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Research Article

Attitudes toward vaccines and their relationship with health literacy among İnönü University students

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Abstract

Objective: This study aimed to determine attitudes toward vaccination among university students and to examine the relationship between these attitudes and health literacy levels.

Method: The population of this cross-sectional study consisted of students at İnönü University. The minimum sample size was calculated as 295 using PASS 11 software. Data were collected between November and December 2017 using faculty-based cluster sampling and a 47-item questionnaire. The questionnaire included items on sociodemographic characteristics, attitudes toward vaccination, and the Turkish Health Literacy Scale (THLS-32). Data were analyzed statistically, and $p<0.05$ was considered significant.

Results: A total of 335 students participated in the study (55.1% female; mean age: 21.80±3.06 years). Among the participants, 75.1% considered vaccines effective, and 67.5% identified health authorities as their primary source of vaccine-related information. The mean THLS-32 score was 32.60±9.61. Health literacy level was significantly associated with faculty group ($p=0.001$) and number of siblings ($p=0.037$), whereas no significant association was observed with gender ($p=0.127$) or income level ($p=0.837$). Health literacy was also significantly associated with several vaccine-related attitudes and beliefs, including media influence, tetanus vaccination, information sources, and thiomersal-related concerns (all $p<0.05$).

Conclusion: Although attitudes toward vaccination among university students were generally positive, media-related information had the potential to influence vaccination attitudes. Higher health literacy was associated with greater resistance to inaccurate information. Health literacy interventions may contribute to more favorable attitudes toward vaccination.

Keywords: Health literacy; universities; vaccination.

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INTRODUCTION

Immunization is defined by the World Health Organization as the process by which an individual becomes resistant to an infectious disease through vaccination or other means; vaccines protect individuals against subsequent infections by stimulating the body's own immune system (1). Vaccines represent one of the greatest achievements of biomedical science and are considered the most effective public health intervention of the twentieth century (2). Through vaccination programs, the burden of infectious diseases has been dramatically reduced, and the fear of losing children to infectious diseases has largely disappeared in developed countries (1). In the history of public health, the only intervention comparable to vaccination in terms of its impact on human health is access to safe drinking water (3).

Despite the rarity of vaccine-preventable diseases in developed countries, anti-vaccination movements and vaccine hesitancy have emerged (4). Although independent expert evaluations and the World Health Organization have repeatedly demonstrated that vaccines possess a substantially higher safety profile than therapeutic drugs, public attention has increasingly focused on vaccine safety rather than vaccine effectiveness (5). While vaccines may rarely be associated with serious acute or chronic adverse effects, current safety records strongly support that vaccination programs are both safe and effective for the vast majority of the pediatric population (6). Today, vaccines are regarded as highly safe interventions, whereas a considerable proportion of vaccine-related fears circulating in the public sphere are based on unsubstantiated claims (7).

Vaccine hesitancy has emerged as a major public health concern because it may reduce vaccination uptake and compromise the success of immunization programs worldwide. In recognition of its growing impact, the World Health Organization (WHO) listed vaccine hesitancy among the ten leading threats to global health in 2019 (8). The WHO Strategic Advisory Group of Experts (SAGE) on Immunization describes vaccine hesitancy as a context-dependent phenomenon that differs according to time, place, and vaccine type and is shaped by factors related to confidence, complacency, and convenience (9).

Health literacy is defined as "the capacity of individuals to obtain, process, and understand basic health information and services needed to make appropriate health decisions" and plays a crucial role in health promotion, disease prevention, early screening, clinical decision-making, and health policy development (10).

Within this context, the present study aimed to determine attitudes toward vaccines among students at İnönü University and to evaluate the relationship between these attitudes and health literacy levels.

METHOD

Study design and sample

This cross-sectional study was conducted among students enrolled at İnönü University. Data were collected between November and December 2017. The sample size was calculated using PASS (Power Analysis and Sample Size) version 11 software based on parameters obtained from a previously published study entitled "Healthy Lifestyle Behaviors and Associated Factors Among Students of Fırat

University Elazığ School of Health." The minimum required sample size was determined to be 295 participants to achieve 80% statistical power with a 95% confidence level. A cluster sampling method based on faculty groups was employed to create clusters of equal or nearly equal size. At the completion of the study, a total of 335 participants had been recruited, thereby exceeding the minimum required sample size.

Data collection instruments

Data were collected using a 47-item questionnaire consisting of three sections. The first section included sociodemographic characteristics (sex, age, faculty, monthly family income, and number of siblings). The second section assessed attitudes toward vaccines. The third section evaluated participants' health literacy levels using the Turkish Health Literacy Scale (THLS-32).

The THLS-32 is the Turkish adaptation of the European Health Literacy Survey Questionnaire developed by the European Health Literacy Survey Consortium (HLS-EU Consortium, 2012). The scale was designed to assess health literacy among individuals aged 15 years and older and is based on a 12-dimensional conceptual framework comprising three health domains (health care, disease prevention, and health promotion) and four information-processing competencies (accessing, understanding, appraising, and applying health information).

Each of the 32 items is rated on a four-point Likert scale ranging from "very difficult" (1) to "very easy" (4), while the response "I do not know" is coded as 5. For scoring purposes, responses are reverse-coded from 1–4 to 4–1. To facilitate interpretation, the overall score is standardized to a scale ranging from 0 to 50 using the following formula: Index = (Mean − 1) × (50 / 3)

A score of 0 represents the lowest level of health literacy, whereas a score of 50 represents the highest level. Total scores are categorized into four levels: inadequate (0–25), problematic/limited (>25–33), adequate (>33–42), and excellent (>42–50) health literacy. The validity and reliability study of the Turkish version was conducted by Okyay and Abacıgil in May 2016, and the internal consistency coefficient was reported as 0.982 (11).

Statistical analysis

Statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) version 17. Statistical significance was accepted at $p<0.05$. The normality of data distribution was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests.

For normally distributed continuous variables, comparisons between two independent groups were performed using Student's t-test, whereas comparisons among more than two groups were conducted using one-way analysis of variance (ANOVA). For non-normally distributed continuous variables, the Mann–Whitney U test and Kruskal–Wallis test were used. Associations between categorical variables were evaluated using Pearson's chi-square test. When cells with expected frequencies below five exceeded 25% of all cells, the Monte Carlo corrected chi-square test was applied.

Missing data were handled using an available-case analysis. Participants with missing responses for a variable were excluded only from analyses involving that particular variable. Therefore, the number of participants included in individual analyses varied slightly according to data completeness. No missing-value imputation was performed.

Ethical approval

Ethical approval was obtained from the Ethics Committee of İnönü University (Decision No 2017/25-11) before the initiation of the study. Additional administrative approval was obtained from the Rectorate of İnönü University. Verbal informed consent was obtained from all participants prior to questionnaire administration. Participants were informed that their responses would remain confidential and that participation was entirely voluntary.

RESULTS

A total of 335 students were included in the study. Because of item-level missing responses, the number of participants included in individual analyses varied according to the variables examined. Of the participants, 184 (55.1%) were female and 150 (44.9%) were male, with a mean age of 21.80 ± 3.06 years. Monthly family income was at or below the hunger threshold in 85 participants (25.6%), between the hunger and poverty thresholds in 172 participants (51.8%), and at or above the poverty threshold in 75 participants (22.6%). Regarding the number of siblings, most participants reported having 1–3 siblings (n=165, 49.5%) or 4–6 siblings (n=120, 36.0%), whereas 20 participants (6.0%) had no siblings and 28 (8.4%) had seven or more siblings. The distribution of participants according to faculty and other sociodemographic characteristics is presented in **Table 1.**

Table 1. Sociodemographic characteristics of the study population (n = 335)

Variable	n	%
Sex		
Male	150	44.9
Female	184	55.1
Faculty groups		
Social Sciences	137	40.9
Natural Sciences	77	23.0
Health Sciences	121	36.1
Income distribution (TL)		
At or below the **hunger** threshold*	85	25.6
Between the hunger and poverty thresholds*	172	51.8
At or above the **poverty** threshold*	75	22.6
Number of siblings		
None	20	6.0
1–3 siblings	165	49.5
4–6 siblings	120	36.0
≥7 siblings	28	8.4
Age, mean ± SD (years)	21.80 ± 3.06	

Abbreviations: n, number of participants; SD, standard deviation; %, percentage.
Note: Income groups were classified according to the nationally defined hunger and poverty threshold criteria in Türkiye during the study period.

When participants were asked to identify vaccines routinely administered within the national immunization program in Türkiye, the highest recognition rates were observed for the measles–mumps–rubella (MMR) vaccine (81.5%) and varicella vaccine (73.4%). More than half of the participants were also aware of the hepatitis B vaccine (69.9%) and tetanus vaccine (64.2%). In contrast, awareness of the human papilloma virus (HPV) vaccine (5.7%), rotavirus vaccine (14.0%), conjugate pneumococcal vaccine (18.5%), and influenza vaccine (31.3%) was relatively low.

In response to the question, "Do you think vaccines are effective?", 251 participants (75.1%) reported that vaccines were effective, 69 (20.7%) considered them partially effective, four (1.2%) considered them ineffective, and ten (3.0%) stated that they had no opinion. Regarding the question, "Do you think vaccines have side effects?", 218 participants (65.1%) answered "yes," 38 (11.3%) answered "no," and 79 (23.6%) reported having no opinion.

Table 2. Distribution of health literacy categories according to sex

Sex	Inadequate n	%	Problematic/ Limited n	%	Adequate n	%	Excellent n	%	Total n	%
Male	35	10.6	44	13.3	45	13.6	24	7.3	148	44.8
Female	32	9.7	59	17.9	56	17.0	35	10.6	182	55.2
Total	67	20.3	103	31.2	101	30.6	59	17.9	330	100.0

Pearson's Chi-square test was used ($\chi^2 = 2.087$, p = 0.555).

Abbreviations: n, number of participants; %, percentage.

For the question concerning perceived vaccine side effects, fever (66.3%), nausea (54.9%), headache (45.7%), and vomiting (41.2%) were the most frequently reported responses. In contrast, autism (3.9%), multiple sclerosis (6.3%), and subacute sclerosing panencephalitis (7.8%) were reported at considerably lower frequencies.

Health authorities were identified as the primary source of vaccine-related information by 67.5% of participants, followed by the media (16.7%), people in their social environment (13.7%), and politicians (1.5%). Furthermore, 156 participants (46.6%) reported that media coverage regarding vaccine side effects could influence their opinions about vaccines. When asked whether they would receive the annual influenza vaccine if recommended by health authorities, 118 participants (35.2%) responded affirmatively, whereas 181 (54.0%) stated that they would not receive the vaccine.

The mean THLS-32 score was 32.60 ± 9.61. Based on the predefined categories, 67 participants (20.3%) were classified as having inadequate health literacy, 103 (31.2%) as limited health literacy, 101 (30.6%) as adequate health literacy, and 59 (17.9%) as excellent health literacy. The distribution of health literacy categories according to sex is presented in **Table 2**. No statistically significant difference was observed between males and females (χ^2=2.087, p=0.555).

The distribution of THLS-32 scores according to descriptive characteristics is summarized in **Table 3**. Although the mean score was higher among females (33.40 ± 9.22) than males (31.78 ± 10.12), the difference was not statistically significant (p=0.127). According to faculty

Table 3. Distribution of THLS-32 mean scores according to descriptive variables

Variable	n	Mean ± SD	p-value
Health literacy (overall)	331	32.60 ± 9.61	—
Sex			
Male	148	31.78 ± 10.12	0.127
Female	178	33.40 ± 9.22	
Faculty groups			
Social Sciences	133	30.45 ± 9.56	0.001
Natural Sciences	73	31.47 ± 9.98	
Health Sciences	120	35.85 ± 8.76	
Income distribution (TL)			
At or below the hunger threshold*	85	32.45 ± 9.77	0.837
Between the hunger and poverty thresholds*	167	32.99 ± 9.86	
At or above the poverty threshold*	74	32.17 ± 9.16	
Number of siblings			
None	20	34.34 ± 13.80	0.037
1–3 siblings	163	33.77 ± 9.46	
4–6 siblings	116	31.74 ± 8.68	
≥7 siblings	27	28.68 ± 10.27	

Abbreviations: n, number of participants; SD, standard deviation.
Note: Independent samples t-test was used for comparisons between two groups, and one-way analysis of variance (ANOVA) was used for comparisons among more than two groups. $p < 0.05$ was considered statistically significant.
*Income groups were classified according to the nationally defined hunger and poverty threshold criteria in Türkiye during the study period.

Table 4. Distribution of responses to the question "Would you receive a tetanus vaccine if you had an actively bleeding wound?" according to health literacy categories

Response	Inadequate n	%	Problematic/ Limited n	%	Adequate n	%	Excellent n	%	Total n	%
Yes	22	6.7	40	12.1	60	18.2	39	11.8	161	48.8
No	20	6.1	43	13.0	29	8.8	16	4.8	108	32.7
No opinion	25	7.6	20	6.1	12	3.6	4	1.2	61	18.5
Total	67	20.3	103	31.2	101	30.6	59	17.9	330	100.0

Pearson's Chi-square test was used ($\chi^2 = 34.994$, p = 0.001). Abbreviations: n, number of participants; %, percentage.

groups, health sciences students demonstrated significantly higher mean scores (35.85 ± 8.76) than students from the natural sciences (31.47 ± 9.98) and social sciences (30.45 ± 9.56) faculties (p=0.001). Evaluation according to the number of siblings revealed mean scores of 34.34 ± 13.80 among participants without siblings, 33.77 ± 9.46 among those with 1–3 siblings, 31.74 ± 8.68 among those with 4–6 siblings, and 28.68 ± 10.27 among those with seven or more siblings. This difference was statistically significant (p=0.037). No significant differences in mean scores were observed across monthly income categories (p=0.837).

A statistically significant association was found between health literacy level and responses to the question, "Would you receive a tetanus vaccine if you had an actively bleeding wound?" **(Table 4; χ^2=34.994, p=0.001)**. In contrast, no significant association was observed between health literacy categories and responses to the question regarding whether vaccines have side effects (p=0.221).

A significant relationship was identified between health literacy levels and responses to the question, "Could media reports about the side effects of a vaccine change your opinion about vaccines?" **(Table 5; χ^2=18.140, p=0.006).** Similarly, a statistically significant association was observed between health literacy levels and responses to the question, "What is the primary source that shapes your opinion about vaccines?" **(Table 6; χ^2=12.807, p=0.046).** However, no significant association was found between health literacy levels and responses to the question, "Would you receive the annual influenza vaccine even if it were recommended by health authorities?" (p=0.808).

Responses to the question, "Would the presence of trace amounts of thiomersal (a mercury-containing compound) in vaccines prevent you

Table 5. Distribution of responses to the question "Could a media report about the side effects of a vaccine change your opinion about vaccination?" according to health literacy categories

Response	Inadequate n	%	Problematic/ Limited n	%	Adequate n	%	Excellent n	%	Total n	%
Yes	33	10.0	53	16.0	47	14.2	22	6.6	155	46.8
No	17	5.1	24	7.3	44	13.3	23	6.9	108	32.6
No opinion	17	5.1	27	8.2	10	3.0	14	4.2	68	20.5
Total	**67**	**20.2**	**104**	**31.4**	**101**	**30.5**	**59**	**17.8**	**331**	**100.0**

Pearson's Chi-square test was used ($\chi^2 = 18.140$, p = 0.006).

Abbreviations: n, number of participants; %, percentage.

Table 6. Distribution of responses to the question "What is the primary source that shapes your opinion about vaccines?" according to health literacy categories

Source	Inadequate n	%	Problematic/ Limited n	%	Adequate n	%	Excellent n	%	Total n	%
Media / politicians	14	4.2	14	4.2	23	7.0	8	2.4	59	17.9
Health authorities	37	11.2	76	23.0	66	20.0	47	14.2	226	68.5
People around them	15	4.5	14	4.2	12	3.6	4	1.2	45	13.6
Total	66	20.0	104	31.5	101	30.6	59	17.9	330	100.0

Pearson's Chi-square test was used ($\chi^2 = 12.807$, $p = 0.046$).

Abbreviations: n, number of participants; %, percentage.

Table 7. Distribution of responses to the question "Would the presence of trace amounts of thiomersal (a mercury-containing compound) in vaccines prevent you from being vaccinated?" according to health literacy categories

Thiomersal	Inadequate n	%	Problematic/ Limited n	%	Adequate n	%	Excellent n	%	Total n	%
No, it would not prevent vaccination	9	2.7	20	6.0	35	10.6	18	5.4	82	24.8
Yes, it would prevent vaccination	30	9.1	52	15.7	31	9.4	21	6.3	134	40.5
No opinion	28	8.5	32	9.7	35	10.6	20	6.0	115	34.7
Total	67	20.2	104	31.4	101	30.5	59	17.8	331	100.0

Pearson's Chi-square test was used ($\chi^2 = 16.345$, $p = 0.012$).

Abbreviations: n, number of participants; %, percentage

from being vaccinated?" differed significantly according to health literacy level (**Table 7; χ^2=16.345, p=0.012**).

DISCUSSION

The findings of the present study indicate that attitudes toward vaccines among university students were generally positive. However, media-derived information appeared to have a substantial potential to influence vaccine-related attitudes, whereas higher levels of health literacy seemed to exert a protective effect against inaccurate and biased information.

A similar study conducted in Poland involving 1,320 university students reported fever (38%), redness or swelling (28%), and allergic reactions (18%) as the most frequently recognized vaccine-related adverse effects (12). Consistent with these findings, fever was identified as the most widely recognized vaccine side effect in the present study. In contrast, awareness of chronic complications allegedly associated with vaccination was considerably lower. This finding may reflect a lack of public knowledge regarding chronic vaccine-related complications. Such knowledge gaps may create a context in which individuals become more susceptible to biased information, thereby influencing attitudes toward vaccination.

Several studies examining the relationship between sex and health literacy have reported significantly higher health literacy levels among

women. Evidence supporting this observation has been reported among patients with diabetes in a study published in JAMA (13), among older adults in China (14), and among adolescent and young adult populations (15,16). Although female participants in the present study demonstrated higher mean THLS-32 scores than males, the difference did not reach statistical significance (p=0.127). Nevertheless, this finding appears to be directionally consistent with the existing literature and may represent a trend that could achieve statistical significance in studies with larger sample sizes. Therefore, male university students may represent a priority target group for interventions aimed at improving health literacy.

Previous studies conducted in the United States (17) and among older adults in China (18) have reported significant positive associations between monthly income and health literacy. No such association was observed in the present study (p=0.837). This discrepancy may be attributable to the relatively homogeneous nature of the study population, consisting exclusively of university students at similar educational stages. In such a population, health-related interests and competencies may be less influenced by family income. Notably, the significant differences observed between faculty groups (p=0.001) are consistent with findings from a Chinese study comparing engineering students with medical and health sciences students (19), supporting the notion that health sciences students possess inherently higher levels of health literacy. This finding suggests that interventions designed to improve health literacy should particularly target students enrolled in non-health-related disciplines.

The observed increase in health literacy scores with decreasing numbers of siblings (p=0.037) is consistent with findings from a meta-analysis reporting an inverse relationship between family size and health literacy (20). One possible explanation is that smaller family size may be associated with higher parental educational attainment. Since higher parental education levels have been linked to lower fertility rates, this indirect pathway may help explain the relationship between sibling number and health literacy.

A previous study examining sources of information used in vaccine-related decision-making reported healthcare professionals (81.7%) as the most influential source, followed by family members (47.3%), other families (23.0%), friends (22.5%), and the internet (9.9%) (21). In the present study, health authorities remained the predominant source of information (67.5%), although the media also occupied a relatively influential position (16.7%). This difference may be attributable to the younger age profile of the study population and their greater exposure to social media. More importantly, the preferred source of vaccine-related information was significantly associated with health literacy categories (p=0.046). The increasing reliance on health authorities with higher levels of health literacy suggests that health literacy influences not only the interpretation of information but also the selection of information sources. Similarly, Ashkenazi et al. reported that parents who relied primarily on healthcare professionals demonstrated greater vaccine knowledge and lower vaccine hesitancy than those obtaining information from informal or internet-based sources, emphasizing the importance of reliable information sources in vaccination decision-making (22).

Regarding the influence of media on vaccine attitudes, a review conducted in the United States reported that approximately 11% of local evening news coverage consisted of health-related news, much of which was characterized as biased or lacking appropriate context, thereby undermining public confidence in vaccines (23). In the present study, 46.6% of participants reported that media reports concerning vaccine side effects could alter their opinions about vaccines, demonstrating a structural similarity to these international findings. Furthermore, a significant association was observed between responses to this question and health literacy levels (p=0.006). This finding suggests that interventions aimed at improving health literacy may enhance resilience against biased vaccine-related information disseminated through the media. This interpretation is supported by Wilson and Wiysonge, who highlighted the growing influence of social media in spreading vaccine misinformation and undermining public confidence in vaccination programmes (24).

To date, no large-scale case-control or cohort study has confirmed the hypothesized association between thiomersal and the development of autism spectrum disorder (ASD). Since 1999, the global use of thiomersal-containing vaccines has steadily declined, whereas the prevalence of ASD has continued to increase, providing evidence against a causal relationship. Moreover, no contraindications have been reported for the use of thiomersal-containing vaccines in infants, children, or non-pregnant women. The risks associated with vaccine-preventable diseases and their complications substantially outweigh any potential risks related to immunization with thiomersal-containing vaccines (25). Despite this substantial body of evidence, 40.3% of participants reported that the presence of thiomersal could influence their vaccination decisions, indicating that scientifically refuted claims continue to exert influence at the societal level. Furthermore, a significant association was identified between health literacy and attitudes toward thiomersal-containing vaccines (p=0.012). Higher health literacy levels were associated with more accurate knowledge regarding thiomersal and with less negative attitudes toward vaccination. This interpretation is supported by recent evidence indicating that higher levels of health literacy are associated with lower vaccine hesitancy, whereas limited health literacy may increase susceptibility to misinformation and negative attitudes toward vaccination (26). Therefore, initiatives aimed at improving health literacy may help counter vaccine-related misconceptions and should be encouraged.

Limitations of the study

Several limitations of the present study should be acknowledged. First, the study population consisted exclusively of university students, the majority of whom had not yet become parents. Therefore, further research focusing specifically on parents of reproductive age is warranted. The single-center and cross-sectional design may limit the generalizability of the findings. Data collection was completed in late 2017, prior to the COVID-19 pandemic. Given the profound impact of the pandemic on public perceptions of vaccination, attitudes toward vaccines may have changed substantially in subsequent years. Therefore, the findings should be interpreted within the temporal context in which the study was conducted.

CONCLUSION

The findings of the present study demonstrated variability in attitudes toward vaccination among university students. The majority of participants regarded vaccines as an effective preventive public health intervention. However, media content was also found to influence perceptions and attitudes toward vaccines. Therefore, increasing the visibility of scientific and trustworthy health authorities in the media and preventing the dissemination of inaccurate or incomplete information may be important for reducing the negative impact of misleading or biased publications on public opinion.

The results further indicated that higher levels of health literacy were associated with greater resistance to misinformation related to health. Individuals with higher health literacy appeared to be more capable of distinguishing reliable and accurate information from misleading or inaccurate claims. In this context, health literacy not only empowers individuals in making informed health decisions but also serves a protective role against anti-vaccination messages and misleading content. Expanding initiatives aimed at improving health literacy across the population may contribute to the development of more positive attitudes toward vaccination among future generations.

Despite exposure to negative information and publications, confidence in vaccines was found to remain generally high among participants. The implementation of comprehensive vaccine communication programs may therefore be essential for maintaining public trust in vaccination and preserving its societal value. Furthermore, scientific evidence should remain the primary basis for decision-making in matters directly affecting public health, such as vaccination, and policies should be aligned with recommendations from health authorities. Vaccination should be regarded as a fundamental public health practice and evaluated independently of political debates.

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Conflict of Interest

The authors declare that they have no conflict of interests regarding content of this article.

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Ethical Declaration

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Author Contributions

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