 | 58.13 | 123 | 622/861 | 72.24 | **<0.001** |
| | University Degree | 43 | 157/301 | 52.16 | 262 | 1561/1834 | 85.11 | **<0.001** |
| | Master's Degree | 11 | 32/77 | 41.56 | 44 | 257/308 | 83.44 | **<0.001** |

**Notes**: [a]In the year 2017, the number of individuals who responded to the inquiry. [b]In the year 2017, the number of individuals who provided an accurate response to the posed question (expressed as a percentage). [c]In the year 2021, the number of individuals who responded to the inquiry. [d]In the year 2021, the number of individuals who provided an accurate response to the posed question (expressed as a percentage). [e]In 2017, the number of correct answers to total questions/total number of questions. [f]In the year 2017, the percentage of correct answers to all questions. [g]In 2021, the number of correct answers to total questions/total number of questions. [h]In the year 2021, the percentage of correct answers to all questions. In order to determine statistical significance, a P value of less than 0.05 was set. For the sake of clarity, values that were considered statistically significant have been marked in bold font.

A comprehensive analysis of the responses to all questions revealed a notable disparity in the accuracy of answers between genders and marital statuses. Specifically, the findings indicated that women exhibited a markedly higher rate of correct answers than men, and singles demonstrated a higher accuracy than married individuals, in both PrP and PP periods. The proportion of participants who provided correct responses was higher among high school graduates in the PrP period and among university graduates in the PP period. A comparison of the answers provided to all questions revealed that the correct answer rates were 57.62 and 73.77%, in PrP and PP periods, respectively. The aforementioned rate was observed to be 59.29 and 79.63% for women, 47.31 and 78.57% for men, 48.78 and 75.47% for married individuals, 52.08 and 80.89% for singles. The correct answer rates for those with a primary school education were 39.38 and 56.43%, 58.13 and 72.24% for those with a high school education, 52.16 and 85.11% for those with a university education, and 41.56 and 83.44% for those with a master's degree or higher, in PrP and PP periods, respectively. The observed increase in knowledge levels is more significant in men than in women and in single individuals than in married individuals. With regard to educational status, the most significant increase was observed among those with a master's degree or higher. (Table 2).

## Discussion

Over the past two and a half years, in addition to the ongoing humanitarian crises and economic difficulties, the HIV pandemic and the Coronavirus Disease 2019 (Covid-19) pandemic have resulted in significant disruptions to health and education services. As a result, it has become increasingly challenging to attain the anticipated objectives for HIV on a global scale.[1,7] It is regrettable that the pandemic's proclivity for social isolation has resulted in the suspension of HIV prevention campaigns. Consequently, the global spread of the novel coronavirus is believed to have negatively affected numerous research initiatives, including the 90–90-90 target set forth by the United Nations Programme on HIV/AIDS (UNAIDS).[8]

The most effective method for combating the spread of HIV is through prevention. In order to eradicate HIV, it is essential that the public is equipped with an understanding of the transmission techniques, preventive strategies, and relevant, fact-based information pertaining to this disease.[2]

A greater understanding of HIV/AIDS can facilitate more positive attitudes towards those living with the virus.[9] Greater knowledge and more positive attitudes towards HIV-positive individuals may provide hope for those who are unable to access diagnosis and treatment due to fear of stigma, enabling them to access vital treatment.[10] As the level of education increases, so too does the understanding of HIV/AIDS.

It has been determined that individuals residing in rural areas and those who do not attend school have low levels of knowledge about HIV/AIDS. The results of our study also demonstrated that HIV knowledge increases in direct proportion to the level of education.[11–14] As with the findings of previous studies, it was observed that the increase in knowledge level occurred at the same rate as the increase in education status. The greatest difference in the increase in knowledge level in PP was observed among those with a master's degree or higher.

Qashqari et al employed a survey to assess the knowledge of 22 participants regarding HIV/AIDS in PrP period.[10] The mean score for responses to questions about HIV/AIDS knowledge level was 55.7 ± 3.6%, while the mean score for responses to questions about HIV/AIDS transmission routes was 84.2 ± 15.8%. In contrast to our own findings, it was observed that the male gender exhibited higher levels of knowledge In our study, we observed that the average response to questions about HIV/AIDS knowledge was higher in PP (73.77%) compared to PrP (57.62%). It was evident that the knowledge of the society about HIV/AIDS increased in PP, and the level of knowledge was consistent with literature data.[10]

In recent years, there has been a notable increase in the importance placed on women's awareness of HIV/AIDS, particularly in light of the rising prevalence of heterosexual transmission.[15] Our research revealed a number of studies that sought to assess women's global knowledge of HIV/AIDS. It has been documented that there has been an increase in awareness of HIV/AIDS identification and prevention over the past two decades. However, it is notable that men tend to possess more knowledge in this area than women.[16] A study examining the change in women's knowledge about HIV/AIDS between 2012 and 2017 found that knowledge about the disease only increased from 21% to 33%.[17] As evidenced by data from an additional study, 71.1% of women hold erroneous beliefs regarding the modes of transmission of HIV.[18] It has been demonstrated that the majority of women are unaware that HIV can be transmitted from mother to child during childbirth.[19] In our survey, we posed the question, "How is HIV not transmitted?" In response to this question, 22 out of 249 women (8.8%) in PrP and 2 out of 149 women (1.3%) in PP indicated that the HIV virus is not transmitted from mother to child at the time of birth. Our findings contrasts with the results of previous studies, which have shown that women tend to have less accurate knowledge about HIV/AIDS than men.

In another study that examined the correlation between marital status and HIV knowledge, it was observed that individuals who were married demonstrated a higher level of knowledge compared to those who were single (OR 3.8, 95% CI 2.0–7.4).[20] In contrast with the findings of previous studies, our results indicate that single individuals possess greater knowledge regarding the definition of HIV/AIDS, its transmission routes, and its symptoms, compared to their married counterparts. However, married individuals demonstrated superior accuracy in responding to questions pertaining to diagnosis and treatment.

Another factor contributing to the rise in HIV incidence during the pandemic is the increase in sexual desire and frequency of sexual intercourse due to the confinement at home and the stress experienced. Studies have demonstrated that while a reduction in the number of sexual partners was observed during the initial phase of the pandemic, the number of sexual partners remained unchanged and even increased during the subsequent periods.[21–23]

A comparison of the survey responses from the PrP and PP periods revealed an increase in knowledge levels across all groups during the PP period. This increase was more pronounced in men than in women and in single individuals than in married individuals.

Although studies have demonstrated that sexual desire actually declines during periods of elevated stress, the observed surge in HIV incidence during the pandemic has been addressed in a manner that differs from this established phenomenon. Although the frequency of sexual intercourse did not increase during the initial stages of the pandemic due to the stress associated with contracting the Covid-19 and the confinement of individuals to their homes, the subsequent rise in the frequency of sexual intercourse and the number of sexual partners subsequently exposed individuals to a greater risk of sexually transmitted diseases. In contrast to circumstances that induce stress in society, such as natural disasters, the fact that individuals' living spaces were not lost during the pandemic did not deter the frequency of sexual intercourse.[21–23] The implementation of quarantines during the pandemic resulted in the isolation of individuals from various social activities, including sports, cultural events, and social gatherings. With the closure of educational institutions, individuals who were unable to engage in social interaction were unable to identify potential sexual partners, leading to an increase in the utilisation of dating applications.[24] In consideration of the sociocultural context of our country and the greater sexual freedom typically afforded to the male gender and singles, these groups are at greater risk. The meta-analyses suggest that men may be at a higher risk due to a greater decrease in women's sexual desire during the pandemic compared to men.[25,26] It is plausible that the marked increase in knowledge among singles and men in the risk group may be attributed to the enhanced opportunities for research and investigation during the period of social isolation.

The observation that the knowledge level has risen to a greater extent among those with a higher level of education is potentially indicative of a greater propensity for reading and a heightened curiosity for research, which may be consistent with the aforementioned hypothesis.

## Limitations

As our study was conducted in an urban setting with a limited sample size, it is not possible to generalize the findings with regard to the impact of the pandemic. The absence of a question in the questionnaire on the effect of the pandemic on participants meant that we were unable to address this issue. Our study measures the level of HIV knowledge before and after the pandemic and the results of the study should not be interpreted as a direct effect of the pandemic on the level of HIV knowledge. Consequently, our study is only descriptive in nature.

## Conclusion

The study showed that a high percentage of participants during the PrP period in Turkey had good knowledge about HIV/AIDS transmission routes, symptoms and diagnosis. However, their knowledge about HIV/AIDS definitions, prevention methods and treatment was low. In comparison to the PrP period, the PP period evidenced an enhancement in the level of knowledge exhibited by each group. The observed increase was statistically significant when the total number of questions was analyzed. Upon analysis of the variables gender, marital status, and educational status of the participants, it was observed that there was an increase in males compared to females, in singles compared to those who are married, and in those with a master's degree or higher education compared to the other groups.

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## Disclosure

The authors report no conflicts of interest in this work.

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